11 00 039 Check compression of all cylinders

WARNING

Hot surfaces.

Risk of burning!

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

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

Damage to the acoustic cover.

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

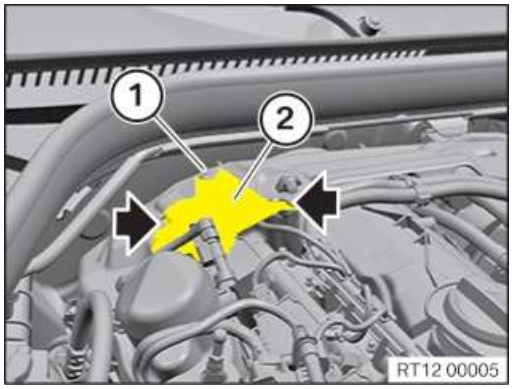
- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Release the acoustic cover (1) towards the top from the rubber mounts (marks).

2 – Release the service opening of the sound insulation at the top of the engine

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- Detach the service opening (2) in the marked areas (arrows) and twist it to the side at the pivot point (1).

3 – Remove all ignition coils.

NOTICE

The description is for one component only. The procedure is identical for all further components.

▸ **Removing the ignition coil**

WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

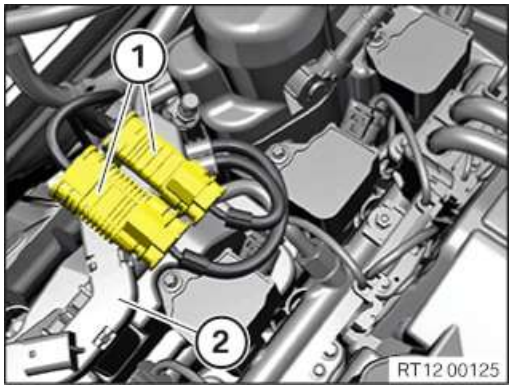
RISK OF DAMAGE

Electrostatic discharge.

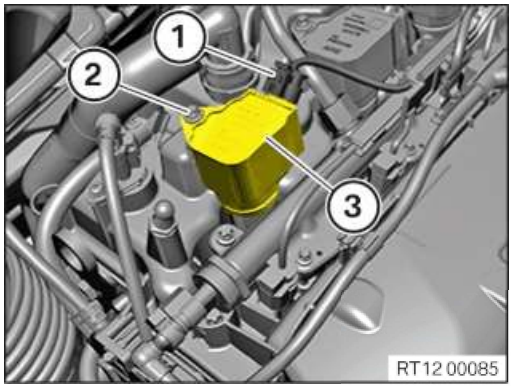
Damage to or destruction of electrical components.

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

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- Disconnect the connector (1) of the front oxygen sensor and the monitoring oxygen sensor from the cable channel (2) and set aside.



- Unlock plug connection (1) and disconnect.
- Loosen screw (2).
- Remove ignition coil (3).

4 – Removing all spark plugs

WARNING

Hot surfaces.

Risk of burning!

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

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.



- Wear safety goggles.

TECHNICAL INFORMATION

Clean spark plug slot with compressed air.

The spark plug shaft must be cleaned using compressed air after having removed the ignition coils and before removing the spark plugs. After having removed the spark plugs, once again check the sealing surface for contamination and (if necessary) clean using a moist cloth or clean using compressed air.

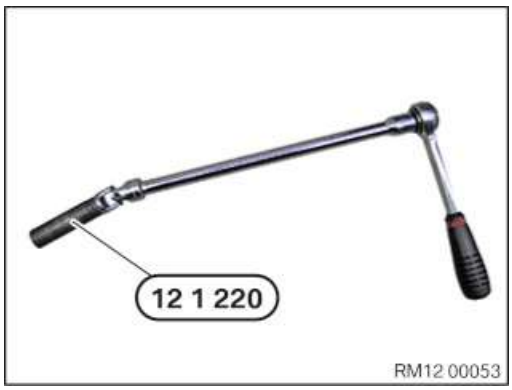
Deposits that are not removed according to instructions may enter the combustion chamber and lead to uncontrolled combustion. Remaining deposits on the spark plug sealing surfaces may lead to leaks and the spark plugs may come loose during engine operation.

Spark plug threads must not be greased or oiled. Insufficiently tightened spark plugs may cause leaks and the sparks plugs may come loose during engine operation.

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NOTICE

The description is for one component only. The procedure is identical for all further components.



TECHNICAL INFORMATION

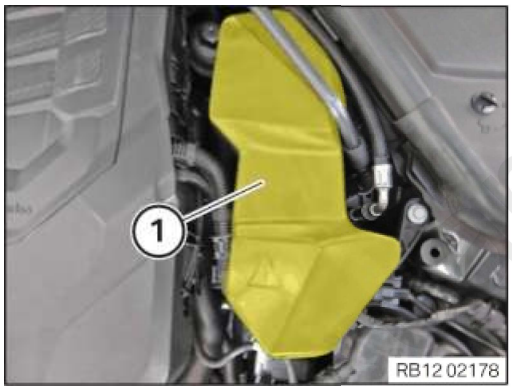
Exclusively swivelling extensions may be used for the reversible ratchet. Rigid mounting tool and variable plug connections with rigid option may not be used; there is a risk that the insulator breaks.

- Mount the special tool 0 495 560 (12 1 220) on a pivoting extension.



- Unscrew spark plugs with the special tool 0 495 560 (12 1 220) and a pivoting extension.

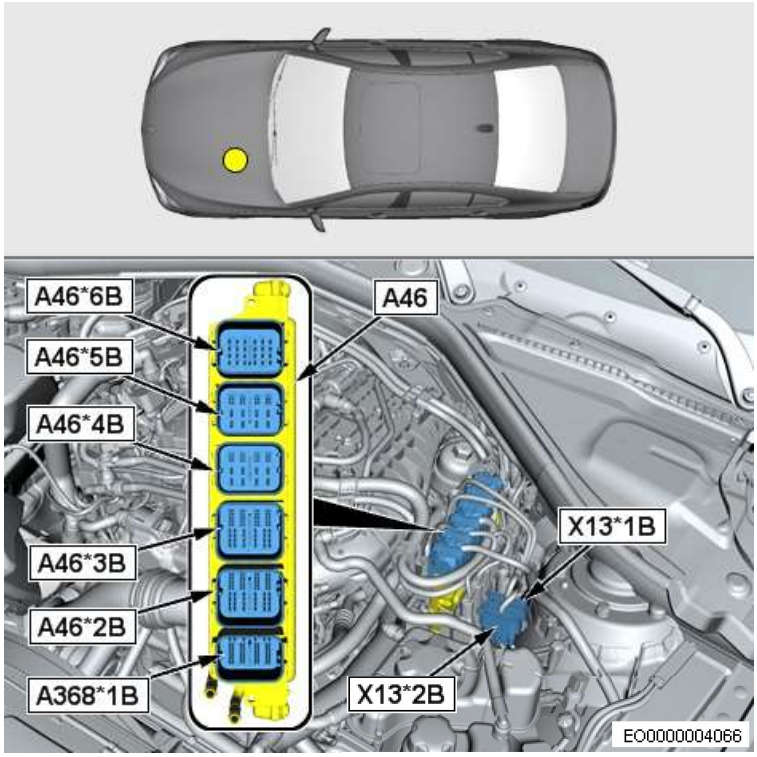
5 – Remove the cover of the DME control unit



- Pull the cover (1) toward the top and remove.

6 – Disconnect the connector A46*6B from the control unit

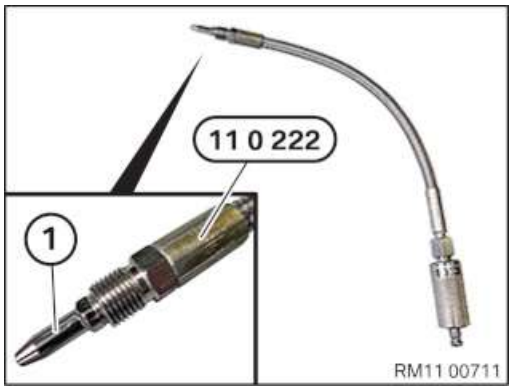
mdiagn.com



- Disconnect the plug connection A46*6B.

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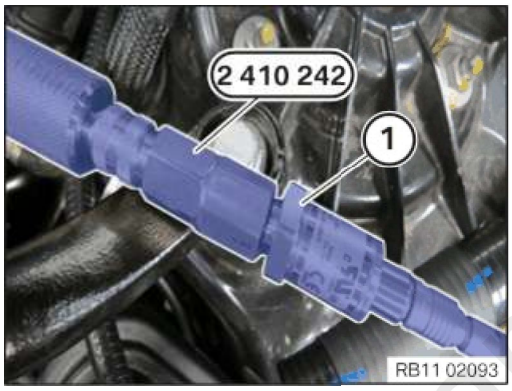
7 – Check compression of all cylinders



- Unscrew sensor (1) from special tool 0 490 615 (11 0 222).
- Check the secure fit of the valve below.



- Prepare special tool 0 490 615 (11 0 222) in conjunction with the special tool 0 496 306 (11 8 732) and 0 496 107 (11 8 730).
- Screw special tool 0 490 615 (11 0 222) with **10 Nm** on the special tool 0 496 107 (11 8 730).



- Connect special tool to special tool 0 490 613 (11 0 220) with the bayonet fitting.
- (1) Screw hand-tight into the special tool .
- (1) with the connect.



- Screw the special tool 0 490 615 (11 0 222) into the spark plug thread using the special tool 0 496 305 (11 8 731) by hand.

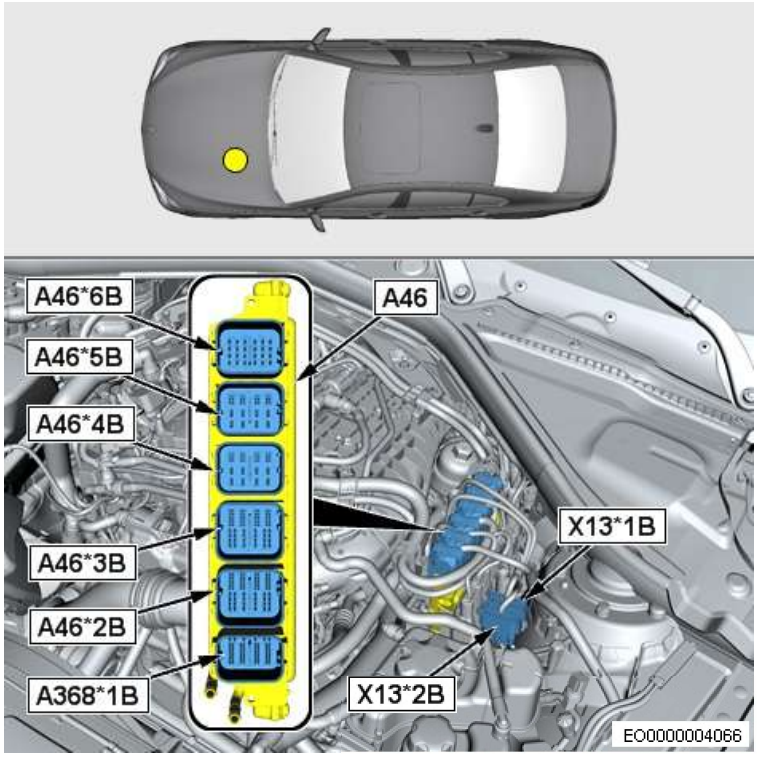


- Observe diagnosis instructions.

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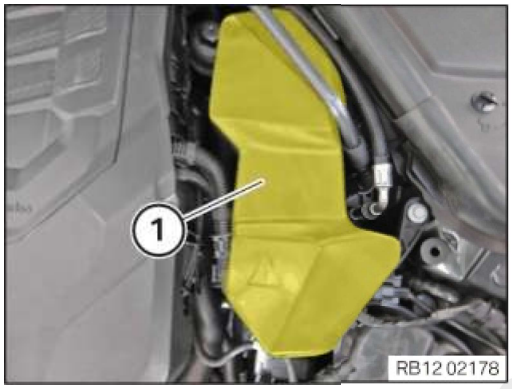
POSTPROCESSES

8 – Plug the connector A46*6B in at the control unit



- Connect and lock the connector A46*6B to the control unit.
- Make sure the connector engages audibly.

9 – Installing the cover of the DME control unit

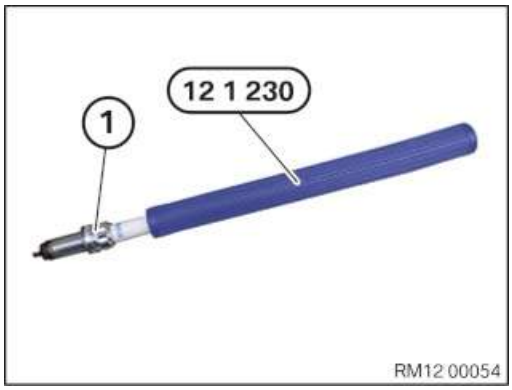


- Insert and install cover (1) into guides.

10 – Installing all spark plugs

NOTICE

The description is for one component only. The procedure is identical for all further components.



- Insert spark plug (1) into special tool 0 496 065 (12 1 230).

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TECHNICAL INFORMATION

Do not drop spark plug into spark plug shaft! This can lead to a reduction of the electrode gap and can thus impair smooth running of the engine, especially in idle position.

- Screw in the spark plugs in the engine with the special tool 0 496 065 (12 1 230) until hand-tight.



TECHNICAL INFORMATION

Exclusively swivelling extensions may be used for the reversible ratchet. Rigid mounting tool and variable plug connections with rigid option may not be used; there is a risk that the insulator breaks.

- Tighten the spark plugs with the torque wrench, the special tool 0 495 560 (12 1 220) and a swivelling extension.

Spark plugs

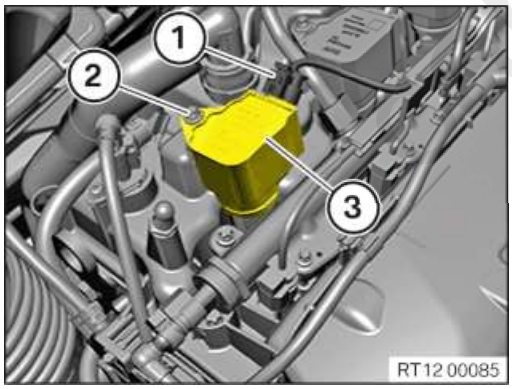
M12x1.25		Tightening torque	23 Nm

11 – Install all ignition coils

NOTICE

The description is for one component only. The procedure is identical for all further components.

▸ **Install ignition coil.**



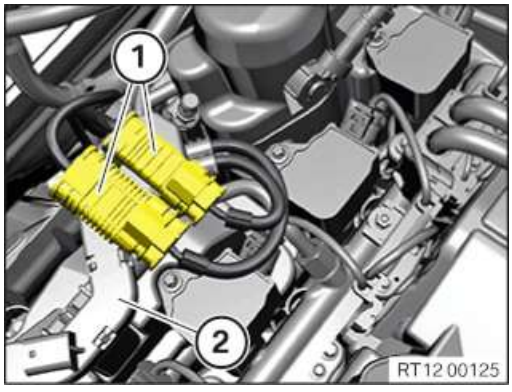
- Install ignition coil (3).
- Tighten down screw (2).

Ignition coil

Screw		Tightening torque	8 Nm

- Connect connectors (1) and lock.

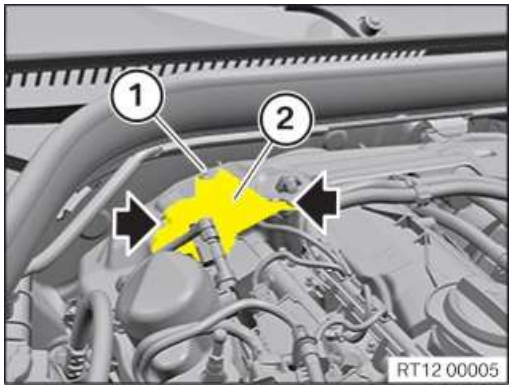
  The connector (1) must engage audibly.



- Connect the connector (1) of the front oxygen sensor and the monitoring oxygen sensor on the cable shaft (2).

12 – Mounting the service opening in sound insulation on top of engine

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- Turn the sound insulation (2) at the pivot point (1) to the installation position and guide it in where marked (arrows).

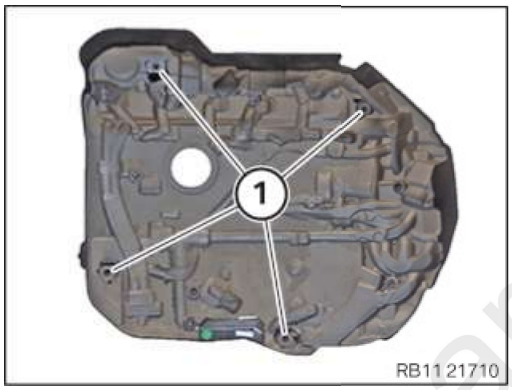
13 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

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

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



- Check the rubber mount (1) for correct fit in the acoustic cover.



- Install acoustic cover (1) and fix in the rubber mounts (marks).

Additional Information

Overview of Tightening Torques

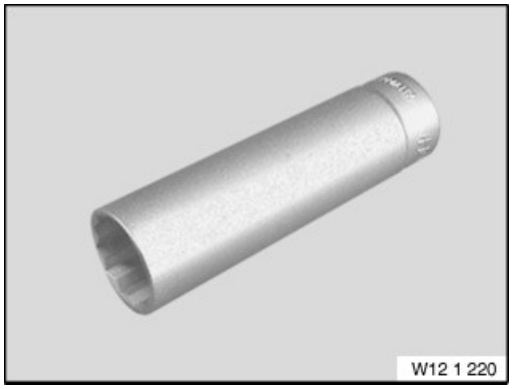
Spark plugs		Used in step	10
M12x1.25		Tightening torque	23 Nm

ardiagn.com

Ignition coil			Used in step 11
Screw		Tightening torque	8 Nm

Overview of Special Tools

0 495 560 (12 1 220) Socket



Common	Used in step 410
Usage	For removing and installing the spark plugs (WAF 14 bihexal).
Included in the tool or work	
Storage location	C18
Replaced by	
In connection with	
SI-Number	01 20 06 (299)

0 490 615 (11 0 222) Sensor



Common	Used in step 7
Usage	(Test probe) For recording compression testers 11 0 221 and 11 0 160 / engine: M21, M41, M47, M51, M57, M57T2
Included in the tool or work	0 490 613
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 306 (11 8 732) Ring

Common	Used in step 7
Usage	(Sealing ring) For secure connection of test probe 11 0 222 and adapter 11 8 730/731.
Included in the tool or work	0 496 107
Storage location	
Replaced by	
In connection with	
SI-Number	01 16 07 (392)

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0 496 107 (11 8 730) Adapter



Common Used in step 7

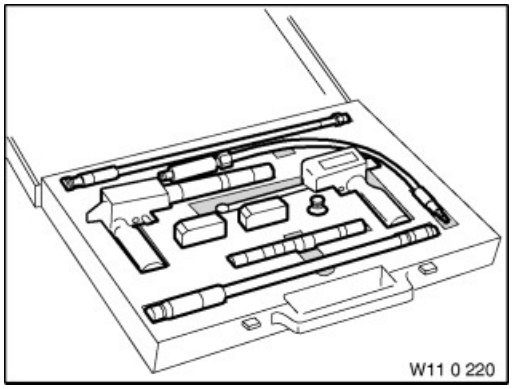
Usage	For compression testing.
Included in the tool or work	
Storage location	C21
Replaced by	
In connection with	
SI-Number	01 04 07 (352)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 305 (11 8 731)		**Adapter** Liquidation of existing inventory and then available only as a complete tool set 11 8 730 (83 30 0 496 107) – as of 19.04.12.	
2	0 496 306 (11 8 732)		**Ring** (Sealing ring) For secure connection of test probe 11 0 222 and adapter 11 8 730/731.	

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0 490 613 (11 0 220) Compression tester



Common Used in step 7

Usage	(compression pressure testing set) For all petrol and diesel engines.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 09 92 (558)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	0 493 634 (11 0 231)		**Case** With foam insert for recording compression tester	
16	0 495 279 (11 0 239)		**Adapter** M67, M67TU engine	
4	0 490 617 (11 0 224)		**Compression tester** (compression tester) For petrol engines.	
4	0 490 622 (11 0 229)		**Card** (Cards) 100 pieces For recording compression tester 11 0 224	
2	0 493 387 (11 0 236)		**Sensor** (Test probe) For recording compression tester 11 0 221 or DIS pressure sensor / engine: M47, M57, M57TU, M57T2	
2	0 494 517 (11 0 237)		**Adapter** Measuring "absolute compression" at all cylinders. Engine: W17	
4	0 490 614 (11 0 221)		**Compression tester** (compression tester) For diesel engines.	
4	0 490 615 (11 0 222)		**Sensor** (Test probe) For recording compression testers 11 0 221 and 11 0 160 / engine: M21, M41, M47, M51, M57, M57T2	
4	0 490 616 (11 0 223)		**Card** (Cards) 100 pieces For recording compression tester 11 0 221	
4	0 490 618 (11 0 225)		**Hose** (Extension hose) For rubber tapered section with fitting 11 0 228	
4	0 490 619 (11 0 226)		**Sensor** (Test probe) For recording compression testers 11 0 224 and 11 0 160 / engine: M10, M20, M30, M40, M42, M43, M44, M50, M52, M60, M62, M70, M73, N62, S50US, S52US, S62	
4	0 490 620 (11 0 227)	0 493 129	**Sensor** (Test probe) For recording compression testers 11 0 224 and 11 0 160 / engine: S14, S38, S50 - Replaced by 11 0 235 (0 493 129)	

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4	0 490 621 (11 0 228)		**Tapered section** (Rubber tapered section) For recording compression testers 11 0 224 and 11 0 160.	
4	0 490 625 (11 0 233)		**Valve** (non-return valve)	
4	0 490 626 (11 0 234)		**Filter** (filter) 3 x 3 mm	
9	0 493 129 (11 0 235)		**Sensor** (test probe, screw-in) For measuring "absolute compression" at all cylinders, engine: S14, S38, S50B30, S50B32, S50US, S52US, S54, S85	

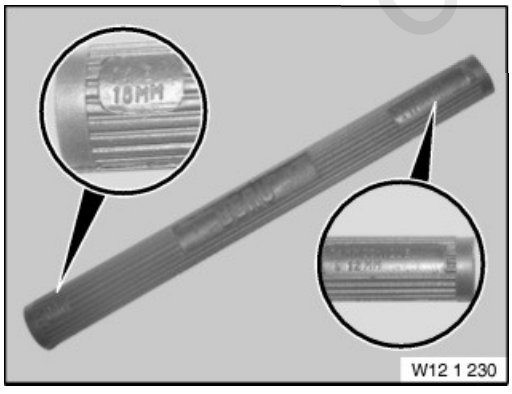
0 496 305 (11 8 731) Adapter



Common Used in step 7

Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 730 (83 30 0 496 107) – as of 19.04.12.
Included in the tool or work	0 496 107
Storage location	
Replaced by	
In connection with	
SI-Number	01 04 07 (352)

0 496 065 (12 1 230) Fitting aid



Common Used in step 10

Usage	Fitting aid for spark plug installation. Original BERU ZMH 001 rubber hose 0 890 00 001.
Included in the tool or work	
Storage location	individual
Replaced by	
In connection with	
SI-Number	01 04 07 (352)

Replacement tools:

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0 493 129 (11 0 235) Sensor



Common	Used in step 7
Usage	(Test probe, screw-in) For measuring "absolute compression" at all cylinders, engine: S14, S38, S50B30, S50B32, S50US, S52US, S54, S85
Included in the tool or work	0 490 613
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	3

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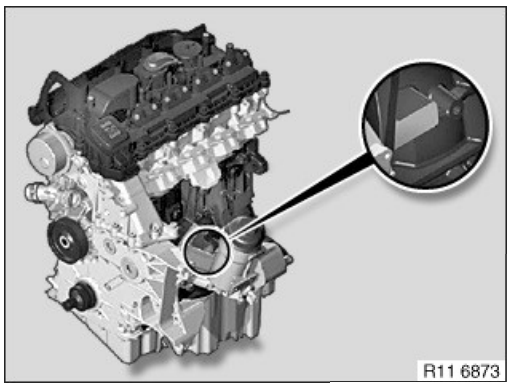
Engine identification

Engine number at the marked surface.

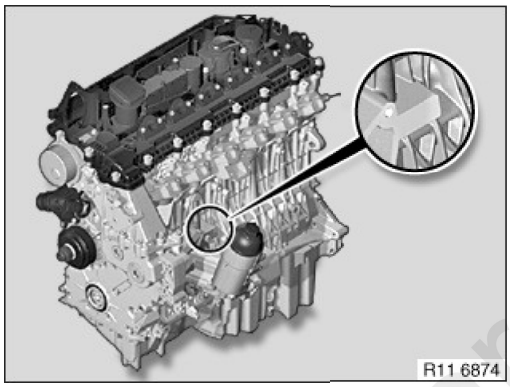
Replacement drives are already assigned a number containing the identification and engine number at the factory.

The old drive number must be imprinted for replacement crankcases.

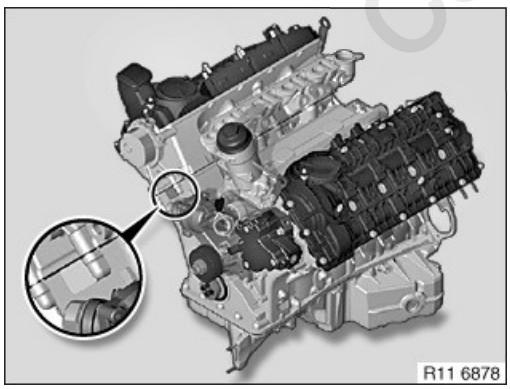
Magnesium crank cases feature a label, the engine number does not need to be embossed.



M47 / M47TU / M47T2

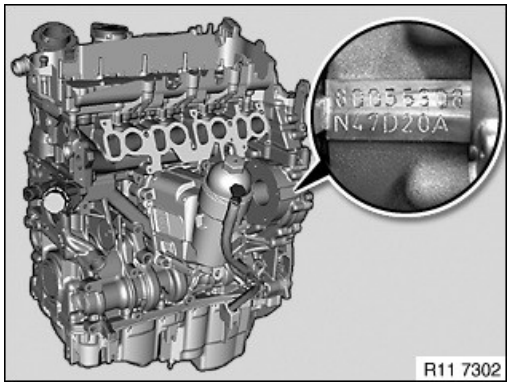


M57 / M57TU / M57T2

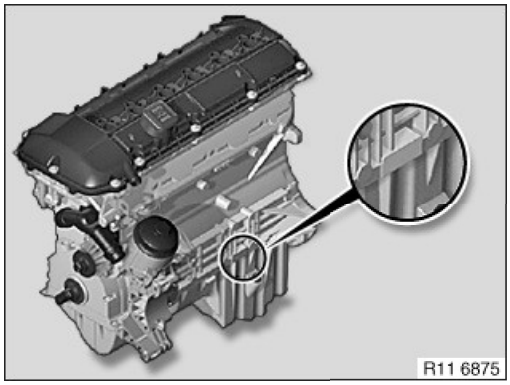


M67 / M67TU

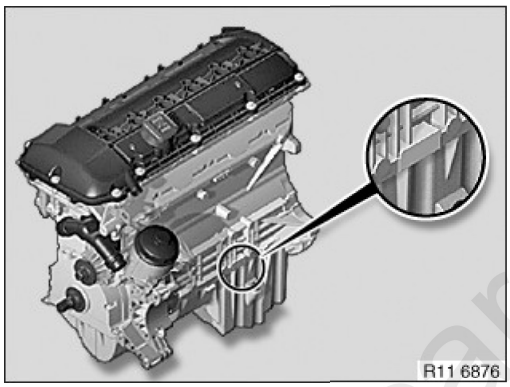
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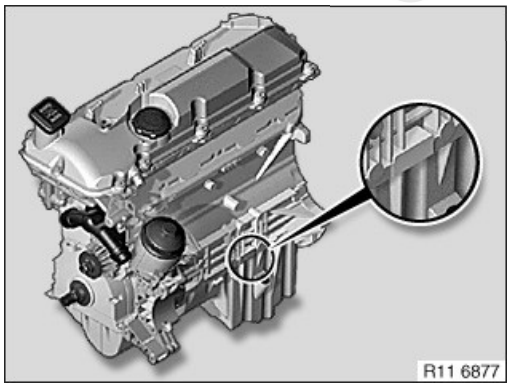
N47 / N47S / N47C / N47T / N57 / N57S / N57T



M52 / M52TU

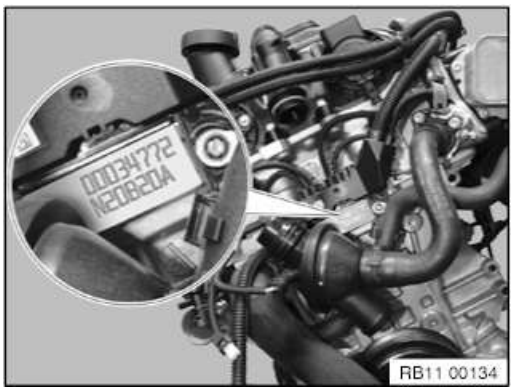


M54

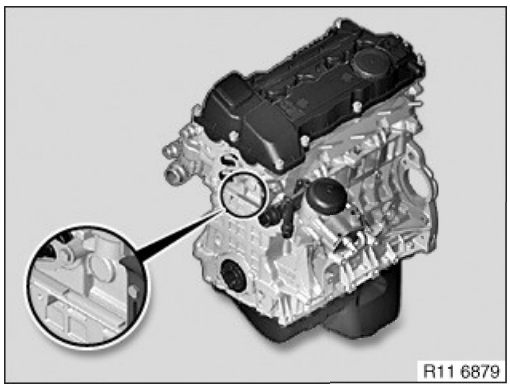


M56

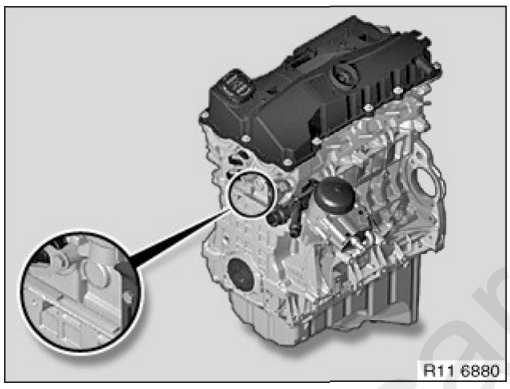
cardiagn.com



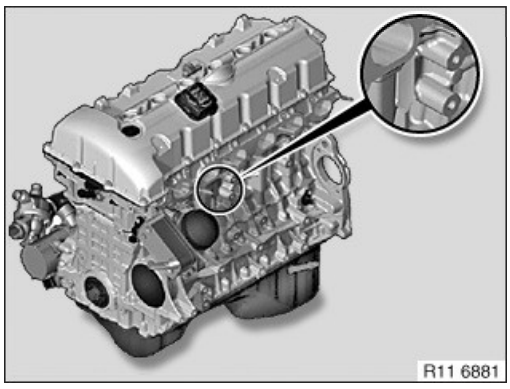
N20 / N26



N40 / N45 / N45T / N43

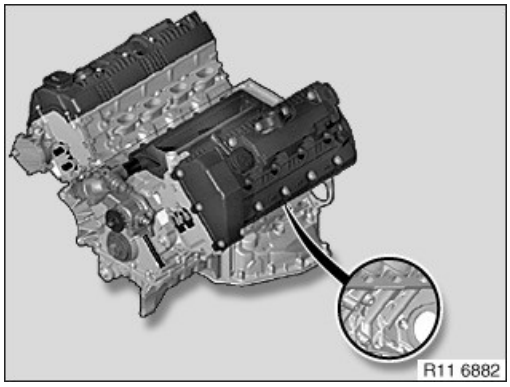


N42 / N46 / N46T

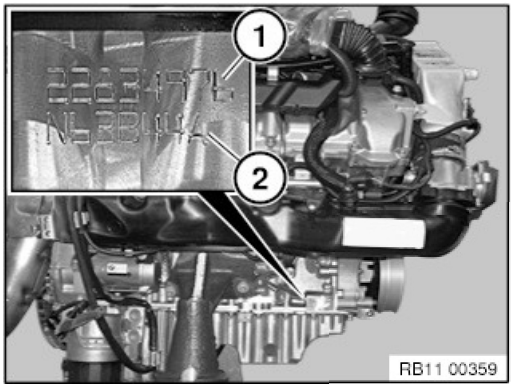


N51 / N52 / N52K / N52T / N53 / N54 / N55

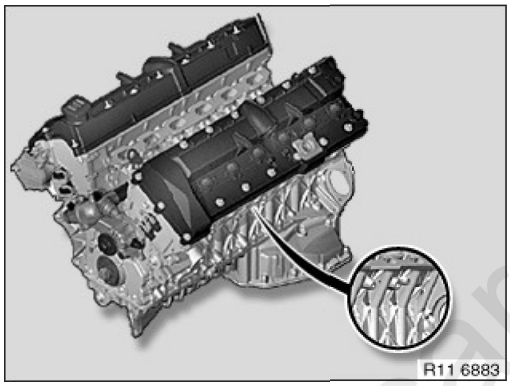
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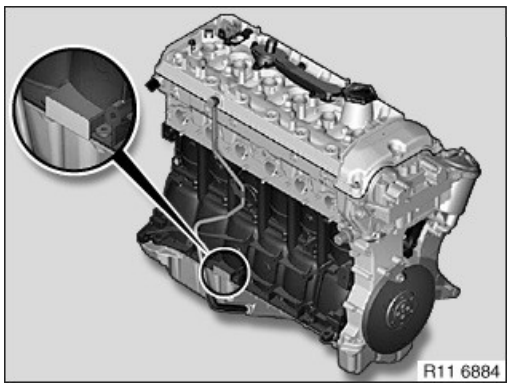
N62 / N62TU



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

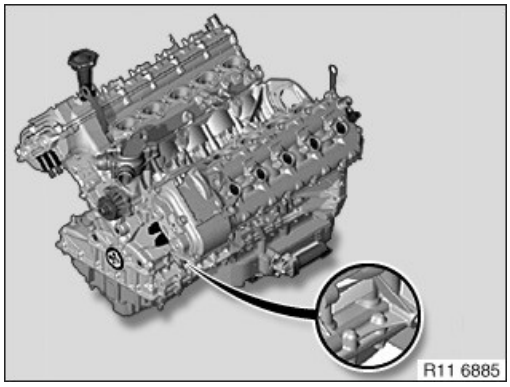


N73



S54

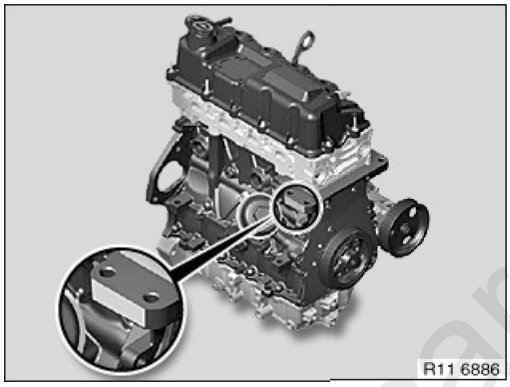
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S85 / S65



S55

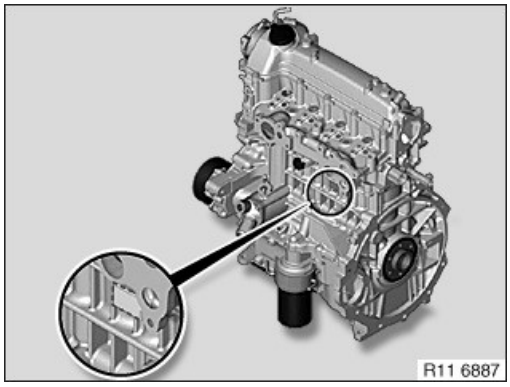


W10 / W11



W16

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W17



W20

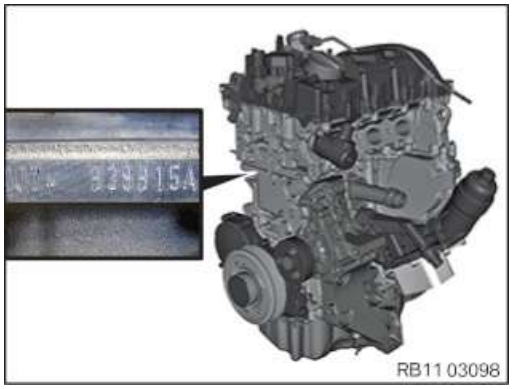


N12 / N13 / N14 / N16 / N18

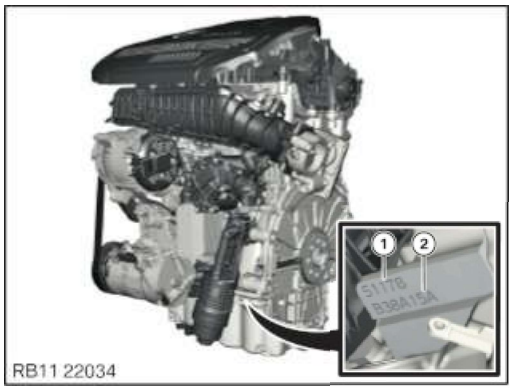


B37 / B38**A** / B47 / B48**A**
in the area of the oil sump

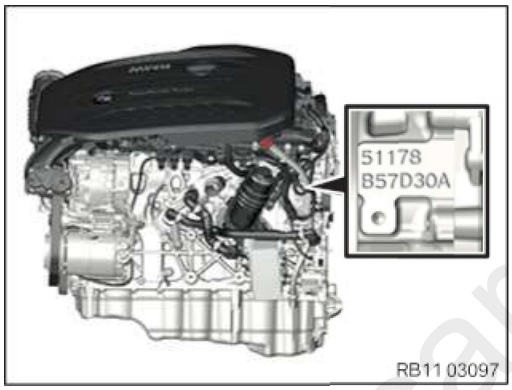
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B38**B** / B48**B**



B38



B57



B58

Assemble engine.

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11 00 300 Engine oil consumption measurement

Attention!

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

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

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

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

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

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

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

Measuring oil consumption by weighing:

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

Note:

The engine must not leak any oil.

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

Preparation:

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

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

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

Example:

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

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

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

0.78 cm³/km = 0.78 l/1,000 km

Test certificate for engine oil consumption:

Vehicle data: _____

BMW (type): _____

Chassis number: _____

Added oil quantity (in ccm): _____ ccm at kilometre reading:_____

less drained off oil quantity (in g) : 0.86 (g/ccm) _____ ccm at kilometre reading:_____

=> oil consumption: _____ ccm => mileage: _____ km

Oil consumption [l/1000 km] =

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

Oil consumption after balancing out: _____ l/1000 km

Oil grade: _____

Oil grade: _____

Viscosity: _____

Cause of damage: _____

_____ _____

Dealer address Signature

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11 00 ... Engine oil consumption measurement



Procedure for engine oil consumption measurement, see following documents:

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

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

Equipment recoding from 00 0 200 to 00 6 0 000

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

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11 00 ... Handling components after flood damage

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

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

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

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

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

1.0 Sealing compound for **injection**.

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

2.0 Sealing compound for **application**.

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

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2.4	N12, N13, N14, N16, N18 W16	Loctite 121078 liquid sealing compound	83 19 2 223 765	Sealing between cover sleeve and crankcase

3.0 **Cleaning agent**.

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

4.0 Lubricant for **application**.

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

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

5.0 lubricant for **filling**

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

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

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

7.0 **Leak detection spray and contact spray**

	Designation in repair instructions	**Designation, Electronic Parts Catalogue**	**Part number, Electronic Parts Catalogue**	**Application examples**

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

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11 00 598 Remove and install the engine on the front axle

CAUTION

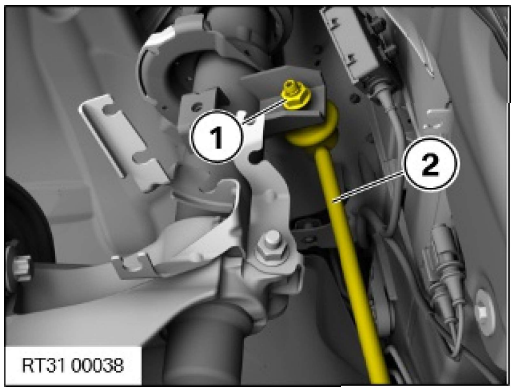
Heavy component.

Heavy components can lead to injury or damage.

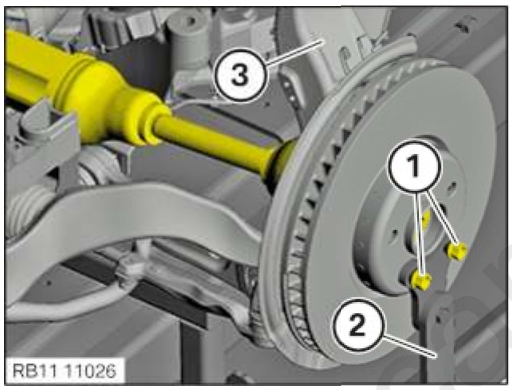
- Remove and install heavy components with the aid of another person/other persons.

PRELIMINARY WORK

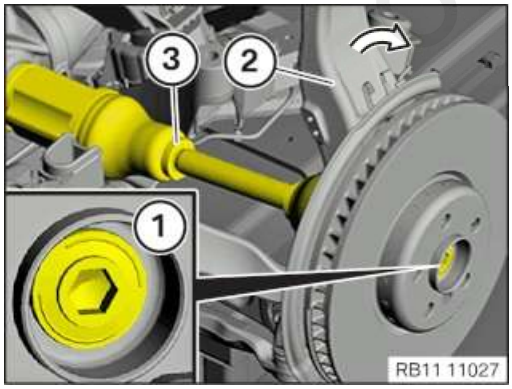
1 – Remove the front output shafts (on the mobile lifting table)



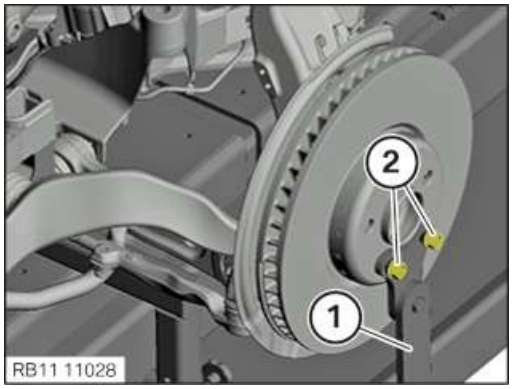
- Loosen the nut (1), if necessary, counter-hold the Torx socket.
- Release the anti-roll bar link (2) from the spring strut.



- Loosen screws (1).
- Remove the fixture (2) of the swivel bearing and set it aside.
- Hold the swivel bearing (3) with the workshop crane 2 220 718.



- Loosen screw (1).
- Tilt the swivel bearing (2) slightly forward in the direction of arrow.
- Loosen and remove the output shaft (3) at the front axle differential with a suitable tool.

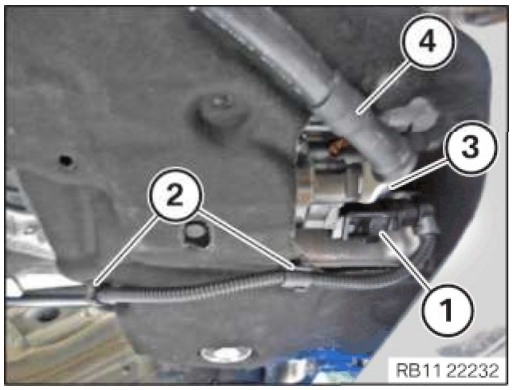


- Install the fixture (1) of the swivel bearing.
- Tighten the screws (2).

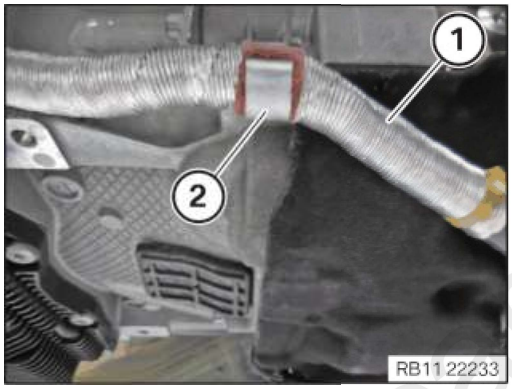
2 – Removing the acoustic cover of the oil sump

Prerequisite

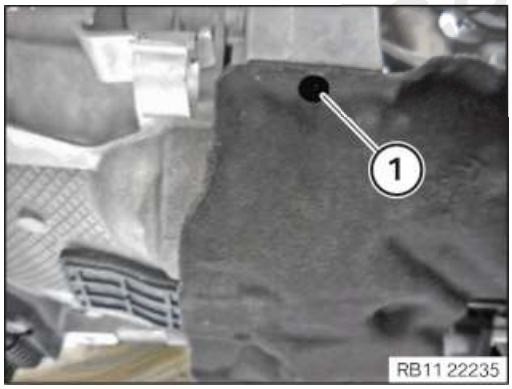
Disconnect all negative battery cables.



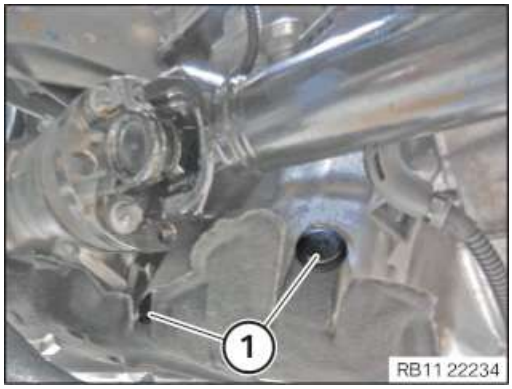
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Loosen nut (3).
- Feed out positive battery cable (4) and set it aside.



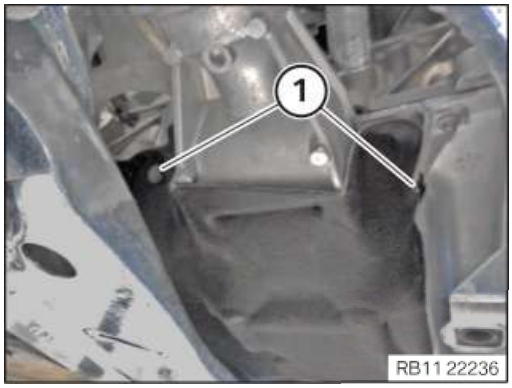
- Guide the positive battery cable (1) out of the clamp (2) and lay to one side.



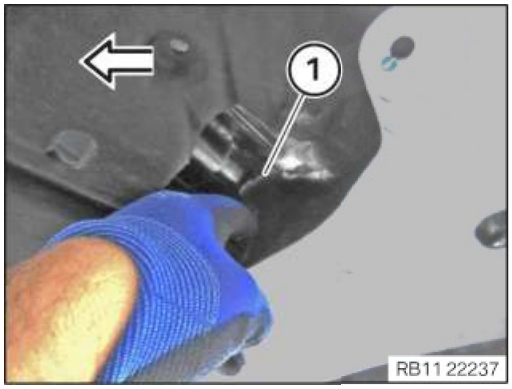
- Undo fir tree clip (1).



- Loosen the expanding rivet (1).



- Loosen the expanding rivet (1).



- Push the acoustic cover (1) downward.
- Feed out and remove the acoustic cover (1) in the **direction** of the arrow.

3 – Removing starter motor

Prerequisite

Oil sump acoustic cover removed.

WARNING

Hot surfaces.

Risk of burning!

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

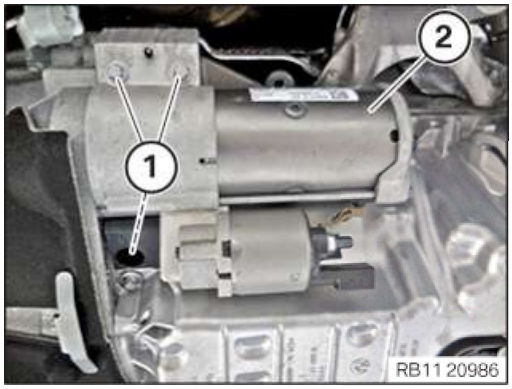
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

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



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

4 – Removing the engine from the automatic transmission (lifting table)

RISK OF DAMAGE

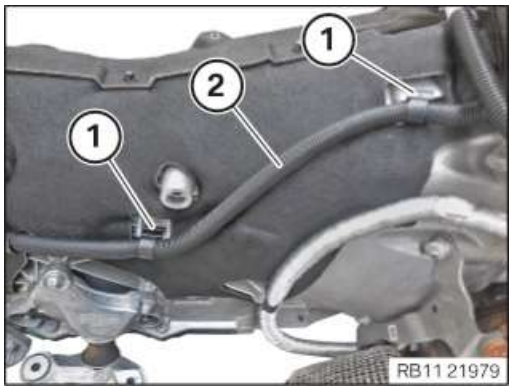
Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

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

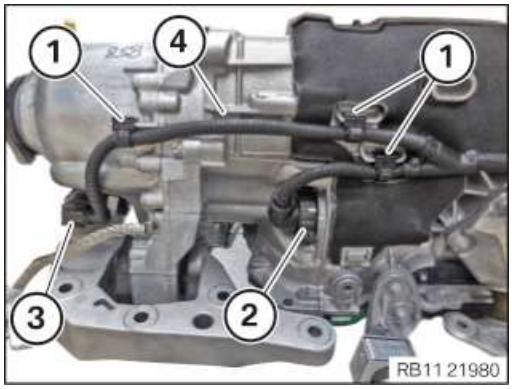
TECHNICAL INFORMATION

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

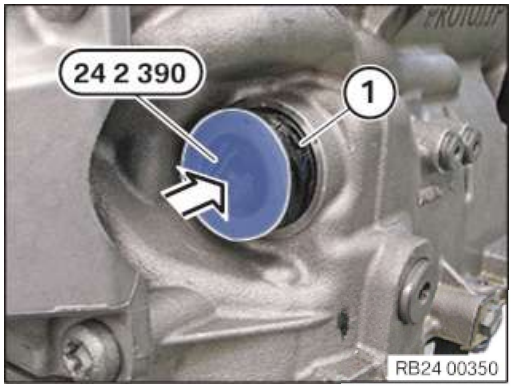


- Loosen clamps (1).
- Guide out transmission wiring harness (2) and place it aside.

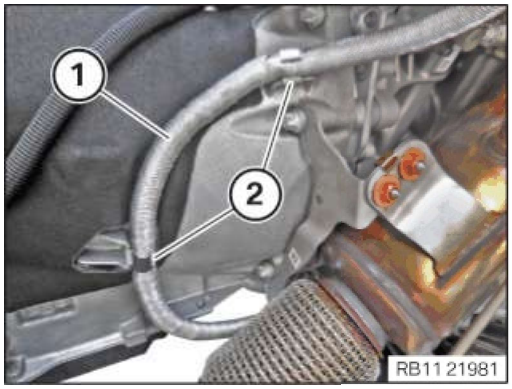
cardiagn.com



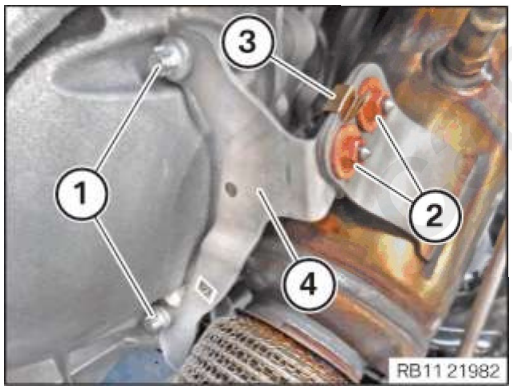
- Loosen clamps (1).
- Unlock plug connection (2) and disconnect.
- Unlock plug connection (3) and disconnect.
- Guide out transmission wiring harness (4) and place it aside.



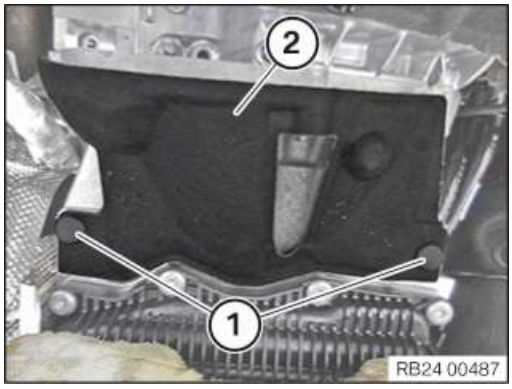
- Insert the special tool 0 494 213 (24 2 390) in the sealing sleeve (1) in direction of arrow.



- Remove positive battery cable (1) from clamps (2).



- Loosen nuts (2).
- Loosen screws (1).
- Loosen clamp (3).
- Thread out the holder (4) for the catalytic converter.

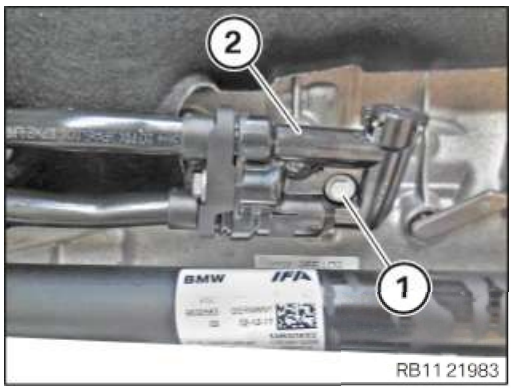


- Pull the expanding rivet (1) off.
- Remove the acoustic cover (2).

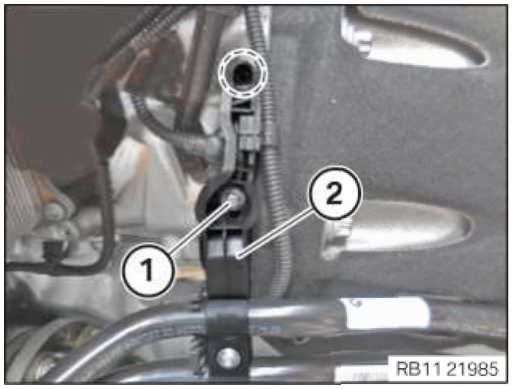
rdiagn.com



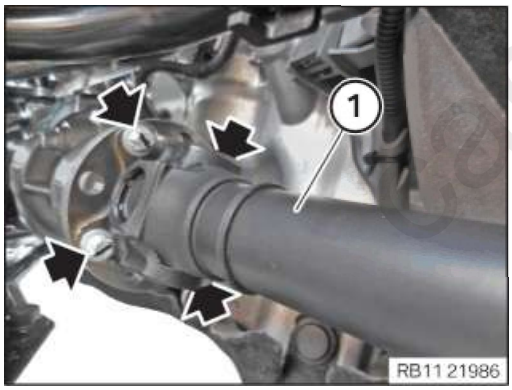
- Thread the sealing cap (1) out and remove.



- Loosen screw (1).
- Thread out transmission oil line (2) and set aside.
- Catch and dispose of escaping transmission oil.



- Loosen screw (1).
- Feed out holder (2) for the transmission oil lines in the **marked** area and lay it aside.



- Remove screws (arrows).
- Secure propeller shaft (1) against falling off.



- Fit special tool 0 493 380 (11 6 480).

RISK OF DAMAGE

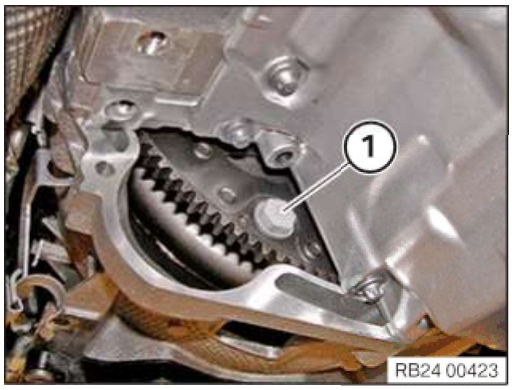
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

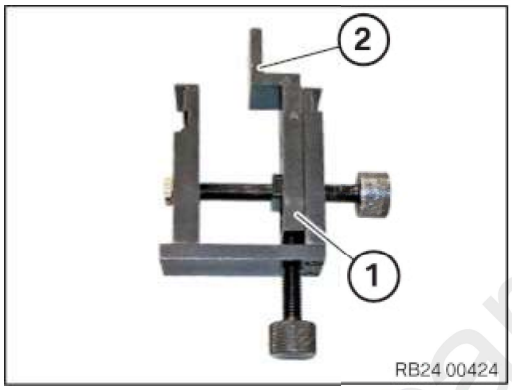
- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Turn the engine by hand using special tool 0 493 380 (11 6 480).

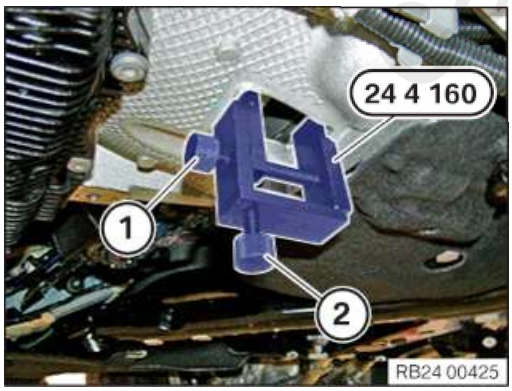
cardiagn.com



- Turn the engine on the vibration damper with the special tool 0 493 380 (11 6 480) in the direction of rotation until the bolt (1) becomes visible in the recess.
- Undo all 6 screws (1) on the torque converter.

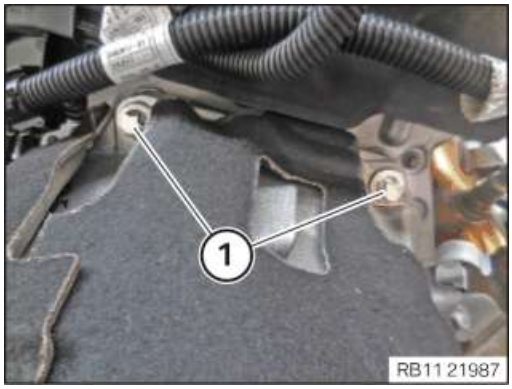


- Prepare special tool 0 494 478 (24 4 161) (1) with the shaped element 0 494 965 (24 4 165) (2) as shown.

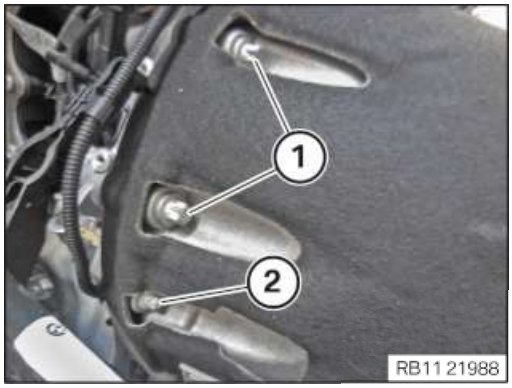


- Insert special tool 0 494 451 (24 4 160) into the recess of the transmission housing and apply slight tension using the screw (1).
- Screw the bolt (2) in to the stop.
- Tighten down screw (1).

mardiagr.com



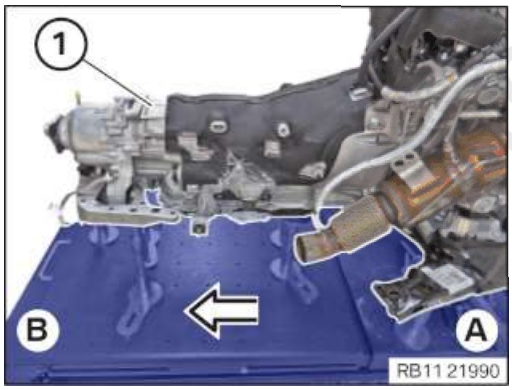
- Unscrew the transmission bolts (1).



- Unscrew the transmission bolts (1).
- Loosen the transmission bolt (2).



- Unscrew the transmission bolts (1).



- Slide the table top (B) in the direction of the arrow and slide the automatic transmission (1) to the side.

MAIN WORK

5 – Removing engine from the front axle support

diagn.com

CAUTION

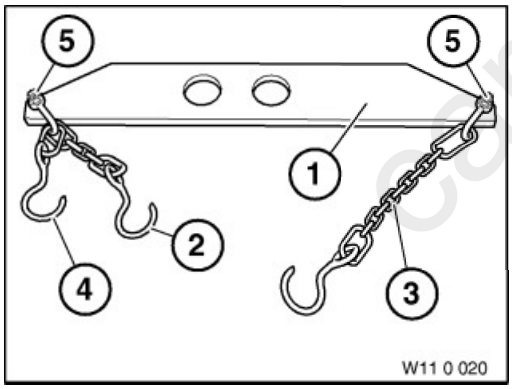
Components connected to the engine joint or cross member.

Danger of injury!

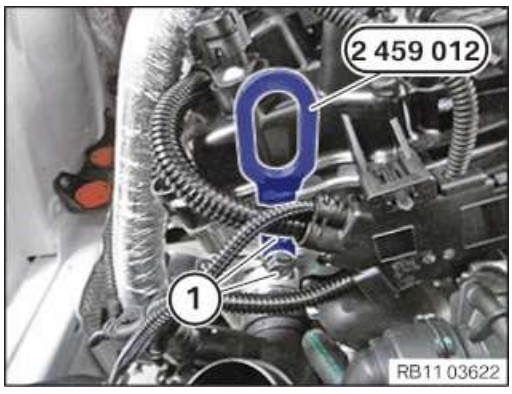
- Check lifting eyes and engine mounting brackets for damage, e.g. cracks.
- Attach the component to correctly mounted engine joints or cross members only.
- Exclusively lift the component, do not move it forwards, backwards or in transverse direction.



- Stage the workshop crane 2 220 718.



- Stage the lifting gear 0 490 567 (11 0 020).

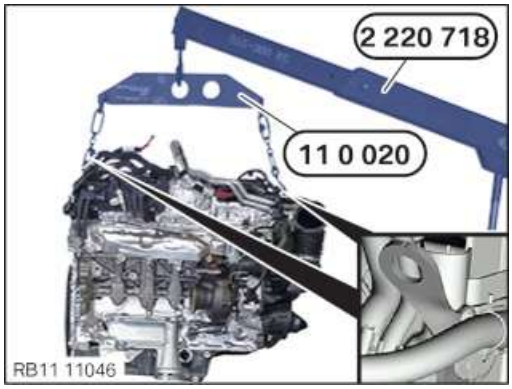


- Guide in and position special tool on cylinder head.
- Tighten the screws (1) of special tool .

Special tool to cylinder head

M8		Tightening torque	21,5 Nm

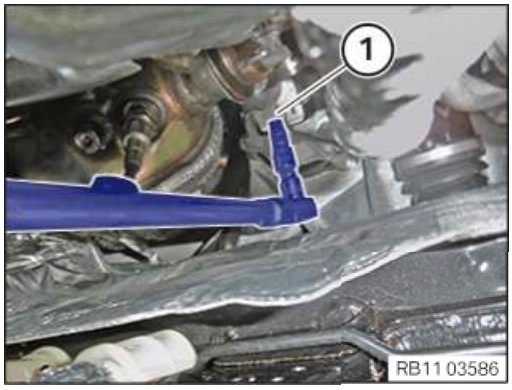
cardiagn.com



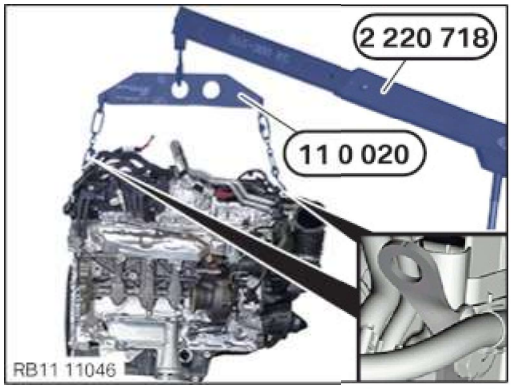
TECHNICAL INFORMATION

The workshop crane, lifting gear and the mounting brackets on the engine must all be connected to each other so that the engine hangs straight upon lifting.

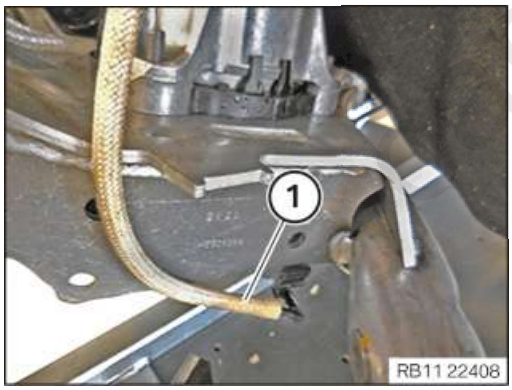
- Connect both hooks of the special tool 0 490 567 (11 0 020) to the front and back of the engine with the mounting brackets.
- Connect the workshop crane 2 220 718 with the special tool 0 490 567 (11 0 020).



- Release screw (1) on the left and right engine mount with standard tool.



- Lift engine using the workshop crane 2 220 718 and remove.



- **Engine mount version with vacuum line:**
- Undo vacuum line (1).

6 – Mounting the engine on the front axle support

CAUTION

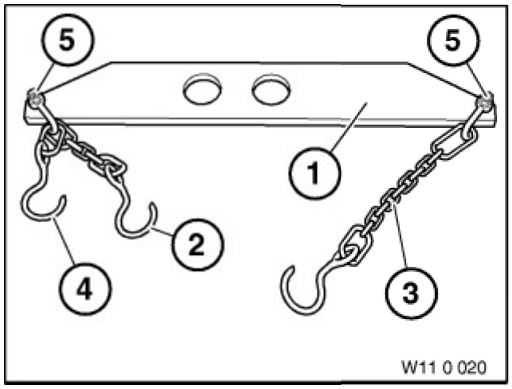
Components connected to the engine joint or cross member.

Danger of injury!

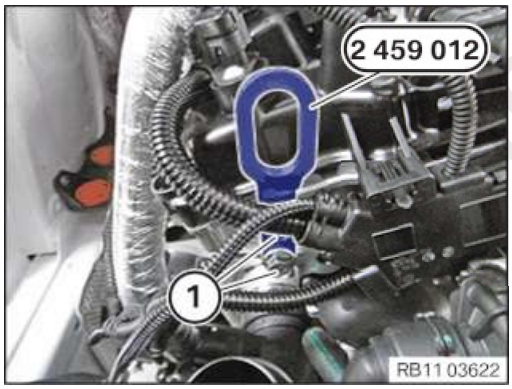
- Check lifting eyes and engine mounting brackets for damage, e.g. cracks.
- Attach the component to correctly mounted engine joints or cross members only.
- Exclusively lift the component, do not move it forwards, backwards or in transverse direction.



- Stage the workshop crane 2 220 718.



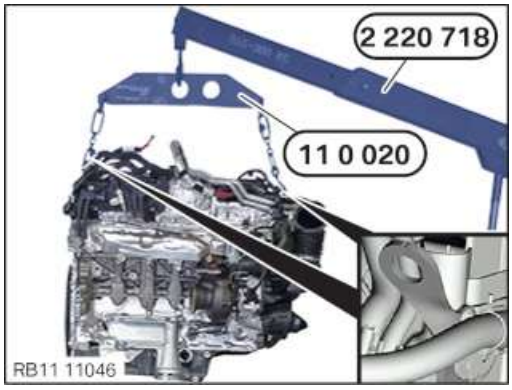
- Stage the lifting gear 0 490 567 (11 0 020).



- Guide in and position special tool on cylinder head.
- Tighten the screws (1) of special tool .

Special tool to cylinder head

M8		Tightening torque	21,5 Nm

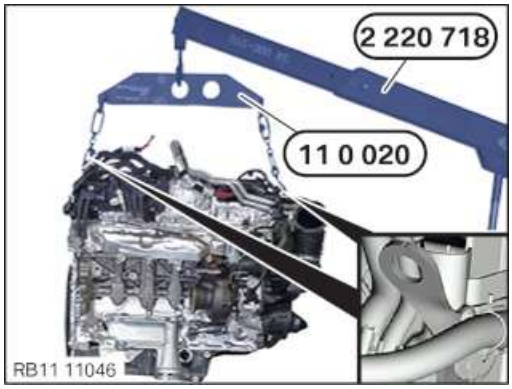


TECHNICAL INFORMATION

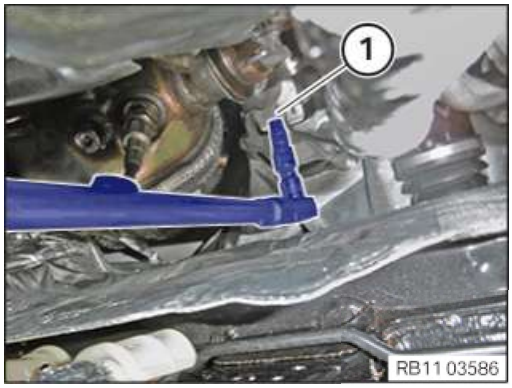
The workshop crane, lifting gear and the mounting brackets on the engine must all be connected to each other so that the engine hangs straight upon lifting.

- Connect both hooks of the special tool 0 490 567 (11 0 020) to the front and back of the engine with the mounting brackets.
- Connect the workshop crane 2 220 718 with the special tool 0 490 567 (11 0 020).

mdiagn.com



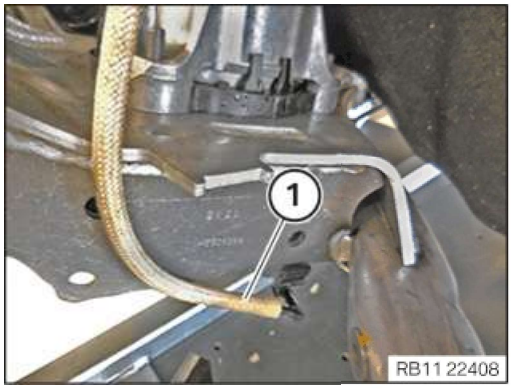
- Position engine on front axle support using workshop crane 2 220 718.



- Tighten bolt (1) of the right and left engine mount using a commonly available tool.

Engine mount to engine mounting bracket

M12		Tightening torque	100 Nm



- **Equipment specification: engine mount with vacuum line:**
- Secure vacuum line (1).

POSTPROCESSES

7 – Install engine of automatic transmission (table lift)

RISK OF DAMAGE

Damage to the transmission.

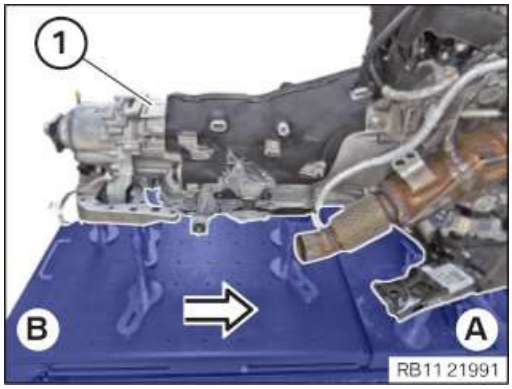
Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

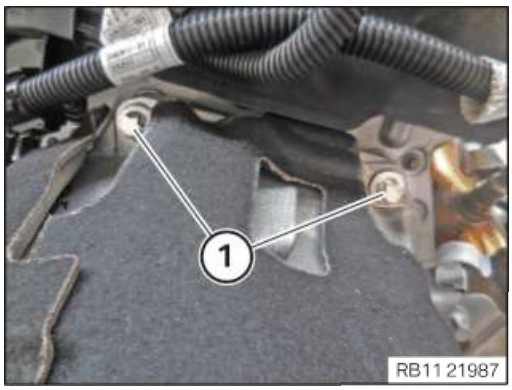


- Check the fitting sleeves (1) for correct fit and damage and renew as needed.

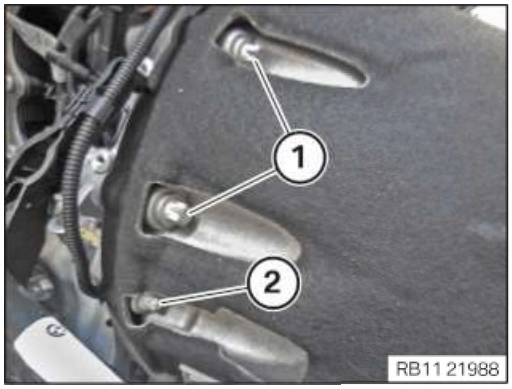
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- Slide the table top (B) on table top (A) in the direction of the arrow.
- Position the automatic transmission (1) on the engine.
- Turn torque converter until bore hole of torque converter is aligned with bore hole of flywheel.



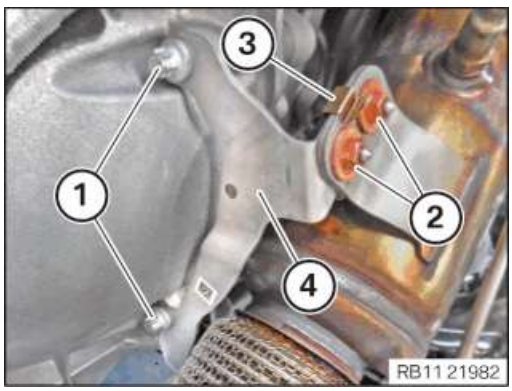
- Tighten transmission bolt (1) hand-tight.



- Tighten transmission bolts (1) hand-tight.
- Tighten transmission bolt (2) hand-tight.



- Tighten transmission bolts (1) hand-tight.



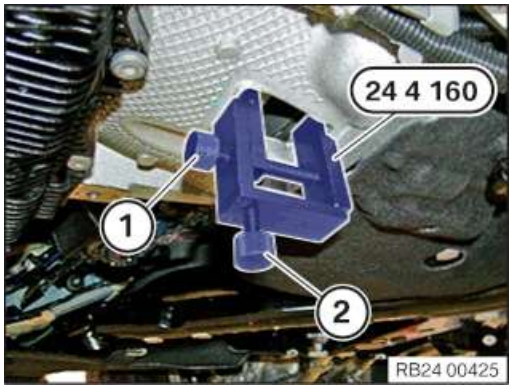
- Insert holder(4) for the catalytic converter and position.
- Tighten transmission bolts (1) hand-tight.
- Secure clamps (3).
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Catalytic converter to holder

M8 nut	Renew nut.	Tightening torque	28 Nm

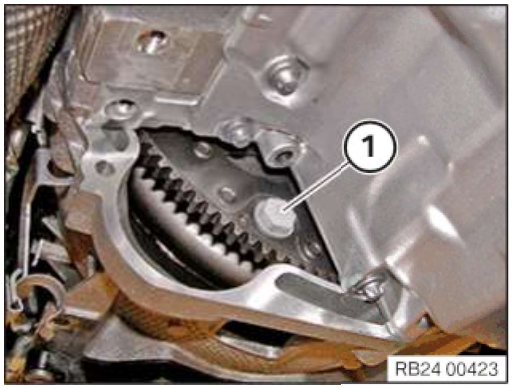
carfdiagn.com



- Release screw (1) and screw (2).
- Remove special tool 0 494 451 (24 4 160).



- Guide in and install sealing cap (1).



RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

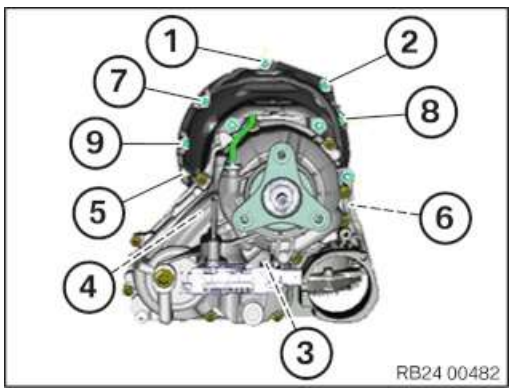
- Renew screws.

  Parts: Bolts

- Crank the engine on the vibration damper in the direction of rotation using special tool 0 493 380 (11 6 480) to tighten all six screws (1).
- Tighten all 6 screws (1) of the torque converter using special tool 0 491 667 (24 1 110) .

Torque converter to flywheel

M10	Renew screws.	Tightening torque	56 Nm

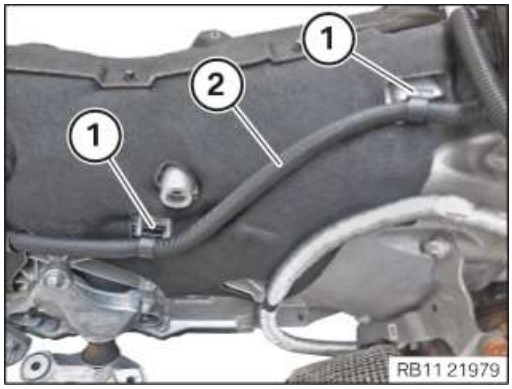


- Tighten the transmission bolts in sequence (1) to (9).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

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RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

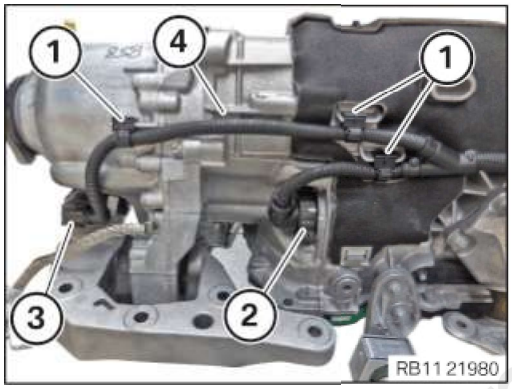
Trapped, crushed or damaged cables may cause short circuits and malfunctions.

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

- Feed in and position transmission wiring harness (2).
- Secure clamps (1).



- Feed out and remove the special tool 0 494 213 (24 2 390) from the sealing sleeve in direction of arrow.



RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

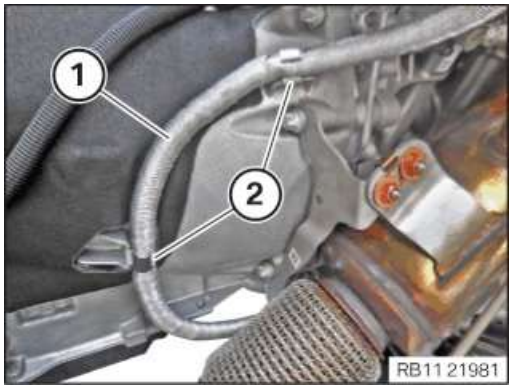
Trapped, crushed or damaged cables may cause short circuits and malfunctions.

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

- Insert and install the transmission wiring harness (4).
- Secure clamps (1).
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (3) and lock.

  The connector (3) must engage audibly.



CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

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

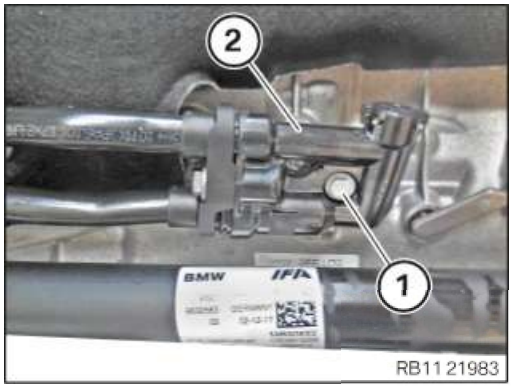
- Secure the positive battery cable (1) at the clamps (2).

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- Renew the sealing rings (1).

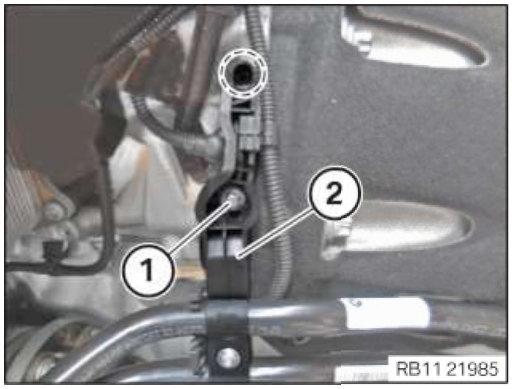
  Parts: Sealing ring



- Insert and install the transmission oil line (2).
- Tighten down screw (1).

Transmission oil line to transmission

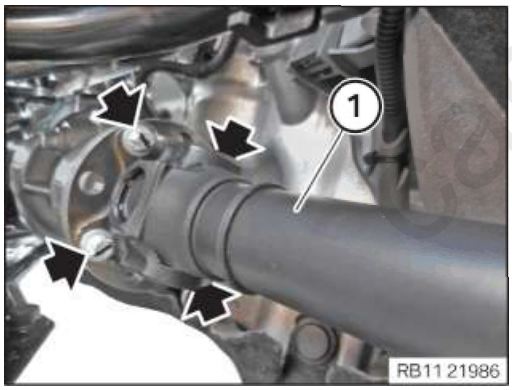
M6x25	Renew the sealing ring.	Tightening torque	8 Nm



- Guide in holder (2) for the transmission oil lines in **to the marked area** and install it.
- Tighten down screw (1).

Holder to end cover

M6X16		Tightening torque	8 Nm

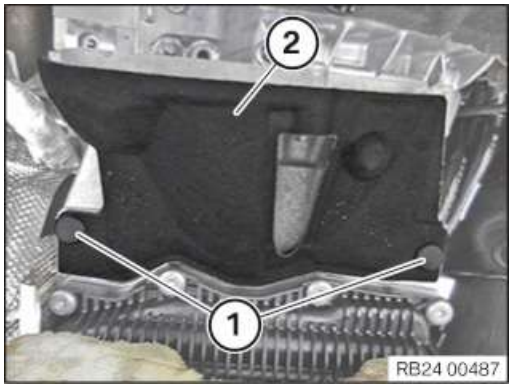


- Guide in propeller shaft (1) and position.
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Propeller shaft before the front axle differential

Renew screws. Jointing torque and angle of rotation must be observed without fail.	Tightening torque Angle of rotation	25 Nm 45 °



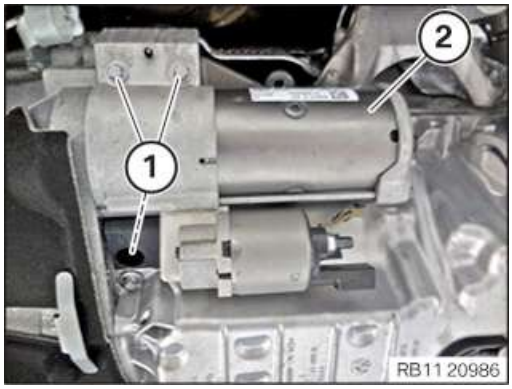
- Feed the acoustic cover (2) in and install.
- Insert and install the expanding rivet (1).

8 – Installing starter motor

Prerequisite

Acoustic cover of oil sump removed.

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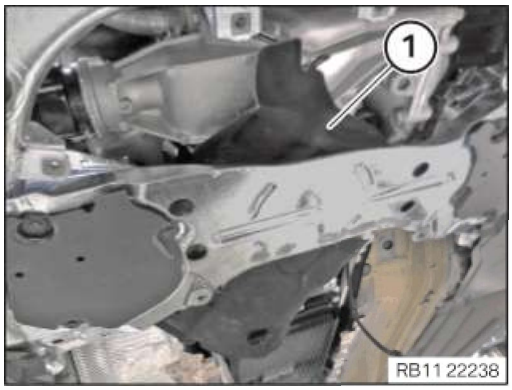


- Insert and install the starter motor (2).
- Tighten the screws (1).

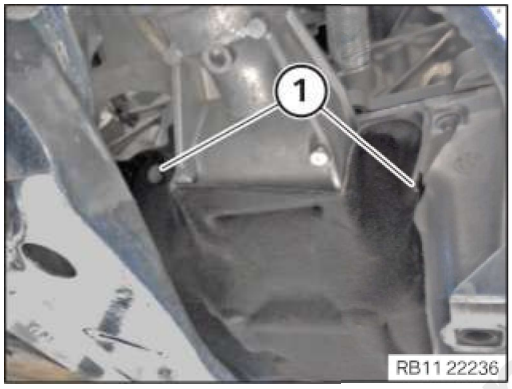
Starter motor to crankcase

M8x60		Tightening torque	19 Nm

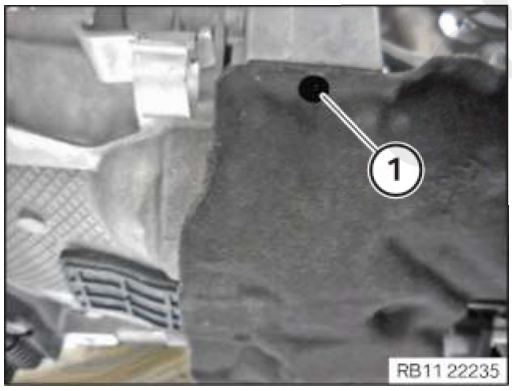
9 – Installing the acoustic cover for the oil sump



- Thread in and position the acoustic cover (1).

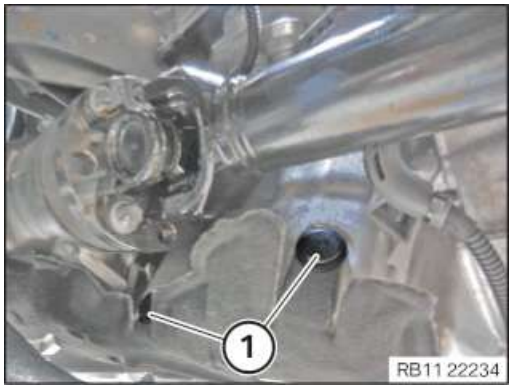


- Secure expanding rivet (1).



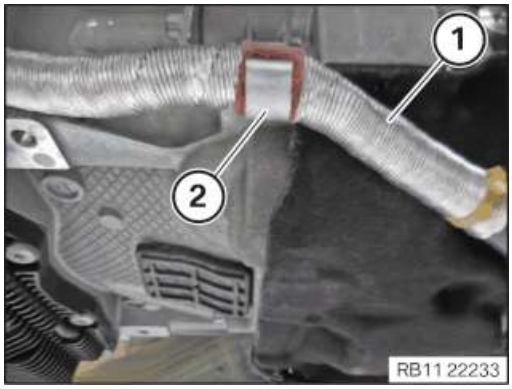
- Check the fir tree clip (1) for damage and renew if necessary.

  Parts: Fir tree clip

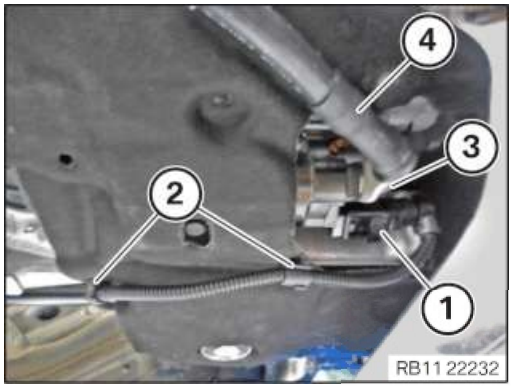


- Secure expanding rivet (1).

diag.com

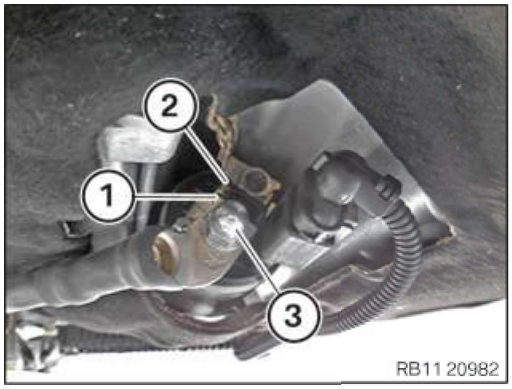


- Secure positive battery cable (1) at the clamp (2).



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Insert and install the positive battery cable (4).
- Tighten the nut (3) hand-tight.



CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

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

- Attach positive battery cable (1) **correctly** to anti-twist lock (2).
- Tighten nut (3).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

cardiagn.com

10 – Renew the radial shaft seal on the left and right

NOTICE

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

▸ **Renew the radial shaft seal**

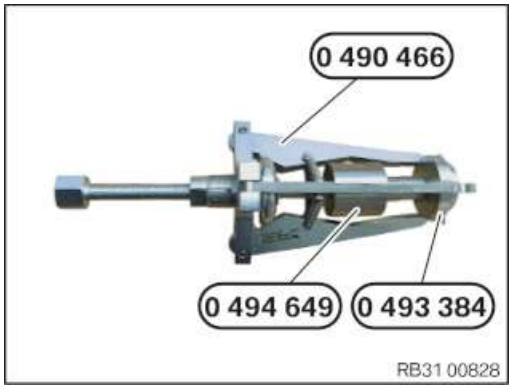
TECHNICAL INFORMATION

Radial shaft seal ring are equipped with an installation protection ring. The installation protection ring is used to protect the sealing lip when installing the output shaft.

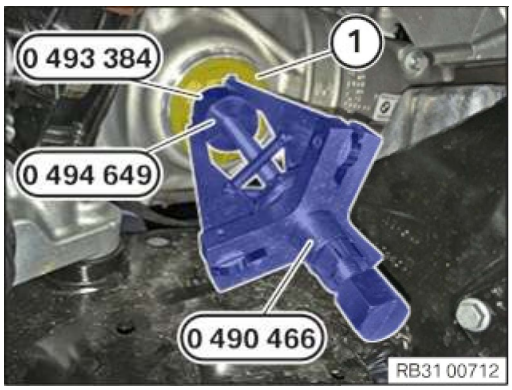
NOTICE

The figure shows the procedure for the front axle differential. The procedure for the bearing support is identical.

▷ **Removing the radial shaft seal**



- Prepare the special tool with the special tools 0 494 649 (21 2 230) (without the screw) and .



- Pull out and remove the radial shaft seal (1) with the special tools , 0 494 649 (21 2 230)and .

◁



- Remove the installation protection ring (1) from the radial shaft seal (2).

▷ **Install the radial shaft seal**



- Coat the housing sheet metal flange of the radial shaft seal with the approved front axle transmission oil.
- Drive in the radial shaft seal up to the limit position using special tool .
- Remove special tool .

◁

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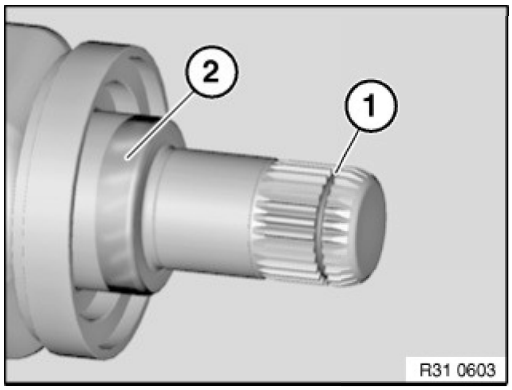


- Reinstall the installation protection ring (1) into the radial shaft seal (2).

11 – Install the front output shafts (on the mobile lifting table)

TECHNICAL INFORMATION

It is essential to renew the circlip of the output shaft.



TECHNICAL INFORMATION

Extreme force being required during installation is an indication that the component is damaged or deformed. Check the component; replace if necessary.

- Check the gearing of the output shaft for damage and renew damaged parts if necessary.
- Check the gaiter for damage and replace damaged parts as needed.
- Renew the circlip (1).

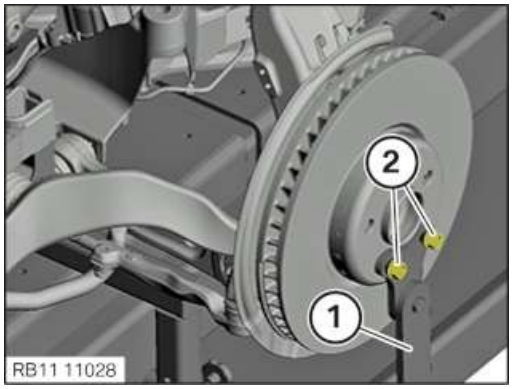
  Parts: Circlip
- Coat the contact surfaces (2) using approved final drive transmission oil.



NOTICE

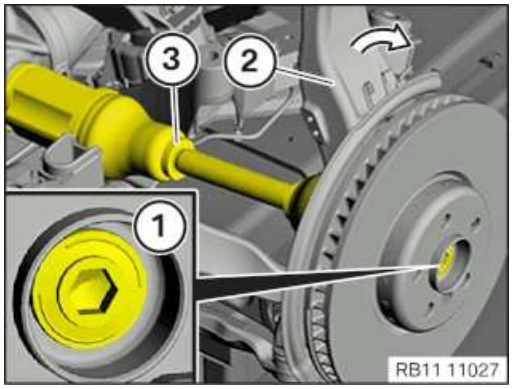
The figure shows the procedure for the front axle differential. The procedure for the bearing support is identical.

- Fold open the assembly protection ring (1).



- Loosen screws (2).
- Remove the fixture (1) of the swivel bearing and set it aside.
- Hold the swivel bearing 2 220 718 with the workshop crane.

mdiagn.com



- Tilt the swivel bearing (2) slightly forward in the direction of arrow.
- Insert the output shaft (3) into the front axle differential until the limit position is reached and until the output shaft is engaged noticeably.
- Tighten screw (1) with the special tool 0 490 504 (00 9 120).

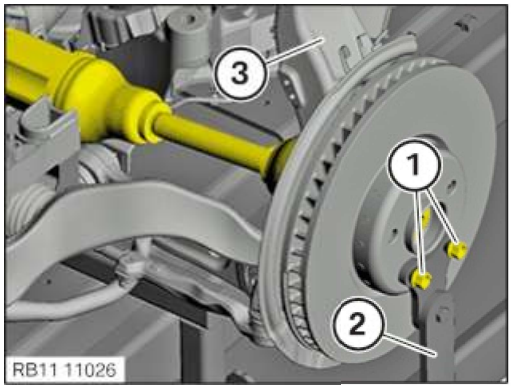
Output shaft to wheel bearing

M16	Replace collar bolt and spring.	Jointing torque Angle of rotation	210 Nm 90 °

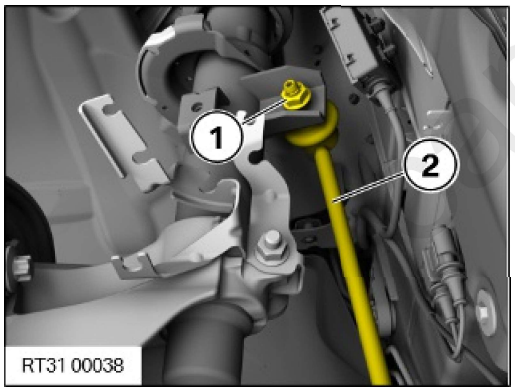


- Pull on the tab of the installation protection ring (1) until one of the two predetermined breaking points breaks.
- Pull out and dispose of the installation protection ring (1).
- Slide the output shaft (2) into front axle differential or bearing support up to the limit position.

  The output shaft (2) must engage noticeably and audibly.



- Install the fixture (2) of the swivel bearing (3).
- Tighten the screws (1).



- Position the anti-roll bar link (2) at the spring strut.
- Renew nut (1).

  Parts: Nut
- Tighten the nut (1), if necessary, counter support the Torx socket.

Front anti-roll bar link to anti-roll bar/spring strut

M10	Renew nut.	Tightening torque	56 Nm

12 – Check/add front axle transmission oil

RISK OF DAMAGE

Damage to the front axle differential.

Failure to comply with the oil specifications can result in serious damage to the front axle differential.

- Use only the approved front axle transmission oil.

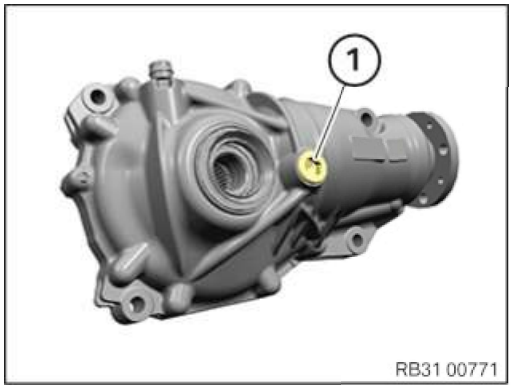
autodiagn.com

TECHNICAL INFORMATION

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



- Use special tool 0 493 337 (00 2 080) to top up the front axle transmission oil.



- Release the screw plug (1).
- Check front axle differential oil level.
- If necessary, top up the front axle transmission oil to the lower edge of the opening for the screw plug (1).

Transmission oil

Technically suitable front axle transmission oils	

Main group 31

- Renew the screw plug (1).

  Parts: Plug
- Tighten the screw plug (1).

Screw plug to front axle transmission

M22	Renew screw plug with O-ring.	Tightening torque	60 Nm

Additional Information

Overview of Tightening Torques

Special tool to cylinder head — Used in step 56

M8		Tightening torque	21,5 Nm

Engine mount to engine mounting bracket — Used in step 6

M12		Tightening torque	100 Nm

Catalytic converter to holder — Used in step 7

M8 nut	Renew nut.	Tightening torque	28 Nm

Torque converter to flywheel — Used in step 7

M10	Renew screws.	Tightening torque	56 Nm

Transmission to engine — Used in step 7

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

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Transmission oil line to transmission — Used in step 7

M6x25	Renew the sealing ring.	Tightening torque	8 Nm

Holder to end cover — Used in step 7

M6X16		Tightening torque	8 Nm

Propeller shaft before the front axle differential — Used in step 7

Renew screws. Jointing torque and angle of rotation must be observed without fail.	Tightening torque Angle of rotation	25 Nm 45 °

Starter motor to crankcase — Used in step 8

M8x60		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 9

M8		Tightening torque	13,5 Nm

Output shaft to wheel bearing — Used in step 11

M16	Replace collar bolt and spring.	Jointing torque Angle of rotation	210 Nm 90 °

Front anti-roll bar link to anti-roll bar/spring strut — Used in step 11

M10	Renew nut.	Tightening torque	56 Nm

Screw plug to front axle transmission — Used in step 12

M22	Renew screw plug with O-ring.	Tightening torque	60 Nm

Overview of Special Tools

2 220 718 Workshop crane



Common	Used in step 15611
Usage	WSK 1000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	06 01 11 (701)

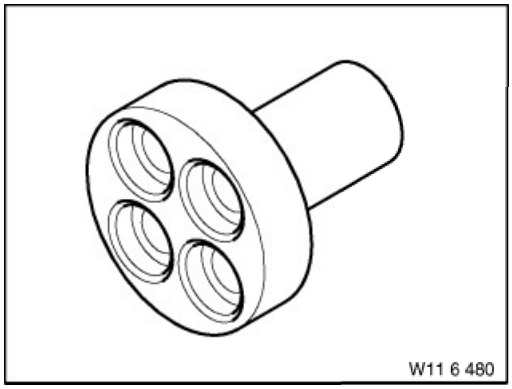
cardiagn.com

0 494 213 (24 2 390) Cap



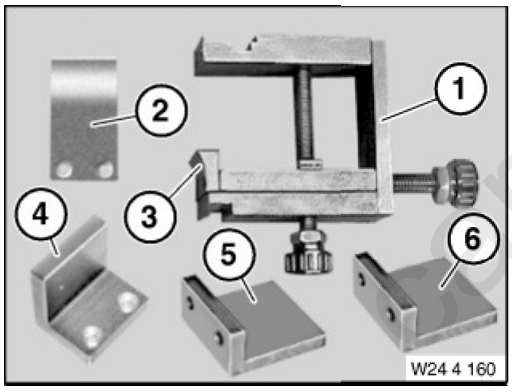
Common	Used in step 47
Usage	(protective cap) For sealing off the guide sleeve of the transmission connector
Included in the tool or work	
Storage location	C49
Replaced by	
In connection with	
SI-Number	01 14 01 (766)

0 493 380 (11 6 480) Connector



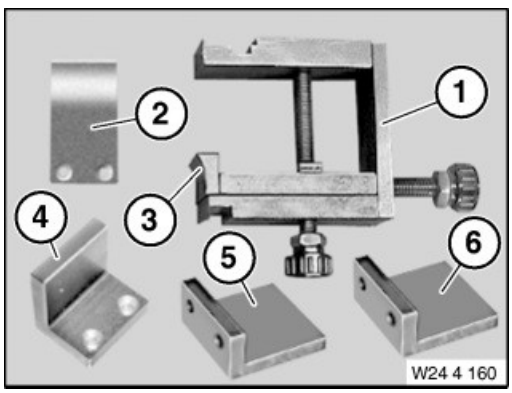
Common	Used in step 47
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

0 494 478 (24 4 161) Basic body



Common	Used in step 4
Usage	
Included in the tool or work	0 494 451
Storage location	C46
Replaced by	
In connection with	
SI-Number	

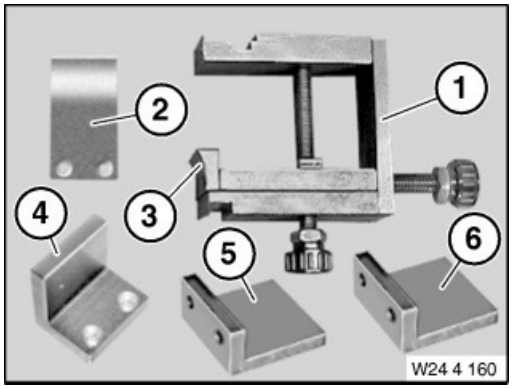
0 494 965 (24 4 165) Shaped element



Common	Used in step 4
Usage	Transmission: GA6 HP19 in E87, E90 Deletion, only available via tool set
Included in the tool or work	0 494 451
Storage location	C46
Replaced by	
In connection with	
SI-Number	01 15 04 (117)

ebiztagn.com

0 494 451 (24 4 160) Holder



Common

Used in step 47

Usage	For securing converter during removal and installation of transmission
Included in the tool or work	
Storage location	B45
Replaced by	
In connection with	
SI-Number	01 11 02 (908)

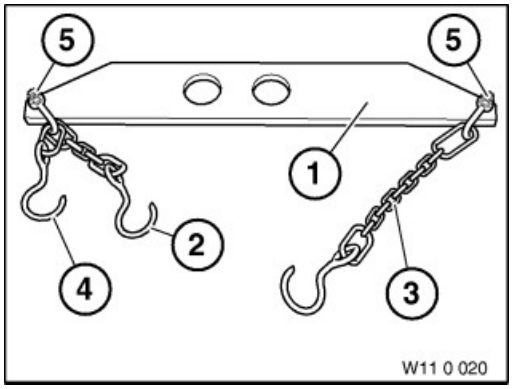
Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	0 494 479 (24 4 162)		**Shaped element** For converter version N73 discontinued, available as part of set of special tools only	
5	0 494 965 (24 4 165)		**Shaped element** Transmission: GA6 HP19 in E87, E90 Discontinued, available as part of set of special tools only	
3	0 494 477 (24 4 163)		**Shaped element** For converter version M57TU discontinued, available as part of set of special tools only	
1	0 494 478 (24 4 161)		**Basic body**	
4	0 494 622 (24 4 164)		**Shaped element** For converter version M54 discontinued, available as part of set of special tools only	
6	0 496 061 (24 4 166)		**Shaped element** Transmission: GA6L45R (GM6) in E83 / N52K Discontinued, available as part of set of special tools only	

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0 490 567 (11 0 020) Lifting gear

Used in step 56



Common

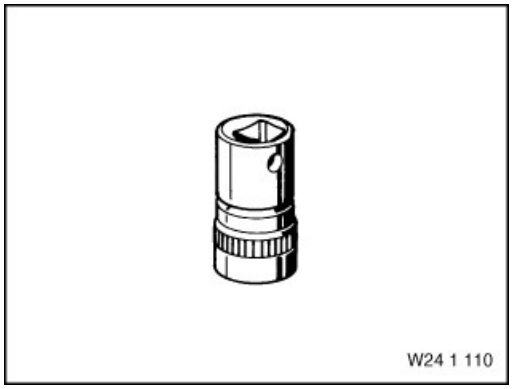
Usage	For removing and installing the engines. 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
5	0 490 572 (11 0 029)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 568 (11 0 021)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 569 (11 0 022)		**Chain** (Chain) As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 570 (11 0 023)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
4	0 490 571 (11 0 024)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	

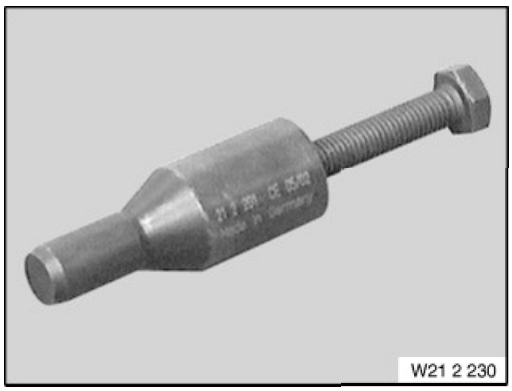
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0 491 667 (24 1 110) Socket wrench insert



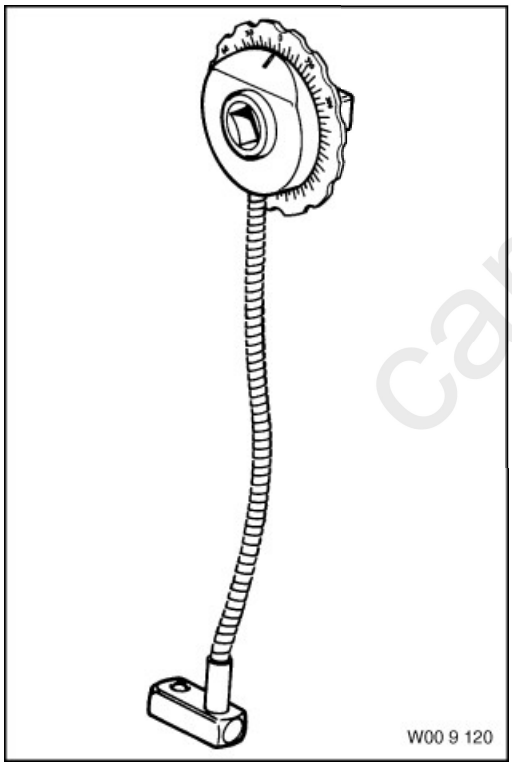
Common	Used in step 7
Usage	Loosening and fastening the converter fastener
Included in the tool or work	
Storage location	A14
Replaced by	
In connection with	
SI-Number	01 04 86 (566)

0 494 649 (21 2 230) Mandrel



Common	Used in step 10
Usage	(clutch centring drift) With screw M10 (G transmission)
Included in the tool or work	
Storage location	C45
Replaced by	
In connection with	
SI-Number	01 03 03 (960)

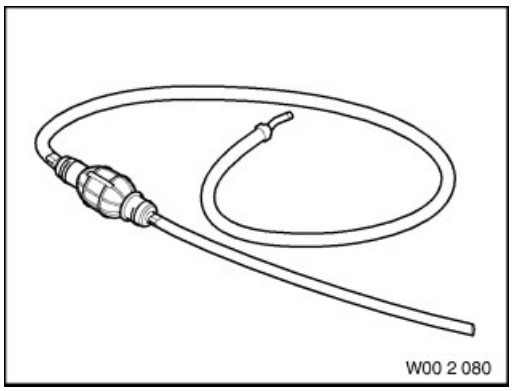
0 490 504 (00 9 120) Torque angle measuring dial



Common	Used in step 11
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 493 337 (00 2 080) Pump



Common	Used in step 12
Usage	(Hand pump) For lifetime oil filling
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 01 98 (294)

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Links

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	3

Operating materials	Used in step
2.0 hypoid oils for final drive without disc-type limited-slip differential (BMW/MINI)	11

Operating materials	Used in step
Main group 31	12

Parts

Parts required

Designation	Used in step
Output shaft circlips, front	11
Front output shaft bolts and compression rings to wheel bearing	11

00 Safety information for working on vehicles with automatic engine start-stop function (MSA)

Warning!

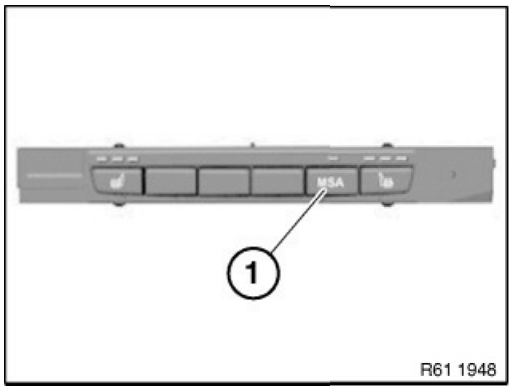
If the engine hood/bonnet contact is pulled upwards (workshop mode), the information "switch closed" is output. The automatic engine start-stop function is active.

An automatic engine start is possible.

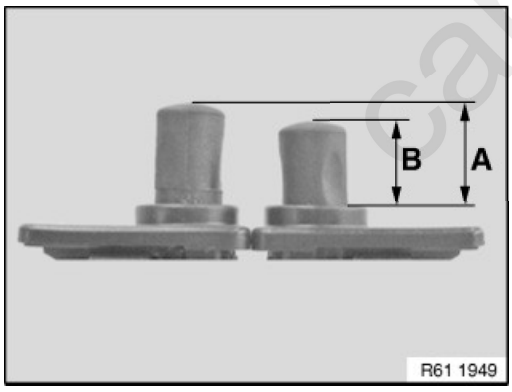
Observe safety precautions when working on MSA vehicles.

Before carrying out practical work on the engine, always ensure that the MSA functionality is deactivated so as to prevent automatic engine starting while work is being carried out in the engine compartment.

MSA function is deactivated by:



- Deactivate MSA by means of button (1) in passenger compartment
- Open seat belt buckle and driver's door



- Open engine bonnet/hood and ensure that engine hood/bonnet contact is not in workshop mode
  - Workshop mode

    A = 10 mm
  - Basic setting (engine hood/bonnet open)

    B = 7 mm

  To make sure that the engine hood/bonnet contact is at the basic setting, if necessary press the hood/bonnet contact up to the limit position before starting work and slowly release.

When working with diagnosis tools:

- Observe instructions in diagnosis tool

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Note:
For further information on automatic engine start-stop function (MSA):

- Refer to the Service Information (bulletin) (for manual transmissions) Service Information (bulletin) 61 01 07 335
- Refer to the Service Information (bulletin) (for automatic transmissions or twin-clutch gearboxes) Service Information (bulletin) 61 01 10 629

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11 00 670 Securing engine in installation position

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



- See additional information.

2 – Bring front compartment lid in the service position

Prerequisite

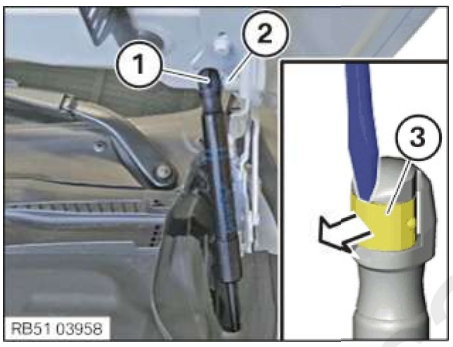
Engine compartment lid is open.

CAUTION

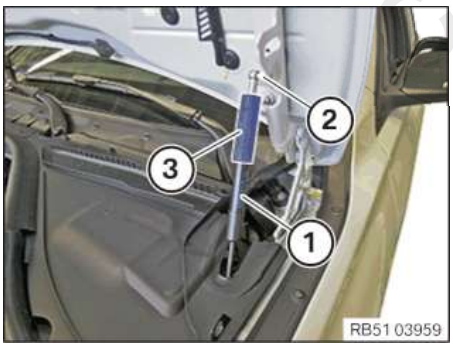
Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.



- Lift clamp (3) slightly using a screwdriver, in the direction of the arrow.
- Lift off ball socket (1) from ball pin (2).
- Repeat the operation on the other side of vehicle.



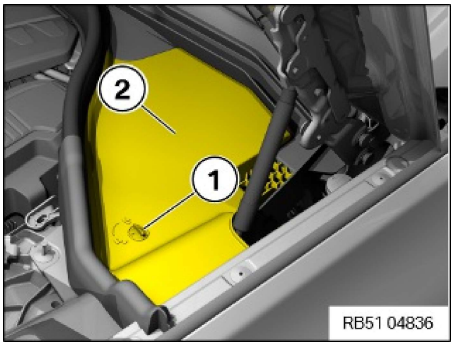
TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Remove the bonnet support and open the bonnet further.
- Push special tool or (3) over gas pressure spring (1).
- Place special tool on the ball pin (2) and engage using force.
- Repeat the operation on the other side of vehicle.

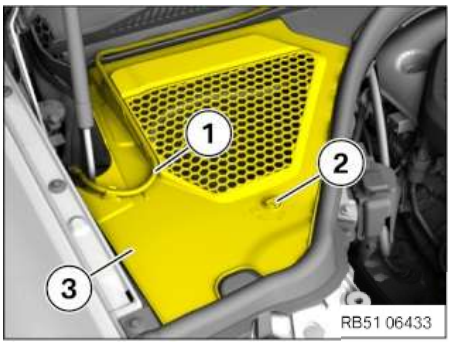
3 – Remove the cover of the engine compartment at the rear left

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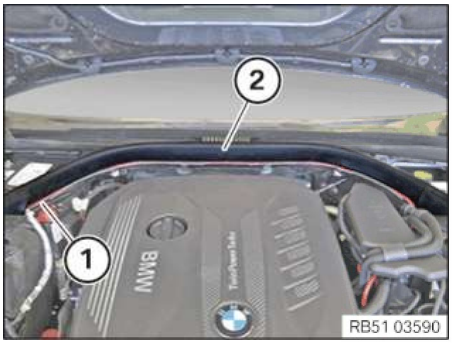
- Loosen the lock (1).
- Remove rear left cover of engine compartment (2).

4 – Remove the cover of the rear right engine compartment



- Release washer fluid hose (1) from the guides.
- Loosen the lock (2).
- Remove the cover of rear right engine compartment (3).

5 – Remove the seal for the rear bonnet



- Feed the cable (1) out of the brackets toward the front.
- Remove the rear bonnet seal (2) from the guide toward the inside.

6 – Removing both wiper arms

NOTICE

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

▶ **Remove the wiper arm**

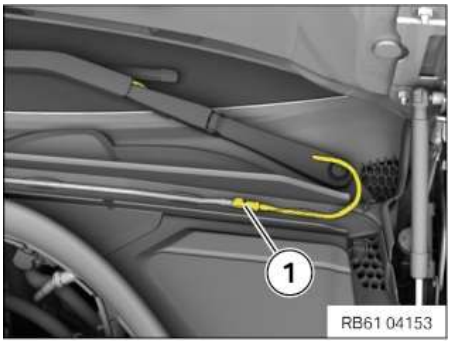
RISK OF DAMAGE

Damage to wiper console

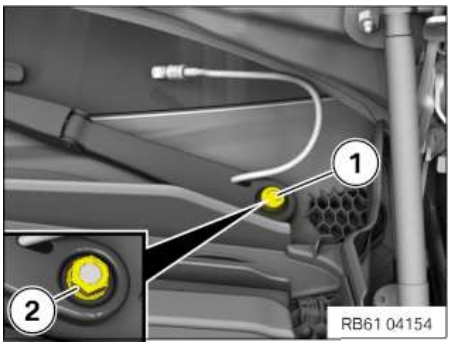
While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.

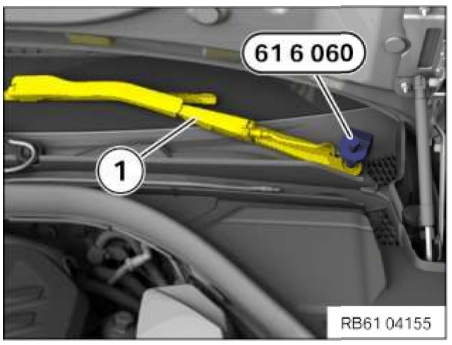
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- Disconnect the windscreen wash hose(1) at the separation point and remove from the cowl guide.

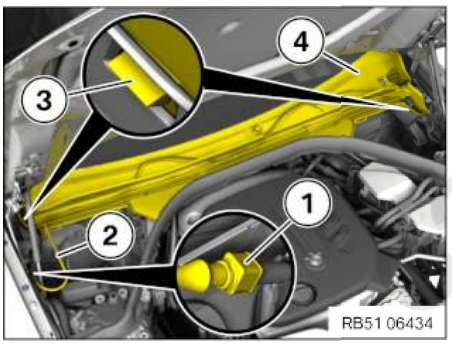


- Remove the protective cap (1).
- Loosen nut (2).

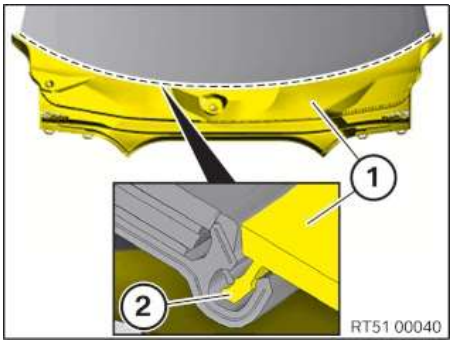


- Pull off the wiper arm (1) using special tool .

7 – Remove cowl panel cover



- Release snap fastener of the washer fluid hose (1) and put the washer fluid hose(2) to one side.
- Unclip clips (3) on the cowl panel cover (4).



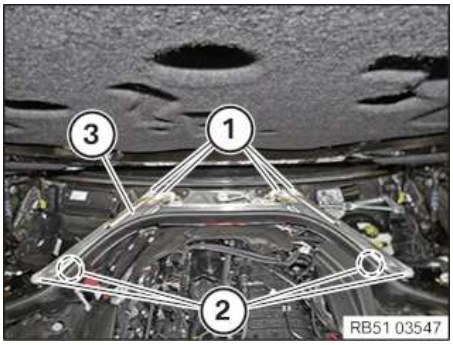
- Pull the cowl panel cover (1) upward out of the latch mechanism (2) beginning on the side.

8 – Removing the centre bulkhead upper part

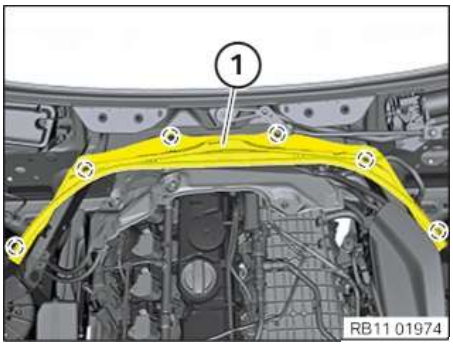
TECHNICAL INFORMATION

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

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- **If installed:** Remove tension strut on spring strut dome.
- Loosen screws (1) and (2).
- Remove tension strut (3) in the spring strut dome upwards.

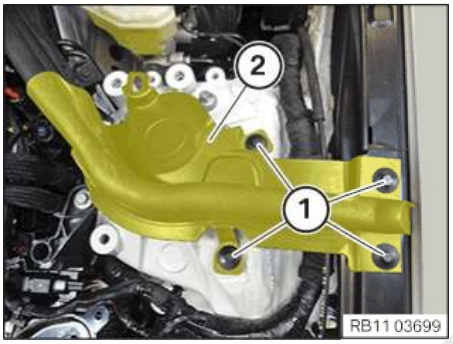


- Unscrew the bolts in the marked areas.
- Remove the centre bulkhead upper part (1).

9 – Removing side bonnet gaskets

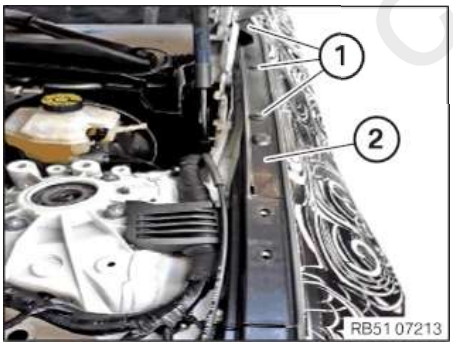
NOTICE

Perform the operations on the left and right side.



- Loosen the rivet (1).
- Remove side bonnet seal (2) from spring strut dome.

10 – Remove sealing of the side panel



NOTICE

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

- Loosen the expanding rivet (1).
- Guide out seal (2) and remove.

11 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

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

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RISK OF DAMAGE

Damage to the acoustic cover.

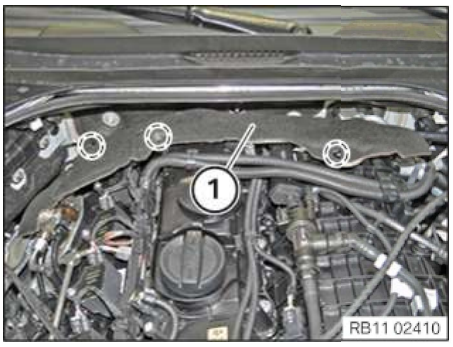
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

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



- Release the acoustic cover (1) towards the top from the rubber mounts (marks).

12 – Removing acoustic cover at rear



- Unclip the acoustic cover (1) in the marked areas and remove it to the top.

13 – Remove all ignition coils.

NOTICE

The description is for one component only. The procedure is identical for all further components.

▶ **Removing the ignition coil**

WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

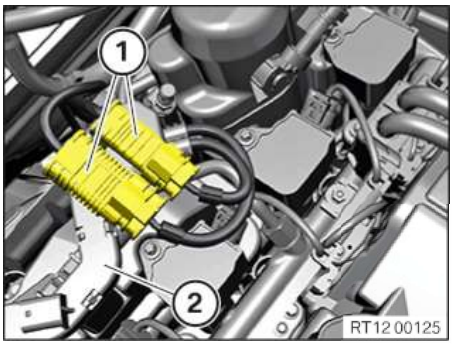
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RISK OF DAMAGE

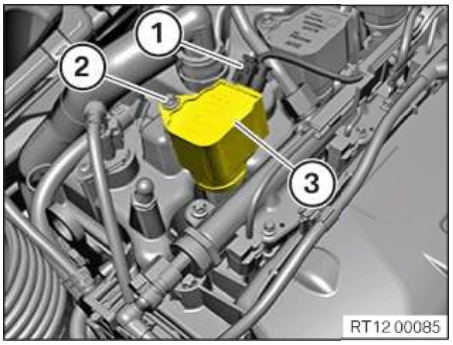
Electrostatic discharge.

Damage to or destruction of electrical components.

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



- Disconnect the connector (1) of the front oxygen sensor and the monitoring oxygen sensor from the cable channel (2) and set aside.



- Unlock plug connection (1) and disconnect.
- Loosen screw (2).
- Remove ignition coil (3).

14 – Remove fuel delivery line

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

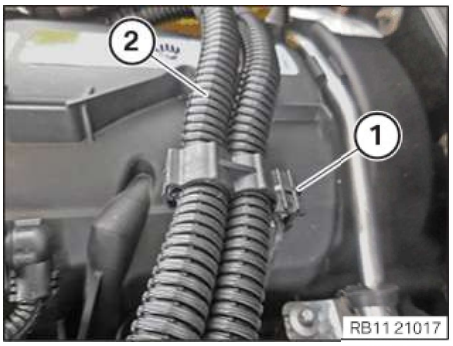
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

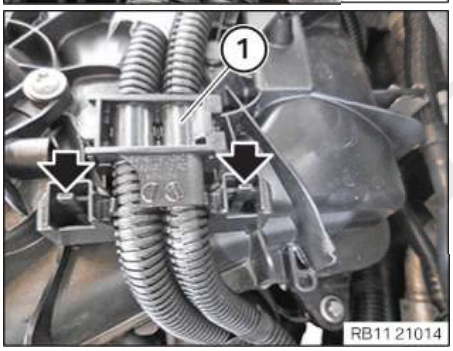
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

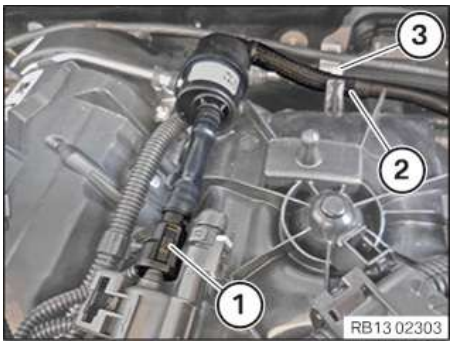
Reset special tool in early to avoid bending pressure lines.



- Loosen clamp (1).
- Guide out wiring harness section (2) for the injectors and ignition coils and place it aside.

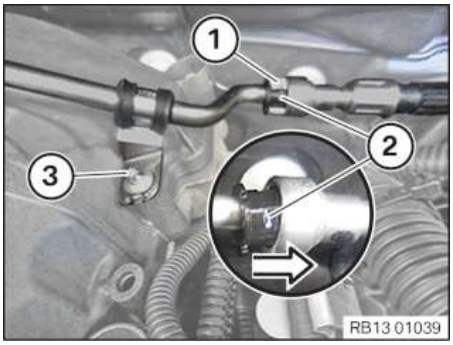


- Unlock the locks (arrows).
- Guide out wiring harness section (1) for the injectors and ignition coils and place it aside.

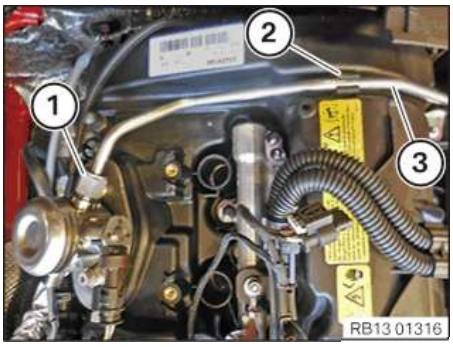


- Unlock and loosen lock (1).
- Guide tank ventilation line (2) out of clamp (3) and place it aside.

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- Unlock and loosen clamp (1).
- Unlock and remove the snap fastener (2) in the direction of the arrow.
- Catch and dispose of escaping fuel.
- Seal the fuel lines with special tools 0 496 567 (13 5 161) and 0 496 568 (13 5 162) from the set of special tools 0 496 565 (13 5 160).
- Loosen screw (3).



- Slacken the union nut (1) on the high pressure pump.
- Catch and dispose of escaping fuel.
- Seal all openings with the special tool .
- Guide the fuel feed line (3) out and remove.
- Make sure that the rubber damper (2) is not lost.

15 – Removing intake silencer housing

RISK OF DAMAGE

Damage to the clean air line. Damage to the air filter.

For changing the air filter insert, if the upper section of intake filter housing is only raised and not completely removed, the clean air line and the air filter insert may be damaged.

- Do not lift upper section of intake filter housing by force.
- Unfasten clamp.
- Remove upper section of intake filter housing completely.



- Unlock plug connection (1) and disconnect.
- Unfasten clamp (2).
- Pull out and remove the intake silencer housing (3) from the rubber mounts towards the top.

16 – Removing the front left wheel

▸ **Removing the wheel**

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- In vehicles with M Carbon ceramic brake: The wheel assembly jack must be used to remove the wheel (see workshop equipment).

  This process is intended to prevent damage to the brake disc.

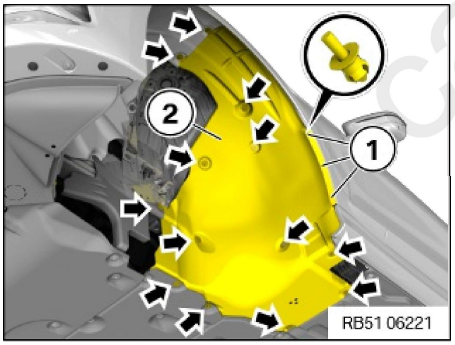


- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Release the wheel bolts (arrows) crosswise and remove the wheel.
- To release and tighten wheel bolts with a security code: Use a suitable adapter from the tool set .

17 – Removing the rear section of the front wheel arch cover front

NOTICE

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



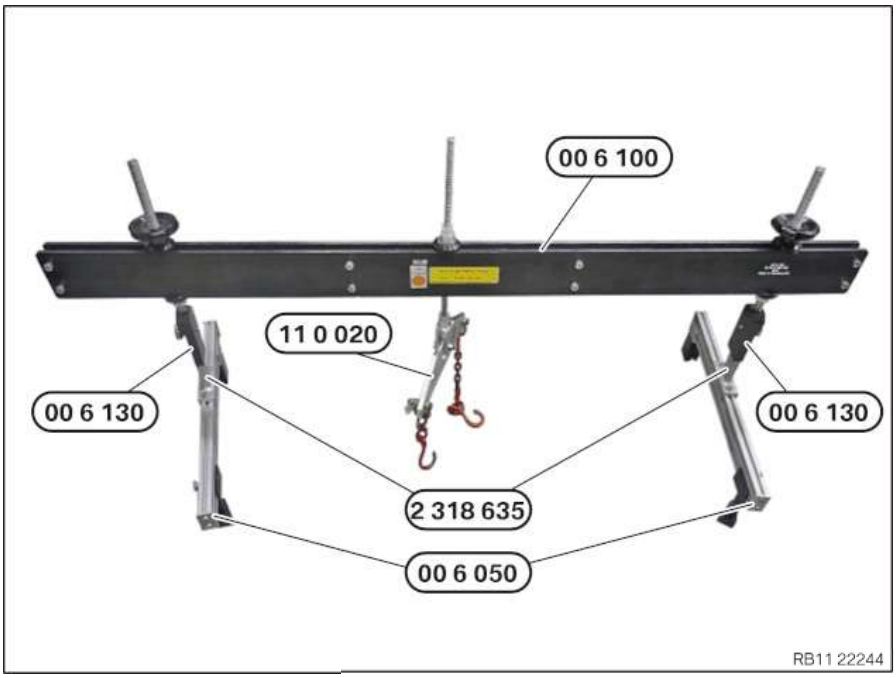
- Loosen the expanding rivet (1).
- Remove screws (arrows).
- Remove the rear section of the front wheel arch cover (2).

MAIN WORK

18 – Securing engine in installation position

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Overview: prepared engine bridge



CAUTION

Components connected to the engine joint or cross member.

Danger of injury!

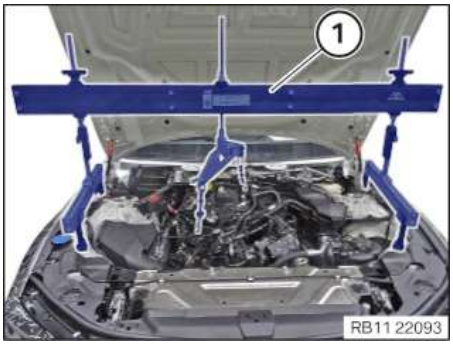
- Check lifting eyes and engine mounting brackets for damage, e.g. cracks.
- Attach the component to correctly mounted engine joints or cross members only.
- Exclusively lift the component, do not move it forwards, backwards or in transverse direction.



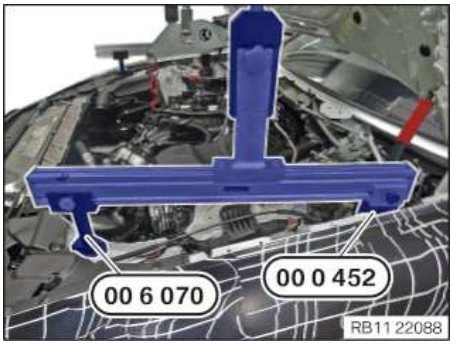
- Guide in and position special tool on cylinder head.
- Tighten the screws (1) of special tool .

Special tool to cylinder head

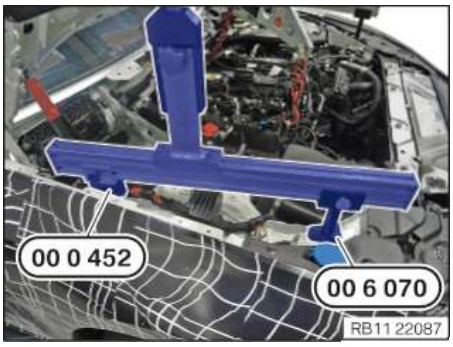
M8		Tightening torque	21,5 Nm



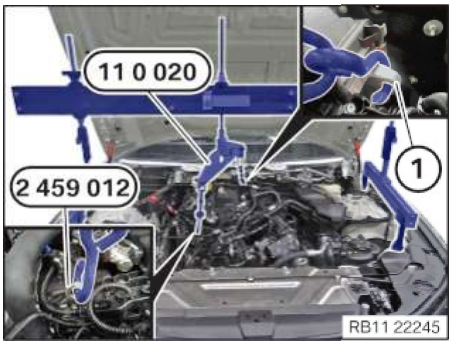
- **Carefully** position engine bridge (1) with help from an auxiliary person.



- Make sure that special tool on the left is **correctly** positioned on the front end.
- Make sure that special tool 0 495 850 (00 0 452) on the left is **correctly** positioned on the carrier support.



- Make sure that special tool on the right is **correctly** positioned on the front end.
- Make sure that special tool 0 495 850 (00 0 452) on the right is **correctly** positioned on the carrier support.



- Align the engine bridge by moving it on the profile strips of the special tool above the engine mounting bracket and screw it down.
- Connect special tool 0 490 567 (11 0 020) to special tool .
- Connect the special tool 0 490 567 (11 0 020) above the engine mounting bracket (1) at the rear.



- Check whether the special tool on the right is **correctly** positioned on the front end.



- Check whether the special tool 0 495 850 (00 0 452) on the right is **correctly** positioned on the carrier support.



- Check whether the special tool on the left is **correctly** positioned on the front end.

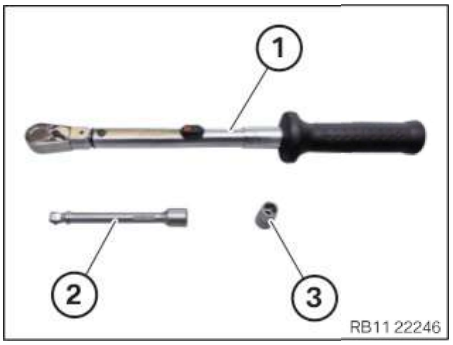
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- Check whether the special tool 0 495 850 (00 0 452) on the left is **correctly** positioned on the carrier support.

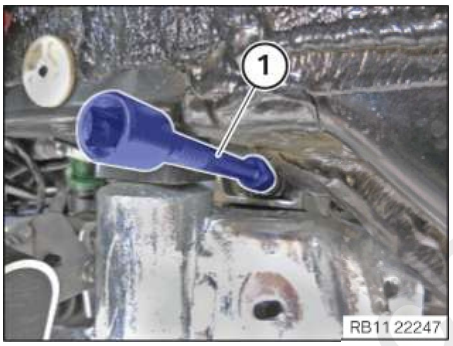


- Release screw (1) on the right engine mount from the top with a commercially available tool.

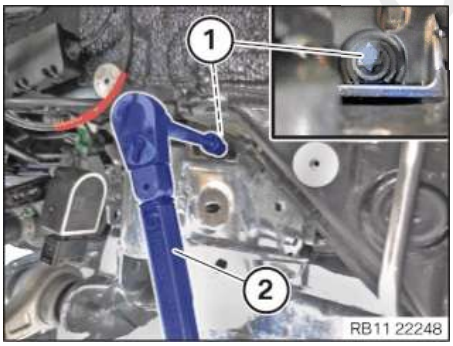


- Have all suitable tools ready.

Number	Description
1	Commercial available torque spanner
2	Swivel mounted extension
3	External Torx E14



- Position the suitable tool (1).



- Release screw (1) of the left engine mount with standard tool (2) sideways.



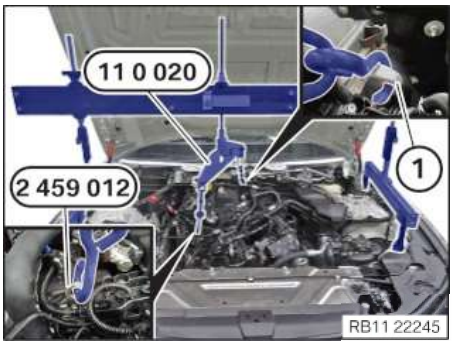
- Raise the engine by turning the special tool 2 361 506 (00 6 103) (spindle) by 10 mm.

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19 – Loosen the attachment of the engine in installation position



- Lower engine by turning the spindle 2 361 506 (00 6 103) until the engine lies completely on the engine supports.



- Feed out special tool 0 490 567 (11 0 020) on the special tool and set aside.
- Feed out special tool 0 490 567 (11 0 020) on the engine mounting bracket (1) and set aside.



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

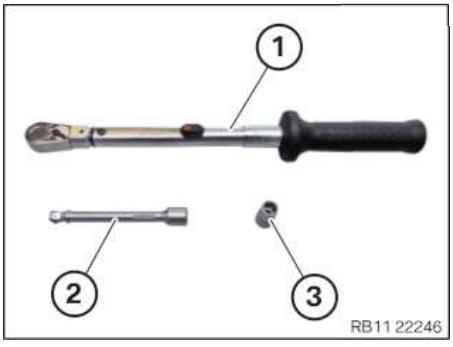
- Remove the engine bridge (1) with an auxiliary person.



- Tighten bolt (1) of the right engine mount from the top using a standard tool.

Engine mount to engine mounting bracket

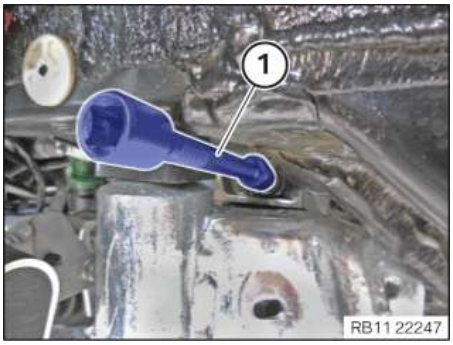
M12		Tightening torque	100 Nm



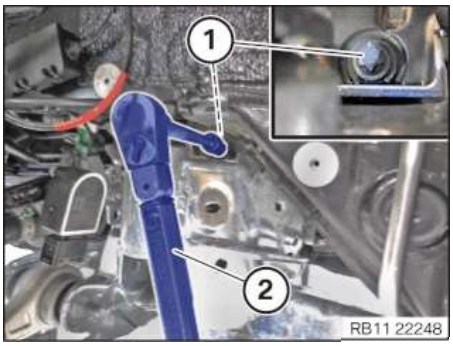
- Have all suitable tools available.

Number	Description
1	Commercial available torque spanner
2	Swivelling extension
3	External TorxE14

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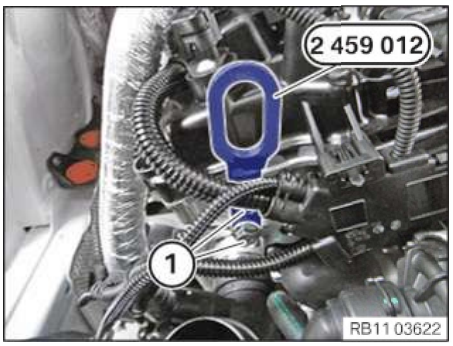
- Position suitable tools (1).



- Tighten bolt (1) of the left engine mount using a standard tool (2) sideways.

Engine mount to engine mounting bracket

M12		Tightening torque	100 Nm



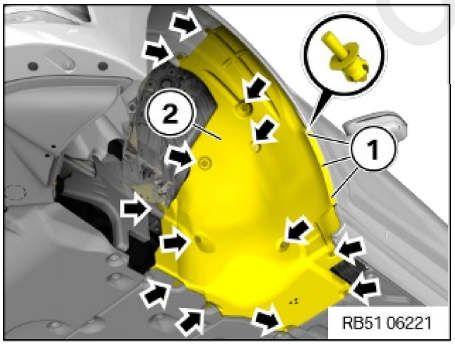
- Unscrew the bolts (1) of the special tool .
- Feed out the special tool at the cylinder head and remove.

POSTPROCESSES

20 – Install the rear section of the front wheel arch cover

NOTICE

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



- Install the rear section of the front wheel arch cover(2) .
- Tighten screws (arrows).

Wheel arch trim panel, front

Thermoplastic hexagon screw		Tightening torque	2,6 Nm

- Secure expanding rivet (1).

21 – Attaching the front left wheel

▸ **Mounting the wheel**

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TECHNICAL INFORMATION

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

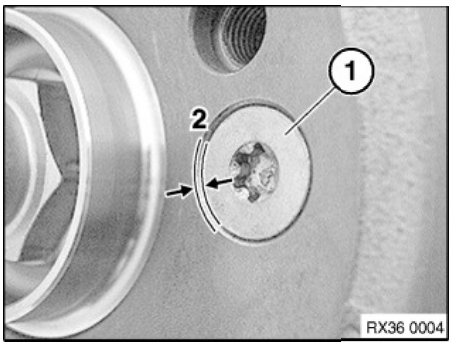
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool 2 344 011.

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



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

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



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

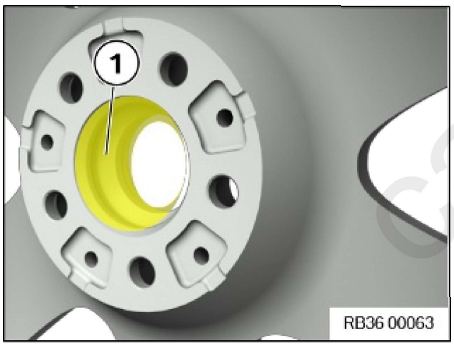
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Thinly grease the wheel centring (1) in the wheel rim.

Expendable materials

Brake block paste * TU = Trade Unit. TU numbers cannot be ordered! For invoicing purposes only.	3 g, Bag	83192158851
	100 g, Tube	83192158852
	5 g, TU*	83230140233



- Lightly grease the front and rear wheel hubs in this area (1) to protect from corrosion.

Expendable materials

Brake block paste * TU = Trade Unit. TU numbers cannot be ordered! For invoicing purposes only.	3 g, Bag	83192158851
	100 g, Tube	83192158852
	5 g, TU*	83230140233

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- In vehicles with M Carbon ceramic brake: The wheel assembly jack must be used to install the wheel (see workshop equipment).

  This process is intended to prevent damage to the brake disc.



TECHNICAL INFORMATION

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

The wheel rim must rest uniformly against the brake disc.

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

Do not apply oil to new wheel bolts.

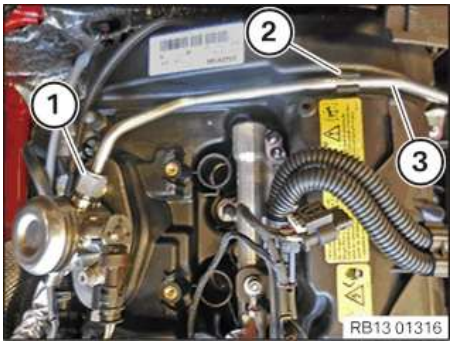
- Renew corroded wheel bolts.

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

Wheel bolts

M14 / SW17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

22 – Installing fuel delivery line

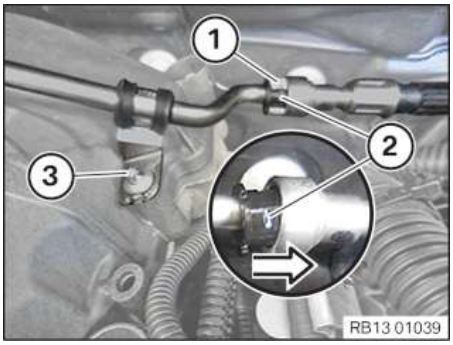


- Guide the fuel delivery line (3) in and install.
- Install rubber damper (2).
- Check the rubber damper (2) for the correct fit.
- Tighten the union nut (1) hand-tight.
- Tighten union nut (1).

Fuel delivery line to high pressure pump

M14		Tightening torque	31 Nm

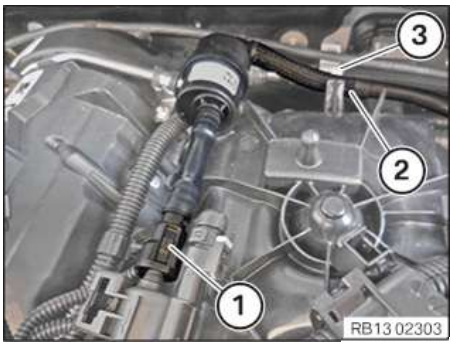
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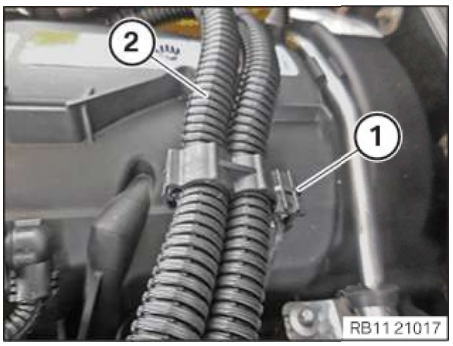
- Slide in and lock the fuel feed line in the direction of the arrow in the snap fastener (2).
  The fuel feed line must be audibly engage in the snap fastener (2).
- Secure clamps (1).
- Tighten down screw (3).

Fuel line to cylinder head cover

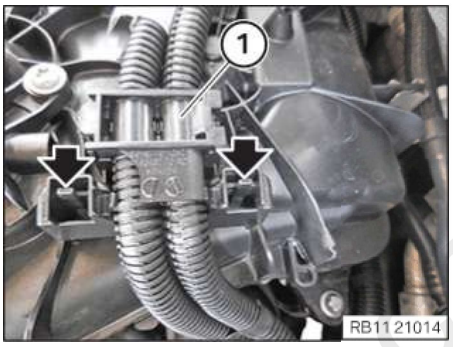
6x18		Tightening torque	6,5 Nm



- Insert and install the tank ventilation line (2).
- Lock (1) must engage audibly.
- Secure the tank ventilation line (2) to the clamp (3).



- Insert and install wiring harness section (2) for injectors and ignition coils.
- Secure clamps (1).



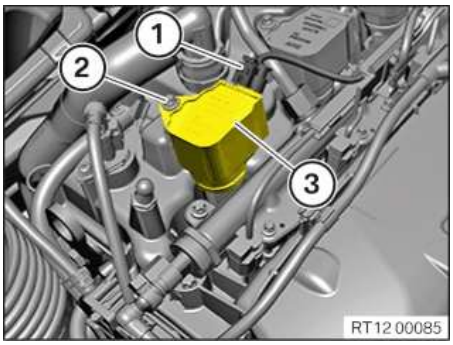
- Insert and install wiring harness section (1) for injectors and ignition coils.
- The locks (arrows) must engage audibly.

23 – Install all ignition coils

NOTICE

The description is for one component only. The procedure is identical for all further components.

▸ **Install ignition coil.**



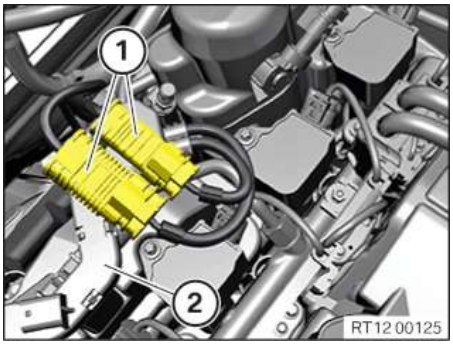
- Install ignition coil (3).
- Tighten down screw (2).

Ignition coil

Screw		Tightening torque	8 Nm

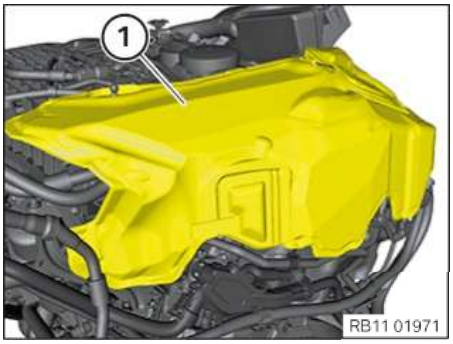
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.

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- Connect the connector (1) of the front oxygen sensor and the monitoring oxygen sensor on the cable shaft (2).

24 – Installing acoustic cover at rear

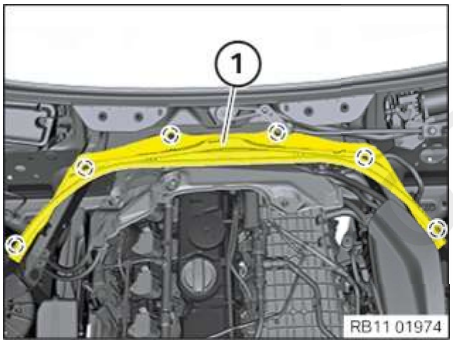


- Make sure the acoustic cover (1) is correctly positioned on the rear side of the engine.



- Install the acoustic cover (1) from the top and clip it in into the marked areas.

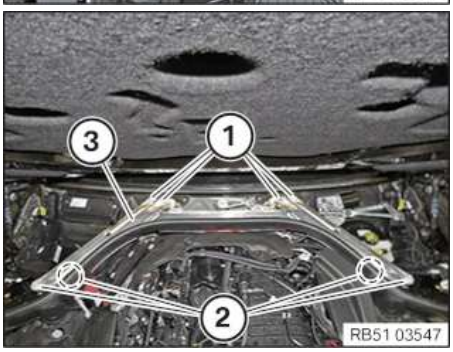
25 – Installing the centre bulkhead upper part



- Position the centre bulkhead upper part (1).
- Tighten the bolts in the marked areas.

Bulkhead upper part to bottom bulkhead

	Tightening torque	3 Nm



- **If installed:** Install tension strut on spring strut dome.
- Install the tension strut (3) on the spring strut dome.
- Tighten the screws (1).

Tension strut on bulkhead

M10x25 screw		Tightening torque	56 Nm

- Renew screws (2).

  Parts: Bolts
- Tighten the screws (2).

Tension strut to spring strut dome

Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

26 – Installing cowl panel cover

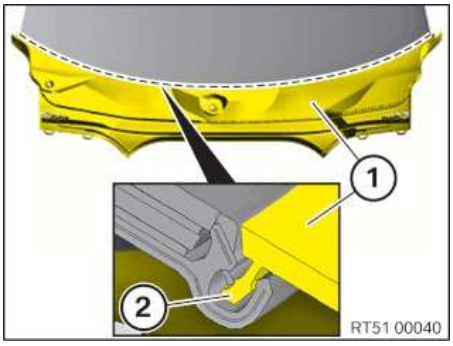
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RISK OF DAMAGE

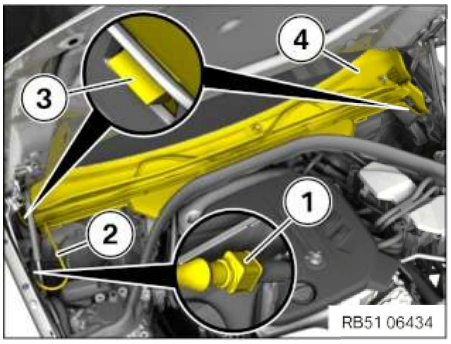
Damage caused by water ingress into the vehicle.

Water ingress into the vehicle may result in damage to components, malfunctions and corrosion.

- Ensure correct installation of the components.
- Only use undamaged components.



- Push the cowl panel cover (1) into the latch mechanism (2) beginning on the side.



- Clip cowl panel cover (4)in by means of the latch mechanisms (3).
- Position windscreen wash hose (2) and connect windscreen wash hose (1)quick lock.

27 – Installing both wiper arms

NOTICE

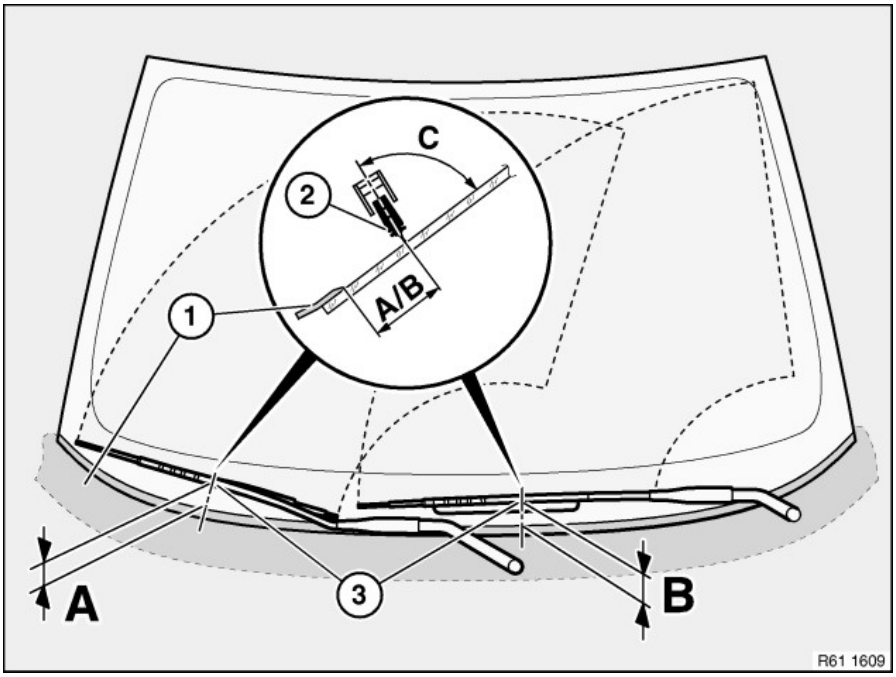
Description is for left component only. Procedure on the right side is identical.

▸ Install the wiper arm

TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.

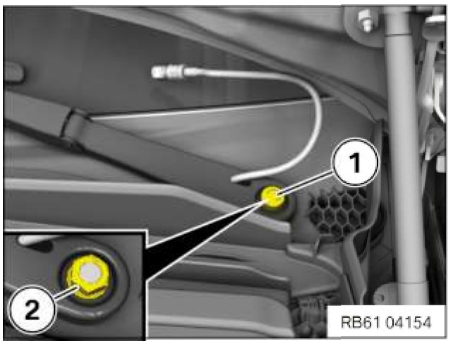
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- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).

Distance from window pane edge to wiper blade

Wiper arm right (A)	57,5 ± 5 mm
Wiper arm left (B)	63,3 ± 4 mm

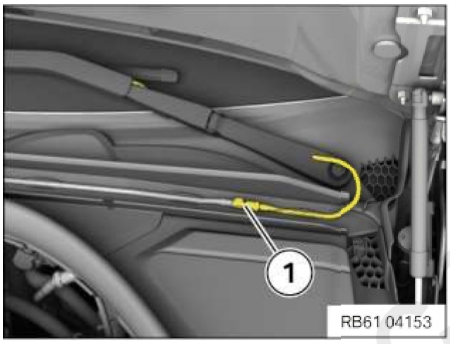


- Tighten nut (2).

Windscreen wiper arm

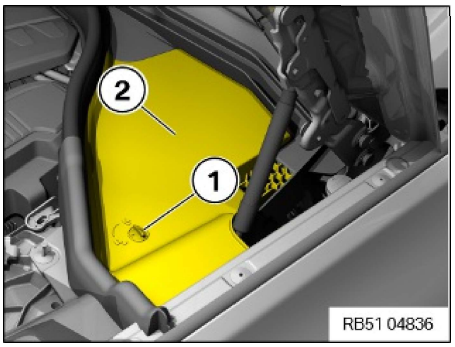
Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).



- Insert windscreen wash hose (1) into the cowl and connect at the separating point.

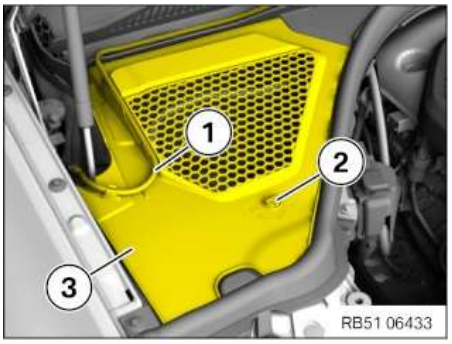
28 – Install the cover of the engine compartment on the rear left



- Position the engine compartment cover at the rear left (2) .
- Close lock (1).

29 – Install the rear right engine compartment cover

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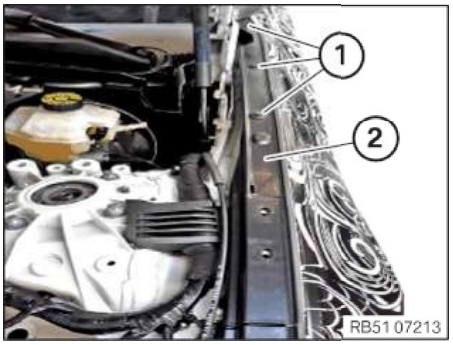
- Position the cover of the engine compartment on the rear right (3).
- Close lock (2).
- Insert washer fluid hose (1) into the guides.

30 – Install the seal for the bonnet



- Press the rear bonnet seal (2) into the guide.
- Feed in cable (1) into the brackets.
- Check that the rear bonnet seal (2) and the cable (1) are seated correctly.

31 – Installation of side panel sealing.



NOTICE

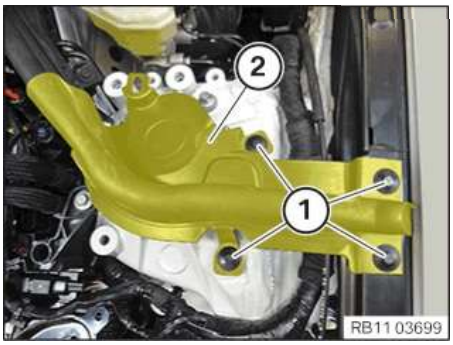
Description is for left component only. Procedure on the right side is identical.

- Guide the sealing (2) in and install it.
- Mount the expanding rivets (1).

32 – Install side bonnet seals

NOTICE

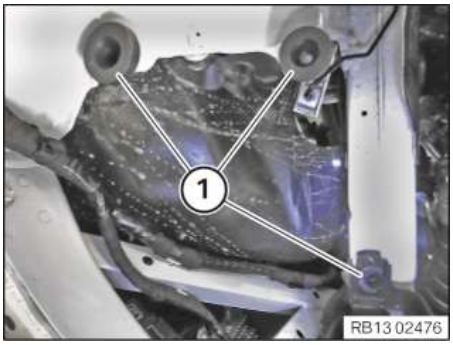
Perform the operations on the left and right side.



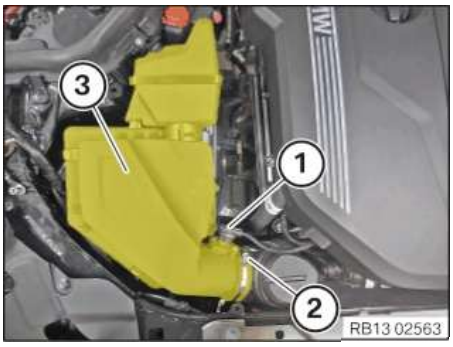
- Position the side bonnet seal (2) on the spring strut dome.
- Secure the rivet (1).

33 – Installing intake silencer housing

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- Check the rubber mount (1) for correct fit.



- Feed the intake filter housing (3) in and engage it in the rubber mounts.
- Tighten clamp (2).

Clean air pipe to upper section of intake filter housing

Clamp		Tightening torque	3 Nm

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

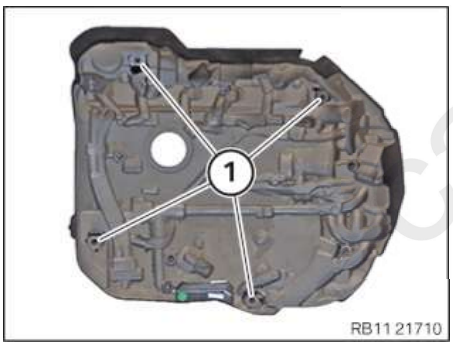
34 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

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

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



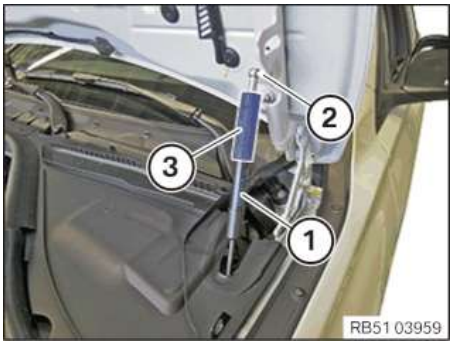
- Check the rubber mount (1) for correct fit in the acoustic cover.



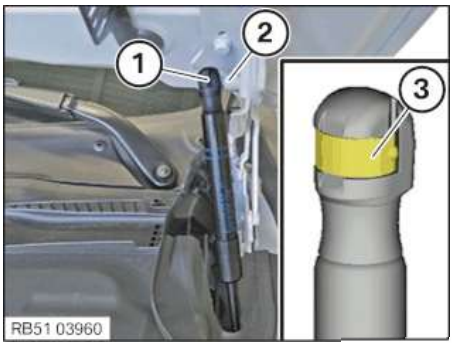
- Install acoustic cover (1) and fix in the rubber mounts (marks).

35 – Take bonnet out of the service position

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- Support the bonnet by hand.
- Remove the special tool (3) from the ball pin (2).
- Pull off the special tool (3) from the gas pressure spring (1).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.



CAUTION

Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.

- Check the clamp (3) is fitted correctly.
- Connect ball socket (1) to ball pin (2).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.

36 – Disconnecting all battery earth leads



- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head			Used in step 18
M8		Tightening torque	21,5 Nm

Engine mount to engine mounting bracket			Used in step 19
M12		Tightening torque	100 Nm

Wheel arch trim panel, front			Used in step 20
Thermoplastic hexagon screw		Tightening torque	2,6 Nm

Brake disc to front wheel hub			Used in step 21
M8	Renew screw.	Tightening torque	16 Nm

Brake disc to rear wheel hub			Used in step 21
M8	Renew screw.	Tightening torque	16 Nm

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Wheel bolts			Used in step 21
M14 / SW17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Fuel delivery line to high pressure pump			Used in step 22
M14		Tightening torque	31 Nm

Fuel line to cylinder head cover			Used in step 22
6x18		Tightening torque	6,5 Nm

Ignition coil			Used in step 23
Screw		Tightening torque	8 Nm

Bulkhead upper part to bottom bulkhead			Used in step 25
		Tightening torque	3 Nm

Tension strut on bulkhead			Used in step 25
M10x25 screw		Tightening torque	56 Nm

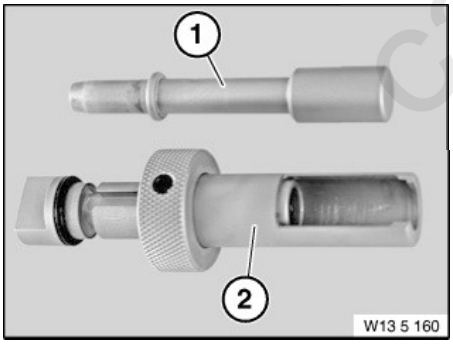
Tension strut to spring strut dome			Used in step 25
Screw	Renew screws.	Jointing torque Angle of rotation	56 Nm 90 °

Windscreen wiper arm			Used in step 27
Combination hexagon nut		Tightening torque	35 Nm

Clean air pipe to upper section of intake filter housing			Used in step 33
Clamp		Tightening torque	3 Nm

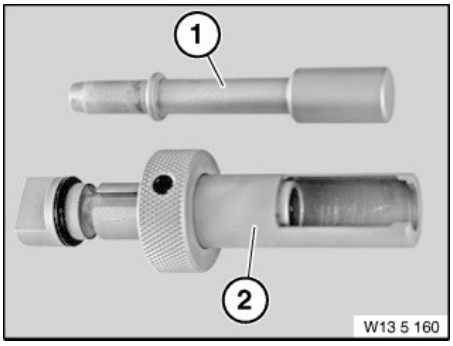
Overview of Special Tools

0 496 567 (13 5 161) Fastener



Common		Used in step 14
Usage	(Cap (2 piece)) For sealing the quick connectors Deletion, only available via tool set	
Included in the tool or work	0 496 565	
Storage location		
Replaced by		
In connection with		
SI-Number		

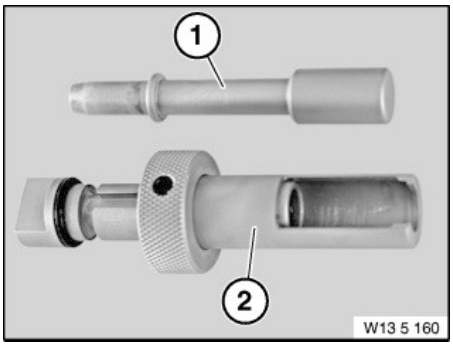
0 496 568 (13 5 162) Fastener



Common		Used in step 14
Usage	(Cap (2 x)) To close off the fuel lines. Discontinued, can only be ordered using complete tool	
Included in the tool or work	0 496 565	
Storage location		
Replaced by		
In connection with		
SI-Number		

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0 496 565 (13 5 160) Fastener



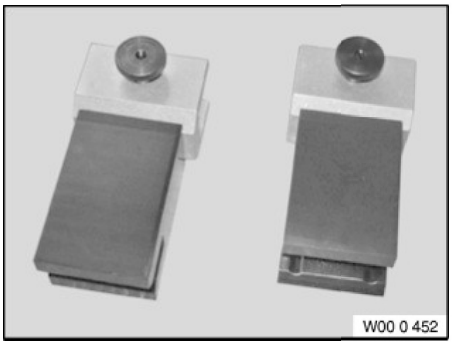
Common Used in step 14

Usage	(Caps (2x)) To close off the fuel lines when removing and installing the engine.
Included in the tool or work	
Storage location	B26
Replaced by	
In connection with	
SI-Number	01 22 08 (498)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 567 (13 5 161)		**Fastener** (Cap (2 piece)) For sealing the quick connectors Deletion, only available via tool set	
2	0 496 568 (13 5 162)		**Fastener** (Cap (2 x)) To close off the fuel lines. Discontinued, can only be ordered using complete tool	

0 495 850 (00 0 452) Upholstery



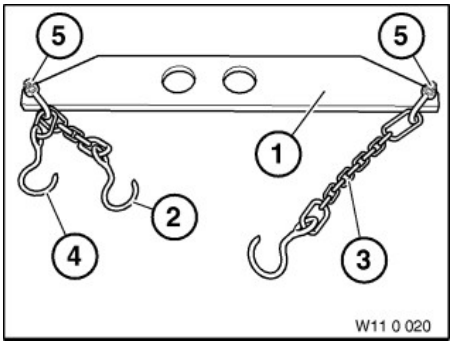
Common Used in step 18

Usage	(Pads (2 x)) Series: E70 Replaced by 00 6 042
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 22 06 (307)

0 490 567 (11 0 020) Lifting gear

Used in step 1819

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Common

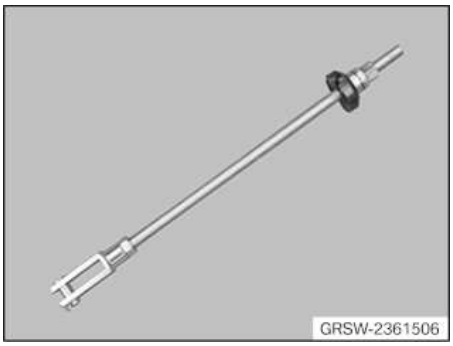
Usage	For removing and installing the engines. 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
5	0 490 572 (11 0 029)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 568 (11 0 021)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 569 (11 0 022)		**Chain** (Chain) As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 570 (11 0 023)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
4	0 490 571 (11 0 024)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	

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2 361 506 (00 6 103) Spindle



Common	Used in step 1819
Usage	Spindle (central spindle) for Traverse 00 6 100.
Included in the tool or work	0 496 852
Storage location	
Replaced by	
In connection with	
SI-Number	01 17 10 (659)

2 344 011 Tool



Common	Used in step 21
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 16
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 16
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

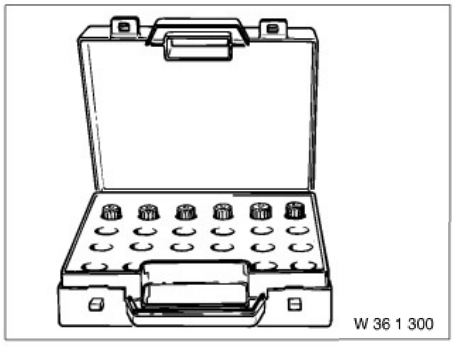
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0 495 225 (36 1 327) Wheel stud



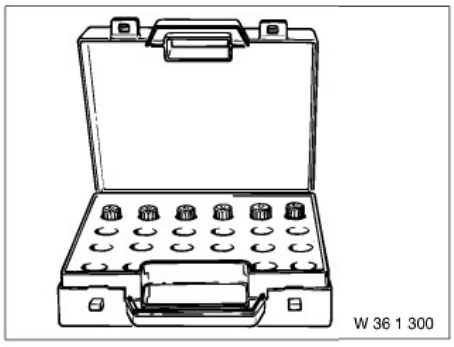
Common	Used in step 16
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 16
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 16
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 16
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

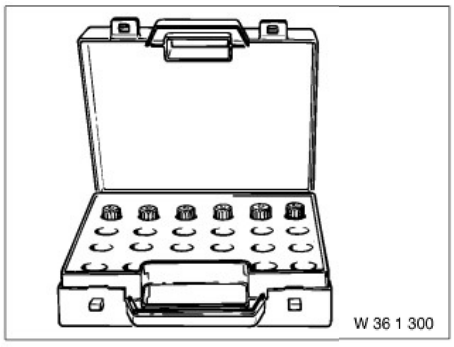
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0 495 229 (36 1 332) Wheel stud



Common	Used in step 16
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 16
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Distance from window pane edge to wiper blade	Used in step 27
Wiper arm right (A)	57,5 ± 5 mm
Wiper arm left (B)	63,3 ± 4 mm

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	136
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	136
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	136
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	136

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61 20 900 Disconnecting and connecting battery earth lead 136
61 20 900 Disconnecting and connecting battery earth lead 136
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61 20 900 Disconnecting and connecting battery earth lead 136
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) 136
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61 20 900 Disconnecting and connecting battery earth lead 136
61 20 900 Disconnecting and connecting battery earth lead 136
61 20 900 Disconnecting and connecting battery earth lead 136
61 20 900 Disconnecting and connecting battery earth lead 136
61 35 ... Notes on ESD protection (Electro Static Discharge) 13

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11 12 729 Checking cylinder head for watertightness

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

PRELIMINARY WORK

1 – Removing the exhaust turbocharger (cylinder head removed)

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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

RISK OF DAMAGE

Damage to the electrical wastegate valve controller.

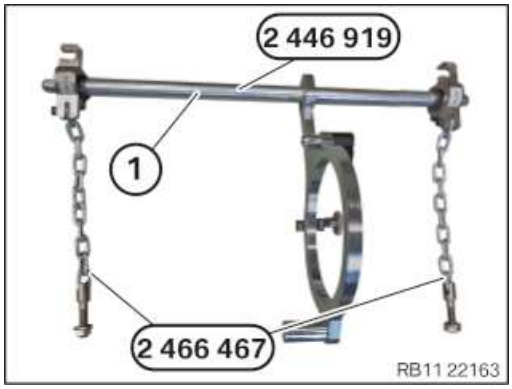
The electrical wastegate valve controller may be damaged as a result of the excessive forces required when removing and installing a jammed exhaust turbocharger.

- Do not pull on the electrical wastegate valve controller.
- Apply force to the turbine housing and exhaust manifold only.
  - Do not pull on the compressor housing.

TECHNICAL INFORMATION

Do not damage the thermal compensating elements. The disassembly and installation including intermediate storage of the exhaust turbocharger is only permitted with mounted special tool 2 466 919 .

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- Have the special tool 2 446 919 and the special tool 2 466 467 ready.



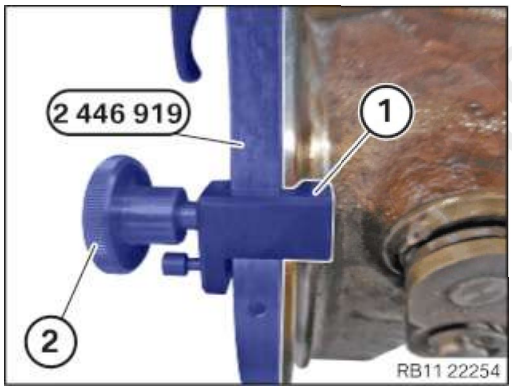
- Install the special tool 2 446 919 on the exhaust turbocharger and secure it with the bolt (1).



- Fix the special tool 2 446 919 by turning the clamping lever (1) in the **direction** of the arrow.

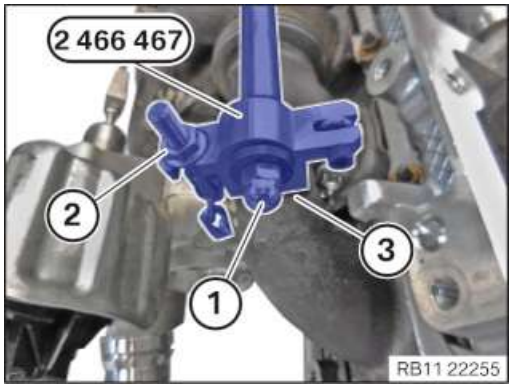
Note: The clamping lever that is shown in the graphic is already in its end position.

- Make sure that the special tool 2 446 919 is flush with the exhaust turbocharger in the **marked area**.

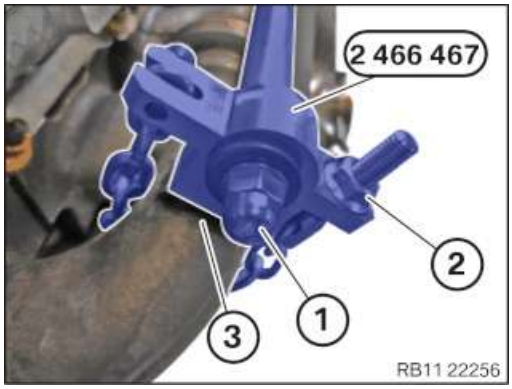


- Position the holder (1) and fasten it with the bolt (2).

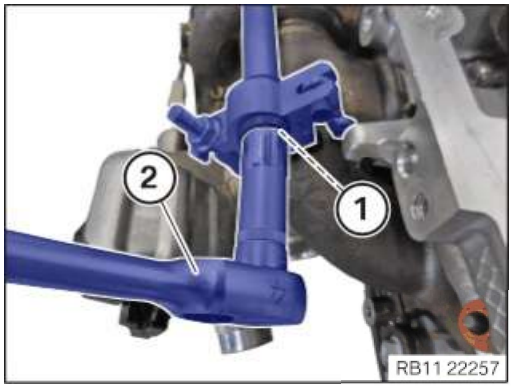
Note: The holder is used for the final mounting of the special tool **2 446 919**.



- Tighten the nut (1) hand-tight.
- Tighten the nut (2) hand-tight.
- Ensure that the special tool 2 466 467 rests correctly on the exhaust turbocharger (3).



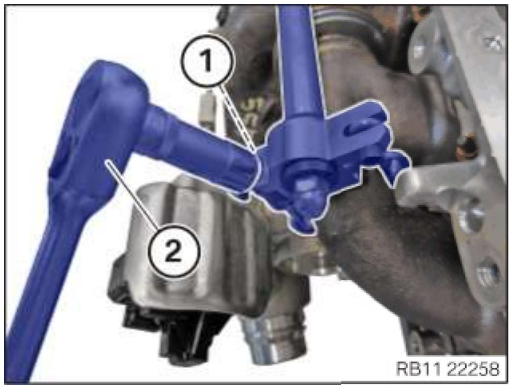
- Tighten the nut (1) hand-tight.
- Tighten the nut (2) hand-tight.
- Ensure that the special tool 2 466 467 rests correctly on the exhaust turbocharger (3).



- Tighten the nut (1) using commercially available tools (2).

Special tool 2 466 467 to special tool 2 446 919

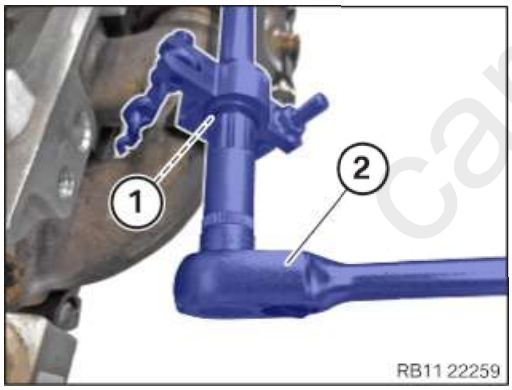
M8		Tightening torque	5 Nm



- Tighten the nut (1) using commercially available tools (2).

Special tool 2 466 467 to special tool 2 446 919

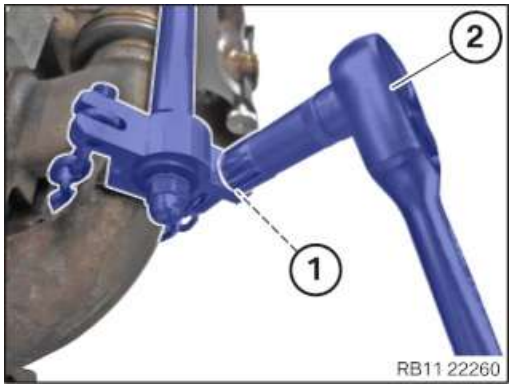
M8		Tightening torque	5 Nm



- Tighten the nut (1) using commercially available tools (2).

Special tool 2 466 467 to special tool 2 446 919

M8		Tightening torque	5 Nm

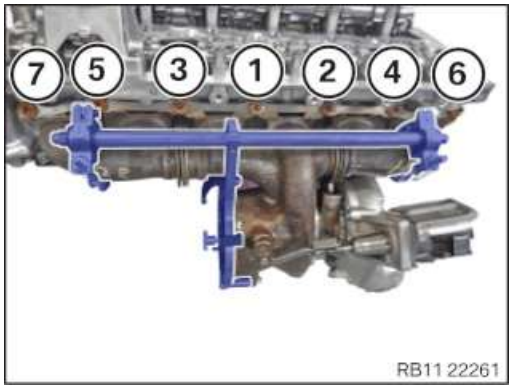


- Tighten the nut (1) using commercially available tools (2).

Special tool 2 466 467 to special tool 2 446 919

M8		Tightening torque	5 Nm

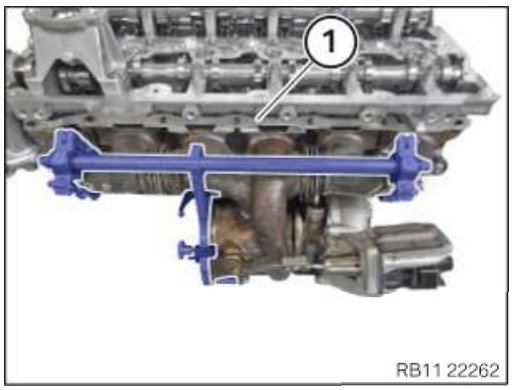
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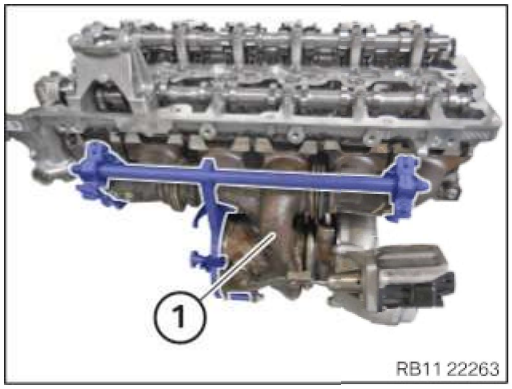
TECHNICAL INFORMATION

Exhaust manifold/exhaust turbocharger is not bolted to the underside, but clamped instead. When removing/replacing the exhaust manifold/exhaust turbocharger, the clamping strip remains screwed on.

- Unscrew the nuts in sequence (7) to (1).
- Secure exhaust turbocharger against falling down.



- Slide the slide rail (1) out and remove.



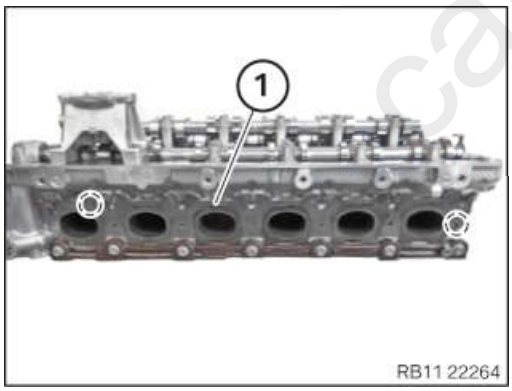
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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

- Carefully guide out and remove the exhaust turbocharger (1).
- Thermal compensating elements of the exhaust turbocharger (1) or exhaust manifold should **not** be bent or deformed.



- Feed out and remove seal (1) in the **marked area.**

2 – Installing cylinder head on the assembly stand

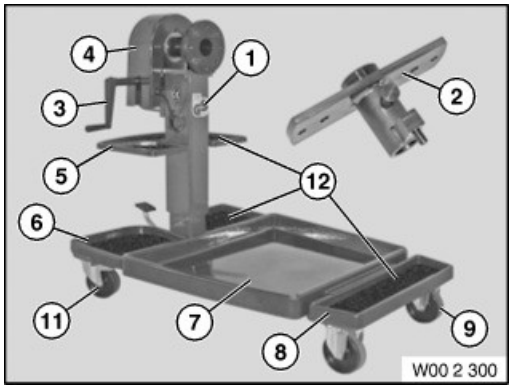
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

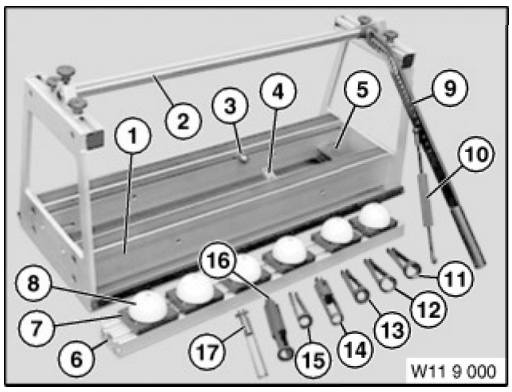
- Remove and install heavy components with the aid of another person/other persons.

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- Have the set of special tools 0 495 187 (00 2 300) ready.

Number	Description
1	Assembly stand
2	Flange
3	Crank
4	Cover
5	oddments tray
6	Shaped element rear
7	Collection pan
8	Shaped element front
9	Front wheel
10	Rear wheel with stop
11	Mat



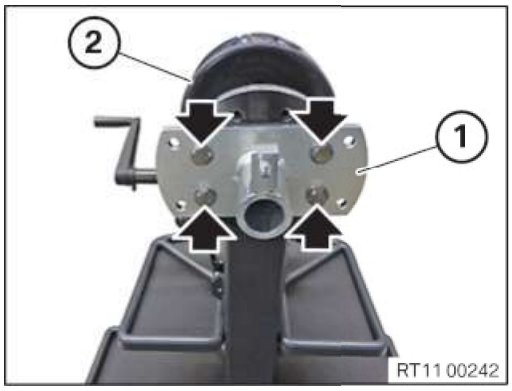
- Have the set of special tools 0 494 362 (11 9 000) ready.

Number	Description
1	Device
2	Rod
3	Adapter
4	Tab
5	Quick fastener
6	Aluminum strip
7	Shaped part
8	Shaped part made of plastic
9	Lever
10	Hook
11	Valve spring cage
12	Valve spring cage
13	Valve spring cage
14	Valve spring cage
15	Valve spring cage
16	Valve spring cage
17	Valve spring cage

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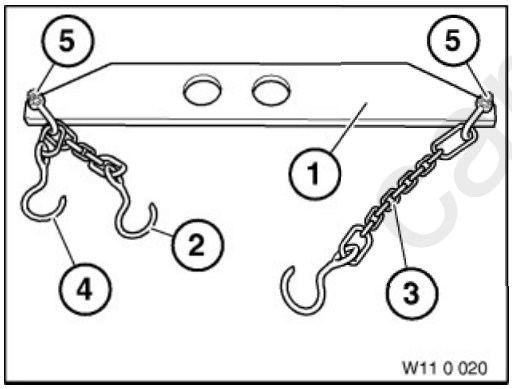
- Stage special tool (workshop crane) 2 220 718.



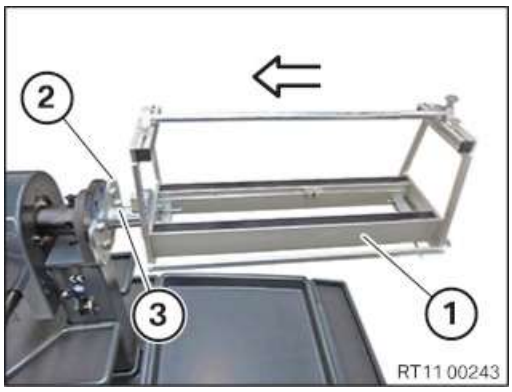
- Position flange (1) on assembly stand (2).
- Tighten screws (arrows).

Flange to assembly stand

M14X30		Tightening torque	135 Nm

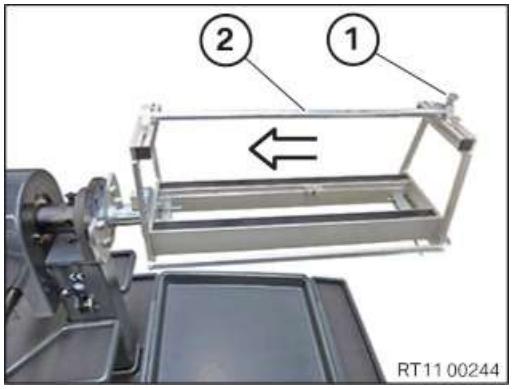


- Prepare the special tool 0 490 567 (11 0 020).

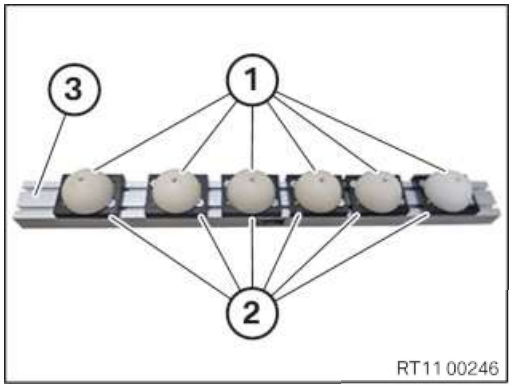


- Fit device (1) onto the flange (2) in the direction of the arrow and install.
- Make sure that the lock (3) engages audibly.

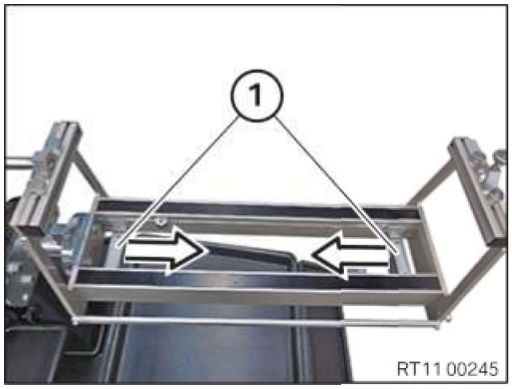
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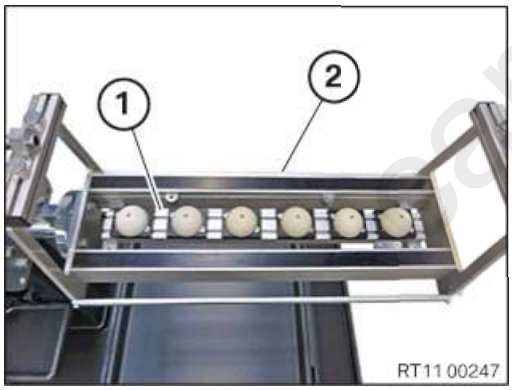
- Loosen screw (1).
- Pull out rod (2) in direction of arrow and set it aside.



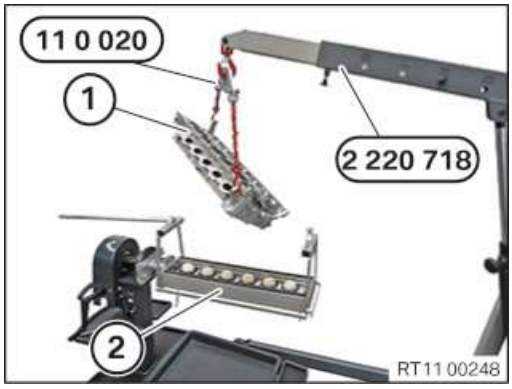
- Prepare plastic shaped part (1) with the shaped parts (2) and the aluminium strip (3).



- Slide quick fastener (1) in the direction of the arrow to the limit position.

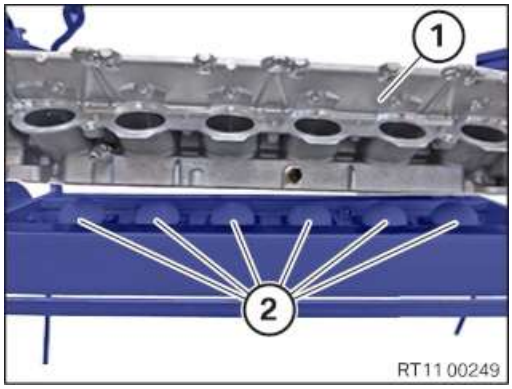


- Position completed aluminium strip (1) **centred** on the device (2).

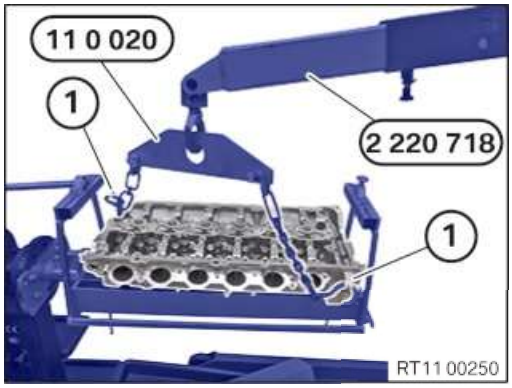


- Position cylinder head (1) with the work crane 2 220 718 and special tool 0 490 567 (11 0 020) on the device (2).

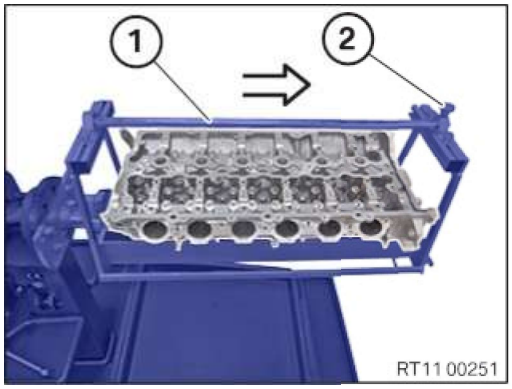
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- Position cylinder head (1) correctly on the completed aluminium strip (2).



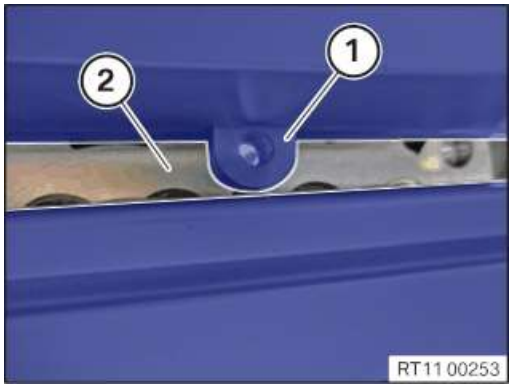
- Lower workshop crane 2 220 718.
- Pull out special tool 0 490 567 (11 0 020) at the cylinder head (1) and remove.
- Remove workshop crane 2 220 718 and set aside.



- Pull in rod (1) in the direction of the arrow and install.
- Hand-tighten the bolt (2).

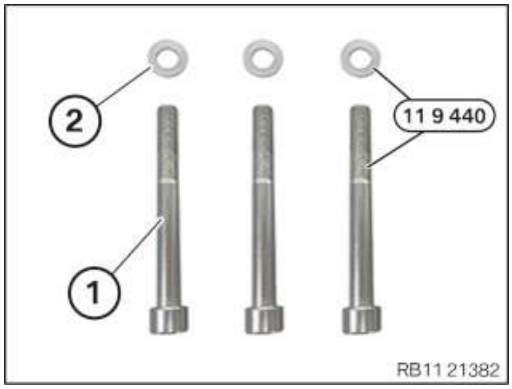


- Position screw connection (1) on cylinder head (2).

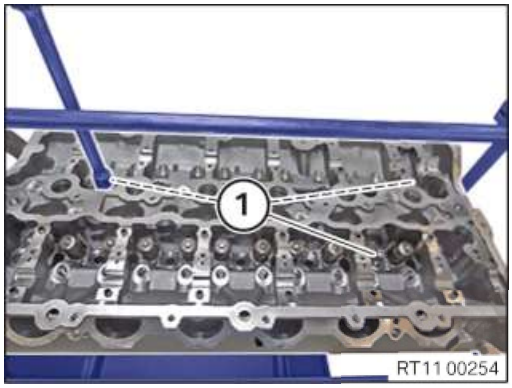


- Position screw connection (1) on cylinder head (2).

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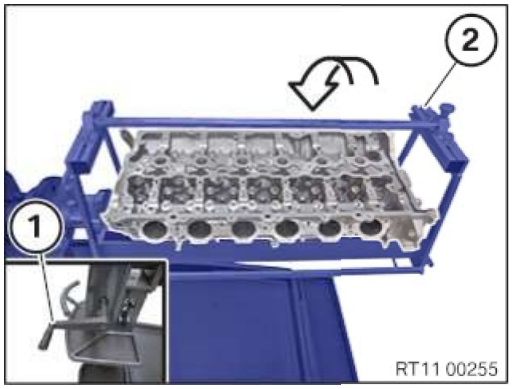
- Keep **M10x90** screws (1) from special tool ready.
- Keep washers (2) from special tool ready.



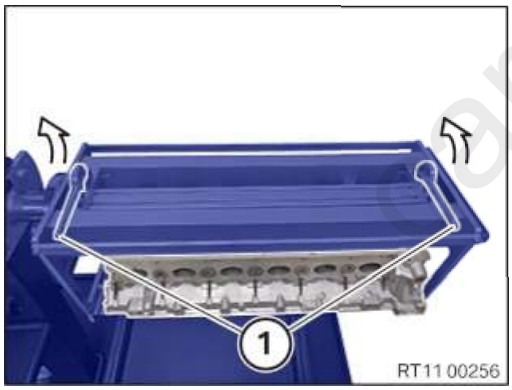
- Tighten screws (1) from special tool.

Cylinder head on device

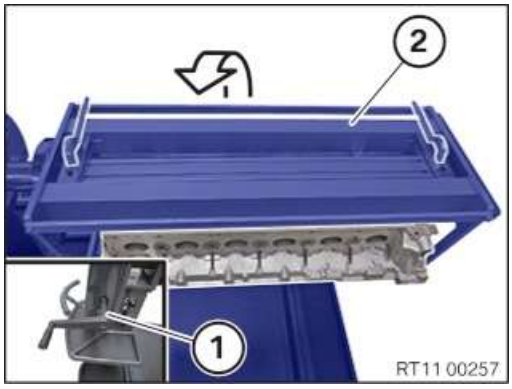
M10X90x1.5		Tightening torque	30 Nm



- Turn device (2) on the crank (1) by 180° in direction of arrow.



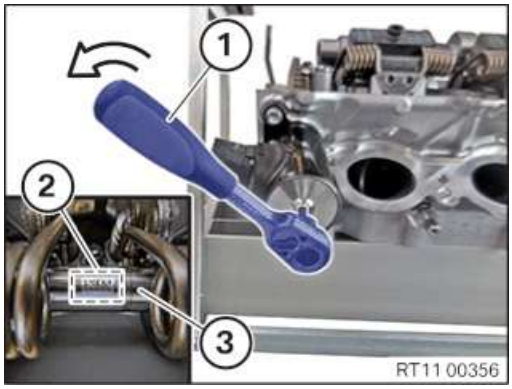
- Lock quick fastener (1) in direction of arrow.



- Turn device (2) on the crank (1) by 180° in direction of arrow.

3 – Adjusting eccentric shaft to minimum lift (cylinder head removed)

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- With the help of the servomotor, use a standard hexagon socket wrench (1) to slowly adjust eccentric shaft (3) to the minimum lift at **4 mm** in the **direction of the arrow**.
- Make sure that the mark (2) on the eccentric shaft (3) points upwards.

4 – Removing all torsion springs (cylinder head removed)

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

TECHNICAL INFORMATION

- Wear safety goggles.



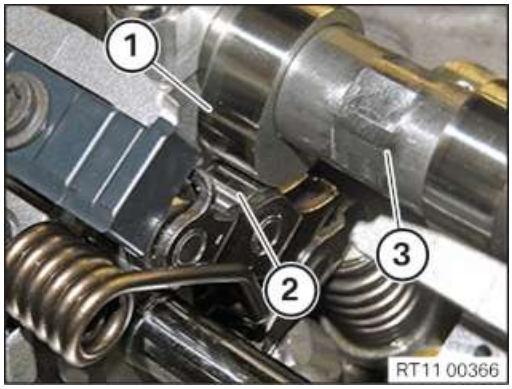
- Have the set of special tools 2 359 088 ready.

Number	Description
1	Clamping lever
2	Mounting for clamping lever (fitting aid)

▸ Checking the position of the intake camshaft (cylinder head removed)

Check

- Check position of the intake camshaft on the respective cylinders.



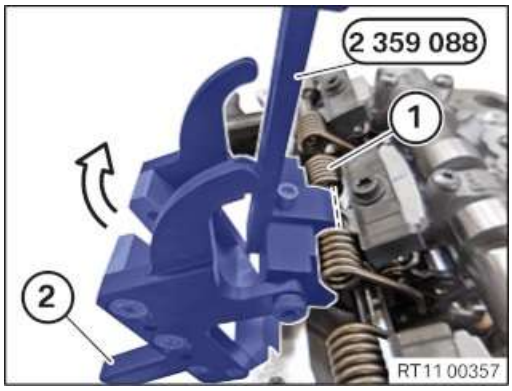
cardiagn.com

Result

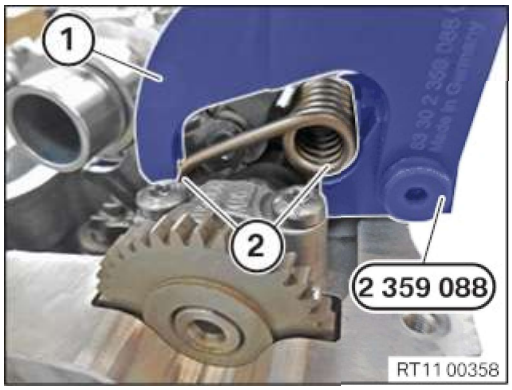
» Cam (1) of the intake camshaft runs on the intermediate lever (2).

Measure

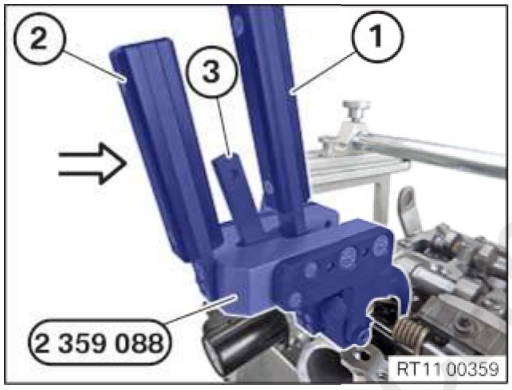
- Turn intake camshaft (3) further using a standard open-end spanner until the cam (1) does not override on the intermediate lever (2).



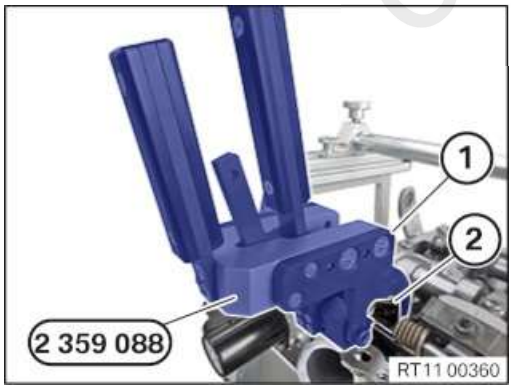
- Open the special tool 2 359 088 and position it at the torsion spring (1).
- Position retaining hook (2) of the special tool 2 359 088 in the direction of arrow.



- Make sure that the torsion spring (2) is correctly positioned in the clamping lever (1) of the special tool 2 359 088.

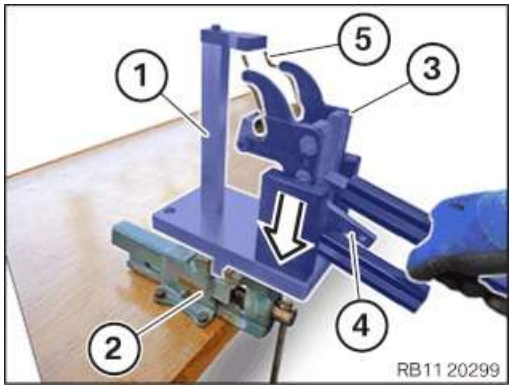


- Hold down lever (1) of special tool 2 359 088.
- Close lever (2) of the special tool 2 359 088 carefully in the **direction of arrow** until the retaining hook (3) engages audibly.



- Guide out and remove clamping lever (1) of special tool 2 359 088 with preloaded spring (2) **carefully**.

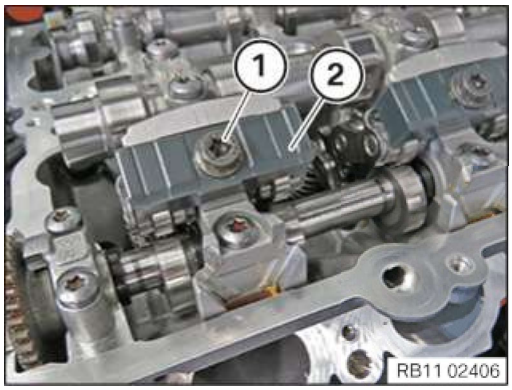
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- Clamp fixture (1) of the special tool 2 359 088 in the vice (2).
- Position clamping lever (3) of special tool 2 359 088 with pre-tensioned torsion spring (5) in direction of arrow in the mounting (1) of the special tool 2 359 088.
- Carefully unlock retaining hook (4) of the special tool 2 359 088.

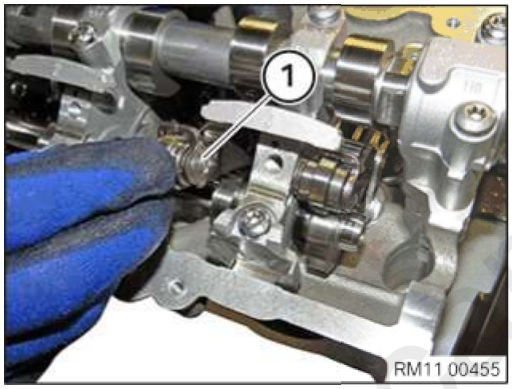
  The torsion spring (5) is relieved.
- Slowly open clamping lever (3) and remove the torsion spring (5).
- Place torsion spring (5) neatly into special tool 0 495 105 (11 4 480).
- Repeat the operations for the remaining torsion springs.

5 – Removing all gates



- Loosen screw (1).
- Remove the gates (2) and place it arranged in order in the special tool 0 495 105 (11 4 480).
- Repeat the step for all the gates.

6 – Removing all intermediate levers



- Remove the intermediate lever (1) and arrange it in the special tool 0 495 105 (11 4 480) in order.
- Repeat the step for all intermediate levers (1).

7 – Removing intake camshaft (cylinder head removed)

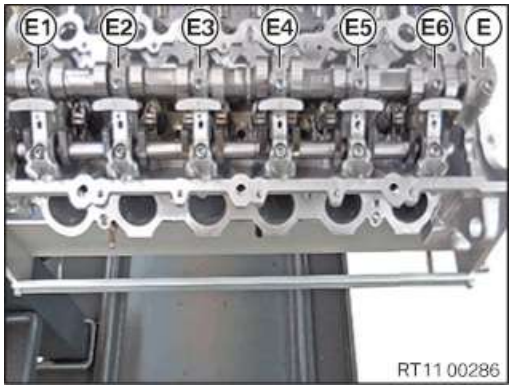
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

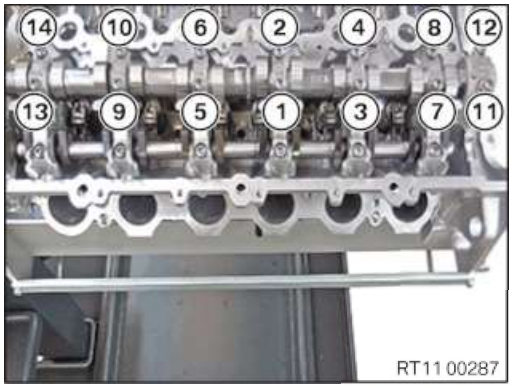
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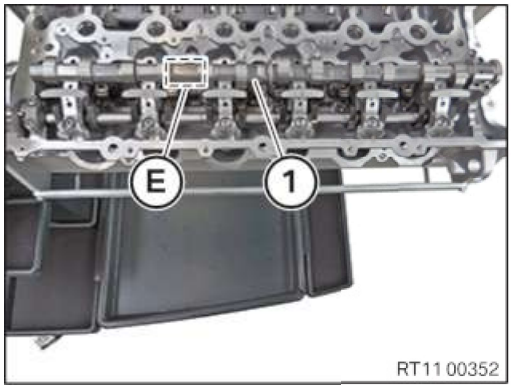
- Observe the numbering of the intake camshaft bearing caps.

  The intake camshaft bearing caps are numbered from (E1) to (E6) and are laid down according to their numbering in the special tool 0 495 105 (11 4 480).

  The intake camshaft bearing cap (E) is a thrust bearing.



- Release screws in the right sequence (14) till (1) in semi circle pattern.
- Set all intake camshaft bearing caps neatly in the special tool 0 495 105 (11 4 480).



- Guide out intake camshaft (1) toward the top and remove it.

8 – Remove the servomotor for the eccentric shaft (cylinder head removed)

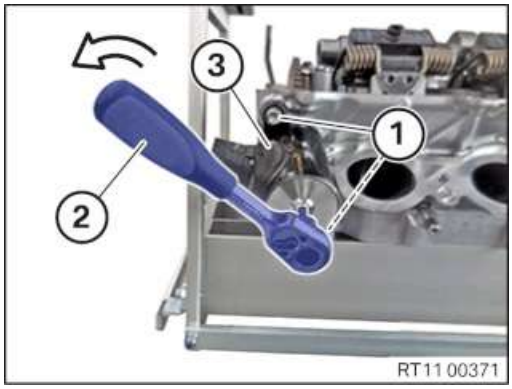
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

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

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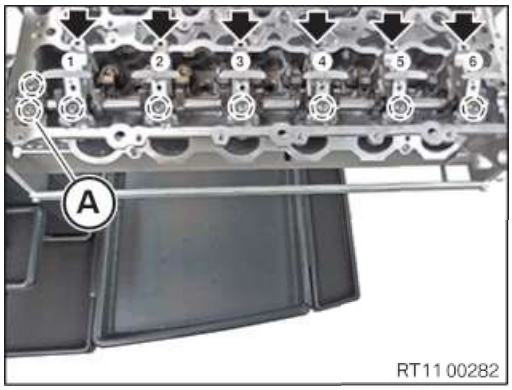


- Loosen screws (1).
- Use a standard hexagon socket wrench (2) to slowly adjust the servomotor for eccentric shaft (3) to the minimum lift at **4 mm** in direction of arrow.

  This releases the tension of the eccentric shaft.

  Do **not** turn the eccentric shaft beyond the end stop.
- Guide out and remove the servomotor for eccentric shaft (3).

9 – Removing the eccentric shaft (cylinder head removed)



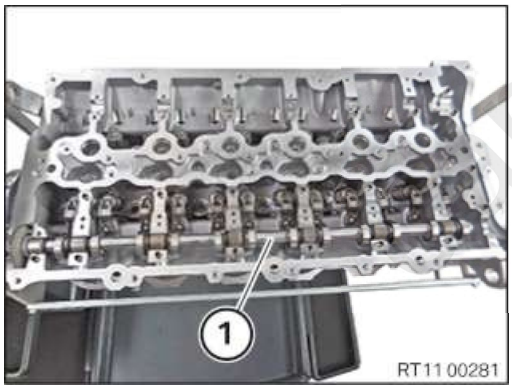
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

- Unscrew all bolts (markings).
- Work mounting brackets (1) to (6) (arrowed) out and remove.
- Place mounting brackets (1) to (6) in order in the special tool 0 495 105 (11 4 480).
- Work bearing caps (A) out and remove.
- Place the bearing cap (A) in the special tool 0 495 105 (11 4 480) in order.



- Guide out the eccentric shaft (1) toward the top and remove it.

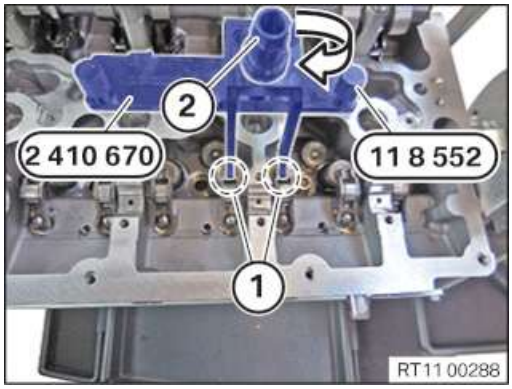
10 – Removing exhaust camshaft (cylinder head removed)

RISK OF DAMAGE

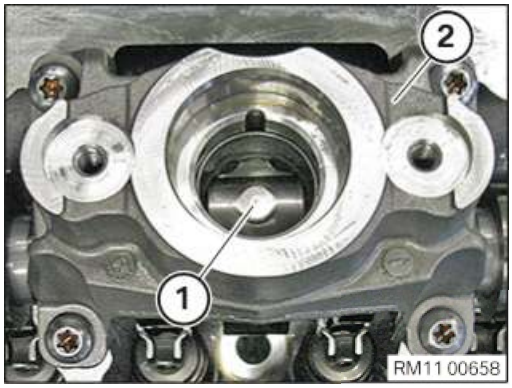
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

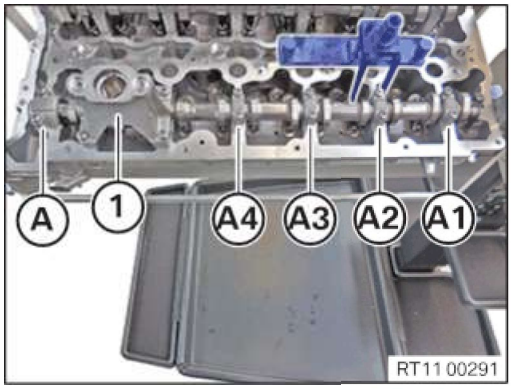
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Position the special tool 2 410 670 at cylinder 2 and apply it hand-tight with the special tool 0 495 741 (11 8 552) from the set of special tools 0 495 739 (11 8 550).
- Screw in both roller cam followers (1) on the 2nd cylinder using the spindle nut (2) of the special tool 2 410 670 in direction of arrow up to the limit position.



- Remove roller tappet (1) from high pressure pump bracket (2).

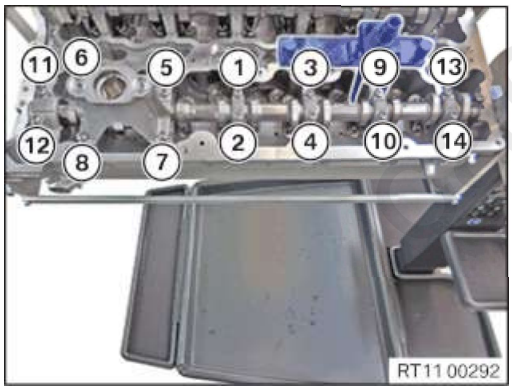


- Observe the numbering of the exhaust camshaft bearing caps.

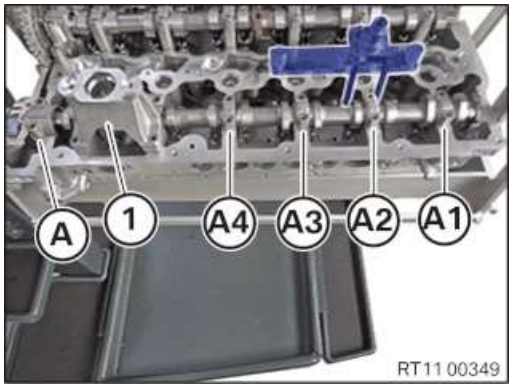
  The exhaust camshaft bearing caps are numbered from (A1) to (A4) and are placed in the special tool 0 495 105 (11 4 480) according to their numbering.

  The exhaust camshaft bearing caps can be read from the intake side.

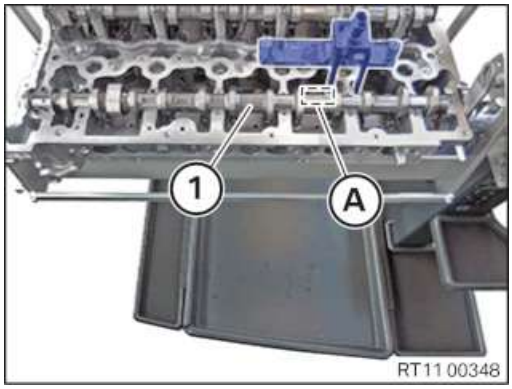
  The exhaust camshaft bearing cap (A) is a thrust bearing.



- Release screws in the right sequence (14) till (1) in semi circle pattern.

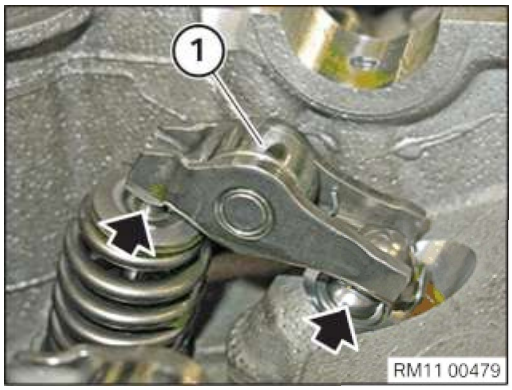


- Pull out all exhaust camshaft bearing caps (A1) to(A4) and the exhaust camshaft bearing cap (A) and remove.
- Place all exhaust camshaft bearing cap in order in special tool 0 495 105 (11 4 480).
- Thread the high pressure pump bracket (1) out and remove.

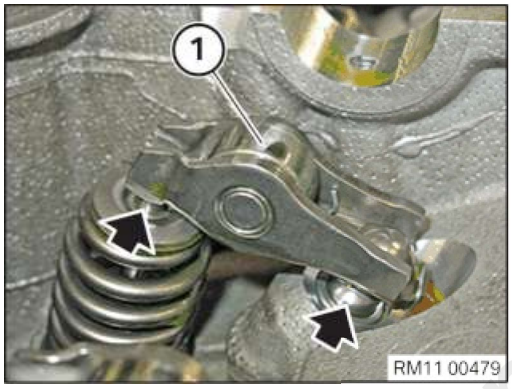


- (1)Remove exhaust camshaft in upward direction.

11 – Remove all roller cam followers



- Detach and remove the roller cam followers (1) on the intake side from hydraulic valve clearance compensating elements (arrows).
- Place all roller cam followers in order in special tool 0 495 105 (11 4 480).



- Detach and remove the roller cam followers (1) on the output side from hydraulic valve clearance compensating elements (arrows).
- Place all roller cam followers in order in special tool 0 495 105 (11 4 480).

12 – Remove all valve springs

CAUTION

Spring preload.

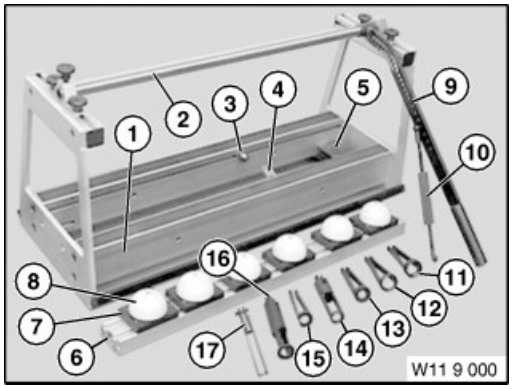
Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

NOTICE

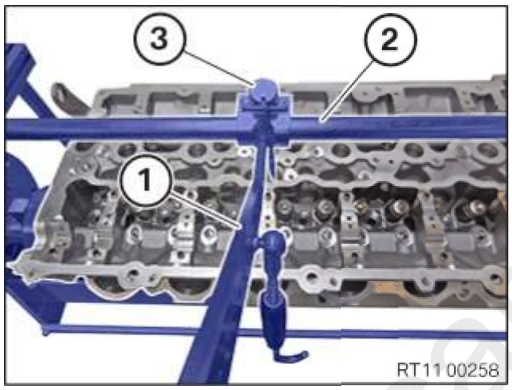
The description is for one component only. The procedure is identical for all further components.

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- Have the set of special tools 0 494 362 (11 9 000) ready.

Number	Description
1	Device
2	Rod
3	Adapter
4	Tab
5	Quick fastener
6	Aluminum strip
7	Shaped part
8	Shaped part made of plastic
9	Lever
10	Hook
11	Valve spring cage
12	Valve spring cage
13	Valve spring cage
14	Valve spring cage
15	Valve spring cage
16	Valve spring cage
17	Valve spring cage



- Feed in and install lever (1) on the rod (2).
- Guide in and install lock (3).

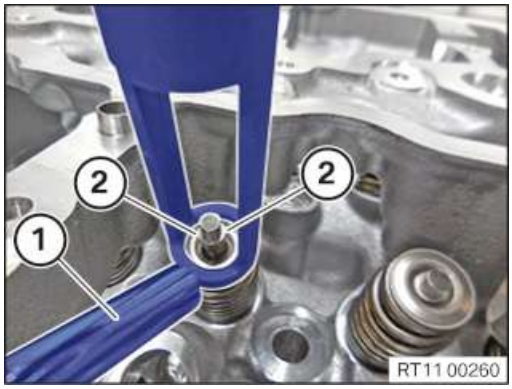


TECHNICAL INFORMATION

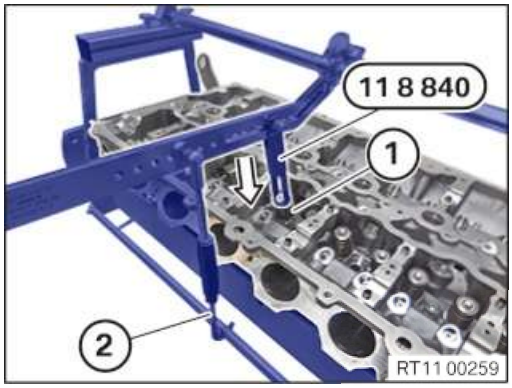
- Wear safety goggles.

- Press down the valve spring (1) on the spring cup at the top with the special tool 0 496 143 (11 8 840) in direction of arrow.
- Hold valve spring (1) **pressed down** using the hook (2).

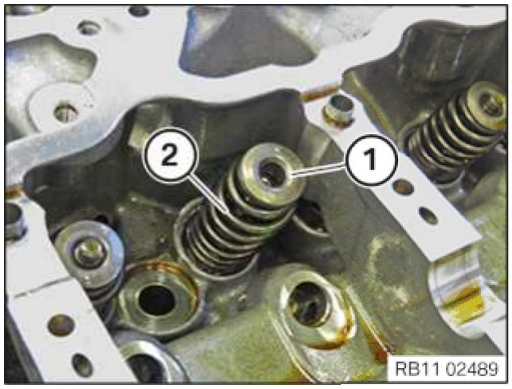
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- Remove valve shims (2) with a magnet (1).



- Press down the valve spring (1) on the spring cup at the top with the special tool 0 496 143 (11 8 840) in **direction of arrow**.
- Thread out hook (2) and place to the side.
- Relieve the valve spring (1) **carefully**.



- Remove the spring cup (1) and the valve spring (2) and position neatly in the special tool 0 495 105 (11 4 480).

13 – Remove valve stem seals

RISK OF DAMAGE

Contaminant or foreign body.

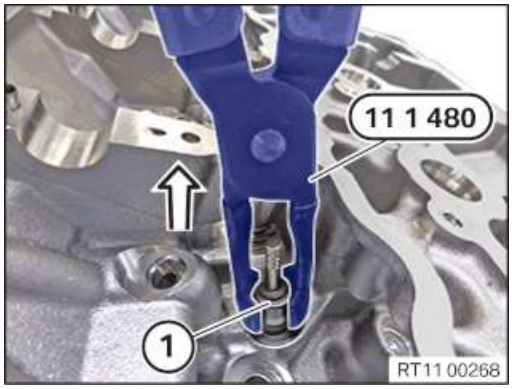
Contamination can result in malfunctions, operating failure or leaks.

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

NOTICE

The description is for one component only. The procedure is identical for all further components.

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- Remove the valve stem seal (1) in the **direction of arrow** using the special tool 0 490 796 (11 1 480).

14 – Remove all valves

RISK OF DAMAGE

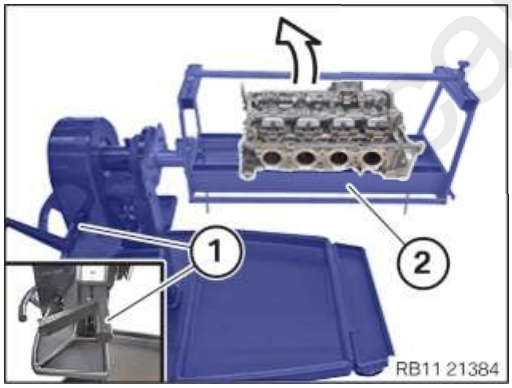
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

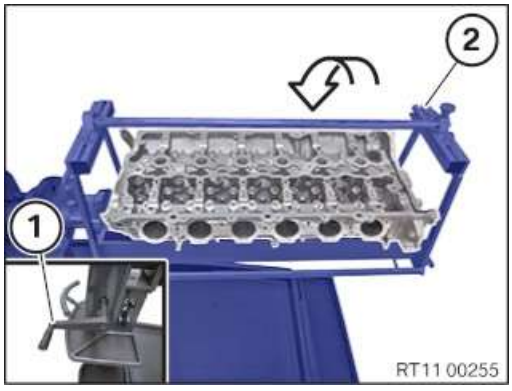
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- **Equipment specification B38**
- Twist the device (2) on the crank (1) 180°.



- **Equipment specification B46/B48**
- Turn device (2) on the crank (1) by 180° in **direction of arrow**.

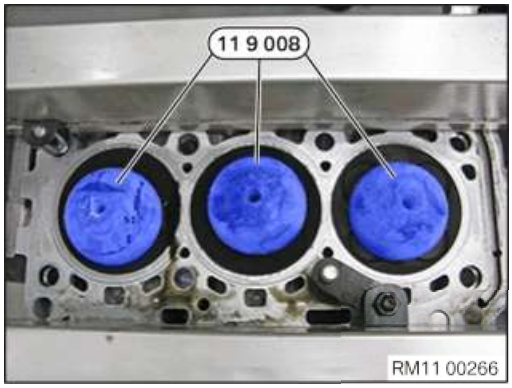


- **Equipment specification B58**
- Turn device (2) on the crank (1) by 180° in direction of arrow.

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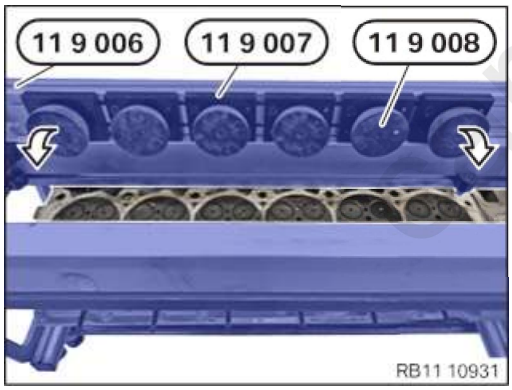
- Unlock the special tool 0 494 370 (11 9 005) in **direction of arrow**.



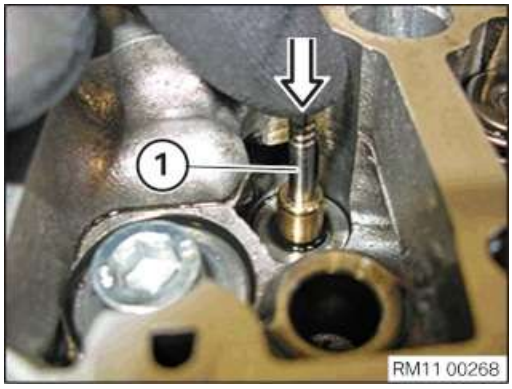
- **Equipment specification B38**
- Remove special tool 0 494 373 (11 9 008) if necessary.



- **Equipment specification B46/B48**
- Remove special tool 0 494 373 (11 9 008) if necessary.

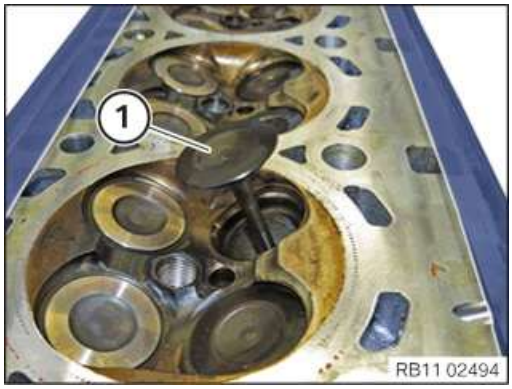


- **Equipment specification B58**
- Thread out and remove special tools 0 494 371 (11 9 006), 0 494 372 (11 9 007) and 0 494 373 (11 9 008) in direction of arrow.



- Push the valve stem (1) into the cylinder head in **direction of arrow**.

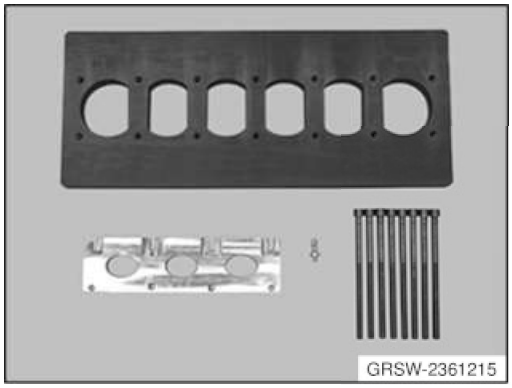
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- Remove the valve (1) and position in special tool 0 495 105 (11 4 480) in order.

MAIN WORK

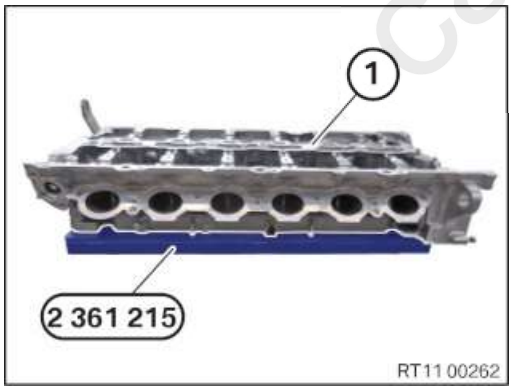
15 – Checking cylinder head for watertightness



- Have the set of special tools 2 361 215 ready.

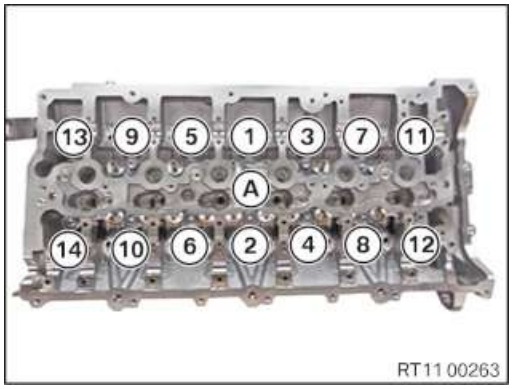


- Have the special tool ready.



- Position the cylinder head (1) on the special tool 2 361 215 so that the rubber layer faces the cylinder head (1) and all water ducts at the cylinder head (1) are closed.

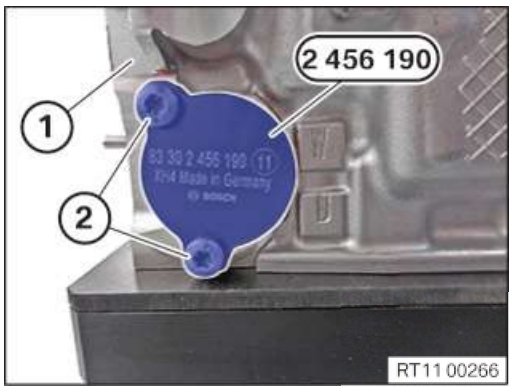
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- Feed screws (1) to (14) into cylinder head(A).
- Tighten screws in the order (1) to (14).

Cylinder head to special tool 2 361 215

			35 Nm

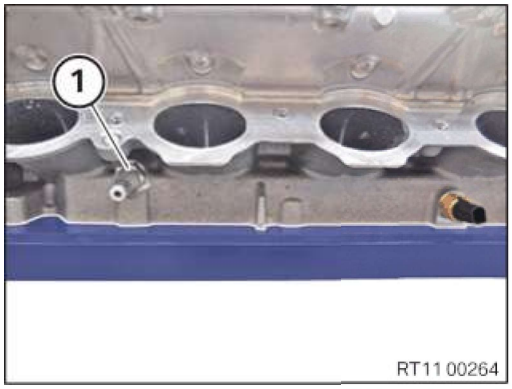


- Thread in and install the special tool on the cylinder head (2).
- Tighten the screws (2).

Note: Use the screws of the coolant line between the cylinder head and the coolant pump.

Special tool 2 456 190 to cylinder head

M6X20		Tightening torque	8 Nm



- Release ventilation connection (1).
- Guide out and remove ventilation connection (1).



- Mount the valve of the special tool 2 361 215 on the cylinder head.

Ventilation connection/special tool to cylinder head

M10			18 Nm

Check

- Heat up the cylinder head.

Check for cylinder head watertightness

Temperature of the cylinder head	60 °C

- Connect compressed air .

Check for cylinder head watertightness

Testing pressure	max. 3,0 bar

- Check the cylinder head in for tightness in a water bath.

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Result

» Air bubbles develop.

Measure

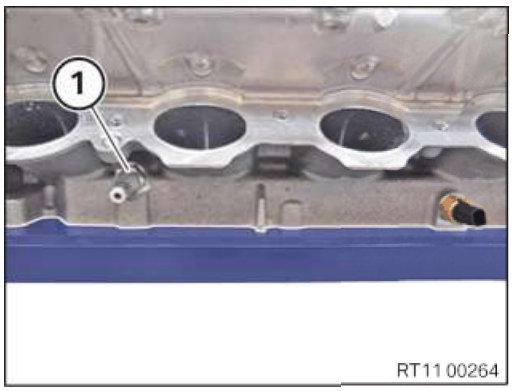
- Check the cylinder head for damage at the point of exit of the air bubbles.

Measure

- Repair or renew the cylinder head if necessary.



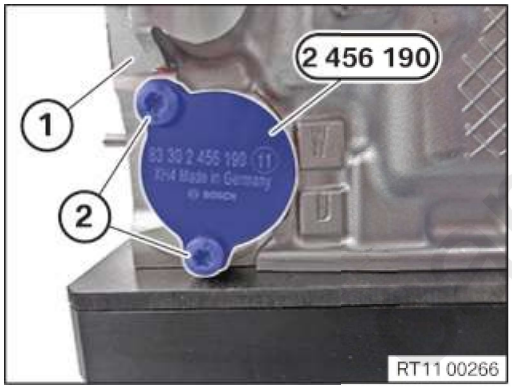
- Disassemble the valve of the special tool 2 361 215.



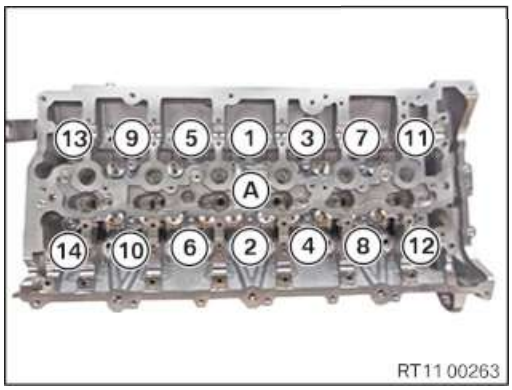
- Install ventilation connection (1).

Ventilation connection/special tool to cylinder head

M10	18 Nm

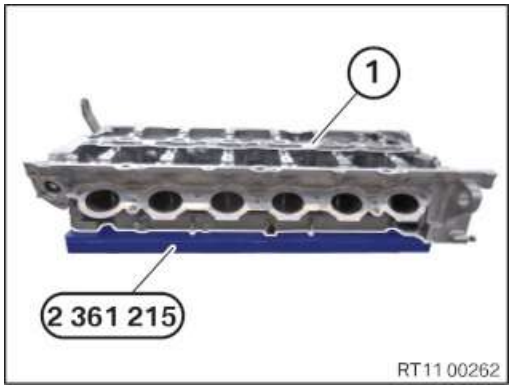


- Loosen screws (2).
- Feed out the special tool from the cylinder head (2) and remove.



- Release the screws in the sequence (14)to (1) from cylinder head (A).
- Feed out and remove screws (14) to (1).

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- Guide out and remove cylinder head (1) from the special tool 2 361 215.

POSTPROCESSES

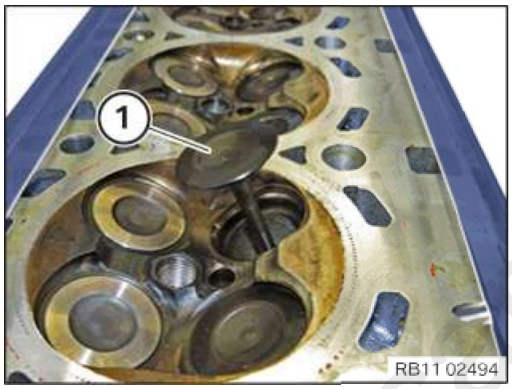
16 – Install all valves

RISK OF DAMAGE

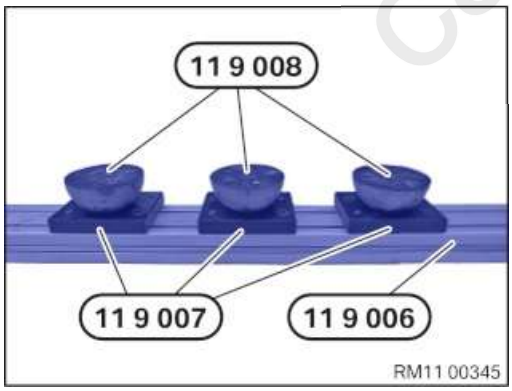
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

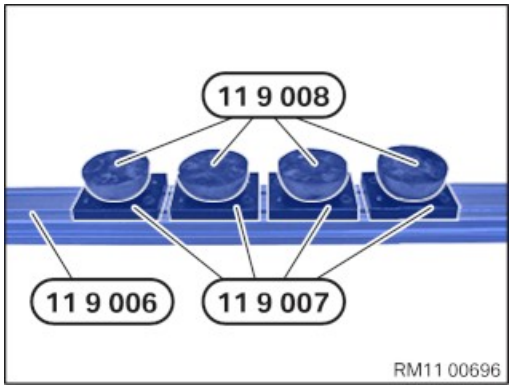


- Slide the valve (1) **carefully** into the cylinder head.

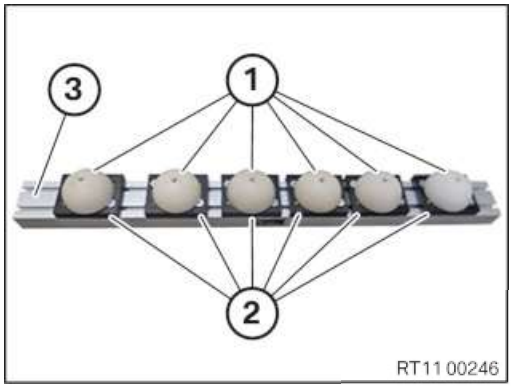


- **Equipment specification B38**
- Prepare the special tools 0 494 371 (11 9 006), 0 494 372 (11 9 007) and 0 494 373 (11 9 008) as shown.

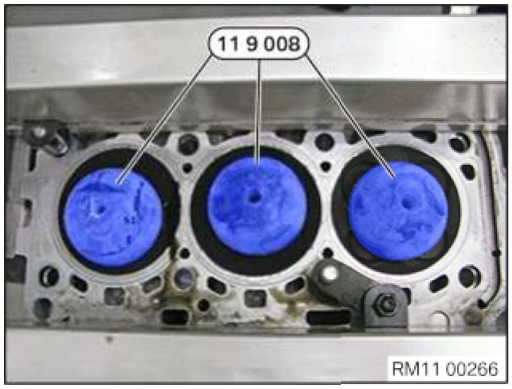
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- **Equipment specification B46/B48**
- Prepare the special tools 0 494 371 (11 9 006), 0 494 372 (11 9 007) and 0 494 373 (11 9 008) as shown.



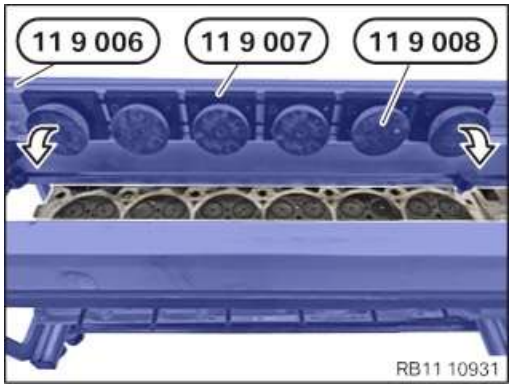
- **Equipment specification B58**
- Prepare plastic shaped part (1) with the shaped parts (2) and the aluminium strip (3).



- **Equipment specification B38**
- The special tools 0 494 373 (11 9 008) must be set up accordingly in the next operation.



- **Equipment specification B46/B48**
- The special tools 0 494 373 (11 9 008) must be set up accordingly in the next operation.

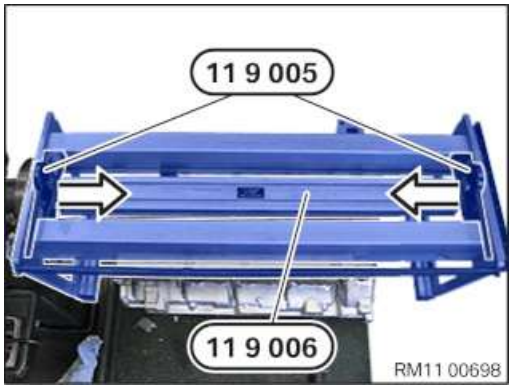


TECHNICAL INFORMATION

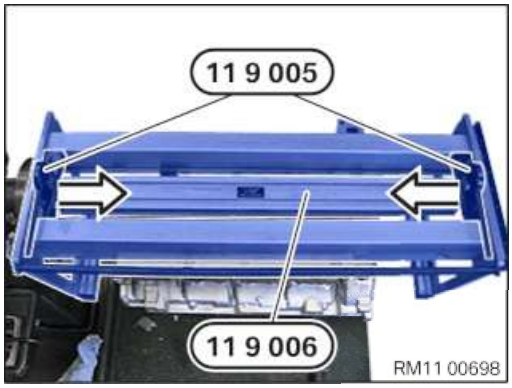
The figure shows the engine B58.

- Position special tools 0 494 371 (11 9 006), 0 494 372 (11 9 007) and 0 494 373 (11 9 008) in the centre on the cylinder head in the direction of the arrow.

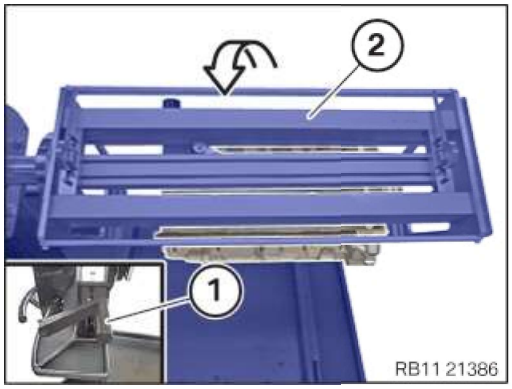
rdiagn.com



- Turn round special tool 0 494 371 (11 9 006) and insert as shown.
- Lock special tool 0 494 370 (11 9 005)in direction of arrow.



- Move and lock special tool 0 494 370 (11 9 005) in the direction of the arrow over the edges of special tool 0 494 371 (11 9 006).

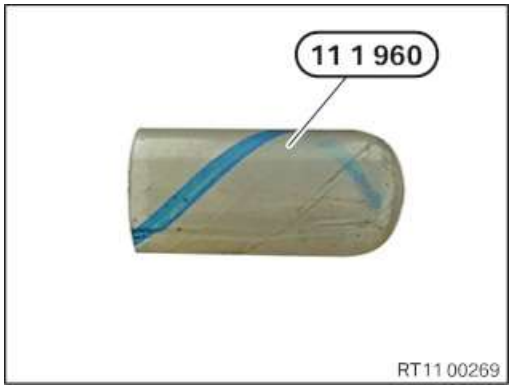


- Turn device (2) on the crank (1) by 180° in **direction of arrow**.

17 – Installing valve stem seals

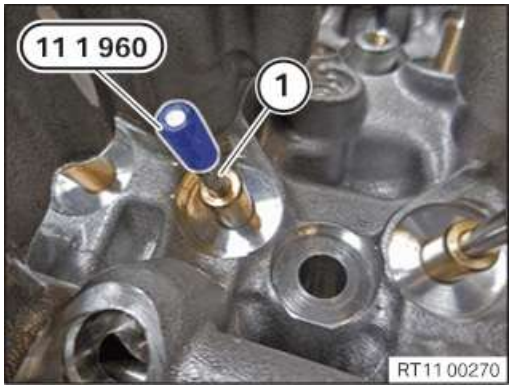


- Remove oil and dirt from the contact surface (1).



- Make sure that the special tool 0 490 797 (11 1 960) is used when installing the valve stem seal.

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- Guide in and install the special tool 0 490 797 (11 1 960) on valve (1).



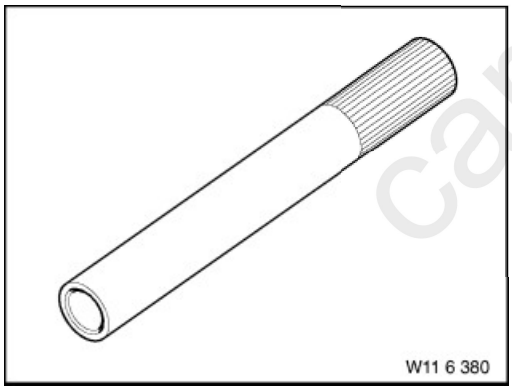
- Renew the valve stem seal (1).

  Parts: Valve stem seal

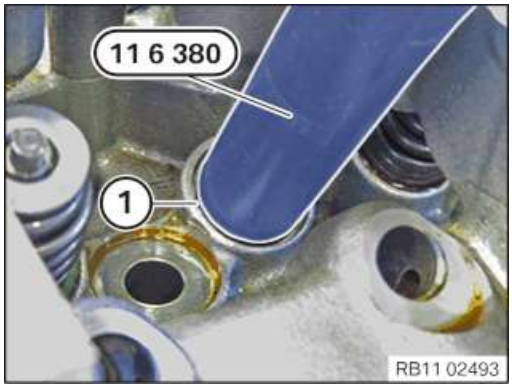
- Guide in and install valve stem seal (1) on the special tool 0 490 797 (11 1 960).



- Guide the special tool 0 490 797 (11 1 960) out and remove.

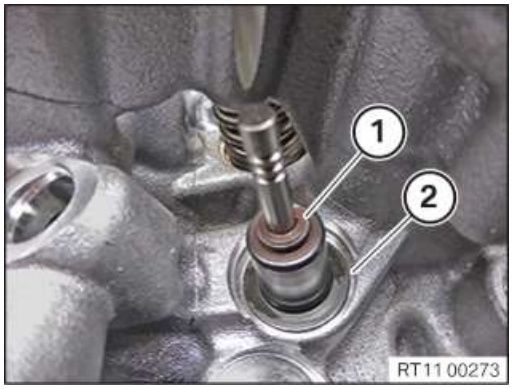


- Prepare special tool 0 493 249 (11 6 380).



- Press the valve stem seal (1) onto the cylinder head till the limit position using special tool 0 493 249 (11 6 380).

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- Make sure that valve stem seal (1) is positioned correctly on cylinder head (2).

18 – Install all valve springs

CAUTION

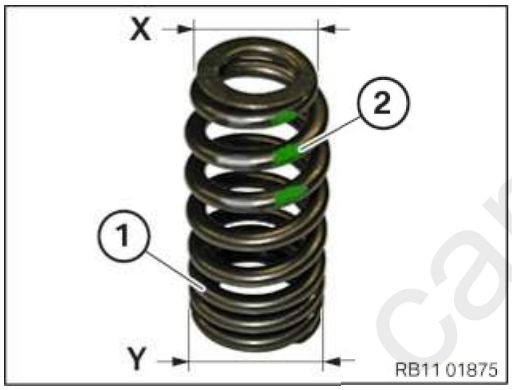
Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

NOTICE

The description is for one component only. The procedure is identical for all further components.

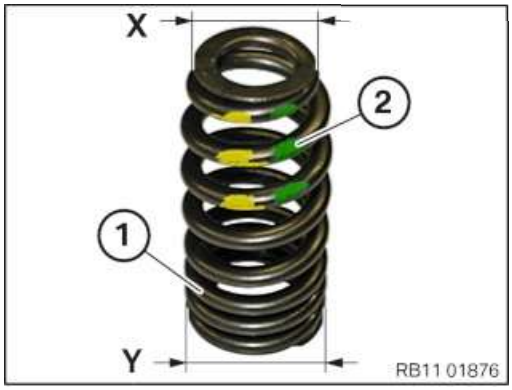


- Note the installation position of the valve spring.

Note: Install the valve spring so that the larger diameter (Y) points to the bottom spring cup.

- Make sure that the intake valves are not switched with the exhaust valves.

Note: Valve springs (1) are marked in colour (2). Colour for the intake valves: Green



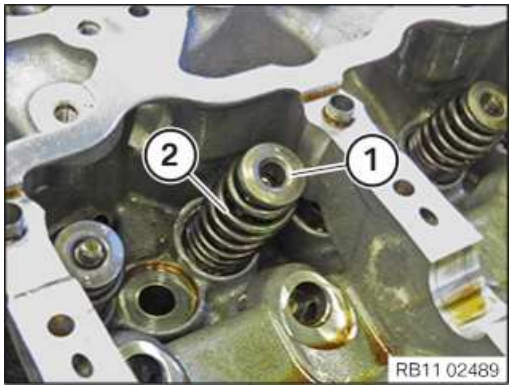
- Note the installation position of the valve spring.

Note: Install the valve spring so that the larger diameter (Y) points to the bottom spring cup.

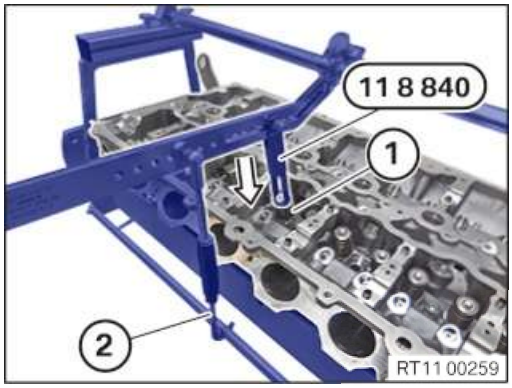
- Make sure that the intake valves are not switched with the exhaust valves.

Note: Valve springs (1) are marked in colour (2). Colour for the exhaust valves: green/yellow

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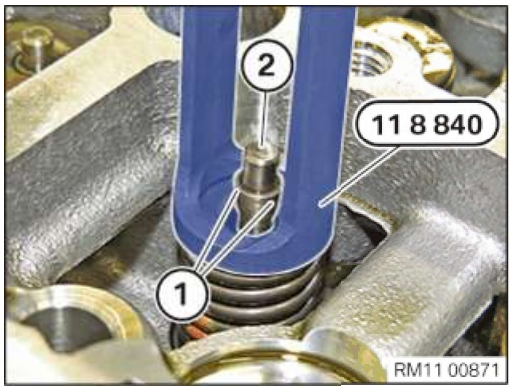
- Install the valve spring (2) and the spring cup (1).



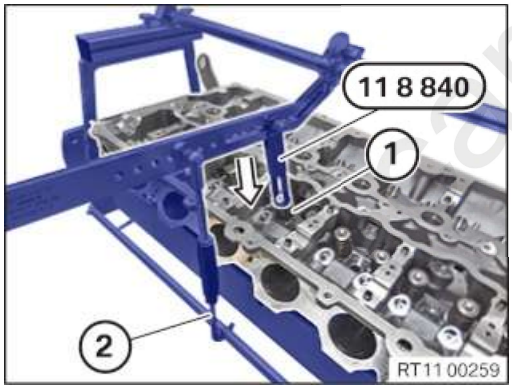
TECHNICAL INFORMATION

- Wear safety goggles.

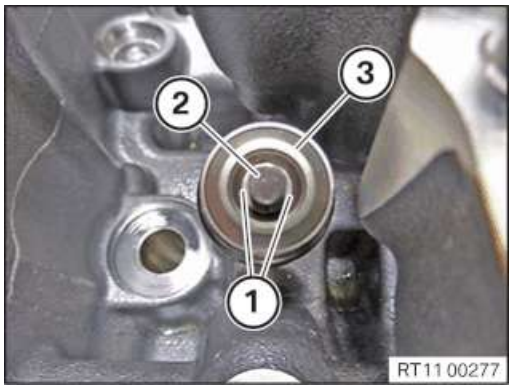
- Press down the valve spring (1) on the spring cup at the top with the special tool 0 496 143 (11 8 840) in direction of arrow.
- Hold valve spring (1) **pressed down** using the hook (2).



- Position the valve shims (1) on the valve (2).



- Press down the valve spring (1) on the spring cup at the top with the special tool 0 496 143 (11 8 840) in **direction of arrow**.
- Thread out hook (2) and place to the side.
- Relieve the valve spring (1) **carefully**.



- Make sure that the valve shims (1) are positioned correctly on the valve (2) and on the valve spring (3).

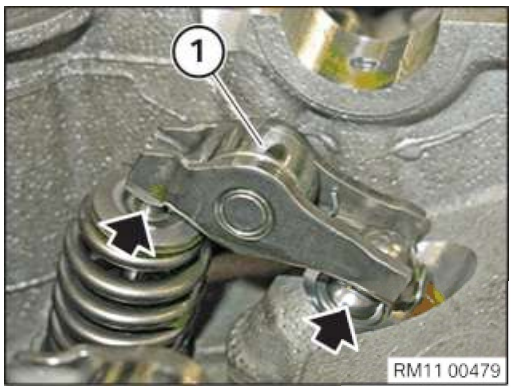
19 – Install all roller cam followers

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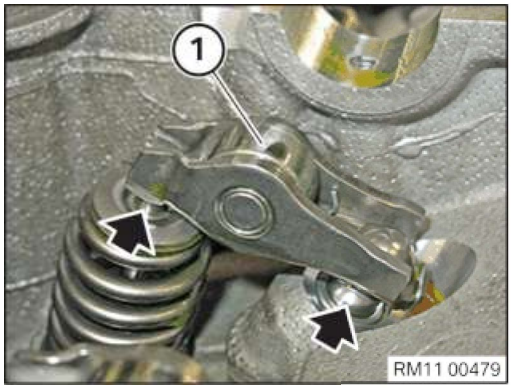


- The classification in digits from 1 to 5 has been printed on the roller cam follower.

Classification	Idle speed
1	Repair case - slow engine speed when idling
2	Installed as standard/initial installation
3	Installed as standard/initial installation
4	Installed as standard/initial installation
5	Repair case - high engine speed when idling

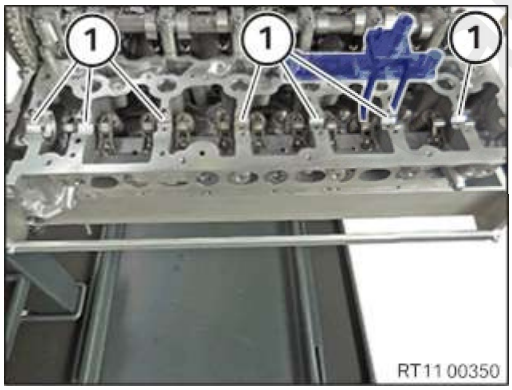


- Install the roller cam follower (1) on the intake side.
- Make sure the roller cam followers are correctly positioned on the hydraulic valve clearance compensating elements (arrows) and on the intake valves.

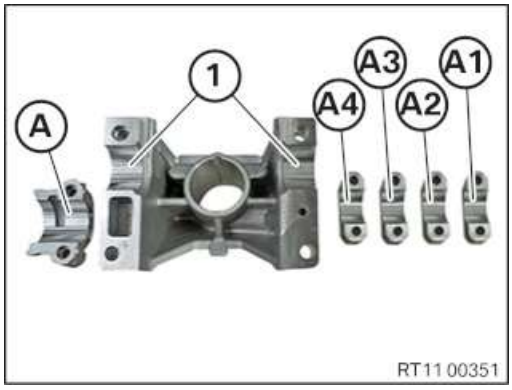


- Install the roller cam followers (1) on the exhaust side.
- Make sure the roller cam followers are correctly positioned on the hydraulic valve clearance compensating elements (arrows) and on the exhaust valves.

20 – Mount exhaust camshaft (cylinder head removed)

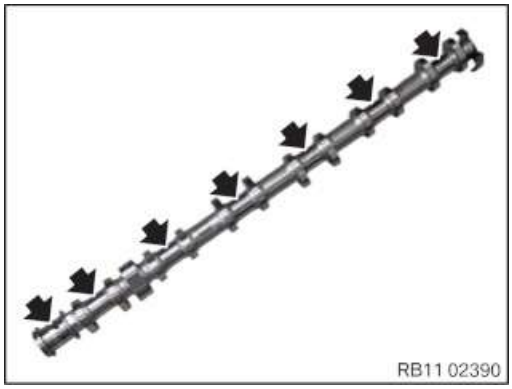


- Clean all bearing positions (1) and coat with engine oil.

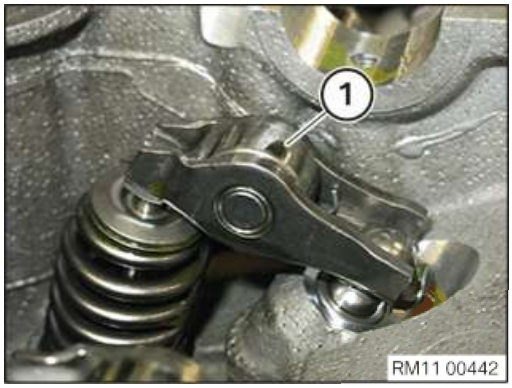


- Clean all bearing positions of exhaust camshaft bearing caps (A1), (A2), (A3), (A4) and (A) and coat with engine oil.
- Clean bearing positions (1) of the high pressure pump bracket and coat with engine oil.

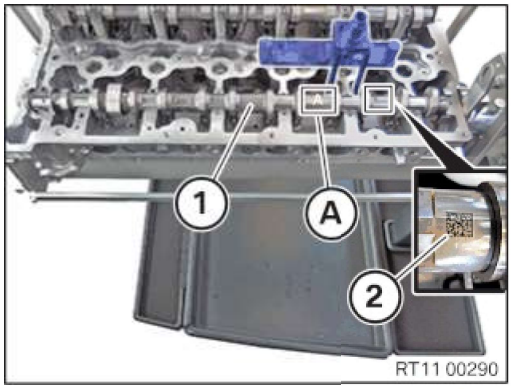
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- Clean all bearing positions (arrows) of the exhaust camshaft and coat with engine oil.



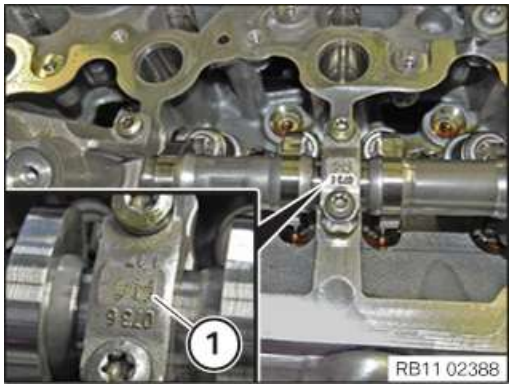
- Check all roller cam follower (1) of the exhaust side for correct fit.



- Insert exhaust camshaft (1) in the cylinder head, such that the mark (2) points upwards.



- Check the fitting sleeves (1) of the thrust bearing for damage and renew if necessary.
- Check the fitting sleeves (2) of the high pressure pump bracket for damage and renew if necessary.



RISK OF DAMAGE

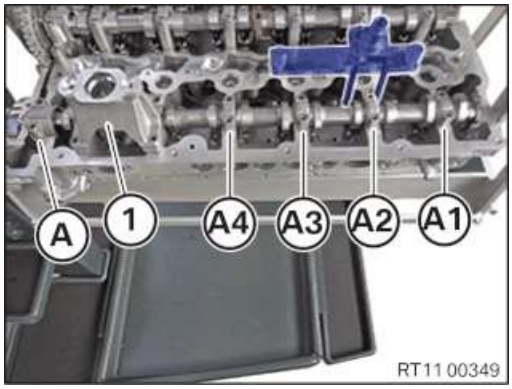
Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

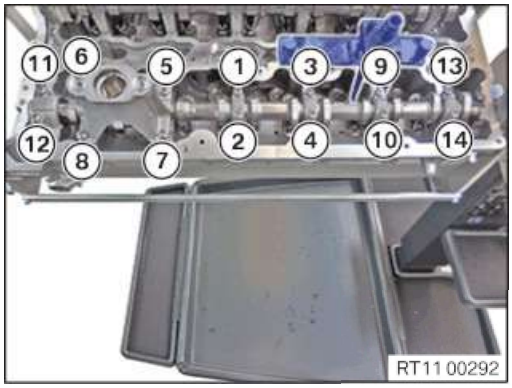
- Always install all bearing shells and bearing supports in the same position from which they were removed.

- Replace all exhaust camshaft bearing cap , that the labelling(1) from the intake side are readable.

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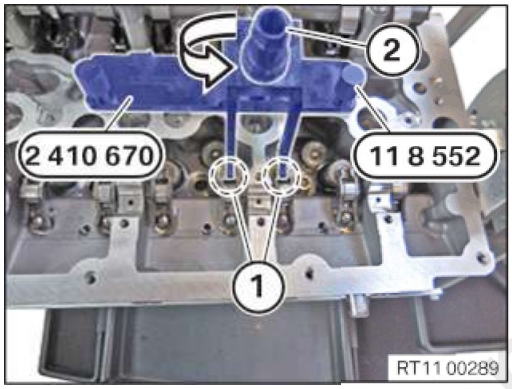
- Feed in all exhaust camshaft bearing cap (A1) until (A4) and the exhaust camshaft bearing cap (A) and position.
- Pull in the high pressure pump bracket (1) and position.



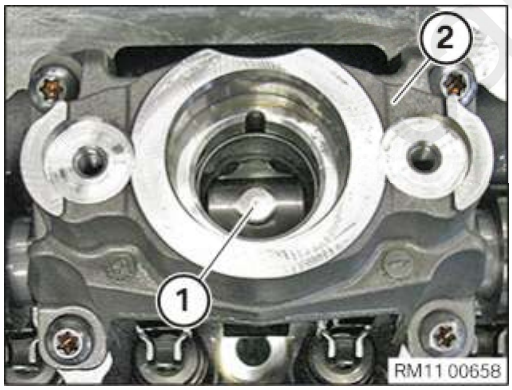
- Press down the exhaust camshaft bearing caps and hand-tighten the bolts incrementally in the sequence(1) to (14).
- Move up all screws in the sequence (1) to (14) **in half rotations.**
- **Adhere to the jointing torque.**
- Tighten all screws in a sequence from (1) to (14) .

Exhaust camshaft to cylinder head

M6	***Observe tightening sequence,*** *mount bearing cap flush.*	Jointing torque	10 Nm
	Tighten the screws.	Tightening torque	10 Nm

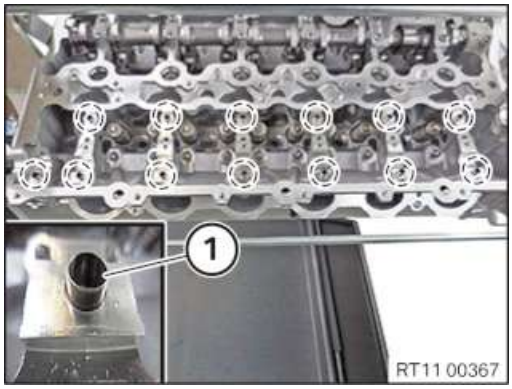


- Twist special tool 2 410 670 using the spindle nut (2) in direction of arrow and relax.
- Release special tool 0 495 741 (11 8 552) and remove special tool 2 410 670.

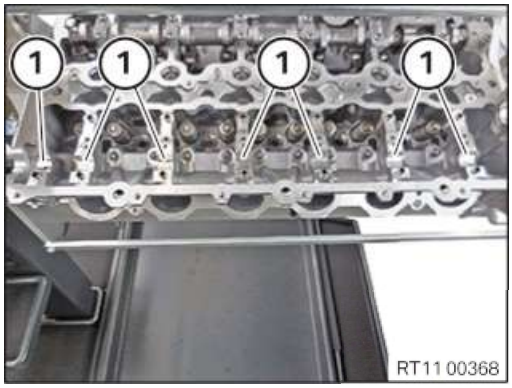


- Install roller tappet (1) into the high pressure pump bracket (2).

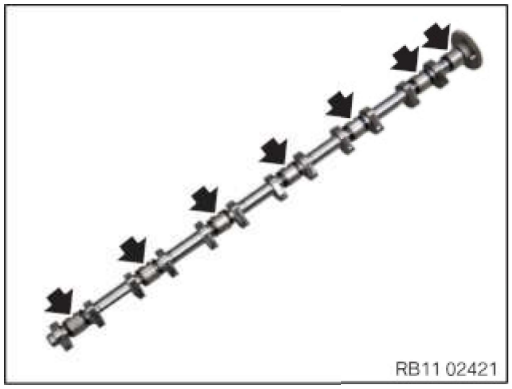
21 – Mounting eccentric shaft (cylinder head removed)



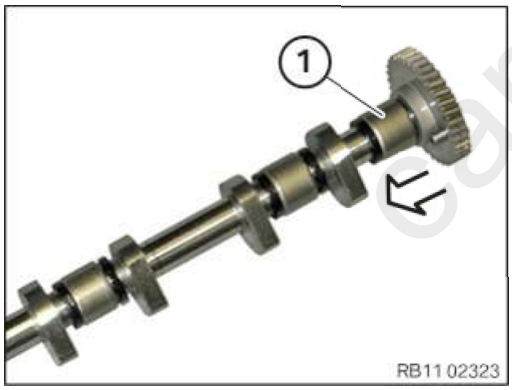
- Check all guide bushes (marks) (1) for damage and renew them if necessary.



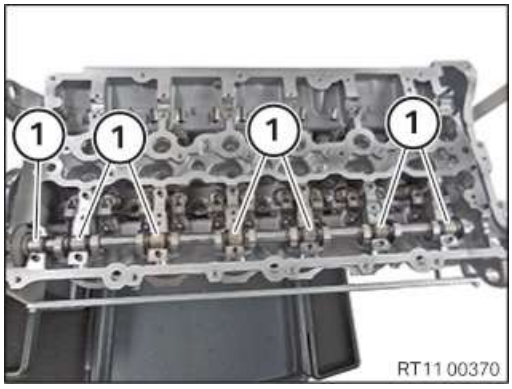
- Clean all the bearing positions (arrows) in the cylinder head and coat them with engine oil.



- Check all the needle bearings (arrows) of the eccentric shaft for ease of movement.
- Renew the eccentric shaft in case of tight needle bearings.

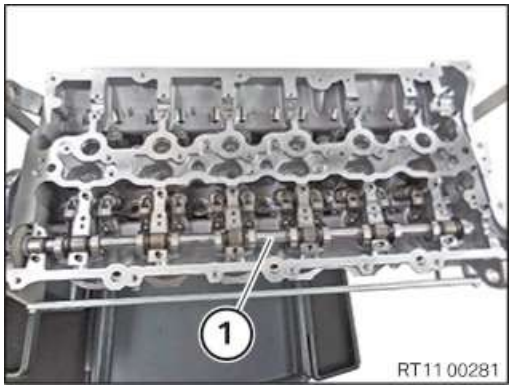


- Push needle bearing (1) up to the limit position in direction of arrow before installing the eccentric shaft.

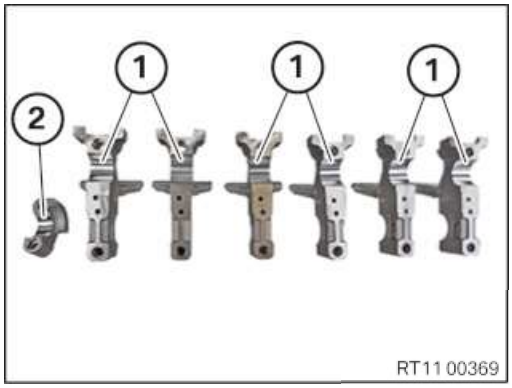


- Clean all needle bearings of the eccentric shaft (arrows) and coat with engine oil.

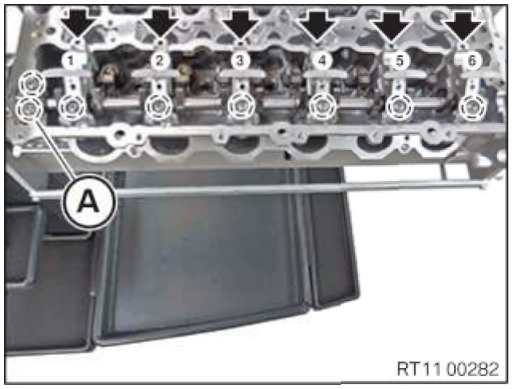
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- Pull in eccentric shaft (1) and install.



- Clean bearing positions (1) of the bearing supports and coat with engine oil.
- Clean bearing position (2) of the bearing cap and coat with engine oil.



RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

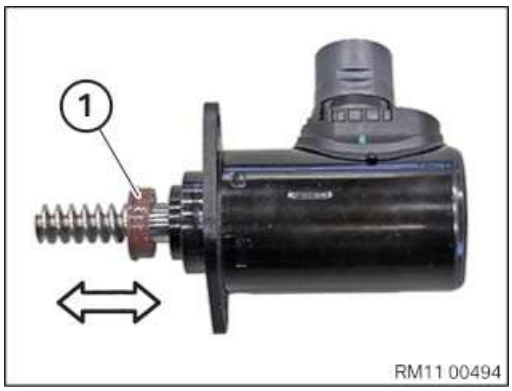
- Pull bearing supports (1) to (6) (arrows) in and install.

  The bearing supports (1) to (6) **must** each be installed again in the **position** from where they were removed.
- Pull in bearing cap (A) and install.
- Tighten the bolts (marks).

Eccentric shaft to bearing support/cylinder head

M6		10 Nm

22 – Install the servomotor for the eccentric shaft (cylinder head removed)



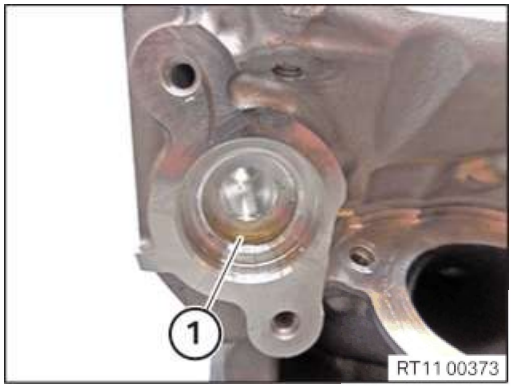
- Renew gasket (1).

  Parts: Gasket

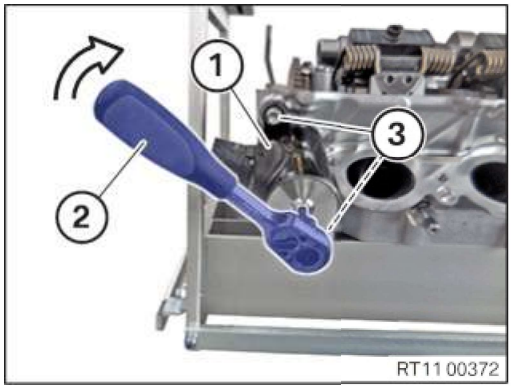
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- Press the gasket (1) in to the limit position on the housing.



- Clean sealing surface (1).



- Slide servomotor for the eccentric shaft (1) up to the limit position and install it.
- Turn servomotor for the eccentric shaft (1) using a standard hexagon socket wrench (2) of **4 mm** in the **direction of arrow** until the servomotor for the eccentric shaft (1) lies on the cylinder head.
- Tighten down screws (3).

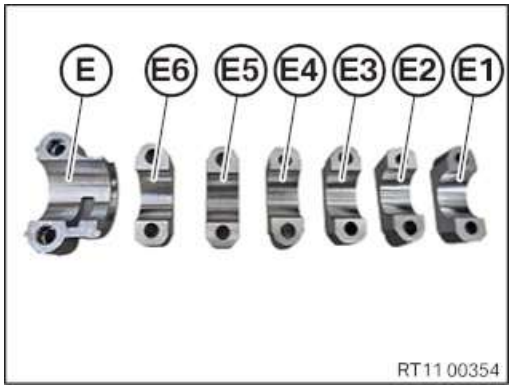
Electrical servomotor to cylinder head

M6		Tightening torque	8 Nm

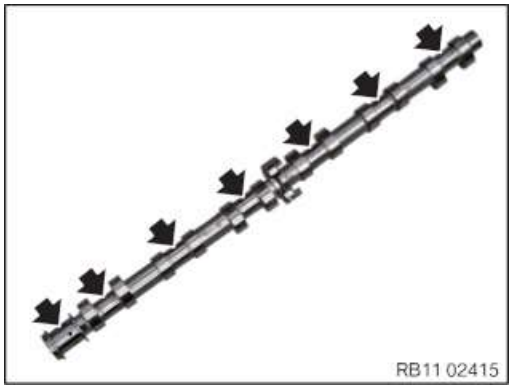
23 – Mounting intake camshaft (cylinder head removed)



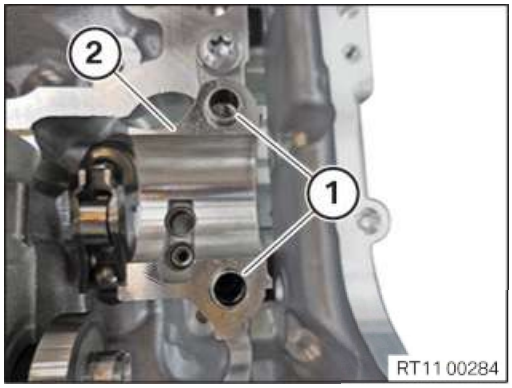
- Clean all bearing positions (arrows) and coat with engine oil.



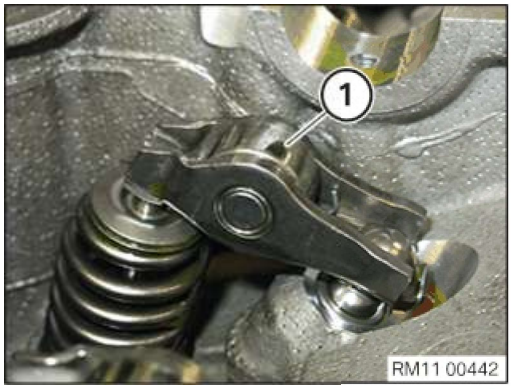
- Clean all bearing positions of intake camshaft bearing caps (E1),(E2),(E3),(E4),(E5),(E6) and (E) and coat with engine oil.



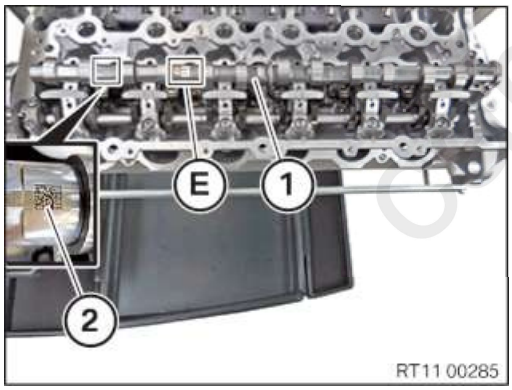
- Clean all bearing positions (arrows) of the intake camshaft and coat with engine oil.



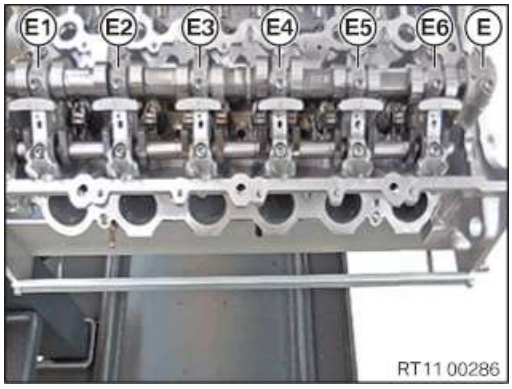
- Check the fitting sleeves (1) of the thrust bearing (2) for damage and renew if necessary.



- Check all roller cam followers(1) of the intake side for correct fit.



- Insert the intake camshaft (1) into the cylinder head so that the mark (2) points up.



RISK OF DAMAGE

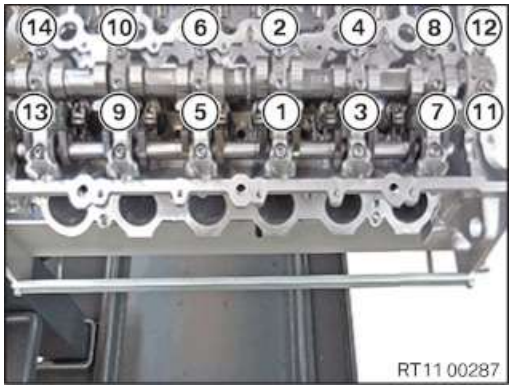
Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

- Feed in all intake camshaft bearing caps (E1) to (E6) and the intake camshaft bearing cap (E) and position.

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- Press down the intake camshaft bearing caps and hand-tighten the bolts incrementally in the sequence (1) to (14).
- Move up all screws in the sequence (1) to (14) **in half rotations.**
- **Adhere to the jointing torque.**
- Tighten all screws in a sequence from (1) to (14) .

Intake camshaft to cylinder head

M6	***Observe tightening sequence,*** *mount bearing cap flush.*	Jointing torque	10 Nm
	Tighten the screws.	Tightening torque.	10 Nm

24 – Checking the intermediate lever classification



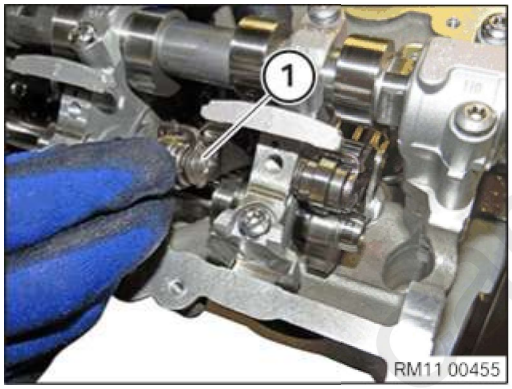
TECHNICAL INFORMATION

All intermediate levers are classified. Only one classification may be used per engine.

All intermediate levers must be installed in the same position in an engine which has already been in use.

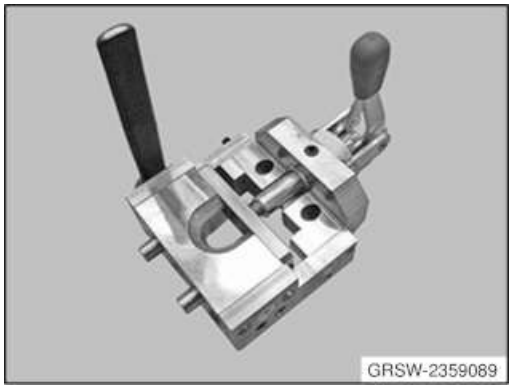
- Checking the intermediate lever classification.

25 – Installing all intermediate levers



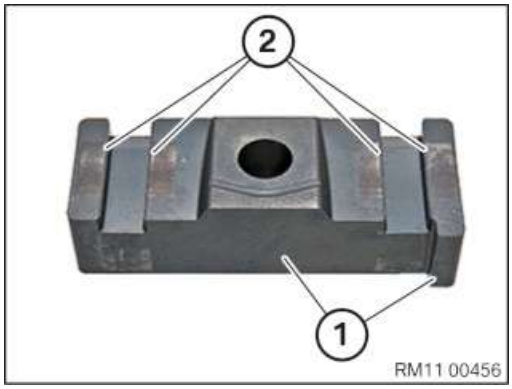
- Install intermediate lever (1).
- Repeat the step for all intermediate levers (1).

26 – Installing all gates

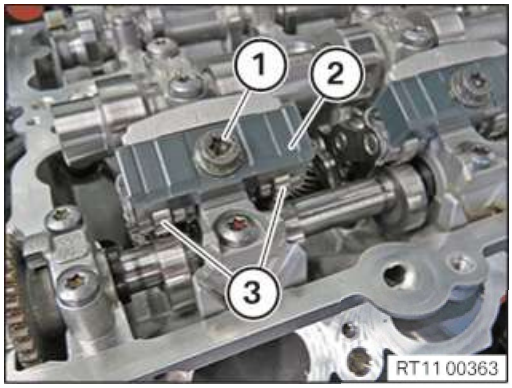


- Have the special tool 2 359 089 ready.

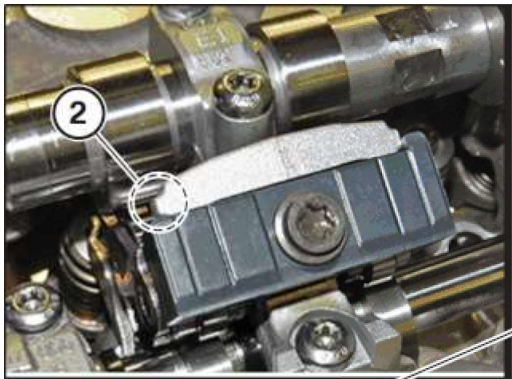
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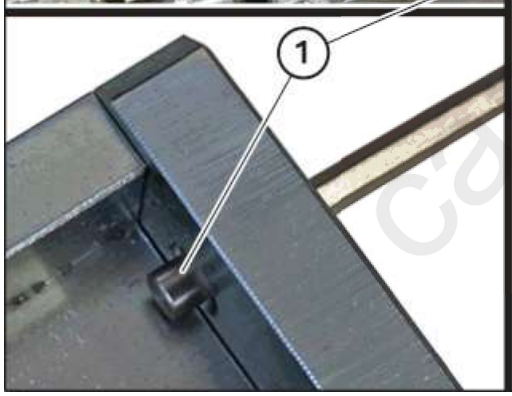


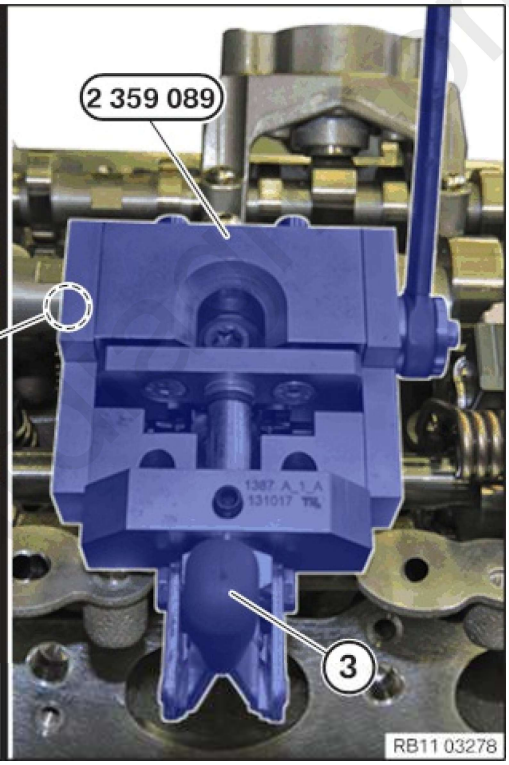
- Clean contact surfaces (1) and (2) off oil, grease and dirt.



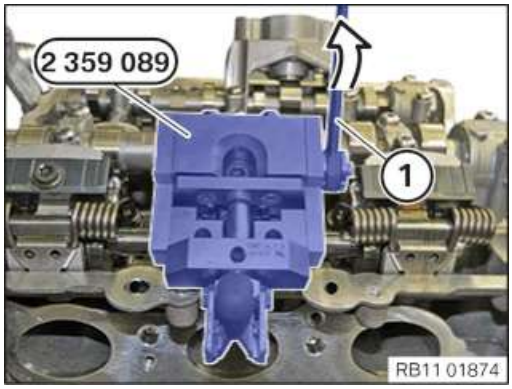
- Position the gate (2) and hand-tighten the bolt (1).
- Check that the intermediate lever (3) is in the correct mounting orientation.



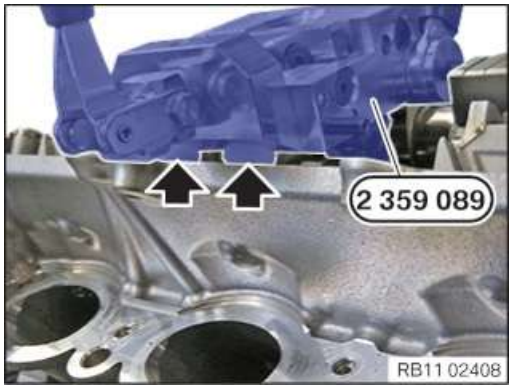




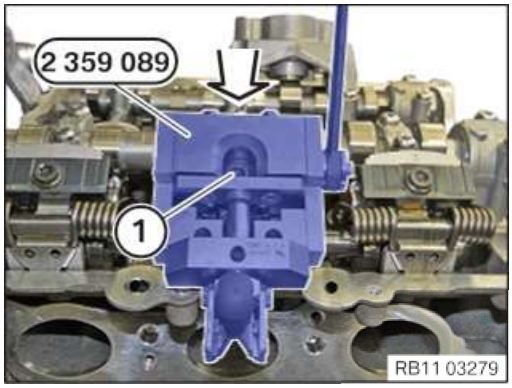
- Position the special tool 2 359 089 on the cylinder head.
- Pre-tension the gate with the lever (3).
- Abut the bolt (1) in the area (2).
- Make sure that the special tool 2 359 089 does not rotate during this process.



- Secure the gate with the lever (1).



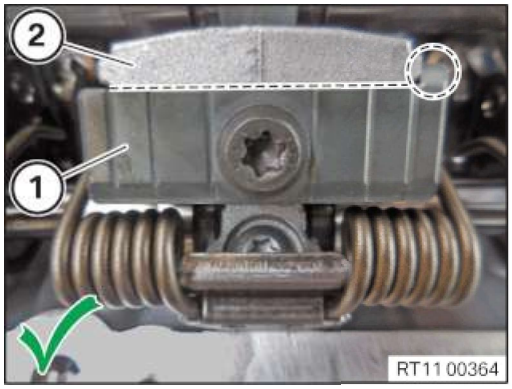
- Ensure that the special tool 2 359 089 lies flat on the cylinder head.



- Press the special tool 2 359 089 onto the cylinder head.
- Tighten the bolt (1) at the same time.

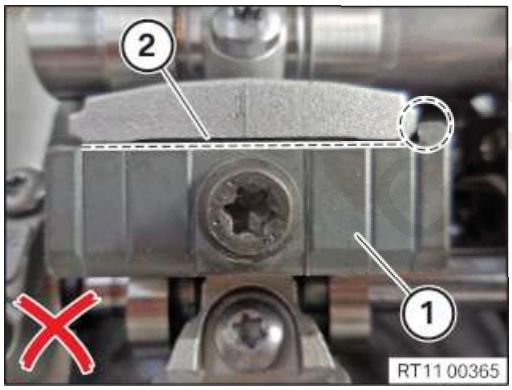
Gate to bearing bracket

M8		20 Nm



- Make sure that gate (1) rests correctly against bearing bracket (2).

  Gate (1) is installed correctly in the marked area.

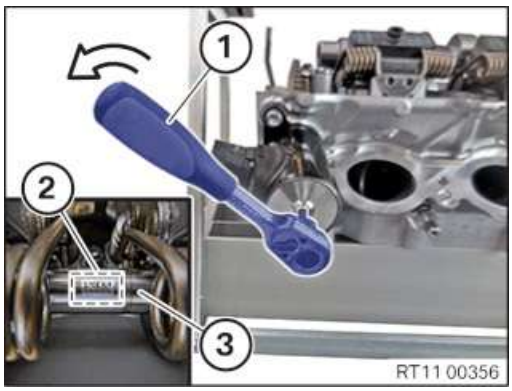


- Make sure that gate (1) rests correctly against bearing bracket (2).

  Gate (1) is installed incorrectly in the marked area.

- Repeat the procedure for all gates.

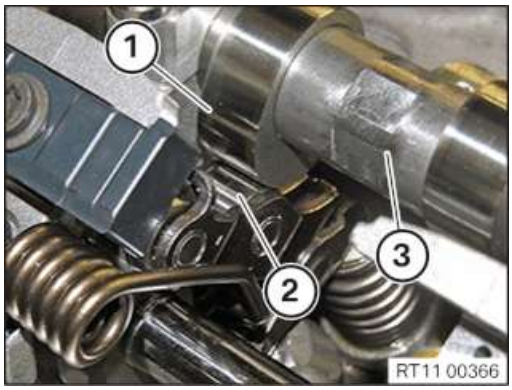
27 – Adjusting eccentric shaft to minimum lift (cylinder head removed)



- With the help of the servomotor, use a standard hexagon socket wrench (1) to slowly adjust eccentric shaft (3) to the minimum lift at **4 mm** in the **direction of the arrow**.
- Make sure that the mark (2) on the eccentric shaft (3) points upwards.

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28 – Checking the position of the intake camshaft (cylinder head removed)



Check

- Check position of the intake camshaft on the respective cylinders.

Result

» Cam (1) of the intake camshaft runs on the intermediate lever (2).

Measure

- Turn intake camshaft (3) further using a standard open-end spanner until the cam (1) does not override on the intermediate lever (2).

29 – Installing all torsion springs (cylinder head removed)

CAUTION

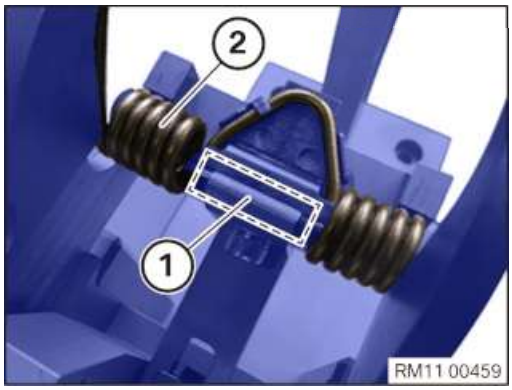
Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

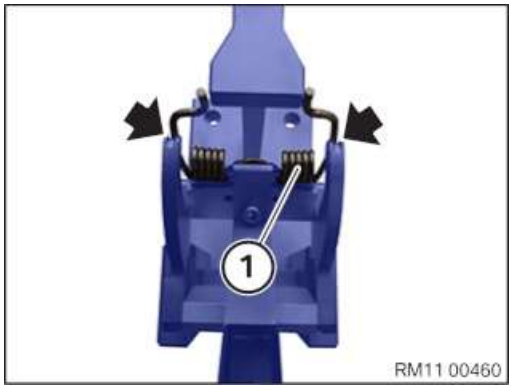
TECHNICAL INFORMATION

- Wear safety goggles.

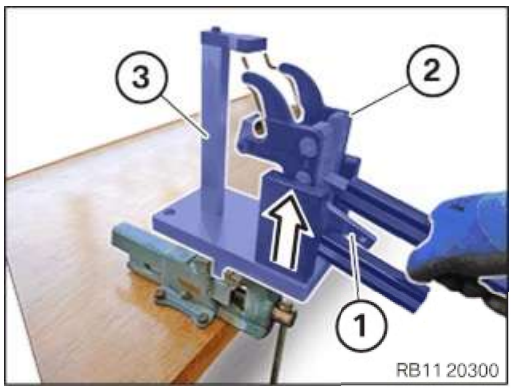


- Insert the torsion spring (2) in the clamping lever of the special tool 2 359 088.
- Make sure that the torsion spring (2) is correctly positioned in the marked area (1) of the special tool 2 359 088.

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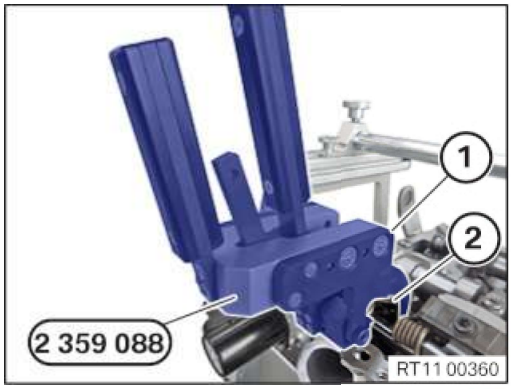


- Carefully close the clamping lever of the special tool 2 359 088 in the accompanying fixture until the retaining hook engages.
- Ensure that the torsion spring (1) lies correctly in the lateral guides (arrows) of the special tool 2 359 088 during tensioning.

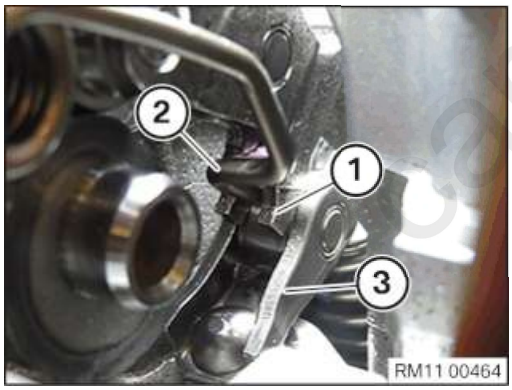


- Carefully close the clamping lever (2) of the special tool 2 359 088 in the fixture (3) until the retaining hook (1) audibly engages.

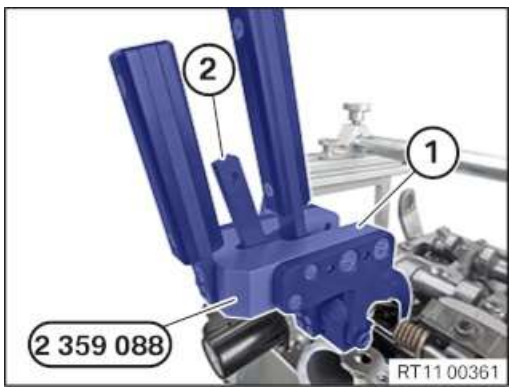
  The torsion spring is tensioned.
- **Carefully** take the clamping lever (2) of the special tool 2 359 088 with the stretched torsion spring out of the fixture (3) of the special tool 2 359 088 in the direction of arrow.



- Feed in clamping lever (1) from the special tool with the pre-tensioned torsion spring (2) and position it.

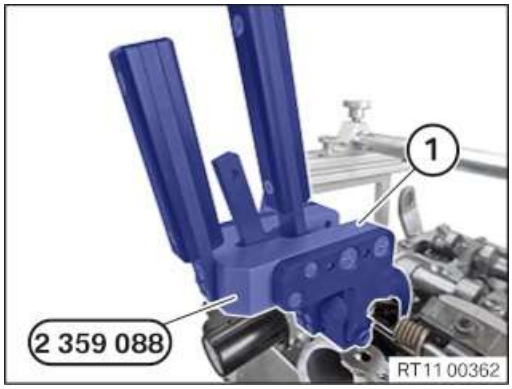


- Ensure that the torsion spring (2) is positioned correctly in the intermediate lever (1).
- Check all roller cam followers (3) for correct installation position.

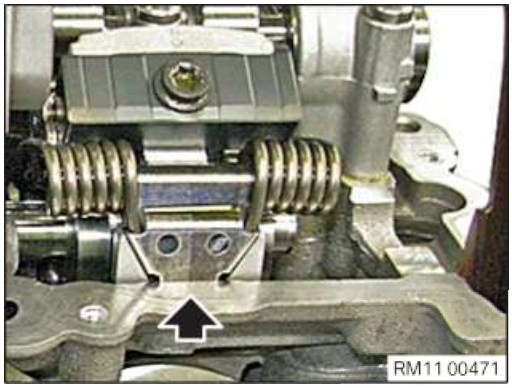


- Press the clamping lever (1) of the special tool 2 359 088 together until the retaining hook (2) unlocks.
- Carefully open the clamping lever (1) of the special tool 2 359 088 until the torsion spring is completely relaxed.

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- Guide out and remove the clamping lever (1) of the special tool 2 359 088.



- Check for correct mounting orientation of the torsion spring (arrow) at the cylinder head.
- Repeat the operations for the remaining torsion springs.

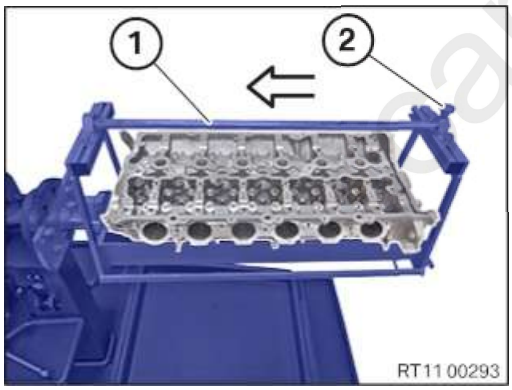
30 – Removing cylinder engine from assembly stand

CAUTION

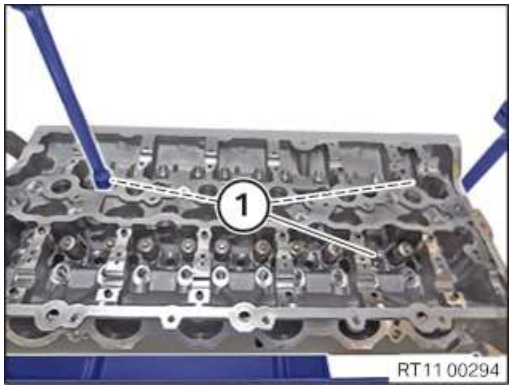
Heavy component.

Heavy components can lead to injury or damage.

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



- Loosen screw (2).
- Pull out rod (1) in direction of arrow and set it aside.

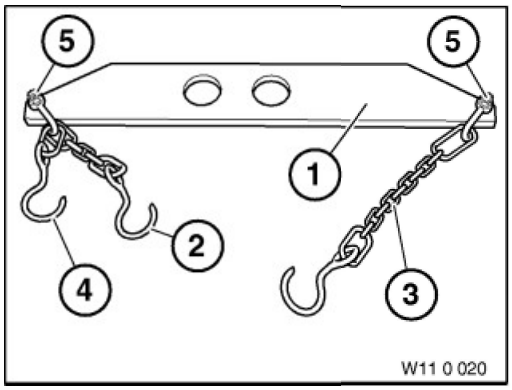


- Release screws (1) from special tool .

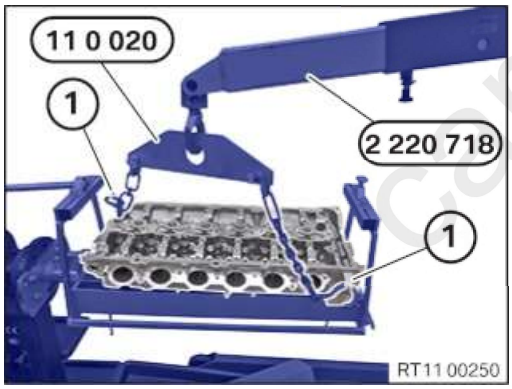
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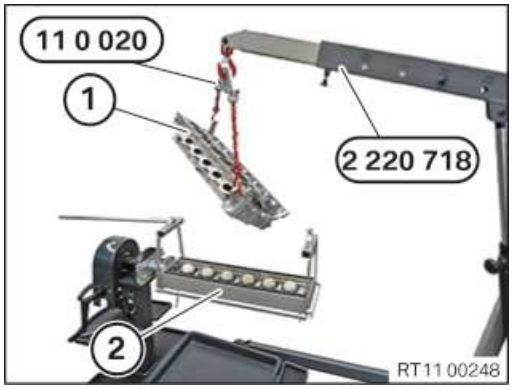
- Stage special tool (workshop crane) 2 220 718.



- Prepare the special tool 0 490 567 (11 0 020).



- Guide in and position special tool 0 490 567 (11 0 020) on cylinder head (1).
- Position workshop crane 2 220 718 and connect to special tool 0 490 567 (11 0 020).



- Detach cylinder head (1) with the work crane 2 220 718 and special tool 0 490 567 (11 0 020) from the device (2), pull out and remove.

31 – Installing the exhaust turbocharger (cylinder head removed)

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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

RISK OF DAMAGE

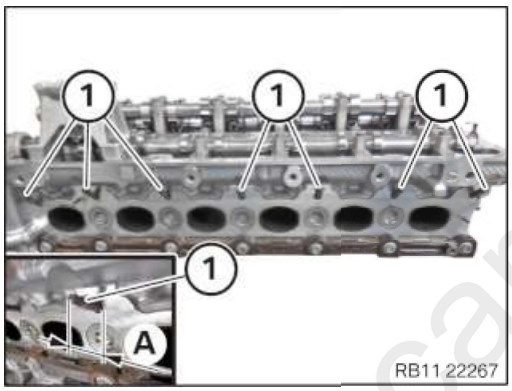
Damage to the electrical wastegate valve controller.

The electrical wastegate valve controller may be damaged as a result of the excessive forces required when removing and installing a jammed exhaust turbocharger.

- Do not pull on the electrical wastegate valve controller.
- Apply force to the turbine housing and exhaust manifold only.
  - Do not pull on the compressor housing.

TECHNICAL INFORMATION

Do not damage the thermal compensating elements. The disassembly and installation including intermediate storage of the exhaust turbocharger is only permitted with mounted special tool 2 466 919 .



- Check stud bolt (1) for damage, renew if necessary.

  Parts: Stud bolt
- Check screw-in depth (A) of the upper stud bolt (1).

Screw-in depth of upper stud bolt on cylinder head

Dimension A	30 mm

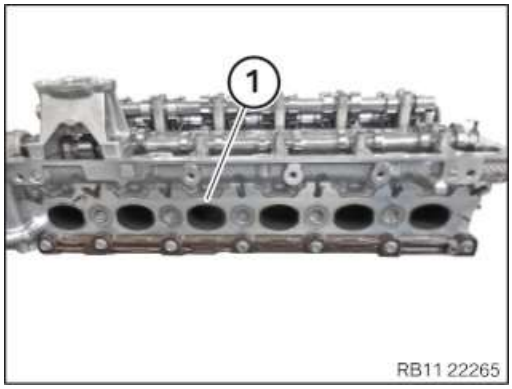
- If necessary, screw the stud bolts in further or unscrew.



- Check stud bolts in the **marked area** for damage and replace if necessary.

  Parts: Stud bolt

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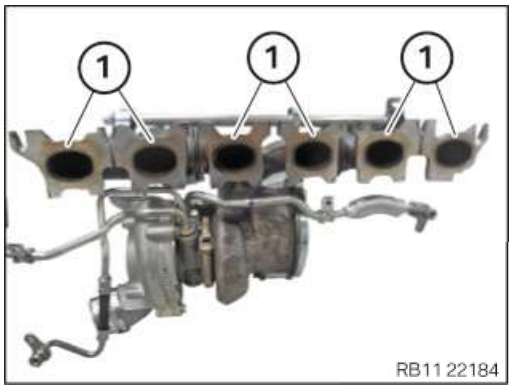
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surfaces (1) on the cylinder head using special tool 0 495 102 (11 4 470).



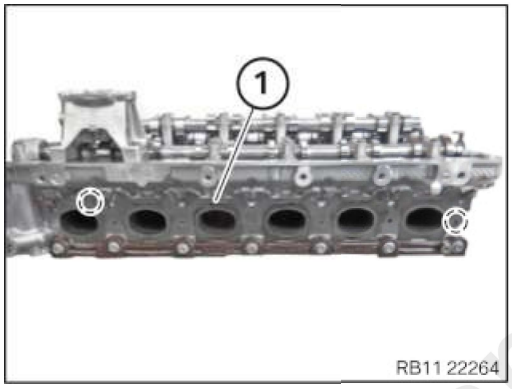
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

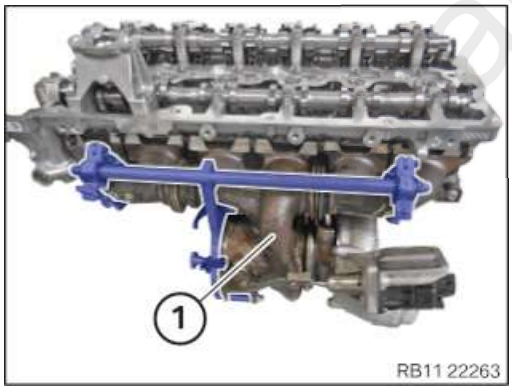
- Clean the sealing surfaces (1) on the exhaust turbocharger using the special tool 0 495 102 (11 4 470).



- Renew the gasket (1).

  Parts: Gasket

- Guide seal (1) into the **marked area** and install it.



CAUTION

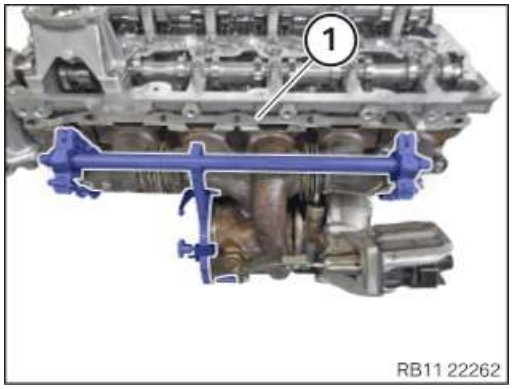
Heavy component.

Heavy components can lead to injury or damage.

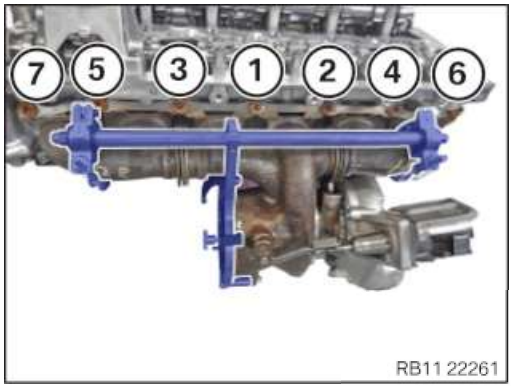
- Remove and install heavy components with the aid of another person/other persons.

- Insert and install the exhaust turbocharger (1).
- Thermal compensating elements of the exhaust turbocharger (1) or exhaust manifold should **not** be bent or deformed.

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- Feed in and install the sliding rail (1).
- Install sliding rail (1) so that the part number is **seen**.

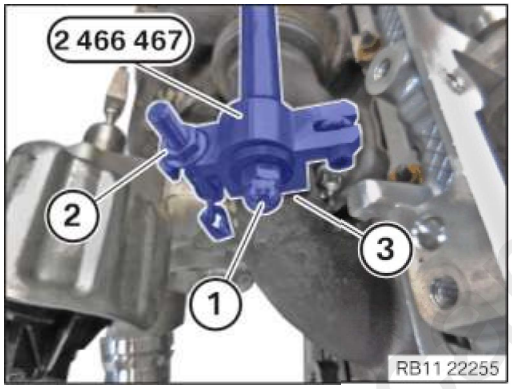


- Tighten nuts in sequence (1) to (7).

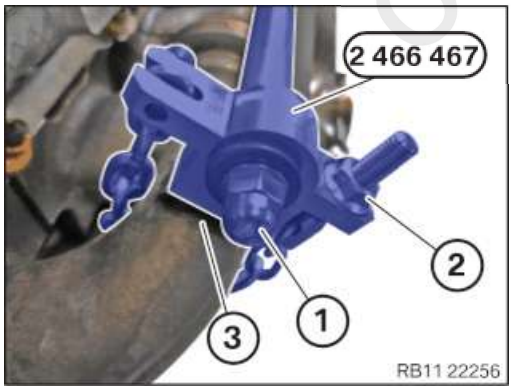
Exhaust manifold to cylinder head

Flange nutM7	*Replace flange nuts*	1. Jointing torque	10 Nm
		2. Jointing torque	10 Nm
		3. Jointing torque	16 Nm
		4. Jointing torque	16 Nm
		5. Jointing torque	16 Nm

- Make sure the thermal compensating elements (A) have **not** been damaged.

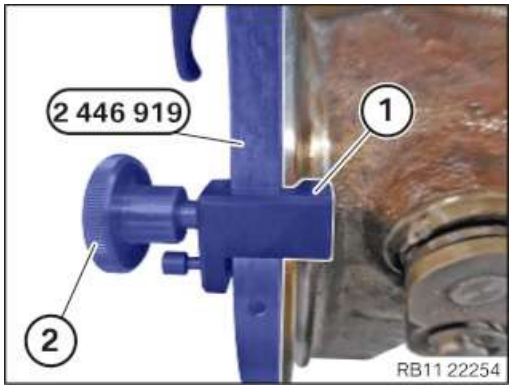


- Loosen nuts (1) and (2).
- Pull out special tool 2 466 467 at the exhaust turbocharger (3) and remove.



- Release the nut (1) and (2).
- Pull out special tool 2 466 467 at the exhaust turbocharger (3) and remove.

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- Loosen screw (2).
- Feed out the bracket (1) of the special tool 2 446 919 and set it aside.



- Release clamping lever (1) of the special tool 2 446 919 in the **direction of arrow**.



- Loosen screw (1).
- Pull out special tool 2 446 919 at the exhaust turbocharger and remove.

Additional Information

Overview of Tightening Torques

Special tool 2 466 467 to special tool 2 446 919			Used in step 1
M8		Tightening torque	5 Nm

Flange to assembly stand			Used in step 2
M14X30		Tightening torque	135 Nm

Cylinder head on device			Used in step 2
M10X90x1.5		Tightening torque	30 Nm

Cylinder head to special tool 2 361 215			Used in step 15
			35 Nm

Special tool 2 456 190 to cylinder head			Used in step 15
M6X20		Tightening torque	8 Nm

Ventilation connection/special tool to cylinder head			Used in step 15
M10			18 Nm

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Exhaust camshaft to cylinder head			Used in step 20
M6	***Observe tightening sequence,*** *mount bearing cap flush.*	Jointing torque	10 Nm
	Tighten the screws.	Tightening torque	10 Nm

Eccentric shaft to bearing support/cylinder head			Used in step 21
M6			10 Nm

Electrical servomotor to cylinder head			Used in step 22
M6		Tightening torque	8 Nm

Intake camshaft to cylinder head			Used in step 23
M6	***Observe tightening sequence,*** *mount bearing cap flush.*	Jointing torque	10 Nm
	Tighten the screws.	Tightening torque.	10 Nm

Gate to bearing bracket			Used in step 26
M8			20 Nm

Exhaust manifold to cylinder head			Used in step 31
Flange nutM7	*Replace flange nuts*	1. Jointing torque	10 Nm
		2. Jointing torque	10 Nm
		3. Jointing torque	16 Nm
		4. Jointing torque	16 Nm
		5. Jointing torque	16 Nm

Overview of Special Tools

2 446 919 Locating fixture



Common	Used in step 131
Usage	For installation and de-installation of the exhaust turbocharger module. Engine: B58.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 08 16 (383)

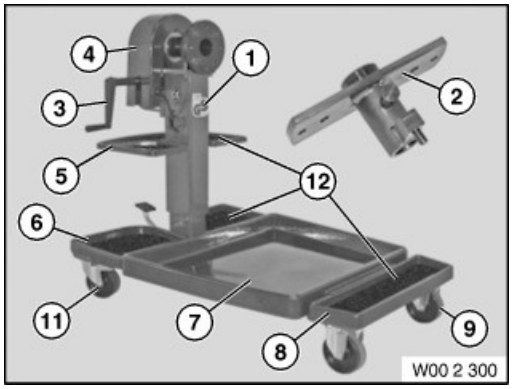
2 466 467 Device



Common	Used in step 131
Usage	For removing and installing the exhaust turbocharger. Engine: B58O1.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 18 (545)

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0 495 187 (00 2 300) Assembly stand



Common

Used in step 2

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

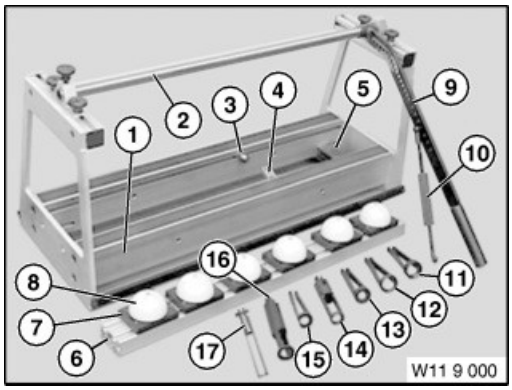
Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	2 299 563	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	

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2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.

0 494 362 (11 9 000) Device



Common Used in step 212

Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	

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14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

2 220 718 Workshop crane

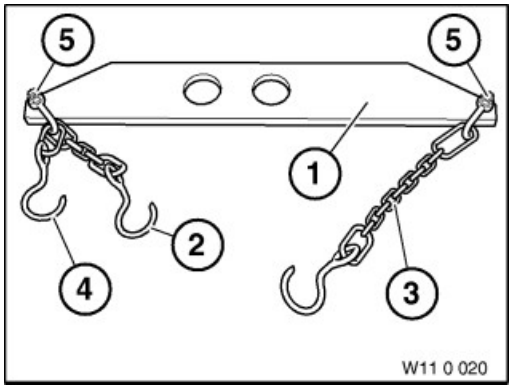


Common	Used in step 230
Usage	WSK 1000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	06 01 11 (701)

0 490 567 (11 0 020) Lifting gear

Used in step 230

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Common

Usage	For removing and installing the engines. 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
5	0 490 572 (11 0 029)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 568 (11 0 021)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 569 (11 0 022)		**Chain** (Chain) As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 570 (11 0 023)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
4	0 490 571 (11 0 024)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	

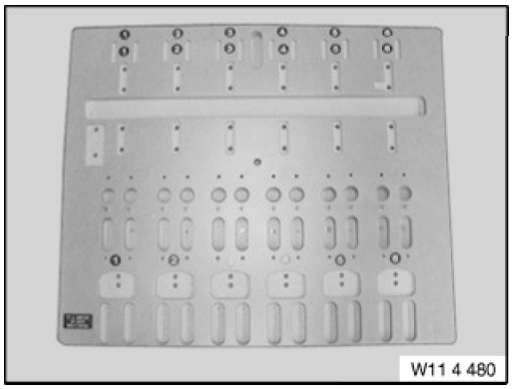
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2 359 088 Device



Common	Used in step 429
Usage	For removing and installing torsion spring of the intermediate lever.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

0 495 105 (11 4 480) oddments tray



Common	Used in step 4567910111214
Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

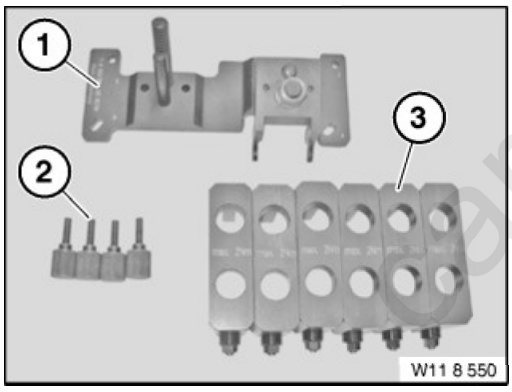
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2 410 670 Device



Common	Used in step 1020
Usage	To press down the valves on the 2nd cylinder, for de-energised disassembly/installation of the exhaust camshaft. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C55
Replaced by	
In connection with	
SI-Number	01 23 15 (280)

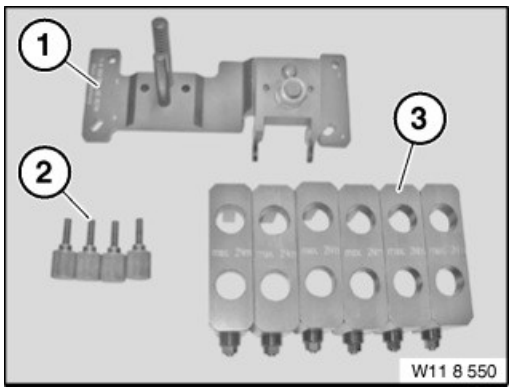
0 495 741 (11 8 552) Screw



Common	Used in step 1020
Usage	(Knurled screw (4 pieces))
Included in the tool or work	0 495 739
Storage location	C19
Replaced by	
In connection with	
SI-Number	01 20 06 (299)

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0 495 739 (11 8 550) Device



Common Used in step 10

Usage	(Locking device) For holding the bearing strips in place when fitting intake camshaft.
Included in the tool or work	
Storage location	C19
Replaced by	
In connection with	
SI-Number	01 20 06 (299)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	0 495 741 (11 8 552)		**Screw** (knurled screw (4 pieces))	
1	0 495 740 (11 8 551)		**Tool** (Tool to press down) discontinued, available as part of set of special tools only	
3	0 495 742 (11 8 553)		**Synchronising key** Thrust piece (1 piece)	

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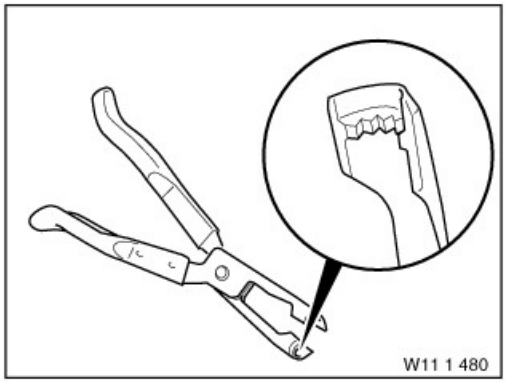
0 496 143 (11 8 840) Basket



Common Used in step 1218

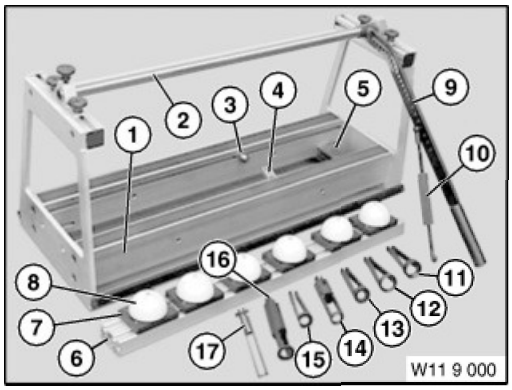
Usage	(Valve spring cage) For removing and fitting the valves.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 490 796 (11 1 480) Pliers



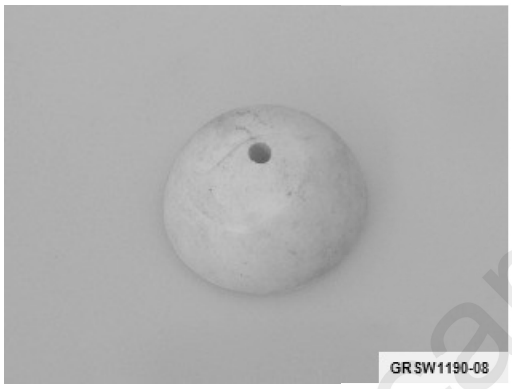
Common	Used in step 13
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 494 370 (11 9 005) Quick fastener



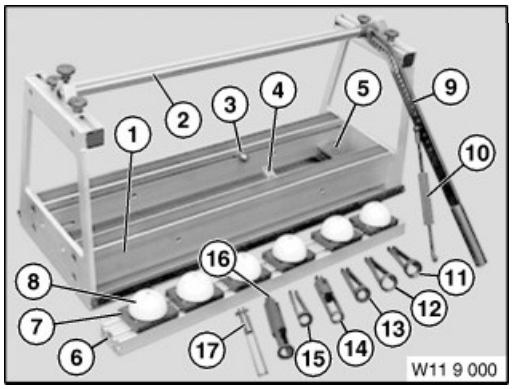
Common	Used in step 1416
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 373 (11 9 008) Shaped part



Common	Used in step 1416
Usage	(Shaped part) Shaped part made of plastic
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

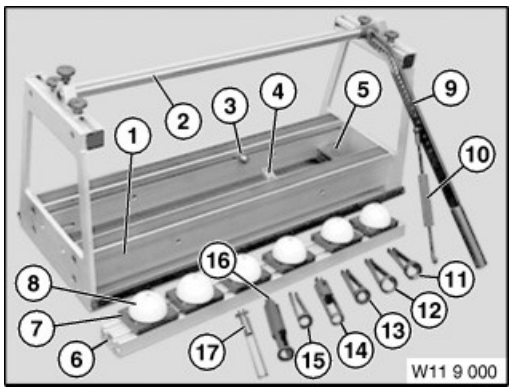
0 494 371 (11 9 006) Insert



Common	Used in step 1416
Usage	(Aluminium strip)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 494 372 (11 9 007) Shaped part



Common	Used in step 1416
Usage	(Shaped part)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

2 361 215 Device



Common	Used in step 15
Usage	For leak-testing cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

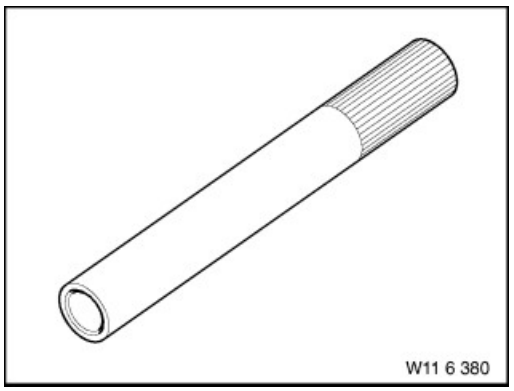
0 490 797 (11 1 960) Holding sleeve



Common	Used in step 17
Usage	(Assembly sleeve) For fitting valve stem seals, 6 mm diameter
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

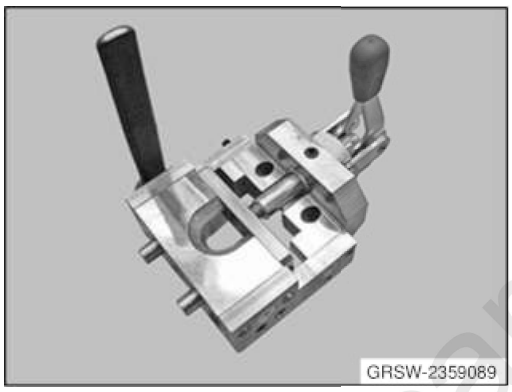
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0 493 249 (11 6 380) Bush



Common	Used in step 17
Usage	For fitting valve stem seal
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

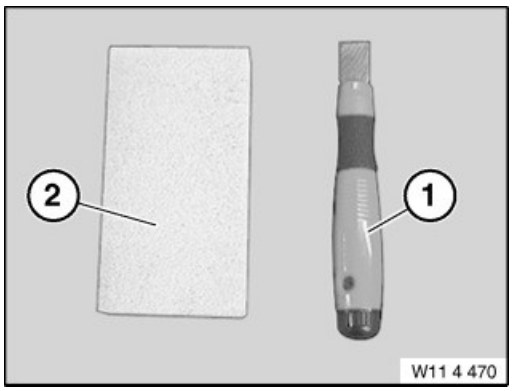
2 359 089 Device



Common	Used in step 26
Usage	For positioning the sliding block. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

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0 495 102 (11 4 470) Tool



Common	Used in step 31
Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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Replacement tools:

2 299 563 Adapter



Common	Used in step 2
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Check for cylinder head watertightness	Used in step 15
Temperature of the cylinder head	60 °C

Check for cylinder head watertightness	Used in step 15
Testing pressure	max. 3,0 bar

Screw-in depth of upper stud bolt on cylinder head	Used in step 31
Dimension A	30 mm

Links

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	8

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11 12 502 Disassemble and assemble cylinder head

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

1 – Removing the exhaust turbocharger (cylinder head removed)

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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

RISK OF DAMAGE

Damage to the electrical wastegate valve controller.

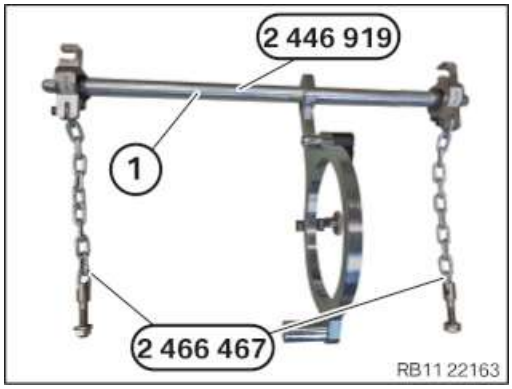
The electrical wastegate valve controller may be damaged as a result of the excessive forces required when removing and installing a jammed exhaust turbocharger.

- Do not pull on the electrical wastegate valve controller.
- Apply force to the turbine housing and exhaust manifold only.
  - Do not pull on the compressor housing.

TECHNICAL INFORMATION

Do not damage the thermal compensating elements. The disassembly and installation including intermediate storage of the exhaust turbocharger is only permitted with mounted special tool 2 466 919 .

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- Have the special tool 2 446 919 and the special tool 2 466 467 ready.



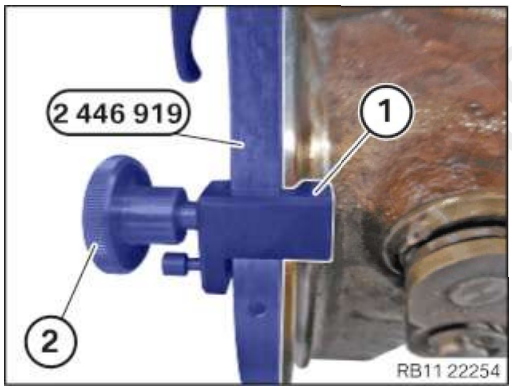
- Install the special tool 2 446 919 on the exhaust turbocharger and secure it with the bolt (1).



- Fix the special tool 2 446 919 by turning the clamping lever (1) in the **direction** of the arrow.

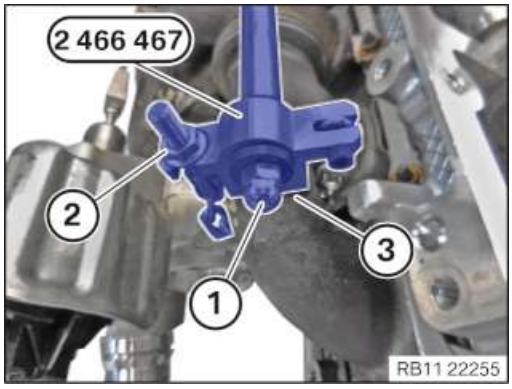
Note: The clamping lever that is shown in the graphic is already in its end position.

- Make sure that the special tool 2 446 919 is flush with the exhaust turbocharger in the **marked area**.

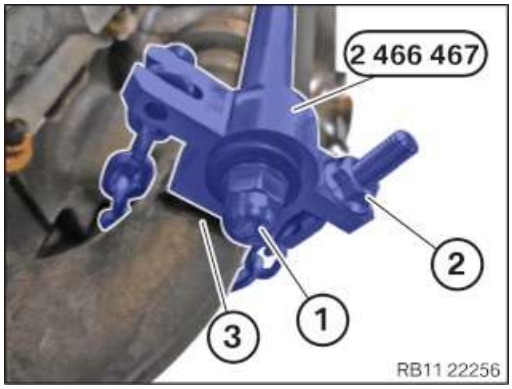


- Position the holder (1) and fasten it with the bolt (2).

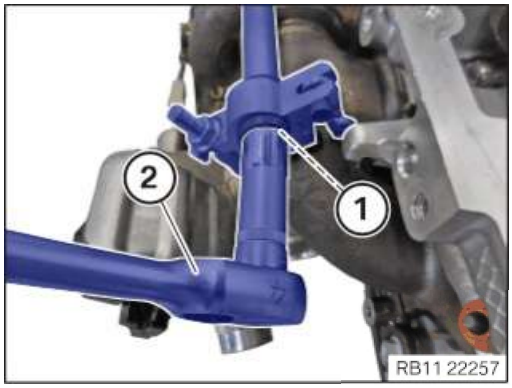
Note: The holder is used for the final mounting of the special tool **2 446 919**.



- Tighten the nut (1) hand-tight.
- Tighten the nut (2) hand-tight.
- Ensure that the special tool 2 466 467 rests correctly on the exhaust turbocharger (3).



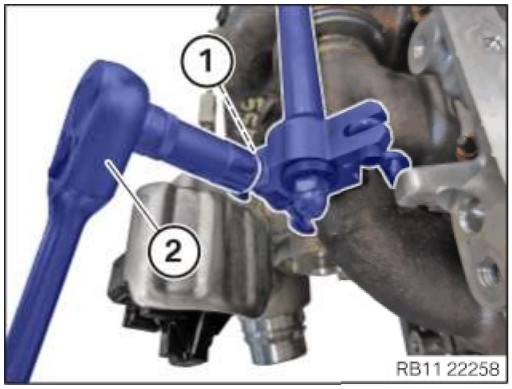
- Tighten the nut (1) hand-tight.
- Tighten the nut (2) hand-tight.
- Ensure that the special tool 2 466 467 rests correctly on the exhaust turbocharger (3).



- Tighten the nut (1) using commercially available tools (2).

Special tool 2 466 467 to special tool 2 446 919

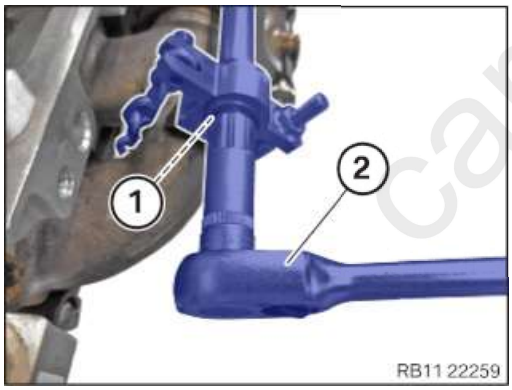
M8		Tightening torque	5 Nm



- Tighten the nut (1) using commercially available tools (2).

Special tool 2 466 467 to special tool 2 446 919

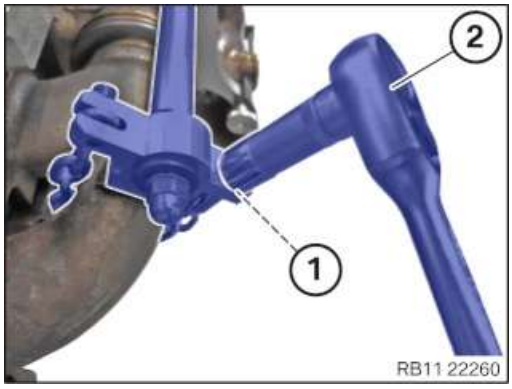
M8		Tightening torque	5 Nm



- Tighten the nut (1) using commercially available tools (2).

Special tool 2 466 467 to special tool 2 446 919

M8		Tightening torque	5 Nm

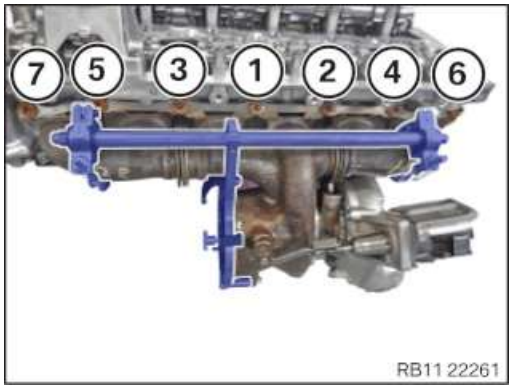


- Tighten the nut (1) using commercially available tools (2).

Special tool 2 466 467 to special tool 2 446 919

M8		Tightening torque	5 Nm

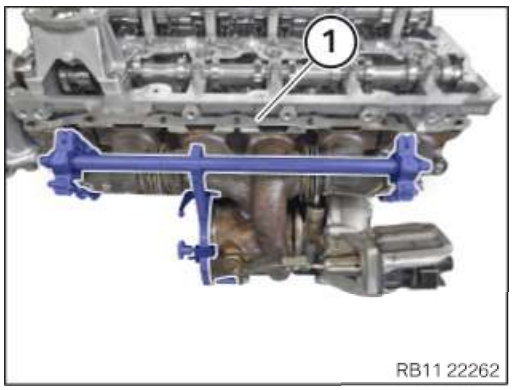
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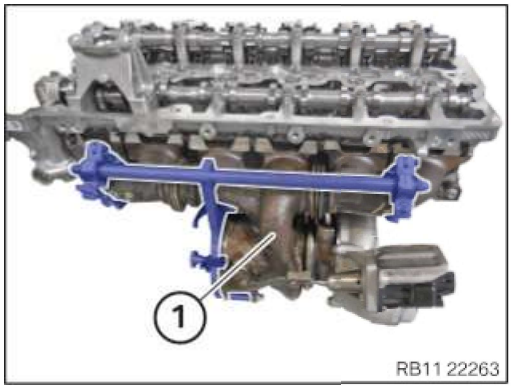
TECHNICAL INFORMATION

Exhaust manifold/exhaust turbocharger is not bolted to the underside, but clamped instead. When removing/replacing the exhaust manifold/exhaust turbocharger, the clamping strip remains screwed on.

- Unscrew the nuts in sequence (7) to (1).
- Secure exhaust turbocharger against falling down.



- Slide the slide rail (1) out and remove.



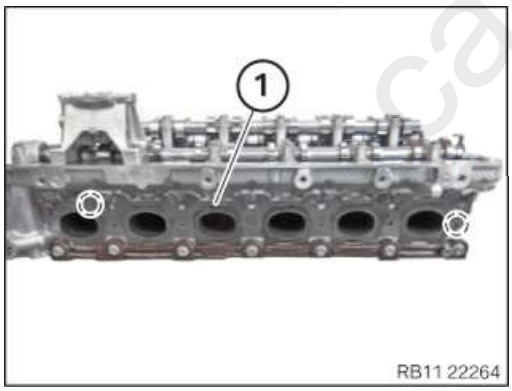
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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

- Carefully guide out and remove the exhaust turbocharger (1).
- Thermal compensating elements of the exhaust turbocharger (1) or exhaust manifold should **not** be bent or deformed.



- Feed out and remove seal (1) in the **marked area.**

2 – Installing cylinder head on the assembly stand

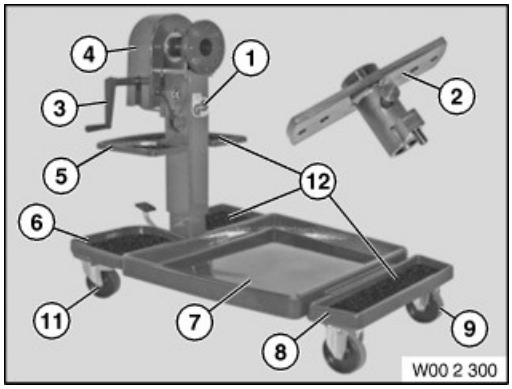
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

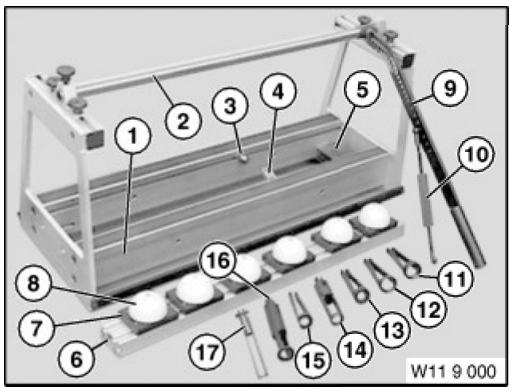
- Remove and install heavy components with the aid of another person/other persons.

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- Have the set of special tools 0 495 187 (00 2 300) ready.

Number	Description
1	Assembly stand
2	Flange
3	Crank
4	Cover
5	oddments tray
6	Shaped element rear
7	Collection pan
8	Shaped element front
9	Front wheel
10	Rear wheel with stop
11	Mat



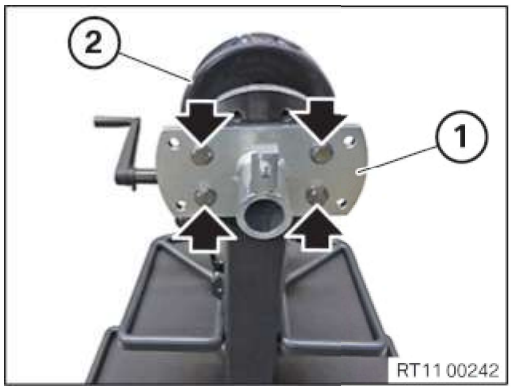
- Have the set of special tools 0 494 362 (11 9 000) ready.

Number	Description
1	Device
2	Rod
3	Adapter
4	Tab
5	Quick fastener
6	Aluminum strip
7	Shaped part
8	Shaped part made of plastic
9	Lever
10	Hook
11	Valve spring cage
12	Valve spring cage
13	Valve spring cage
14	Valve spring cage
15	Valve spring cage
16	Valve spring cage
17	Valve spring cage

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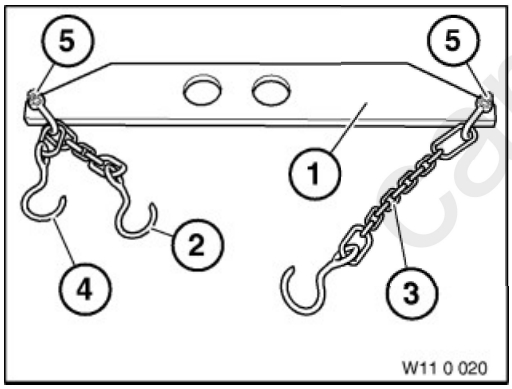
- Stage special tool (workshop crane) 2 220 718.



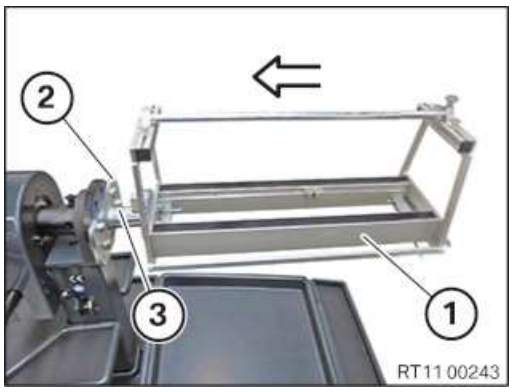
- Position flange (1) on assembly stand (2).
- Tighten screws (arrows).

Flange to assembly stand

M14X30		Tightening torque	135 Nm

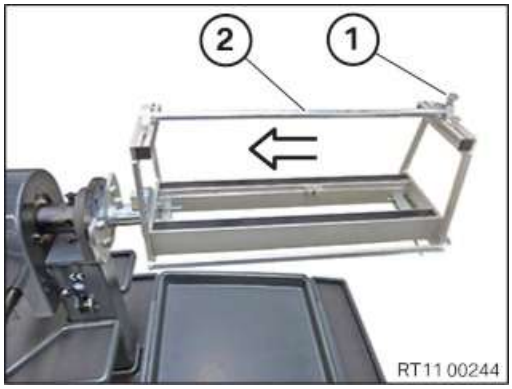


- Prepare the special tool 0 490 567 (11 0 020).

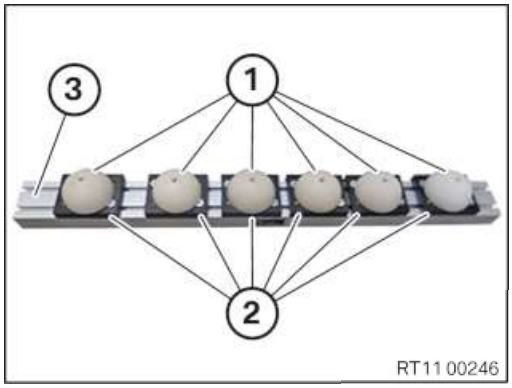


- Fit device (1) onto the flange (2) in the direction of the arrow and install.
- Make sure that the lock (3) engages audibly.

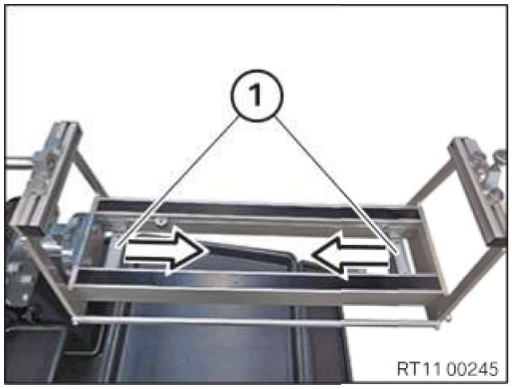
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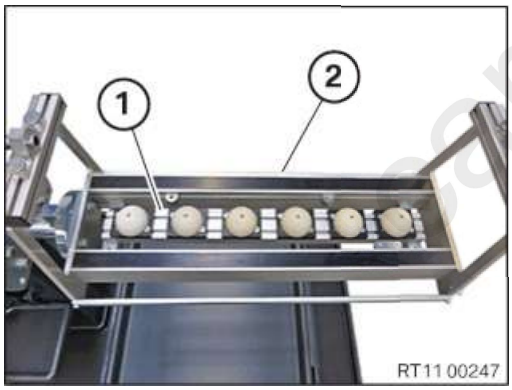
- Loosen screw (1).
- Pull out rod (2) in direction of arrow and set it aside.



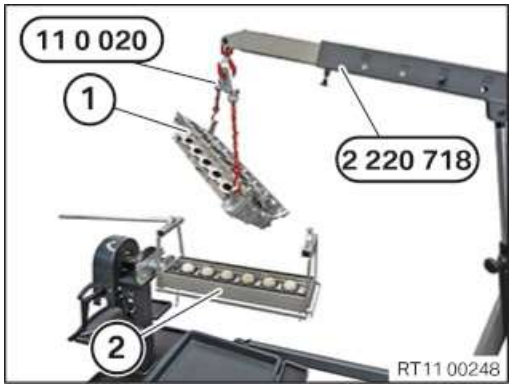
- Prepare plastic shaped part (1) with the shaped parts (2) and the aluminium strip (3).



- Slide quick fastener (1) in the direction of the arrow to the limit position.

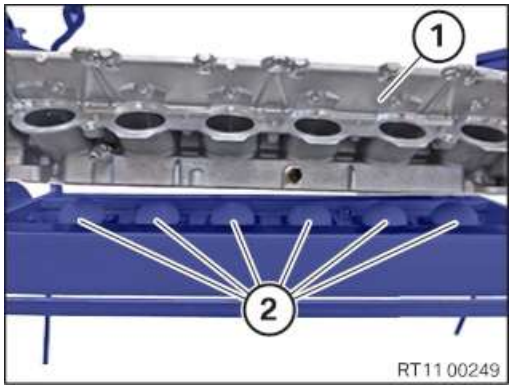


- Position completed aluminium strip (1) **centred** on the device (2).

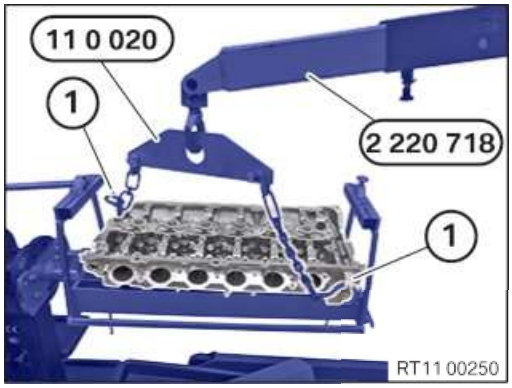


- Position cylinder head (1) with the work crane 2 220 718 and special tool 0 490 567 (11 0 020) on the device (2).

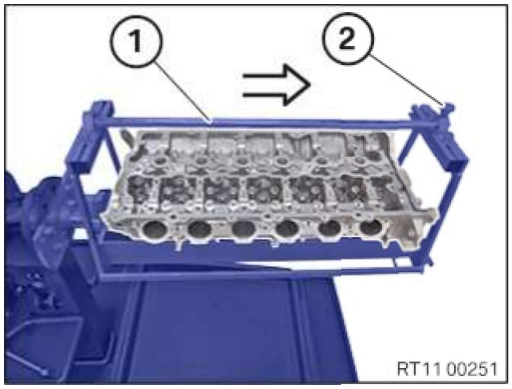
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- Position cylinder head (1) correctly on the completed aluminium strip (2).



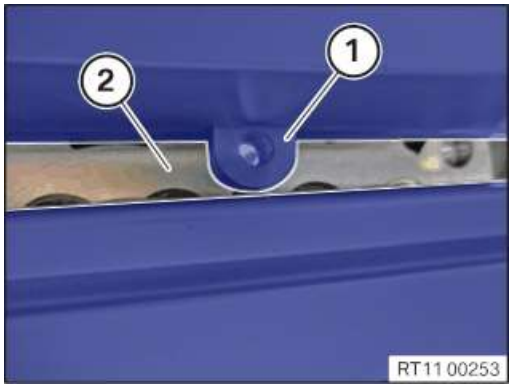
- Lower workshop crane 2 220 718.
- Pull out special tool 0 490 567 (11 0 020) at the cylinder head (1) and remove.
- Remove workshop crane 2 220 718 and set aside.



- Pull in rod (1) in the direction of the arrow and install.
- Hand-tighten the bolt (2).

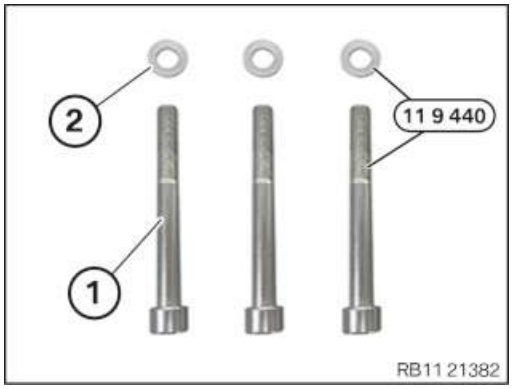


- Position screw connection (1) on cylinder head (2).

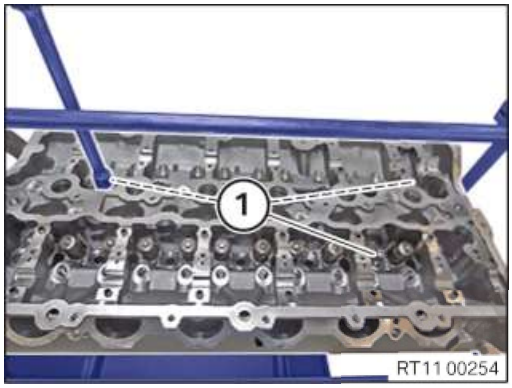


- Position screw connection (1) on cylinder head (2).

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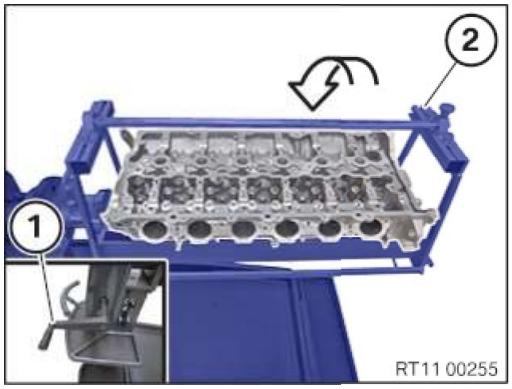
- Keep **M10x90** screws (1) from special tool ready.
- Keep washers (2) from special tool ready.



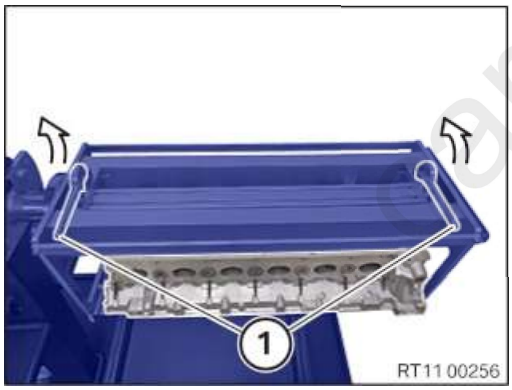
- Tighten screws (1) from special tool.

Cylinder head on device

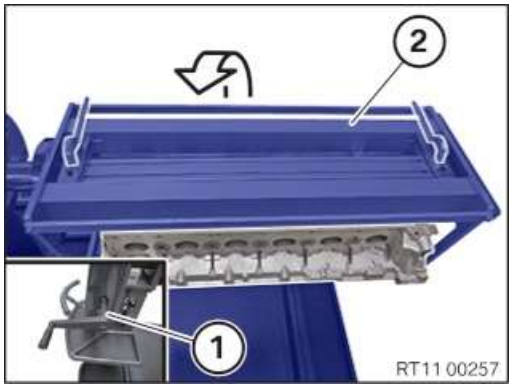
M10X90x1.5		Tightening torque	30 Nm



- Turn device (2) on the crank (1) by 180° in direction of arrow.



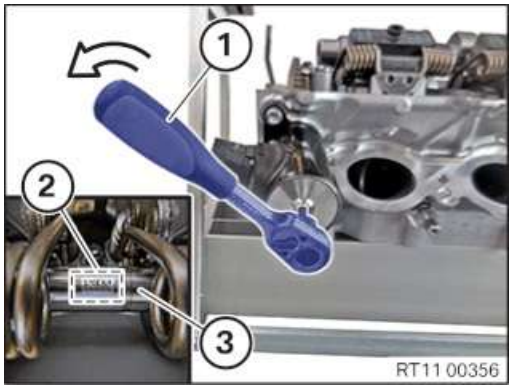
- Lock quick fastener (1) in direction of arrow.



- Turn device (2) on the crank (1) by 180° in direction of arrow.

3 – Adjusting eccentric shaft to minimum lift (cylinder head removed)

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- With the help of the servomotor, use a standard hexagon socket wrench (1) to slowly adjust eccentric shaft (3) to the minimum lift at **4 mm** in the **direction of the arrow**.
- Make sure that the mark (2) on the eccentric shaft (3) points upwards.

4 – Removing all torsion springs (cylinder head removed)

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

TECHNICAL INFORMATION

- Wear safety goggles.



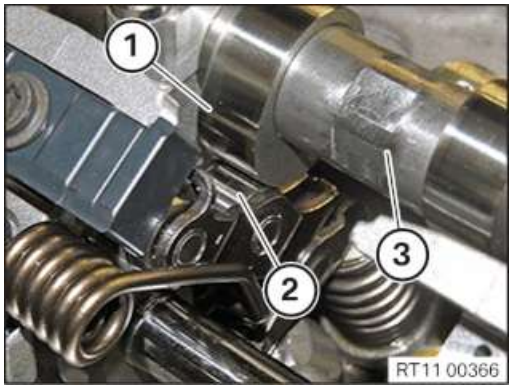
- Have the set of special tools 2 359 088 ready.

Number	Description
1	Clamping lever
2	Mounting for clamping lever (fitting aid)

▸ Checking the position of the intake camshaft (cylinder head removed)

Check

- Check position of the intake camshaft on the respective cylinders.



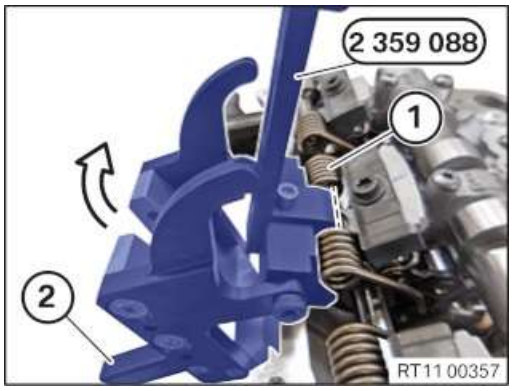
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Result

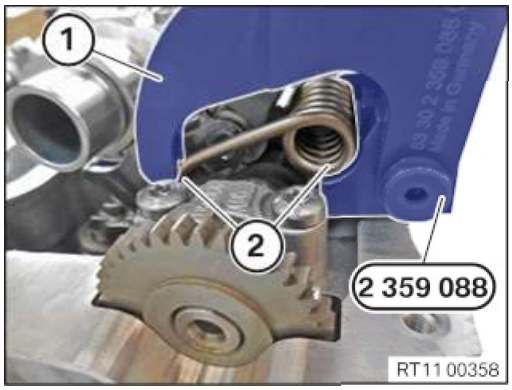
» Cam (1) of the intake camshaft runs on the intermediate lever (2).

Measure

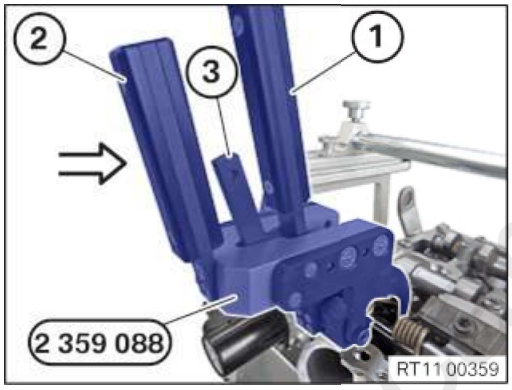
- Turn intake camshaft (3) further using a standard open-end spanner until the cam (1) does not override on the intermediate lever (2).



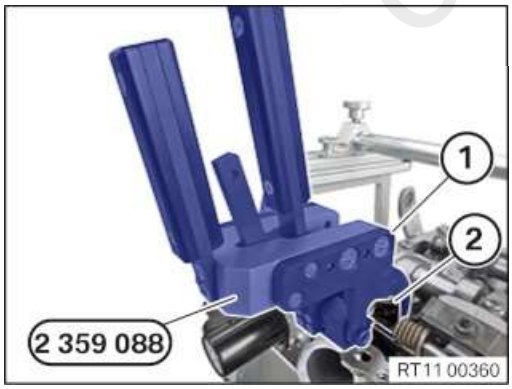
- Open the special tool 2 359 088 and position it at the torsion spring (1).
- Position retaining hook (2) of the special tool 2 359 088 in the direction of arrow.



- Make sure that the torsion spring (2) is correctly positioned in the clamping lever (1) of the special tool 2 359 088.

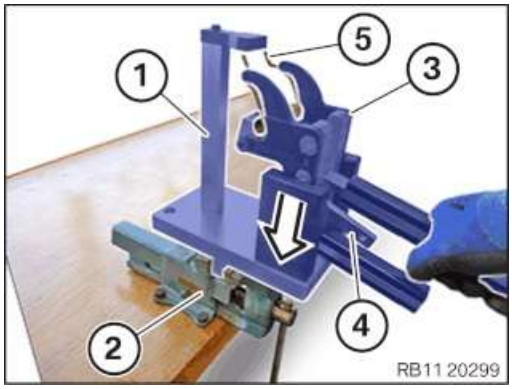


- Hold down lever (1) of special tool 2 359 088.
- Close lever (2) of the special tool 2 359 088 carefully in the **direction of arrow** until the retaining hook (3) engages audibly.



- Guide out and remove clamping lever (1) of special tool 2 359 088 with preloaded spring (2) **carefully**.

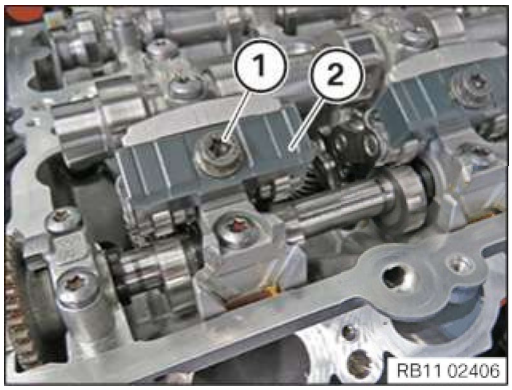
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- Clamp fixture (1) of the special tool 2 359 088 in the vice (2).
- Position clamping lever (3) of special tool 2 359 088 with pre-tensioned torsion spring (5) in direction of arrow in the mounting (1) of the special tool 2 359 088.
- Carefully unlock retaining hook (4) of the special tool 2 359 088.

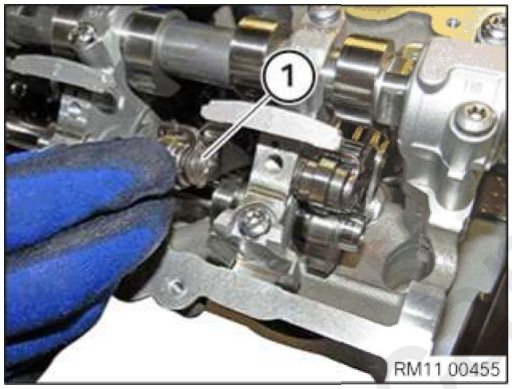
  The torsion spring (5) is relieved.
- Slowly open clamping lever (3) and remove the torsion spring (5).
- Place torsion spring (5) neatly into special tool 0 495 105 (11 4 480).
- Repeat the operations for the remaining torsion springs.

5 – Removing all gates



- Loosen screw (1).
- Remove the gates (2) and place it arranged in order in the special tool 0 495 105 (11 4 480).
- Repeat the step for all the gates.

6 – Removing all intermediate levers



- Remove the intermediate lever (1) and arrange it in the special tool 0 495 105 (11 4 480) in order.
- Repeat the step for all intermediate levers (1).

7 – Removing intake camshaft (cylinder head removed)

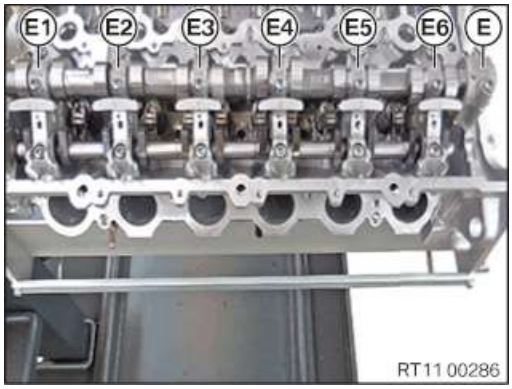
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

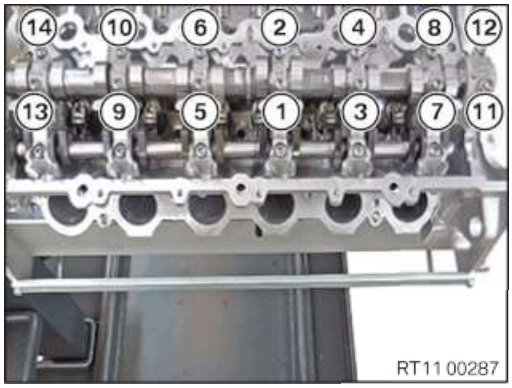
carfdiagn.com



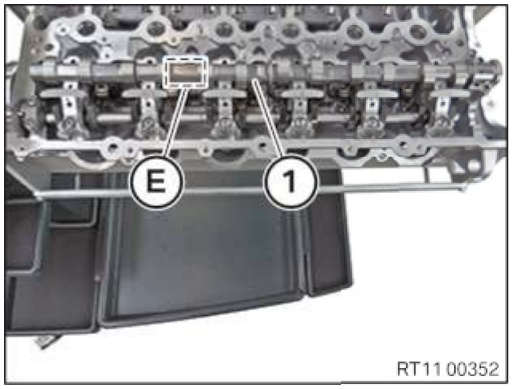
- Observe the numbering of the intake camshaft bearing caps.

  The intake camshaft bearing caps are numbered from (E1) to (E6) and are laid down according to their numbering in the special tool 0 495 105 (11 4 480).

  The intake camshaft bearing cap (E) is a thrust bearing.



- Release screws in the right sequence (14) till (1) in semi circle pattern.
- Set all intake camshaft bearing caps neatly in the special tool 0 495 105 (11 4 480).



- Guide out intake camshaft (1) toward the top and remove it.

8 – Remove the servomotor for the eccentric shaft (cylinder head removed)

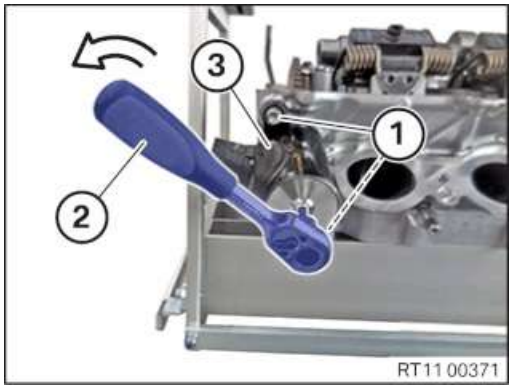
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

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

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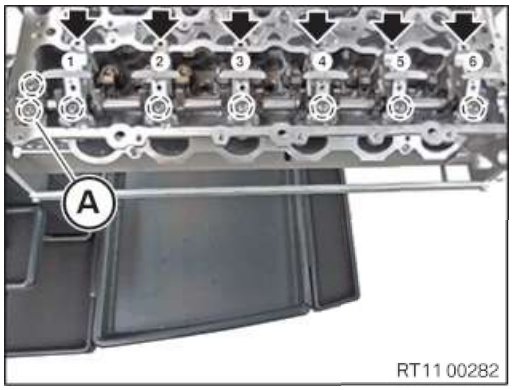


- Loosen screws (1).
- Use a standard hexagon socket wrench (2) to slowly adjust the servomotor for eccentric shaft (3) to the minimum lift at **4 mm** in direction of arrow.

  This releases the tension of the eccentric shaft.

  Do **not** turn the eccentric shaft beyond the end stop.
- Guide out and remove the servomotor for eccentric shaft (3).

9 – Removing the eccentric shaft (cylinder head removed)



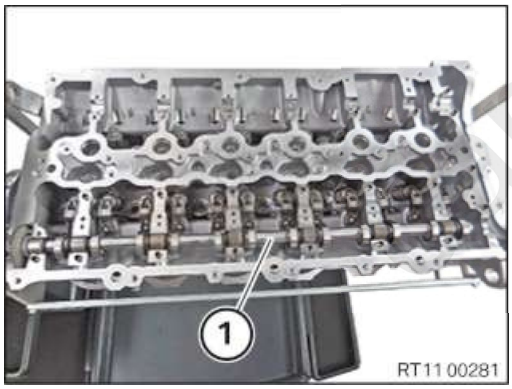
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

- Unscrew all bolts (markings).
- Work mounting brackets (1) to (6) (arrowed) out and remove.
- Place mounting brackets (1) to (6) in order in the special tool 0 495 105 (11 4 480).
- Work bearing caps (A) out and remove.
- Place the bearing cap (A) in the special tool 0 495 105 (11 4 480) in order.



- Guide out the eccentric shaft (1) toward the top and remove it.

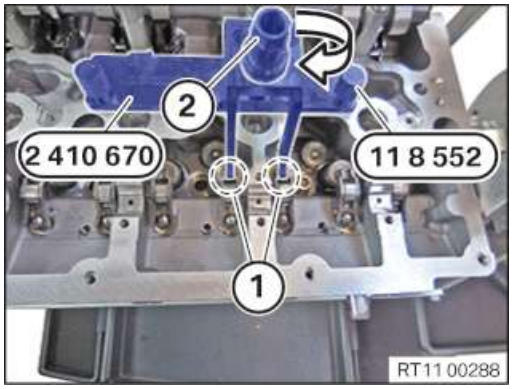
10 – Removing exhaust camshaft (cylinder head removed)

RISK OF DAMAGE

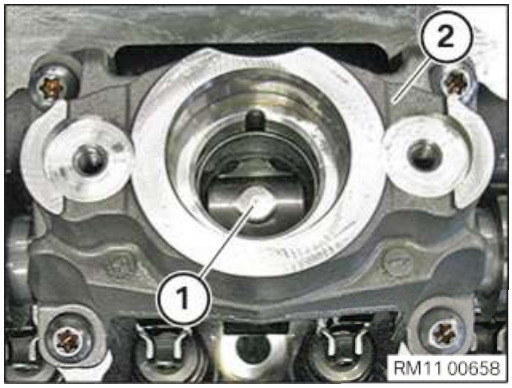
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

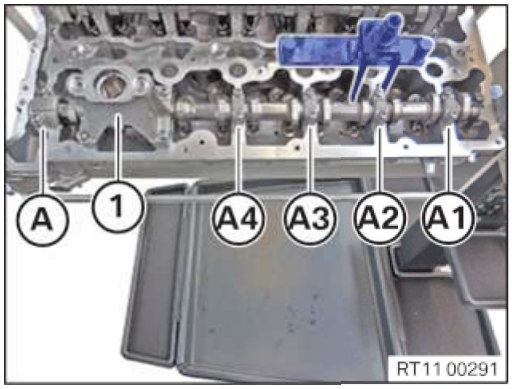
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Position the special tool 2 410 670 at cylinder 2 and apply it hand-tight with the special tool 0 495 741 (11 8 552) from the set of special tools 0 495 739 (11 8 550).
- Screw in both roller cam followers (1) on the 2nd cylinder using the spindle nut (2) of the special tool 2 410 670 in direction of arrow up to the limit position.



- Remove roller tappet (1) from high pressure pump bracket (2).

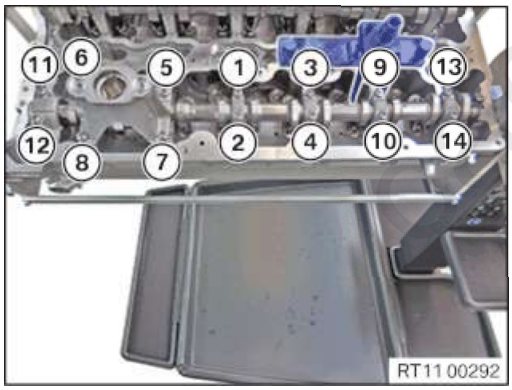


- Observe the numbering of the exhaust camshaft bearing caps.

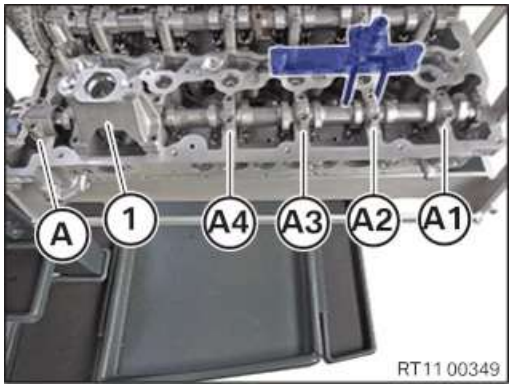
  The exhaust camshaft bearing caps are numbered from (A1) to (A4) and are placed in the special tool 0 495 105 (11 4 480) according to their numbering.

  The exhaust camshaft bearing caps can be read from the intake side.

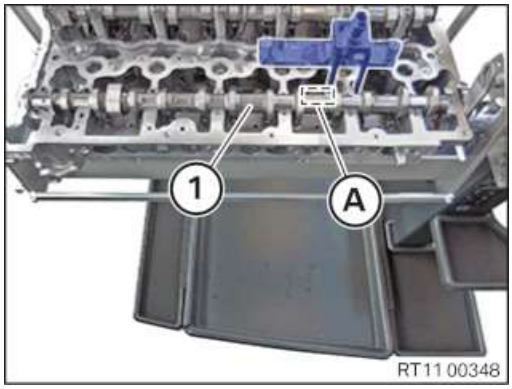
  The exhaust camshaft bearing cap (A) is a thrust bearing.



- Release screws in the right sequence (14) till (1) in semi circle pattern.

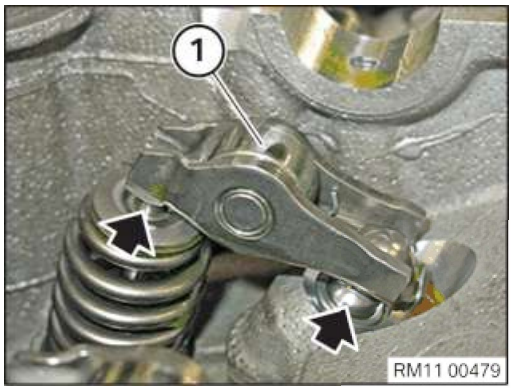


- Pull out all exhaust camshaft bearing caps (A1) to(A4) and the exhaust camshaft bearing cap (A) and remove.
- Place all exhaust camshaft bearing cap in order in special tool 0 495 105 (11 4 480).
- Thread the high pressure pump bracket (1) out and remove.

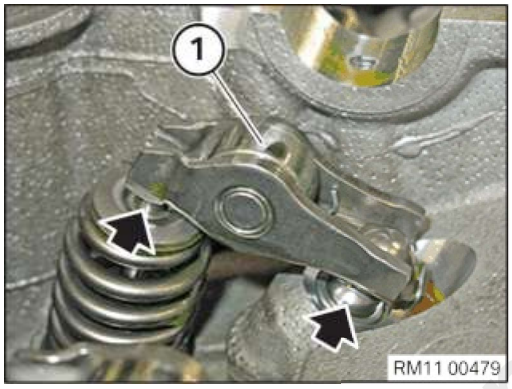


- (1)Remove exhaust camshaft in upward direction.

11 – Remove all roller cam followers



- Detach and remove the roller cam followers (1) on the intake side from hydraulic valve clearance compensating elements (arrows).
- Place all roller cam followers in order in special tool 0 495 105 (11 4 480).



- Detach and remove the roller cam followers (1) on the output side from hydraulic valve clearance compensating elements (arrows).
- Place all roller cam followers in order in special tool 0 495 105 (11 4 480).

12 – Remove all valve springs

CAUTION

Spring preload.

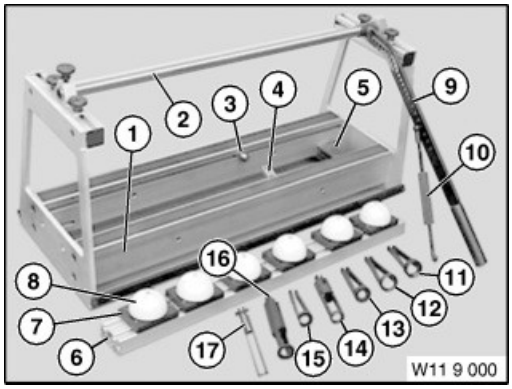
Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

NOTICE

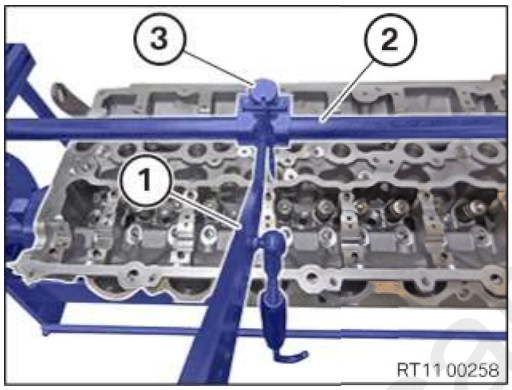
The description is for one component only. The procedure is identical for all further components.

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- Have the set of special tools 0 494 362 (11 9 000) ready.

Number	Description
1	Device
2	Rod
3	Adapter
4	Tab
5	Quick fastener
6	Aluminum strip
7	Shaped part
8	Shaped part made of plastic
9	Lever
10	Hook
11	Valve spring cage
12	Valve spring cage
13	Valve spring cage
14	Valve spring cage
15	Valve spring cage
16	Valve spring cage
17	Valve spring cage



- Feed in and install lever (1) on the rod (2).
- Guide in and install lock (3).

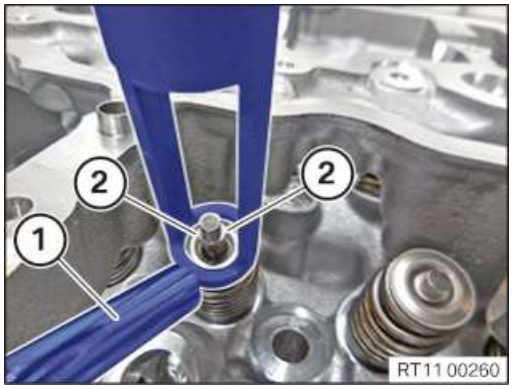


TECHNICAL INFORMATION

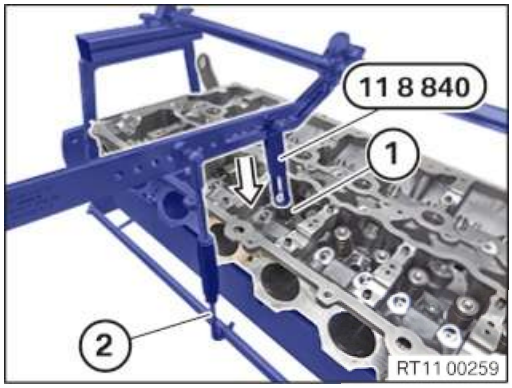
- Wear safety goggles.

- Press down the valve spring (1) on the spring cup at the top with the special tool 0 496 143 (11 8 840) in direction of arrow.
- Hold valve spring (1) **pressed down** using the hook (2).

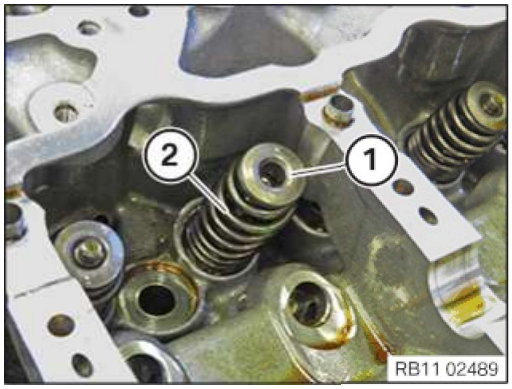
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- Remove valve shims (2) with a magnet (1).



- Press down the valve spring (1) on the spring cup at the top with the special tool 0 496 143 (11 8 840) in **direction of arrow**.
- Thread out hook (2) and place to the side.
- Relieve the valve spring (1) **carefully**.



- Remove the spring cup (1) and the valve spring (2) and position neatly in the special tool 0 495 105 (11 4 480).

13 – Remove valve stem seals

RISK OF DAMAGE

Contaminant or foreign body.

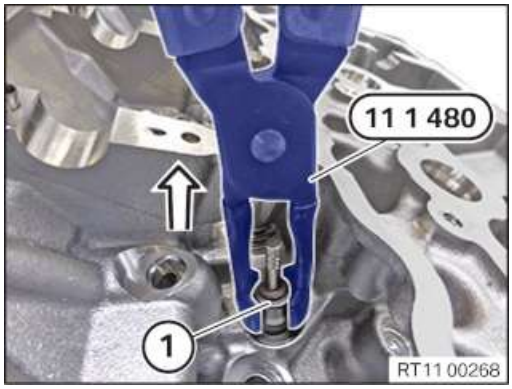
Contamination can result in malfunctions, operating failure or leaks.

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

NOTICE

The description is for one component only. The procedure is identical for all further components.

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- Remove the valve stem seal (1) in the **direction of arrow** using the special tool 0 490 796 (11 1 480).

14 – Remove all valves

RISK OF DAMAGE

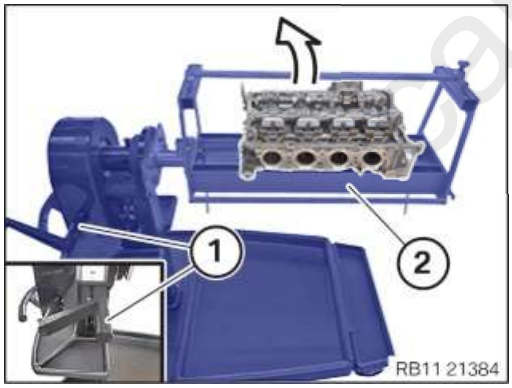
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

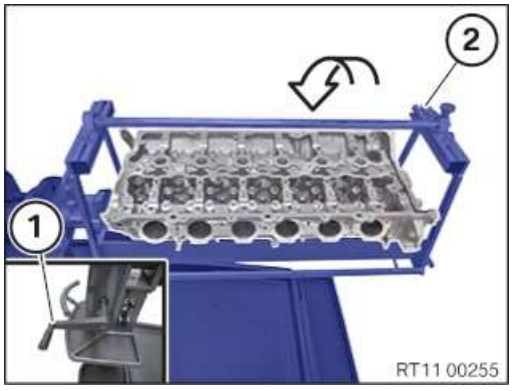
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- **Equipment specification B38**
- Twist the device (2) on the crank (1) 180°.



- **Equipment specification B46/B48**
- Turn device (2) on the crank (1) by 180° in **direction of arrow**.

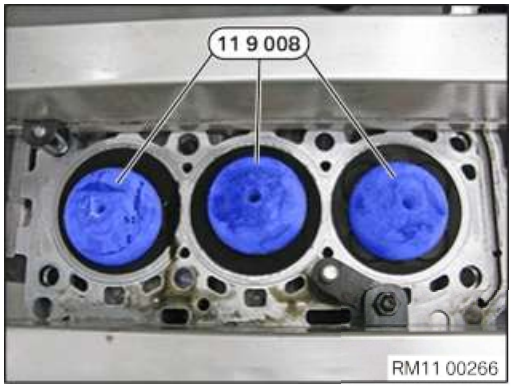


- **Equipment specification B58**
- Turn device (2) on the crank (1) by 180° in direction of arrow.

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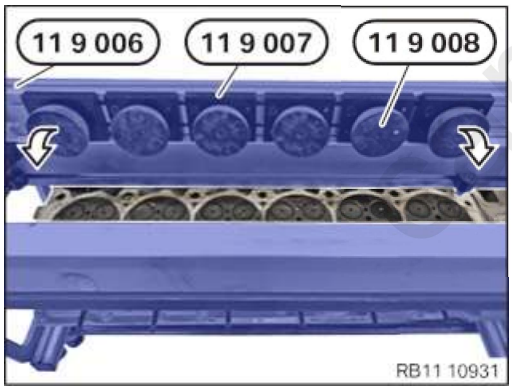
- Unlock the special tool 0 494 370 (11 9 005) in **direction of arrow**.



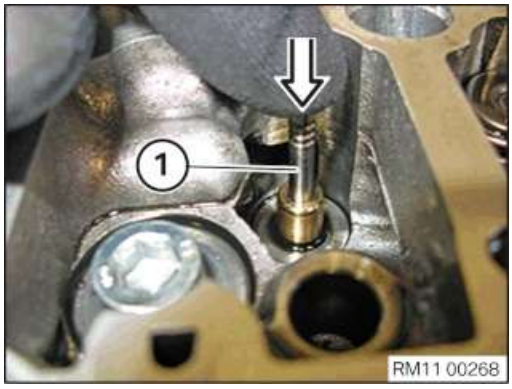
- **Equipment specification B38**
- Remove special tool 0 494 373 (11 9 008) if necessary.



- **Equipment specification B46/B48**
- Remove special tool 0 494 373 (11 9 008) if necessary.

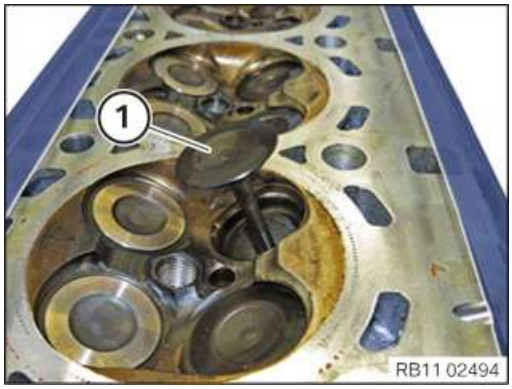


- **Equipment specification B58**
- Thread out and remove special tools 0 494 371 (11 9 006), 0 494 372 (11 9 007) and 0 494 373 (11 9 008) in direction of arrow.



- Push the valve stem (1) into the cylinder head in **direction of arrow**.

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- Remove the valve (1) and position in special tool 0 495 105 (11 4 480) in order.

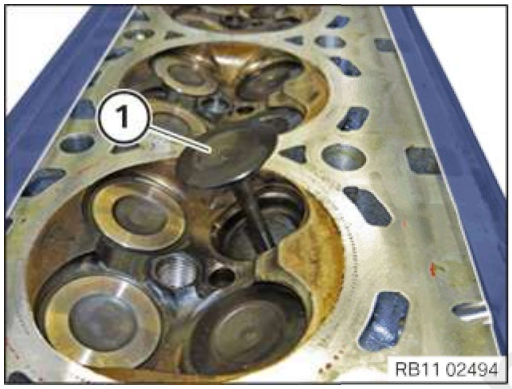
15 – Install all valves

RISK OF DAMAGE

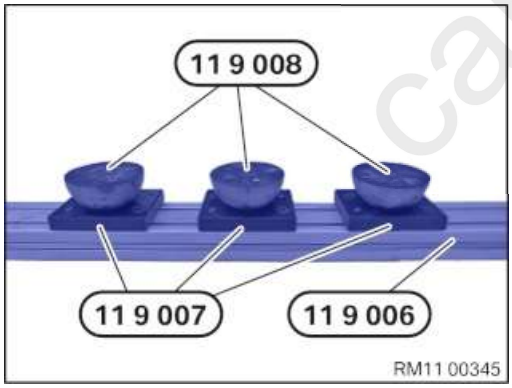
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

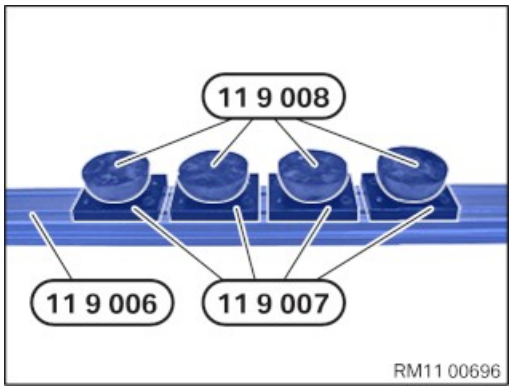
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Slide the valve (1) **carefully** into the cylinder head.

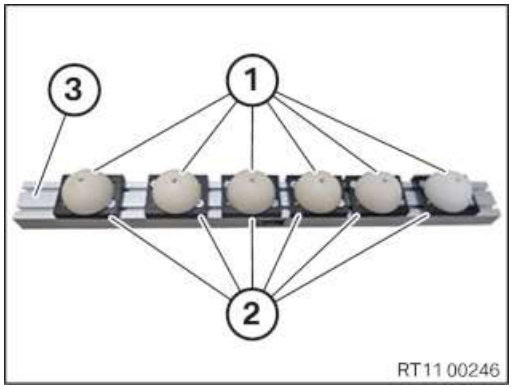


- **Equipment specification B38**
- Prepare the special tools 0 494 371 (11 9 006), 0 494 372 (11 9 007) and 0 494 373 (11 9 008) as shown.

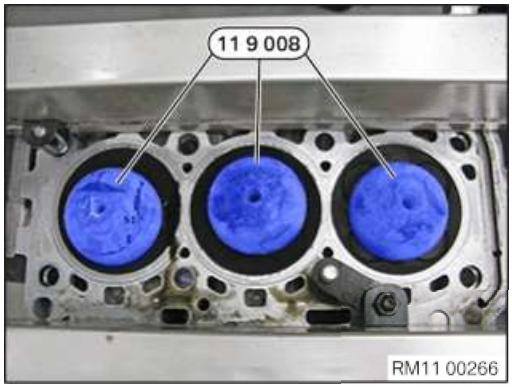


- **Equipment specification B46/B48**
- Prepare the special tools 0 494 371 (11 9 006), 0 494 372 (11 9 007) and 0 494 373 (11 9 008) as shown.

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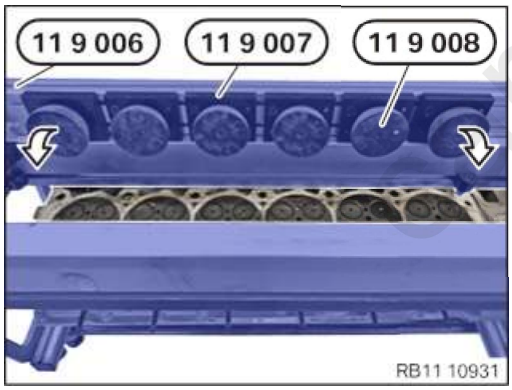
- **Equipment specification B58**
- Prepare plastic shaped part (1) with the shaped parts (2) and the aluminium strip (3).



- **Equipment specification B38**
- The special tools 0 494 373 (11 9 008) must be set up accordingly in the next operation.



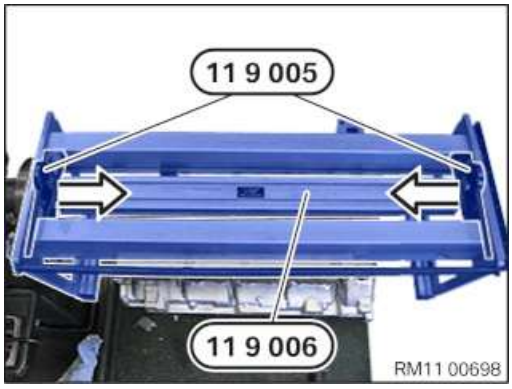
- **Equipment specification B46/B48**
- The special tools 0 494 373 (11 9 008) must be set up accordingly in the next operation.



TECHNICAL INFORMATION

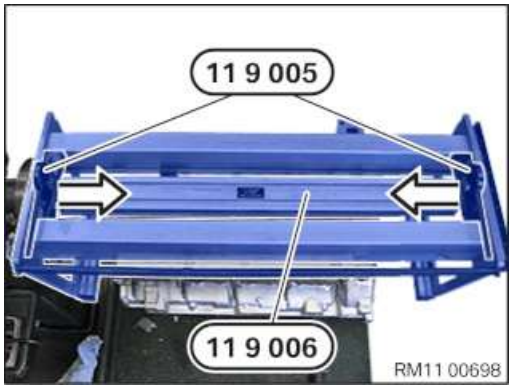
The figure shows the engine B58.

- Position special tools 0 494 371 (11 9 006), 0 494 372 (11 9 007) and 0 494 373 (11 9 008) in the centre on the cylinder head in the direction of the arrow.

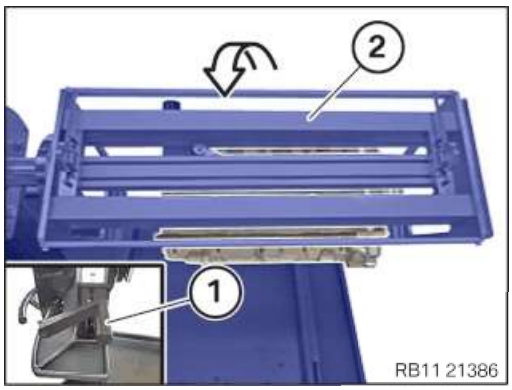


- Turn round special tool 0 494 371 (11 9 006) and insert as shown.
- Lock special tool 0 494 370 (11 9 005)in direction of arrow.

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- Move and lock special tool 0 494 370 (11 9 005) in the direction of the arrow over the edges of special tool 0 494 371 (11 9 006).



- Turn device (2) on the crank (1) by 180° in **direction of arrow**.

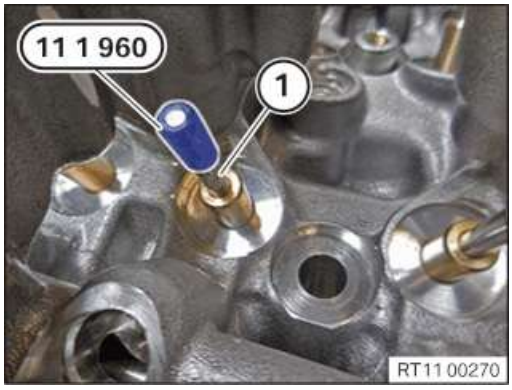
16 – Installing valve stem seals



- Remove oil and dirt from the contact surface (1).



- Make sure that the special tool 0 490 797 (11 1 960) is used when installing the valve stem seal.



- Guide in and install the special tool 0 490 797 (11 1 960) on valve (1).

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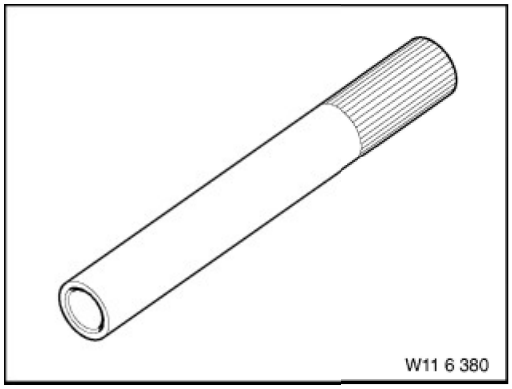


- Renew the valve stem seal (1).

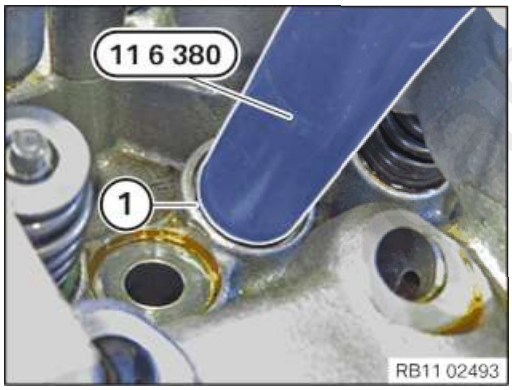
  Parts: Valve stem seal
- Guide in and install valve stem seal (1) on the special tool 0 490 797 (11 1 960).



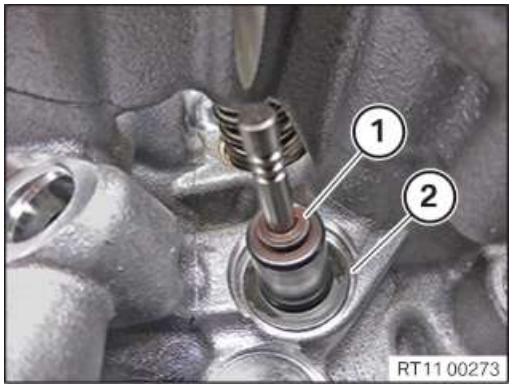
- Guide the special tool 0 490 797 (11 1 960) out and remove.



- Prepare special tool 0 493 249 (11 6 380).



- Press the valve stem seal (1) onto the cylinder head till the limit position using special tool 0 493 249 (11 6 380).



- Make sure that valve stem seal (1) is positioned correctly on cylinder head (2).

17 – Install all valve springs

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CAUTION

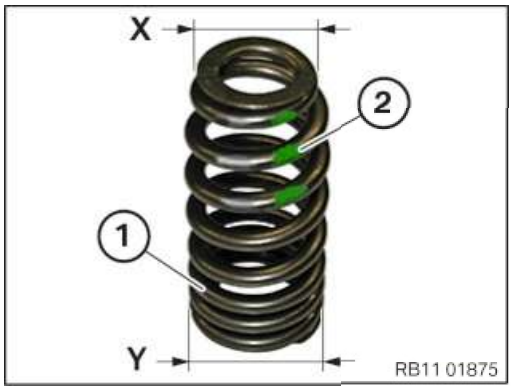
Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

NOTICE

The description is for one component only. The procedure is identical for all further components.

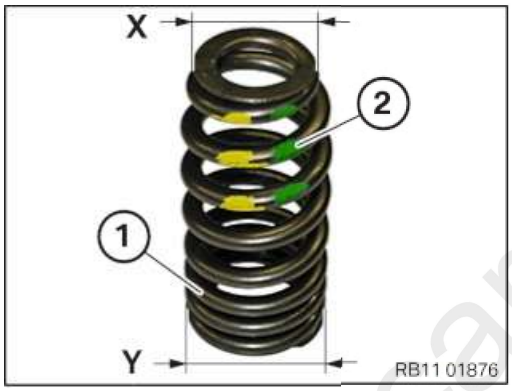


- Note the installation position of the valve spring.

Note: Install the valve spring so that the larger diameter (Y) points to the bottom spring cup.

- Make sure that the intake valves are not switched with the exhaust valves.

Note: Valve springs (1) are marked in colour (2). Colour for the intake valves: Green

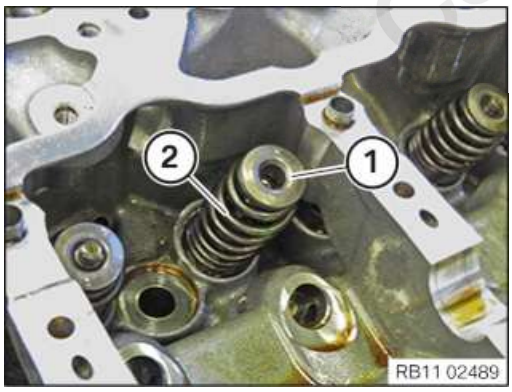


- Note the installation position of the valve spring.

Note: Install the valve spring so that the larger diameter (Y) points to the bottom spring cup.

- Make sure that the intake valves are not switched with the exhaust valves.

Note: Valve springs (1) are marked in colour (2). Colour for the exhaust valves: green/yellow



- Install the valve spring (2) and the spring cup (1).

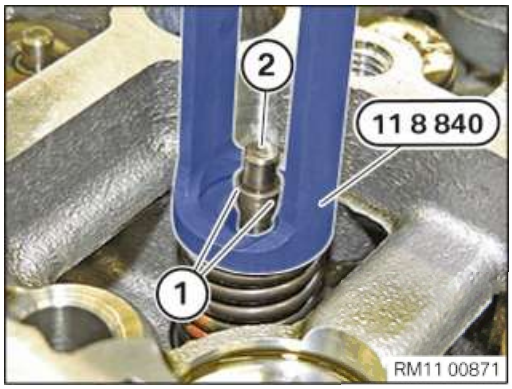


TECHNICAL INFORMATION

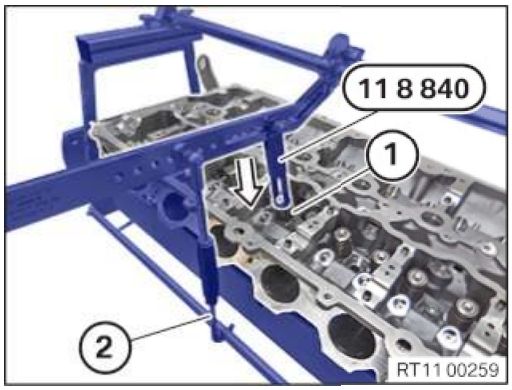


- Wear safety goggles.

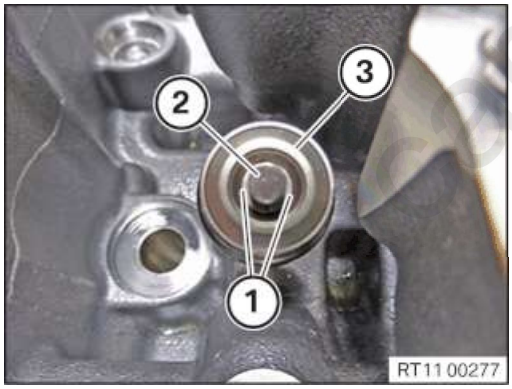
- Press down the valve spring (1) on the spring cup at the top with the special tool 0 496 143 (11 8 840) in direction of arrow.
- Hold valve spring (1) **pressed down** using the hook (2).



- Position the valve shims (1) on the valve (2).



- Press down the valve spring (1) on the spring cup at the top with the special tool 0 496 143 (11 8 840) in **direction of arrow**.
- Thread out hook (2) and place to the side.
- Relieve the valve spring (1) **carefully**.



- Make sure that the valve shims (1) are positioned correctly on the valve (2) and on the valve spring (3).

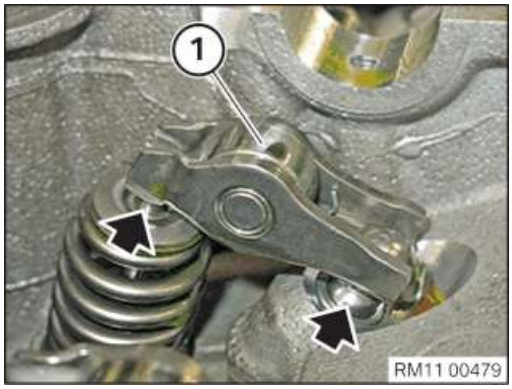
18 – Install all roller cam followers



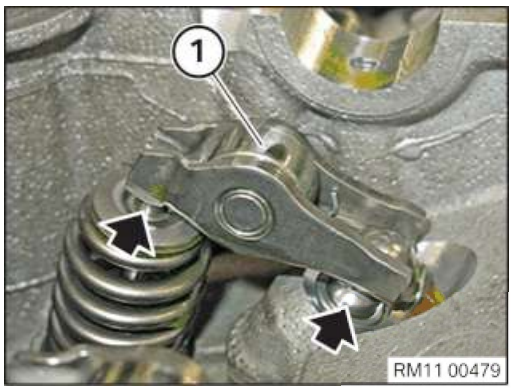
- The classification in digits from 1 to 5 has been printed on the roller cam follower.

Classification	Idle speed
1	Repair case - slow engine speed when idling
2	Installed as standard/initial installation
3	Installed as standard/initial installation
4	Installed as standard/initial installation
5	Repair case - high engine speed when idling

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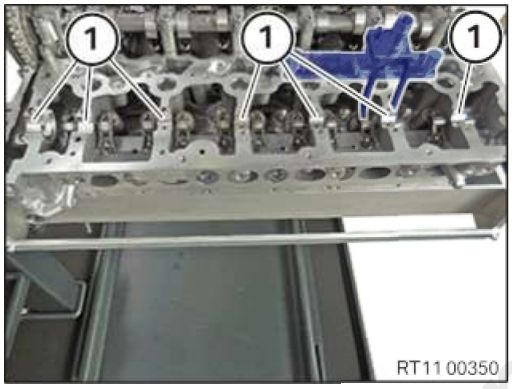


- Install the roller cam follower (1) on the intake side.
- Make sure the roller cam followers are correctly positioned on the hydraulic valve clearance compensating elements (arrows) and on the intake valves.

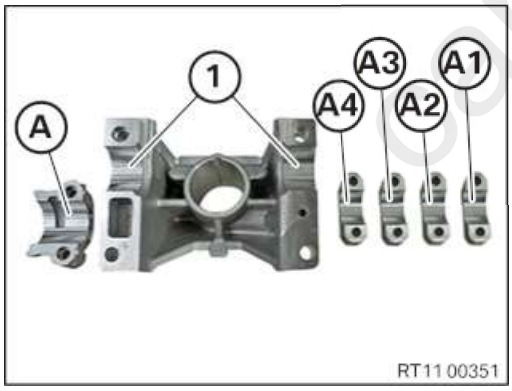


- Install the roller cam followers (1) on the exhaust side.
- Make sure the roller cam followers are correctly positioned on the hydraulic valve clearance compensating elements (arrows) and on the exhaust valves.

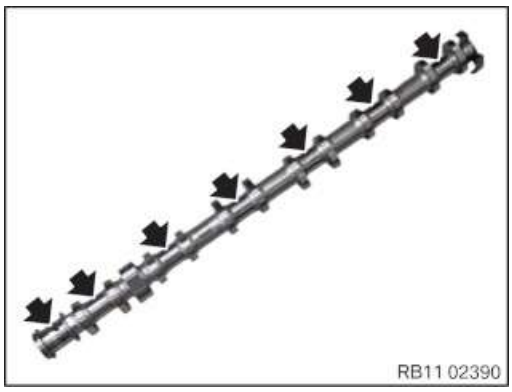
19 – Mount exhaust camshaft (cylinder head removed)



- Clean all bearing positions (1) and coat with engine oil.

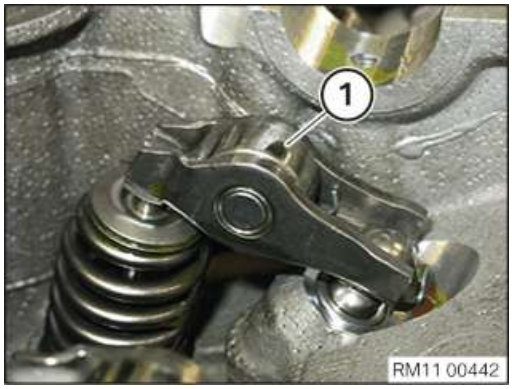


- Clean all bearing positions of exhaust camshaft bearing caps (A1), (A2), (A3), (A4) and (A) and coat with engine oil.
- Clean bearing positions (1) of the high pressure pump bracket and coat with engine oil.

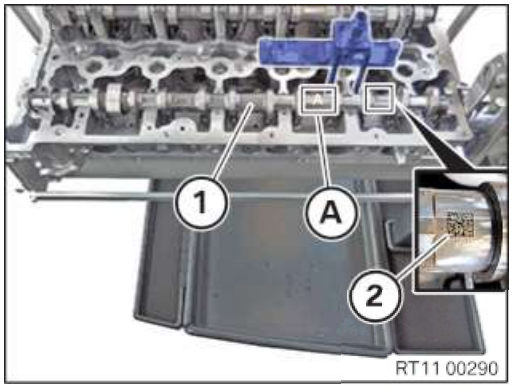


- Clean all bearing positions (arrows) of the exhaust camshaft and coat with engine oil.

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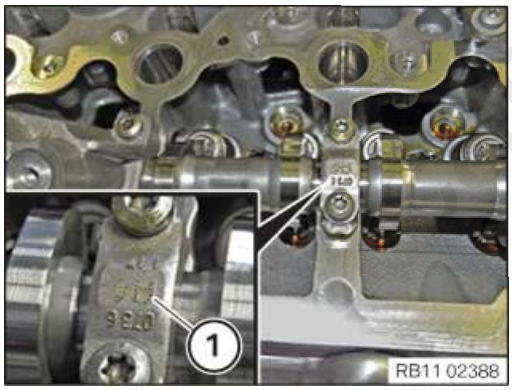
- Check all roller cam follower (1) of the exhaust side for correct fit.



- Insert exhaust camshaft (1) in the cylinder head, such that the mark (2) points upwards.



- Check the fitting sleeves (1) of the thrust bearing for damage and renew if necessary.
- Check the fitting sleeves (2) of the high pressure pump bracket for damage and renew if necessary.



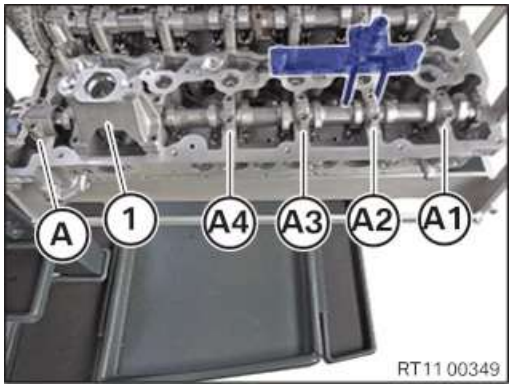
RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

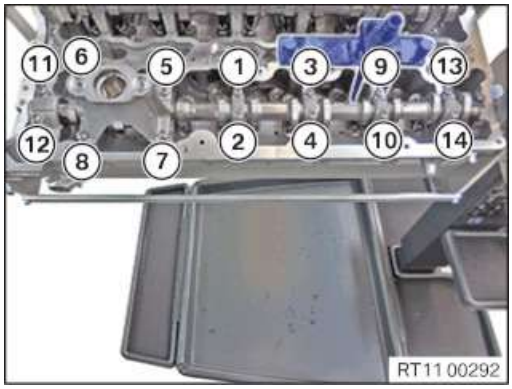
- Always install all bearing shells and bearing supports in the same position from which they were removed.

- Replace all exhaust camshaft bearing cap , that the labelling(1) from the intake side are readable.



- Feed in all exhaust camshaft bearing cap (A1) until (A4) and the exhaust camshaft bearing cap (A) and position.
- Pull in the high pressure pump bracket (1) and position.

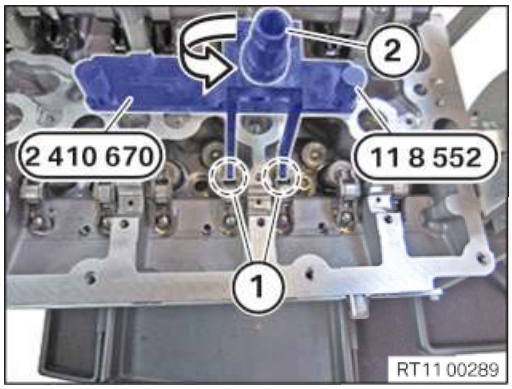
.com



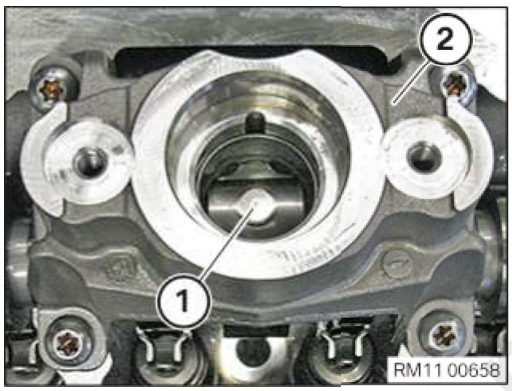
- Press down the exhaust camshaft bearing caps and hand-tighten the bolts incrementally in the sequence(1) to (14).
- Move up all screws in the sequence (1) to (14) **in half rotations.**
- **Adhere to the jointing torque.**
- Tighten all screws in a sequence from (1) to (14) .

Exhaust camshaft to cylinder head

M6	***Observe tightening sequence,*** *mount bearing cap flush.*	Jointing torque	10 Nm
	Tighten the screws.	Tightening torque	10 Nm

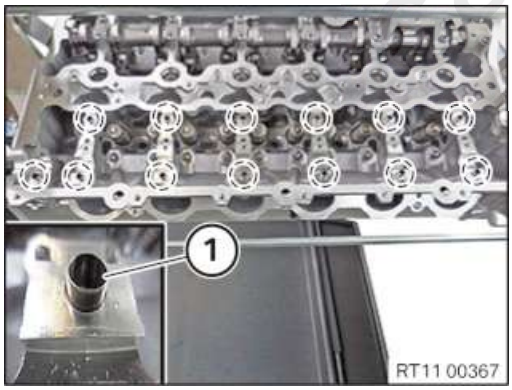


- Twist special tool 2 410 670 using the spindle nut (2) in direction of arrow and relax.
- Release special tool 0 495 741 (11 8 552) and remove special tool 2 410 670.



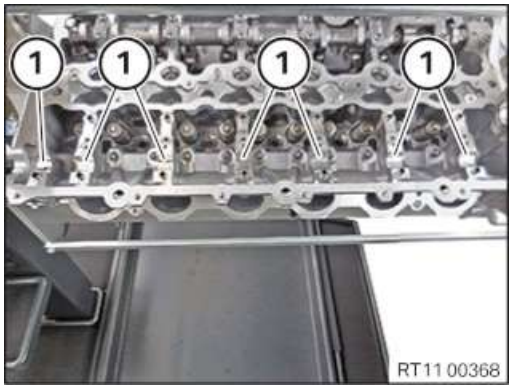
- Install roller tappet (1) into the high pressure pump bracket (2).

20 – Mounting eccentric shaft (cylinder head removed)

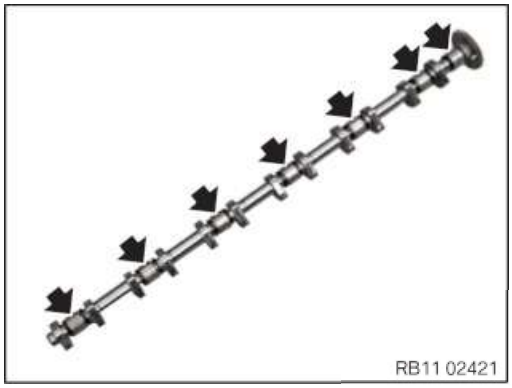


- Check all guide bushes (marks) (1) for damage and renew them if necessary.

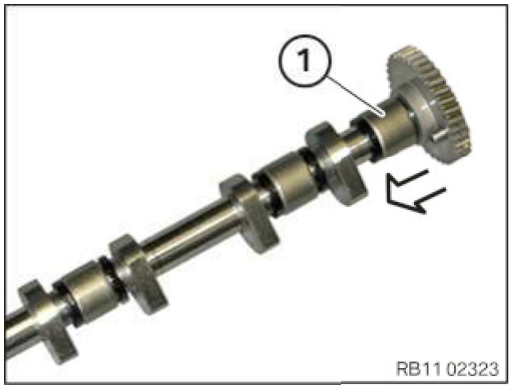
carsdiagn.com



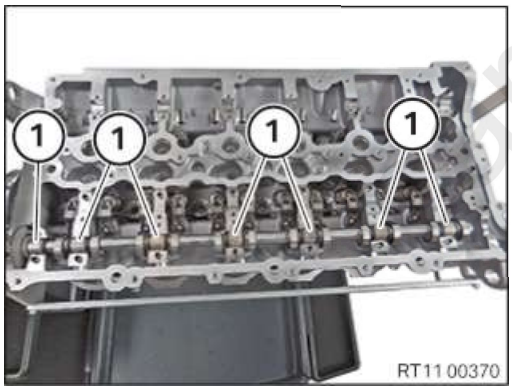
- Clean all the bearing positions (arrows) in the cylinder head and coat them with engine oil.



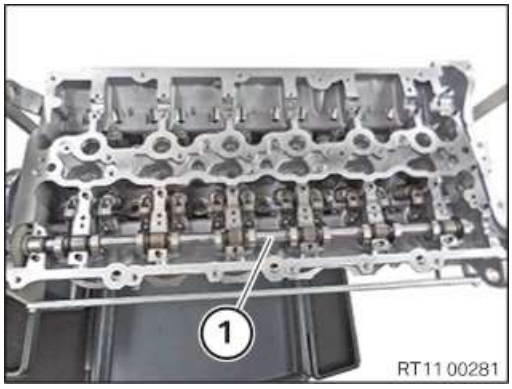
- Check all the needle bearings (arrows) of the eccentric shaft for ease of movement.
- Renew the eccentric shaft in case of tight needle bearings.



- Push needle bearing (1) up to the limit position in direction of arrow before installing the eccentric shaft.

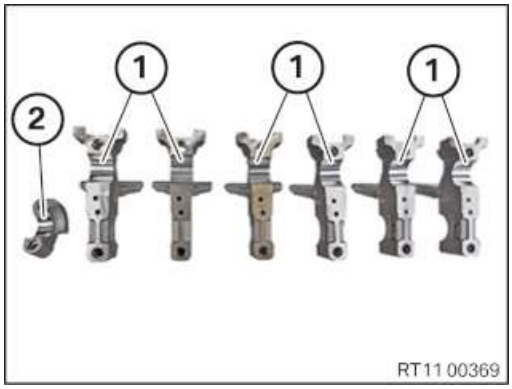


- Clean all needle bearings of the eccentric shaft (arrows) and coat with engine oil.

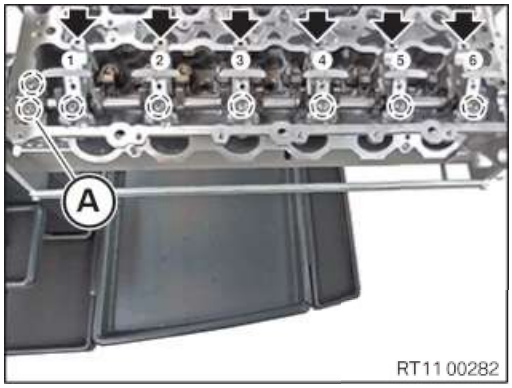


- Pull in eccentric shaft (1) and install.

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- Clean bearing positions (1) of the bearing supports and coat with engine oil.
- Clean bearing position (2) of the bearing cap and coat with engine oil.



RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

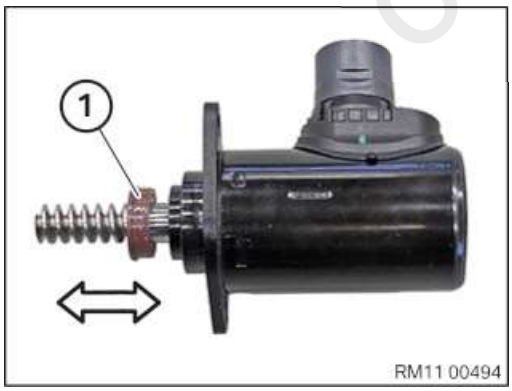
- Pull bearing supports (1) to (6) (arrows) in and install.

  The bearing supports (1) to (6) **must** each be installed again in the **position** from where they were removed.
- Pull in bearing cap (A) and install.
- Tighten the bolts (marks).

Eccentric shaft to bearing support/cylinder head

M6	10 Nm

21 – Install the servomotor for the eccentric shaft (cylinder head removed)



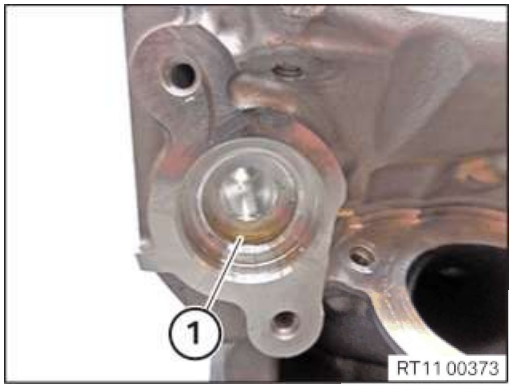
- Renew gasket (1).

  Parts: Gasket

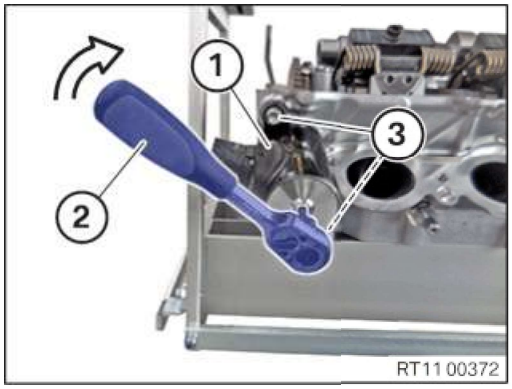
cardiagn.com



- Press the gasket (1) in to the limit position on the housing.



- Clean sealing surface (1).



- Slide servomotor for the eccentric shaft (1) up to the limit position and install it.
- Turn servomotor for the eccentric shaft (1) using a standard hexagon socket wrench (2) of **4 mm** in the **direction of arrow** until the servomotor for the eccentric shaft (1) lies on the cylinder head.
- Tighten down screws (3).

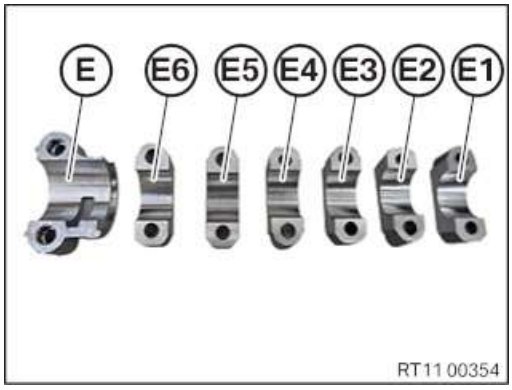
Electrical servomotor to cylinder head

M6		Tightening torque	8 Nm

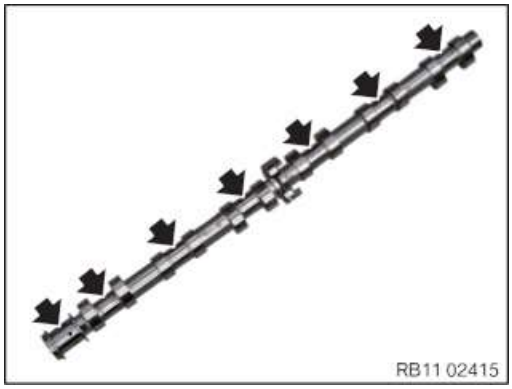
22 – Mounting intake camshaft (cylinder head removed)



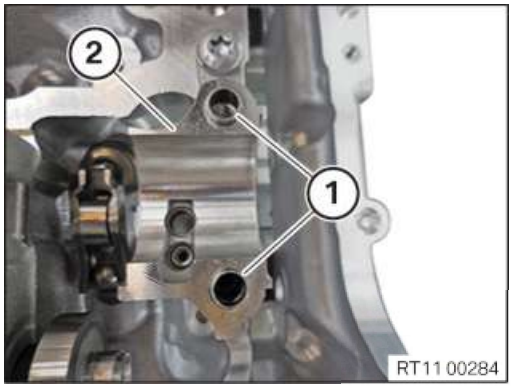
- Clean all bearing positions (arrows) and coat with engine oil.



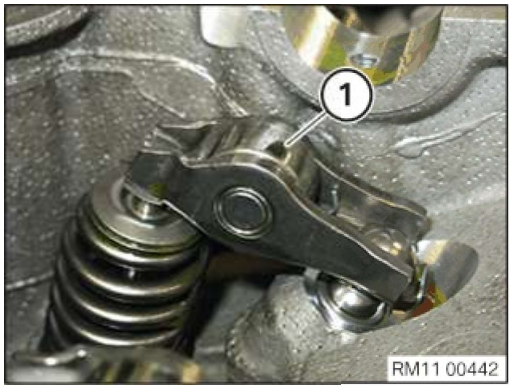
- Clean all bearing positions of intake camshaft bearing caps (E1),(E2),(E3),(E4),(E5),(E6) and (E) and coat with engine oil.



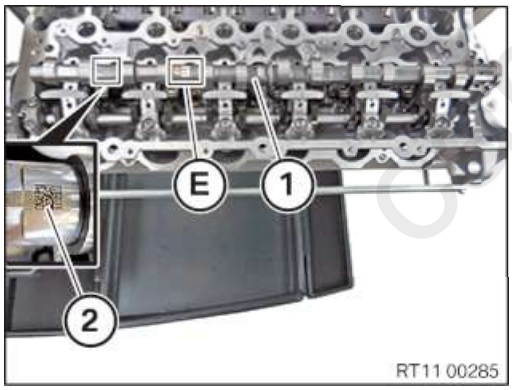
- Clean all bearing positions (arrows) of the intake camshaft and coat with engine oil.



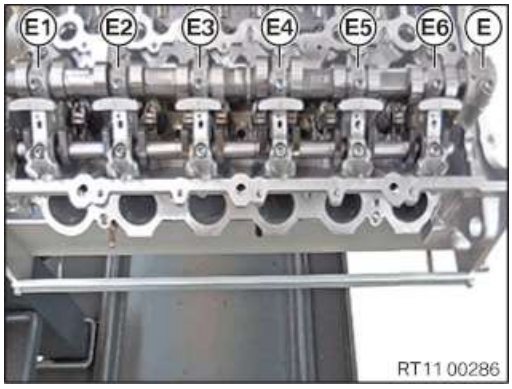
- Check the fitting sleeves (1) of the thrust bearing (2) for damage and renew if necessary.



- Check all roller cam followers(1) of the intake side for correct fit.



- Insert the intake camshaft (1) into the cylinder head so that the mark (2) points up.



RISK OF DAMAGE

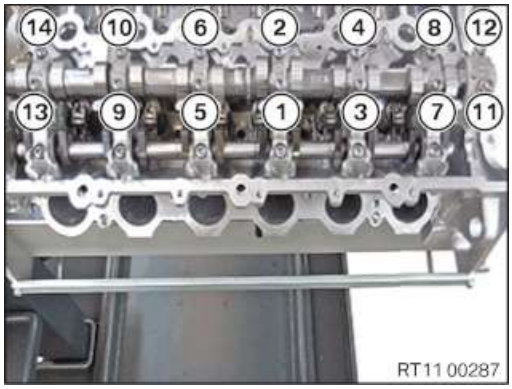
Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

- Feed in all intake camshaft bearing caps (E1) to (E6) and the intake camshaft bearing cap (E) and position.

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- Press down the intake camshaft bearing caps and hand-tighten the bolts incrementally in the sequence (1) to (14).
- Move up all screws in the sequence (1) to (14) **in half rotations.**
- **Adhere to the jointing torque.**
- Tighten all screws in a sequence from (1) to (14) .

Intake camshaft to cylinder head

M6	***Observe tightening sequence,*** *mount bearing cap flush.*	Jointing torque	10 Nm
	Tighten the screws.	Tightening torque.	10 Nm

23 – Checking the intermediate lever classification



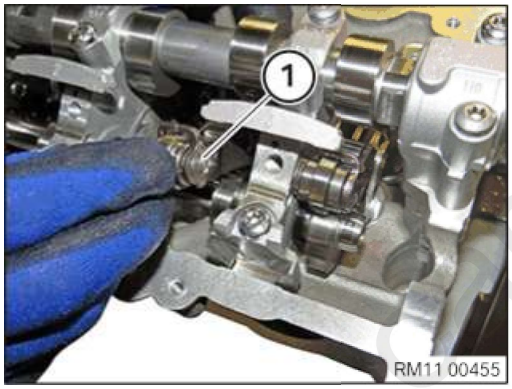
TECHNICAL INFORMATION

All intermediate levers are classified. Only one classification may be used per engine.

All intermediate levers must be installed in the same position in an engine which has already been in use.

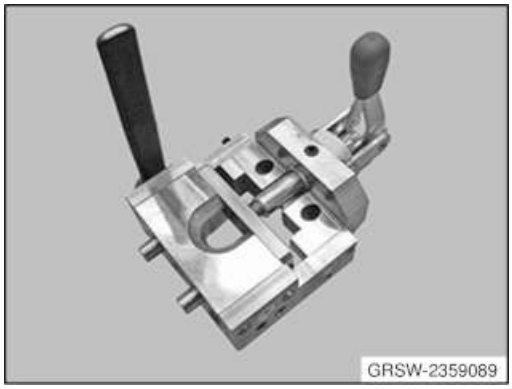
- Checking the intermediate lever classification.

24 – Installing all intermediate levers



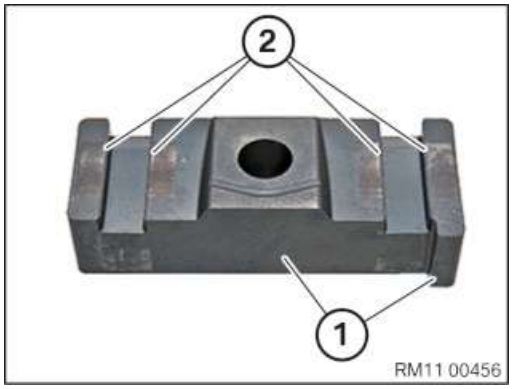
- Install intermediate lever (1).
- Repeat the step for all intermediate levers (1).

25 – Installing all gates

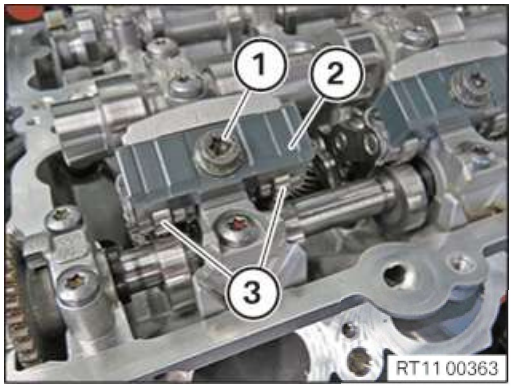


- Have the special tool 2 359 089 ready.

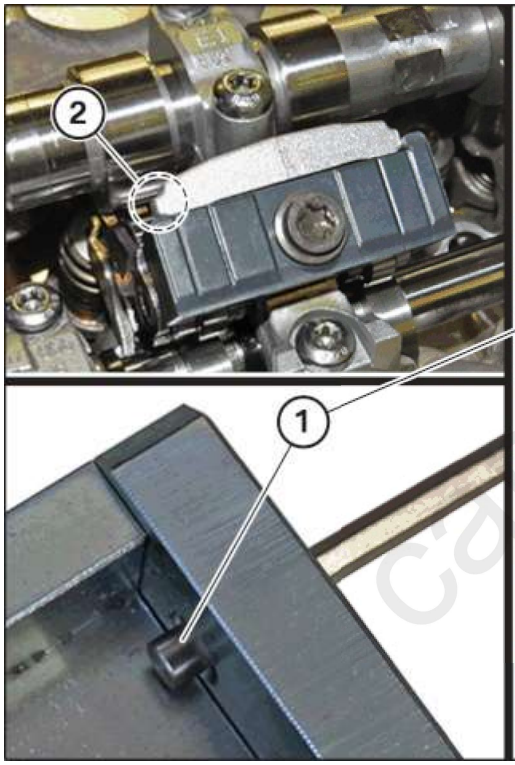
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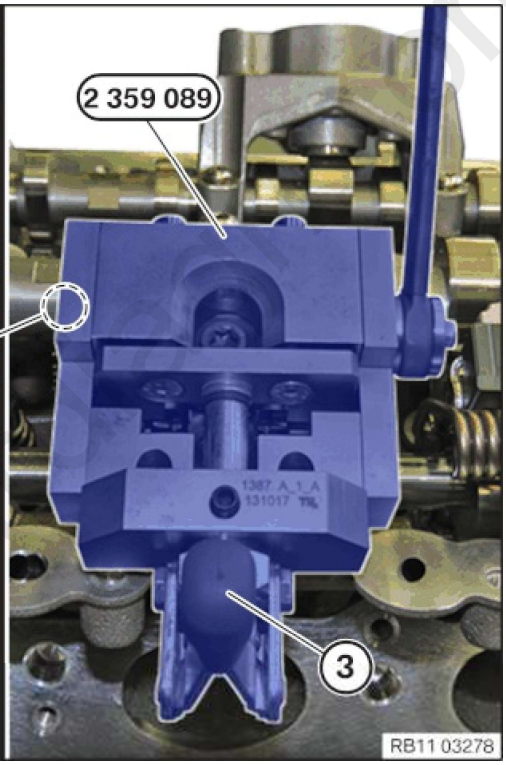


- Clean contact surfaces (1) and (2) off oil, grease and dirt.

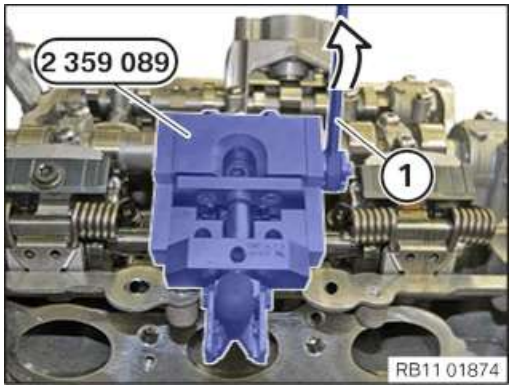


- Position the gate (2) and hand-tighten the bolt (1).
- Check that the intermediate lever (3) is in the correct mounting orientation.

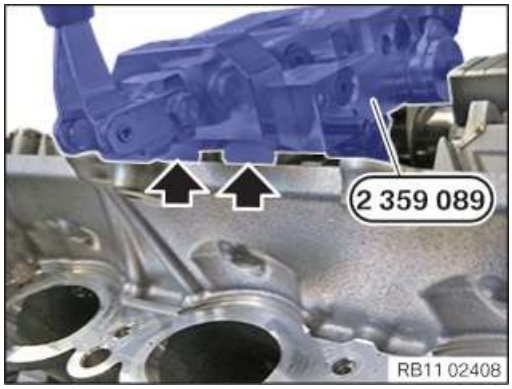




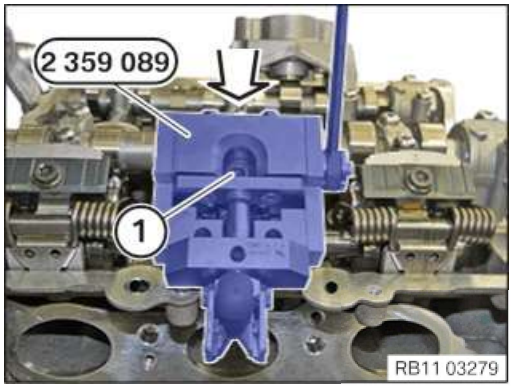
- Position the special tool 2 359 089 on the cylinder head.
- Pre-tension the gate with the lever (3).
- Abut the bolt (1) in the area (2).
- Make sure that the special tool 2 359 089 does not rotate during this process.



- Secure the gate with the lever (1).



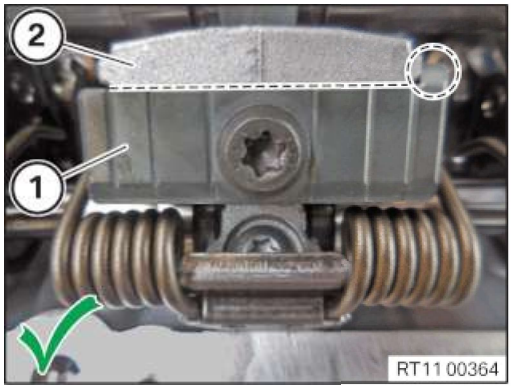
- Ensure that the special tool 2 359 089 lies flat on the cylinder head.



- Press the special tool 2 359 089 onto the cylinder head.
- Tighten the bolt (1) at the same time.

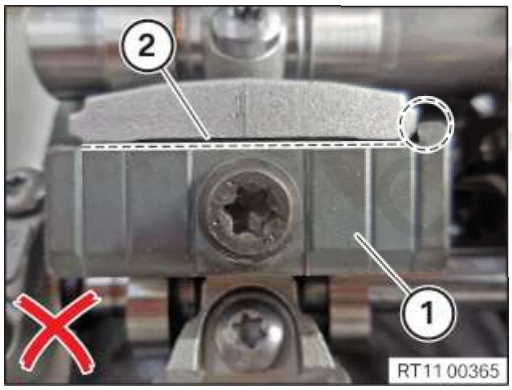
Gate to bearing bracket

M8		20 Nm



- Make sure that gate (1) rests correctly against bearing bracket (2).

  Gate (1) is installed correctly in the marked area.

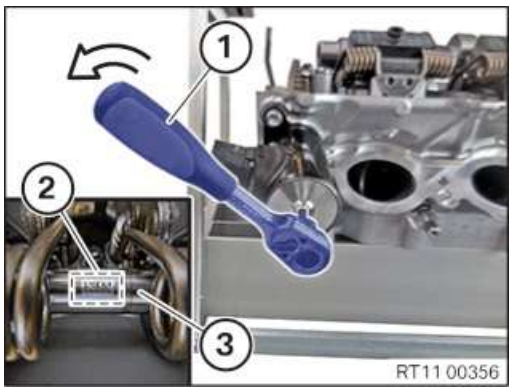


- Make sure that gate (1) rests correctly against bearing bracket (2).

  Gate (1) is installed incorrectly in the marked area.

- Repeat the procedure for all gates.

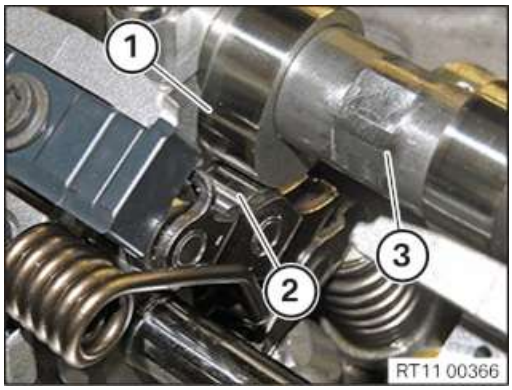
26 – Adjusting eccentric shaft to minimum lift (cylinder head removed)



- With the help of the servomotor, use a standard hexagon socket wrench (1) to slowly adjust eccentric shaft (3) to the minimum lift at **4 mm** in the **direction of the arrow**.
- Make sure that the mark (2) on the eccentric shaft (3) points upwards.

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27 – Checking the position of the intake camshaft (cylinder head removed)



Check

- Check position of the intake camshaft on the respective cylinders.

Result

» Cam (1) of the intake camshaft runs on the intermediate lever (2).

Measure

- Turn intake camshaft (3) further using a standard open-end spanner until the cam (1) does not override on the intermediate lever (2).

28 – Installing all torsion springs (cylinder head removed)

CAUTION

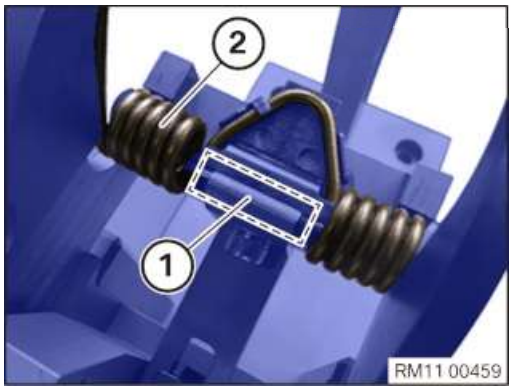
Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

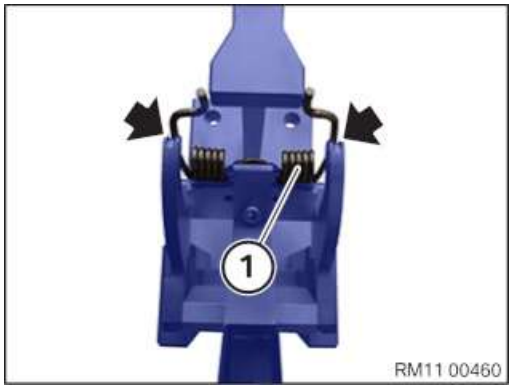
TECHNICAL INFORMATION

- Wear safety goggles.

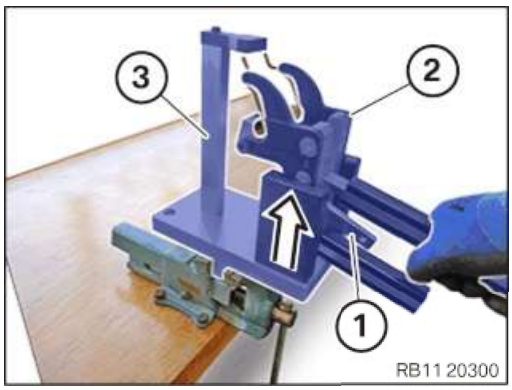


- Insert the torsion spring (2) in the clamping lever of the special tool 2 359 088.
- Make sure that the torsion spring (2) is correctly positioned in the marked area (1) of the special tool 2 359 088.

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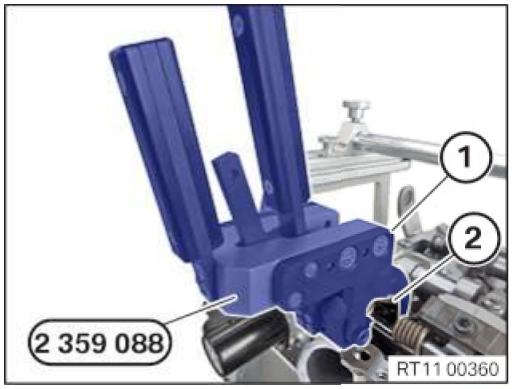


- Carefully close the clamping lever of the special tool 2 359 088 in the accompanying fixture until the retaining hook engages.
- Ensure that the torsion spring (1) lies correctly in the lateral guides (arrows) of the special tool 2 359 088 during tensioning.

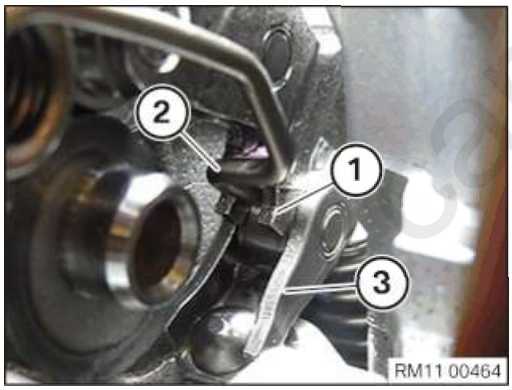


- Carefully close the clamping lever (2) of the special tool 2 359 088 in the fixture (3) until the retaining hook (1) audibly engages.

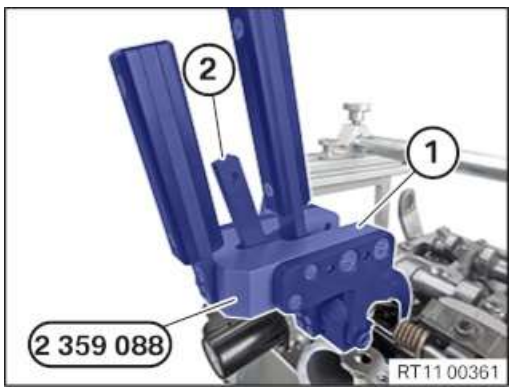
  The torsion spring is tensioned.
- **Carefully** take the clamping lever (2) of the special tool 2 359 088 with the stretched torsion spring out of the fixture (3) of the special tool 2 359 088 in the direction of arrow.



- Feed in clamping lever (1) from the special tool with the pre-tensioned torsion spring (2) and position it.

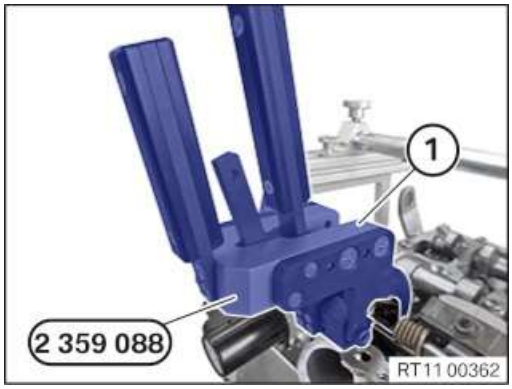


- Ensure that the torsion spring (2) is positioned correctly in the intermediate lever (1).
- Check all roller cam followers (3) for correct installation position.

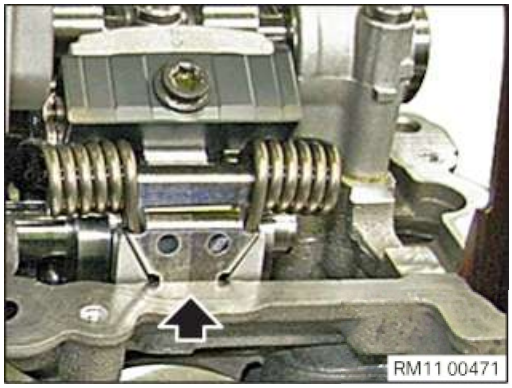


- Press the clamping lever (1) of the special tool 2 359 088 together until the retaining hook (2) unlocks.
- Carefully open the clamping lever (1) of the special tool 2 359 088 until the torsion spring is completely relaxed.

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- Guide out and remove the clamping lever (1) of the special tool 2 359 088.



- Check for correct mounting orientation of the torsion spring (arrow) at the cylinder head.
- Repeat the operations for the remaining torsion springs.

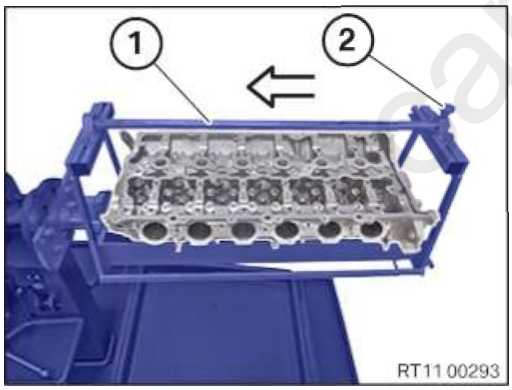
29 – Removing cylinder engine from assembly stand

CAUTION

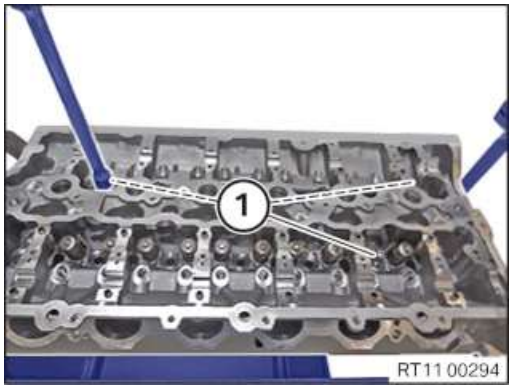
Heavy component.

Heavy components can lead to injury or damage.

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



- Loosen screw (2).
- Pull out rod (1) in direction of arrow and set it aside.

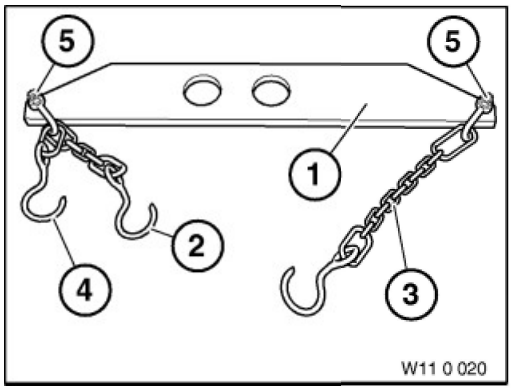


- Release screws (1) from special tool .

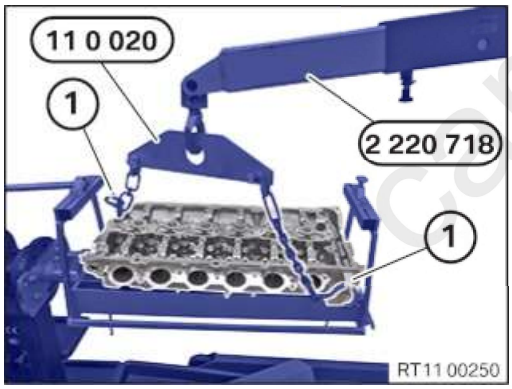
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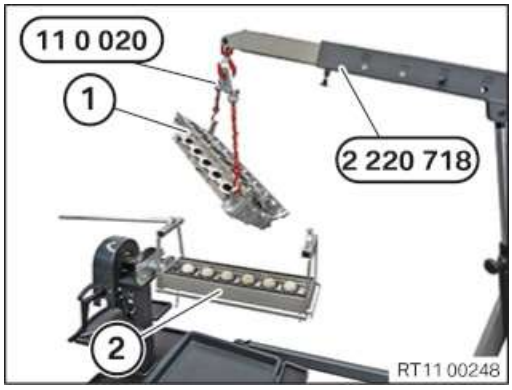
- Stage special tool (workshop crane) 2 220 718.



- Prepare the special tool 0 490 567 (11 0 020).



- Guide in and position special tool 0 490 567 (11 0 020) on cylinder head (1).
- Position workshop crane 2 220 718 and connect to special tool 0 490 567 (11 0 020).



- Detach cylinder head (1) with the work crane 2 220 718 and special tool 0 490 567 (11 0 020) from the device (2), pull out and remove.

30 – Installing the exhaust turbocharger (cylinder head removed)

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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

RISK OF DAMAGE

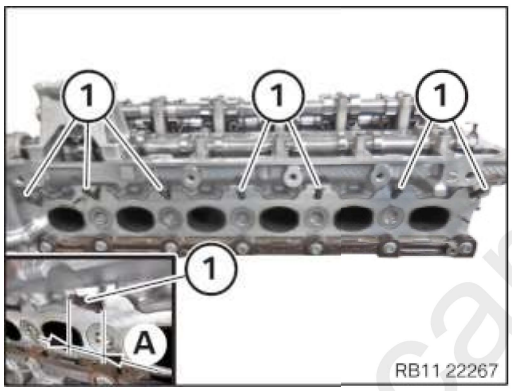
Damage to the electrical wastegate valve controller.

The electrical wastegate valve controller may be damaged as a result of the excessive forces required when removing and installing a jammed exhaust turbocharger.

- Do not pull on the electrical wastegate valve controller.
- Apply force to the turbine housing and exhaust manifold only.
  - Do not pull on the compressor housing.

TECHNICAL INFORMATION

Do not damage the thermal compensating elements. The disassembly and installation including intermediate storage of the exhaust turbocharger is only permitted with mounted special tool 2 466 919 .



- Check stud bolt (1) for damage, renew if necessary.

  Parts: Stud bolt
- Check screw-in depth (A) of the upper stud bolt (1).

Screw-in depth of upper stud bolt on cylinder head

Dimension A	30 mm

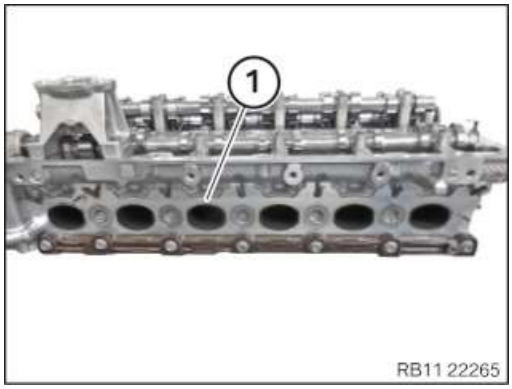
- If necessary, screw the stud bolts in further or unscrew.



- Check stud bolts in the **marked area** for damage and replace if necessary.

  Parts: Stud bolt

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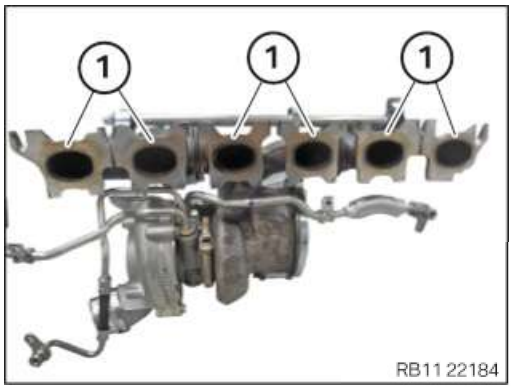
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surfaces (1) on the cylinder head using special tool 0 495 102 (11 4 470).



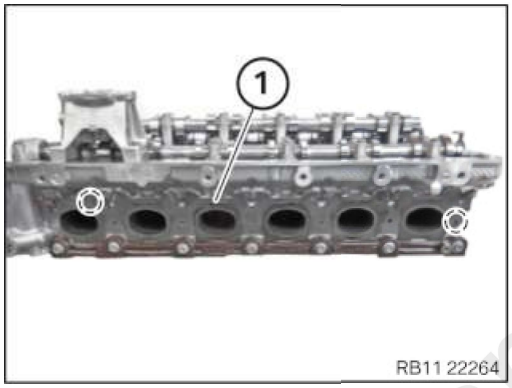
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

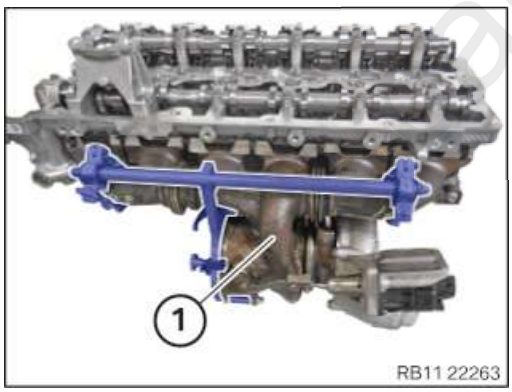
- Clean the sealing surfaces (1) on the exhaust turbocharger using the special tool 0 495 102 (11 4 470).



- Renew the gasket (1).

  Parts: Gasket

- Guide seal (1) into the **marked area** and install it.



CAUTION

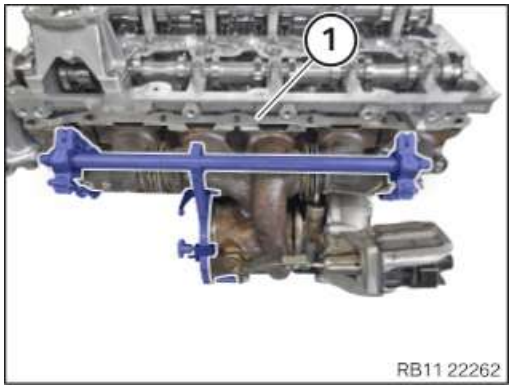
Heavy component.

Heavy components can lead to injury or damage.

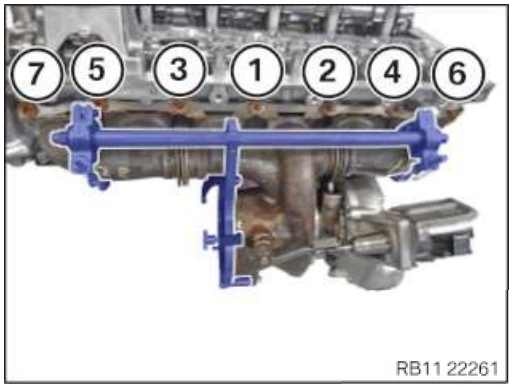
- Remove and install heavy components with the aid of another person/other persons.

- Insert and install the exhaust turbocharger (1).
- Thermal compensating elements of the exhaust turbocharger (1) or exhaust manifold should **not** be bent or deformed.

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- Feed in and install the sliding rail (1).
- Install sliding rail (1) so that the part number is **seen**.

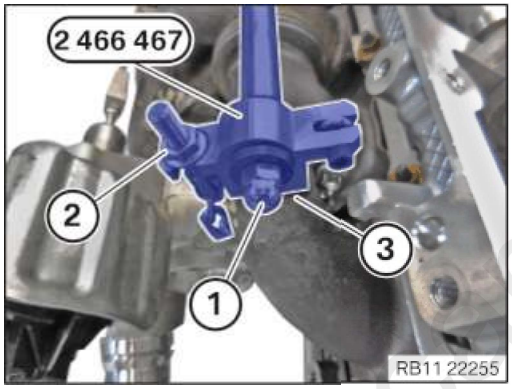


- Tighten nuts in sequence (1) to (7).

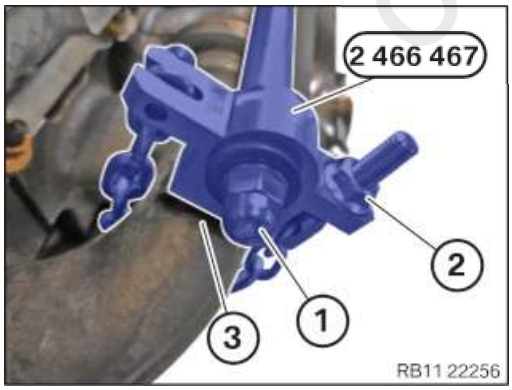
Exhaust manifold to cylinder head

Flange nutM7	*Replace flange nuts*	1. Jointing torque	10 Nm
		2. Jointing torque	10 Nm
		3. Jointing torque	16 Nm
		4. Jointing torque	16 Nm
		5. Jointing torque	16 Nm

- Make sure the thermal compensating elements (A) have **not** been damaged.

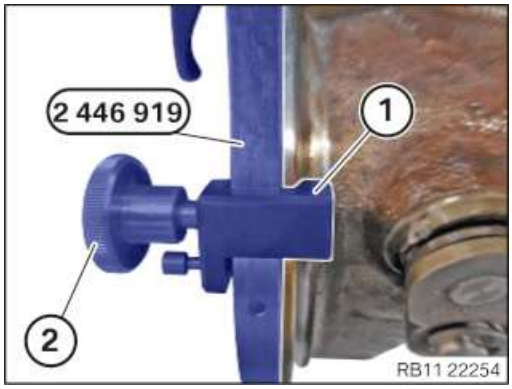


- Loosen nuts (1) and (2).
- Pull out special tool 2 466 467 at the exhaust turbocharger (3) and remove.



- Release the nut (1) and (2).
- Pull out special tool 2 466 467 at the exhaust turbocharger (3) and remove.

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- Loosen screw (2).
- Feed out the bracket (1) of the special tool 2 446 919 and set it aside.



- Release clamping lever (1) of the special tool 2 446 919 in the **direction of arrow**.



- Loosen screw (1).
- Pull out special tool 2 446 919 at the exhaust turbocharger and remove.

Additional Information

Overview of Tightening Torques

Special tool 2 466 467 to special tool 2 446 919			Used in step 1
M8		Tightening torque	5 Nm

Flange to assembly stand			Used in step 2
M14X30		Tightening torque	135 Nm

Cylinder head on device			Used in step 2
M10X90x1.5		Tightening torque	30 Nm

Exhaust camshaft to cylinder head			Used in step 19
M6	***Observe tightening sequence,*** *mount bearing cap flush.*	Jointing torque	10 Nm
	Tighten the screws.	Tightening torque	10 Nm

Eccentric shaft to bearing support/cylinder head			Used in step 20
M6			10 Nm

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Electrical servomotor to cylinder head — Used in step 21

M6		Tightening torque	8 Nm

Intake camshaft to cylinder head — Used in step 22

M6	***Observe tightening sequence,*** *mount bearing cap flush.*	Jointing torque	10 Nm
	Tighten the screws.	Tightening torque.	10 Nm

Gate to bearing bracket — Used in step 25

M8			20 Nm

Exhaust manifold to cylinder head — Used in step 30

Flange nutM7	*Replace flange nuts*	1. Jointing torque	10 Nm
		2. Jointing torque	10 Nm
		3. Jointing torque	16 Nm
		4. Jointing torque	16 Nm
		5. Jointing torque	16 Nm

Overview of Special Tools

2 446 919 Locating fixture



Common — Used in step 130

Usage	For installation and de-installation of the exhaust turbocharger module. Engine: B58.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 08 16 (383)

2 466 467 Device



Common — Used in step 130

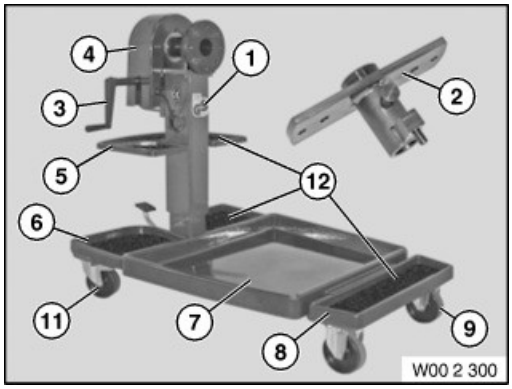
Usage	For removing and installing the exhaust turbocharger. Engine: B58O1.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 18 (545)

0 495 187 (00 2 300) Assembly stand

Common — Used in step 2

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual

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Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

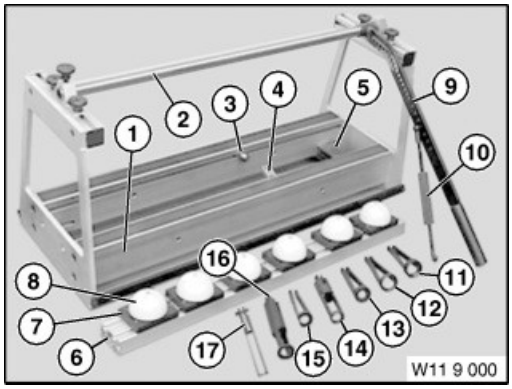
Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	2 299 563	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

0 494 362 (11 9 000) Device

Common Used in step 212

Usage	(Cylinder head expander tool)

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Included in the tool or work

Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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2 220 718 Workshop crane

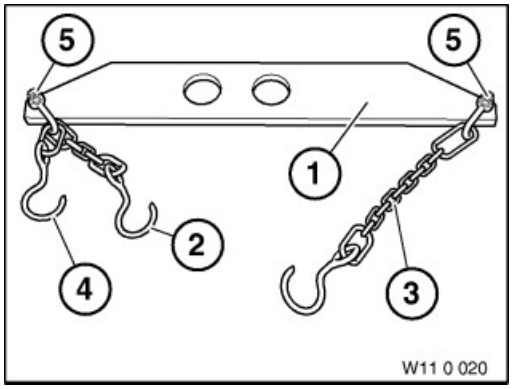


Common	Used in step 229
Usage	WSK 1000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	06 01 11 (701)

0 490 567 (11 0 020) Lifting gear

Used in step 229

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Common

Usage	For removing and installing the engines. 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
5	0 490 572 (11 0 029)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 568 (11 0 021)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 569 (11 0 022)		**Chain** (Chain) As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 570 (11 0 023)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
4	0 490 571 (11 0 024)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	

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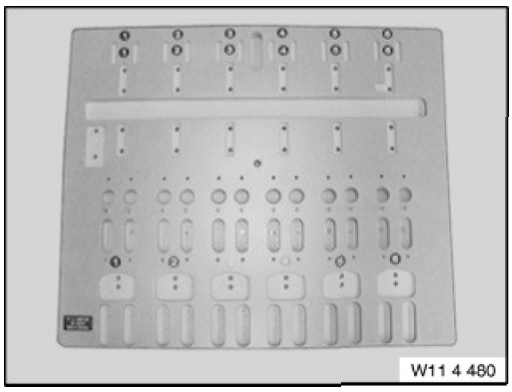
2 359 088 Device



Common Used in step 428

Usage	For removing and installing torsion spring of the intermediate lever.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

0 495 105 (11 4 480) oddments tray



Common Used in step 4567910111214

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

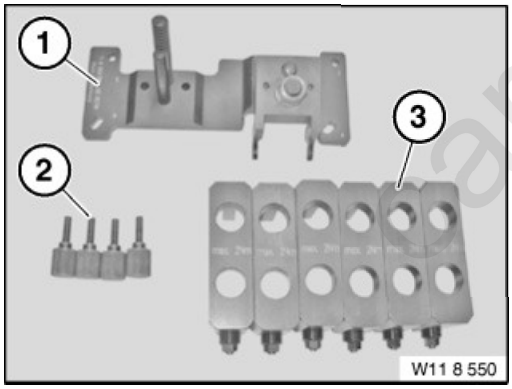
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2 410 670 Device



Common	Used in step 1019
Usage	To press down the valves on the 2nd cylinder, for de-energised disassembly/installation of the exhaust camshaft. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C55
Replaced by	
In connection with	
SI-Number	01 23 15 (280)

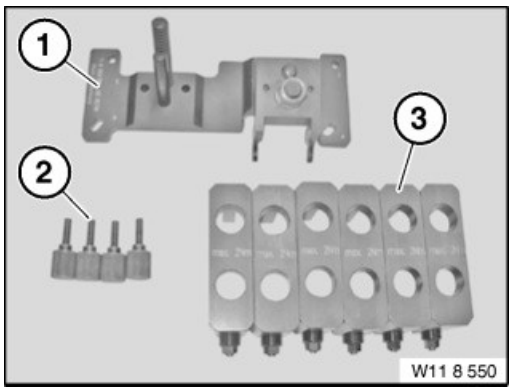
0 495 741 (11 8 552) Screw



Common	Used in step 1019
Usage	(Knurled screw (4 pieces))
Included in the tool or work	0 495 739
Storage location	C19
Replaced by	
In connection with	
SI-Number	01 20 06 (299)

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0 495 739 (11 8 550) Device



Common Used in step 10

Usage	(Locking device) For holding the bearing strips in place when fitting intake camshaft.
Included in the tool or work	
Storage location	C19
Replaced by	
In connection with	
SI-Number	01 20 06 (299)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	0 495 741 (11 8 552)		**Screw** (knurled screw (4 pieces))	
1	0 495 740 (11 8 551)		**Tool** (Tool to press down) discontinued, available as part of set of special tools only	
3	0 495 742 (11 8 553)		**Synchronising key** Thrust piece (1 piece)	

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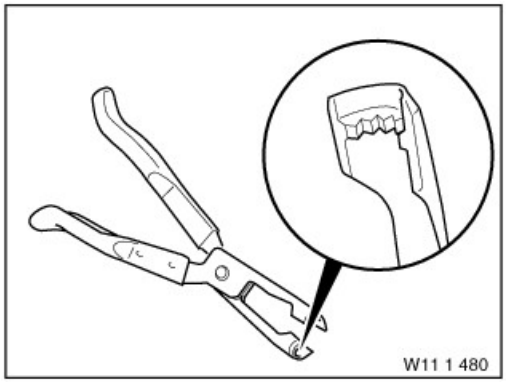
0 496 143 (11 8 840) Basket



Common Used in step 1217

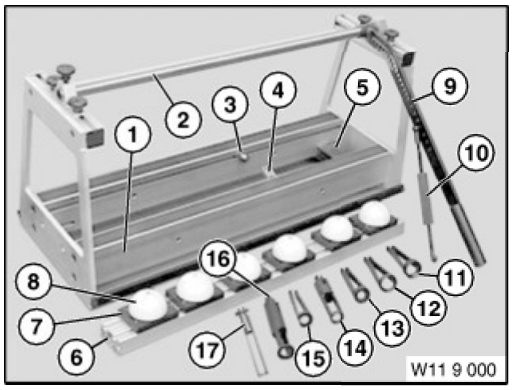
Usage	(Valve spring cage) For removing and fitting the valves.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 490 796 (11 1 480) Pliers



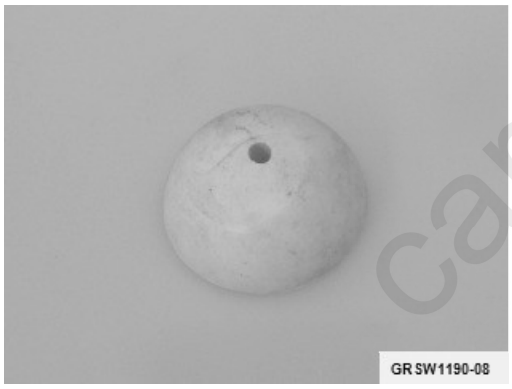
Common	Used in step 13
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 494 370 (11 9 005) Quick fastener



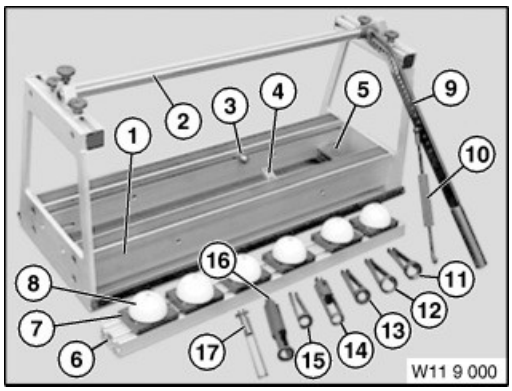
Common	Used in step 1415
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 373 (11 9 008) Shaped part



Common	Used in step 1415
Usage	(Shaped part) Shaped part made of plastic
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

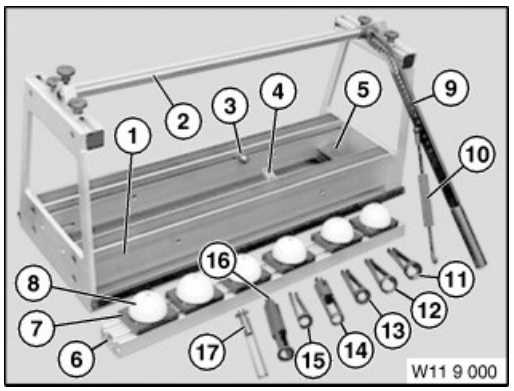
0 494 371 (11 9 006) Insert



Common	Used in step 1415
Usage	(Aluminium strip)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

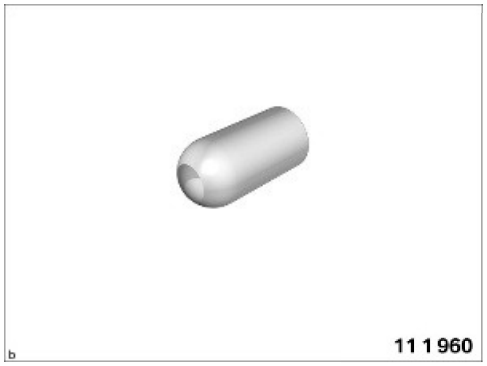
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0 494 372 (11 9 007) Shaped part



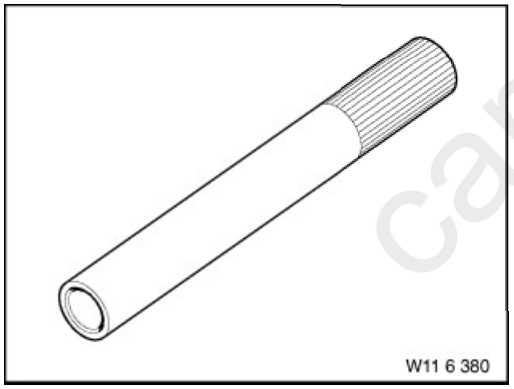
Common	Used in step 1415
Usage	(Shaped part)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 490 797 (11 1 960) Holding sleeve



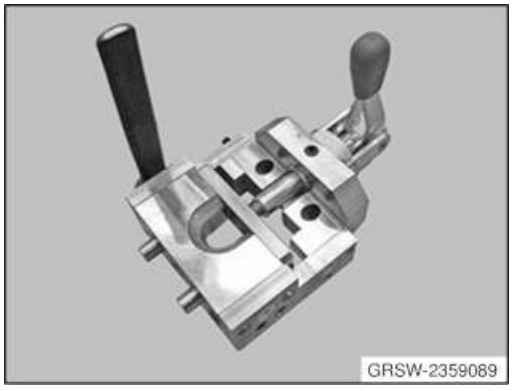
Common	Used in step 16
Usage	(Assembly sleeve) For fitting valve stem seals, 6 mm diameter
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 493 249 (11 6 380) Bush



Common	Used in step 16
Usage	For fitting valve stem seal
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

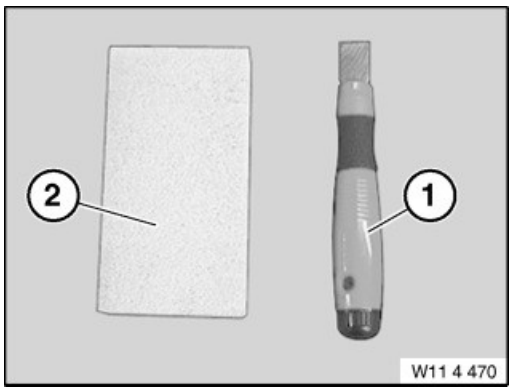
2 359 089 Device



Common	Used in step 25
Usage	For positioning the sliding block. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

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0 495 102 (11 4 470) Tool



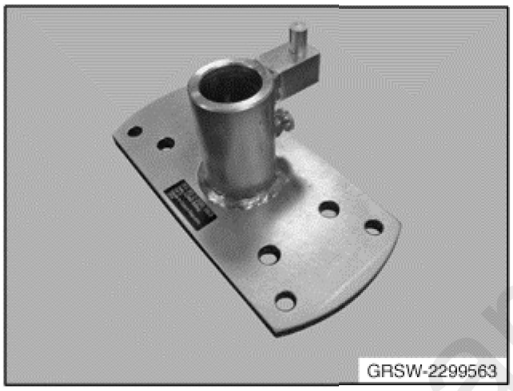
Common	Used in step 30
Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

Replacement tools:

2 299 563 Adapter



Common	Used in step 2
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Screw-in depth of upper stud bolt on cylinder head	Used in step 30
Dimension A	30 mm

Links

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	8

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11 12 070 Remove and install/replace acoustic cover

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

Damage to the acoustic cover.

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

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



- Release the acoustic cover (1) towards the top from the rubber mounts (marks).

2 – Install acoustic cover

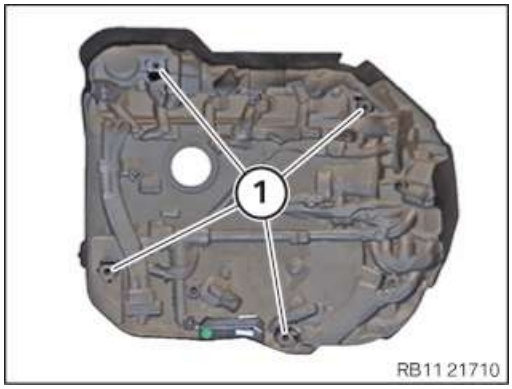
RISK OF DAMAGE

Damage to the acoustic cover.

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

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

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- Check the rubber mount (1) for correct fit in the acoustic cover.



- Install acoustic cover (1) and fix in the rubber mounts (marks).

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11 12 100 Removing and installing cylinder head

WARNING

Hot surfaces.

Risk of burning!

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

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

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

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Damage to battery terminal, the safety battery terminal or the intelligent battery sensor (IBS).

Damaged battery terminals can lead to malfunctions or vehicle electrical system faults.

- Pull off battery terminal from battery pole by carefully moving to and fro. Do not pry off using a tool.

TECHNICAL INFORMATION

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

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

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- See additional information.

2 – Bring front compartment lid in the service position

Prerequisite

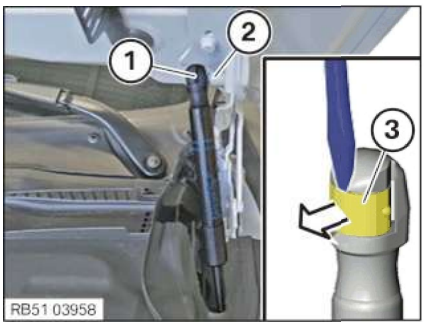
Engine compartment lid is open.

CAUTION

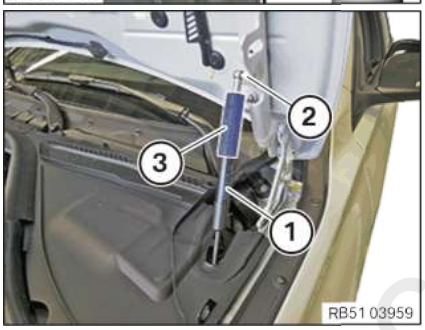
Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.



- Lift clamp (3) slightly using a screwdriver, in the direction of the arrow.
- Lift off ball socket (1) from ball pin (2).
- Repeat the operation on the other side of vehicle.



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Remove the bonnet support and open the bonnet further.
- Push special tool or (3) over gas pressure spring (1).
- Place special tool on the ball pin (2) and engage using force.
- Repeat the operation on the other side of vehicle.

3 – Remove the seal for the rear bonnet



- Feed the cable (1) out of the brackets toward the front.
- Remove the rear bonnet seal (2) from the guide toward the inside.

4 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

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

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RISK OF DAMAGE

Damage to the acoustic cover.

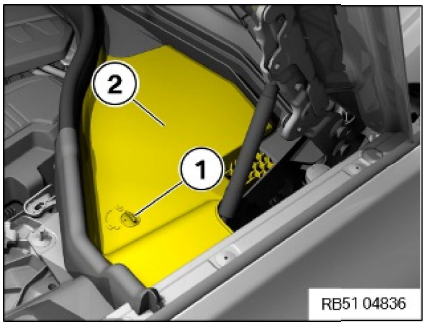
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

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



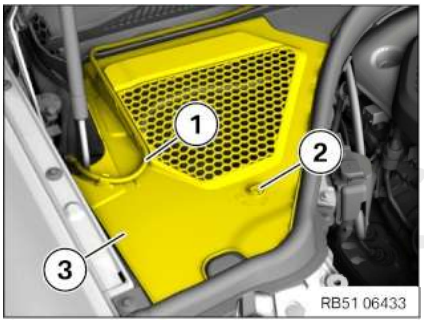
- Release the acoustic cover (1) towards the top from the rubber mounts (marks).

5 – Remove the cover of the engine compartment at the rear left



- Loosen the lock (1).
- Remove rear left cover of engine compartment (2).

6 – Remove the cover of the rear right engine compartment



- Release washer fluid hose (1) from the guides.
- Loosen the lock (2).
- Remove the cover of rear right engine compartment (3).

7 – Removing both wiper arms

NOTICE

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

▶ **Remove the wiper arm**

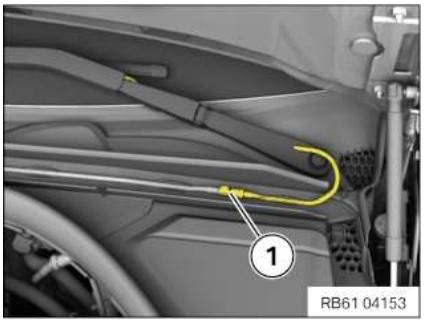
RISK OF DAMAGE

Damage to wiper console

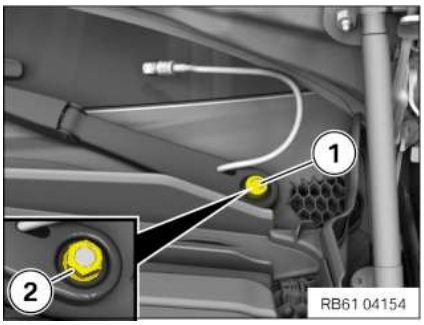
While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.

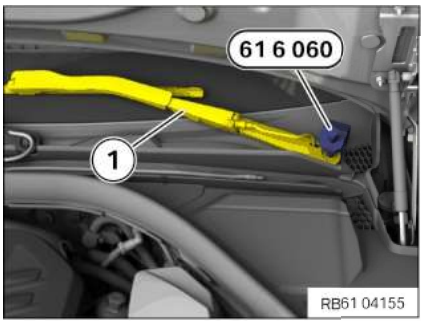
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- Disconnect the windscreen wash hose(1) at the separation point and remove from the cowl guide.

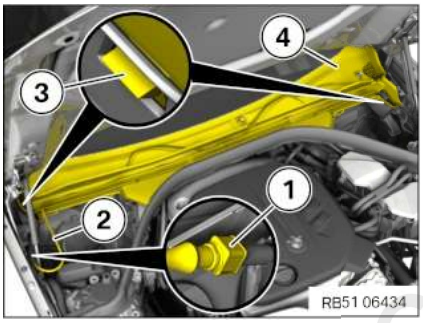


- Remove the protective cap (1).
- Loosen nut (2).

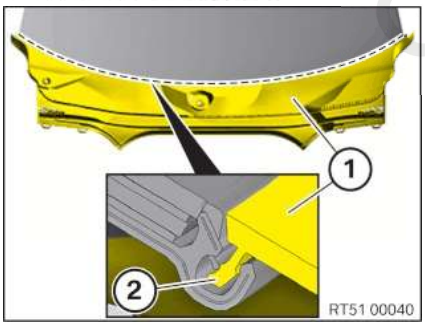


- Pull off the wiper arm (1) using special tool .

8 – Remove cowl panel cover



- Release snap fastener of the washer fluid hose (1) and put the washer fluid hose(2) to one side.
- Unclip clips (3) on the cowl panel cover (4).



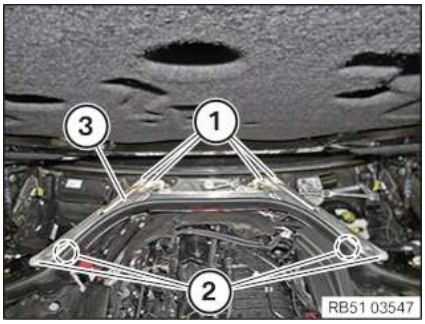
- Pull the cowl panel cover (1) upward out of the latch mechanism (2) beginning on the side.

9 – Removing the centre bulkhead upper part

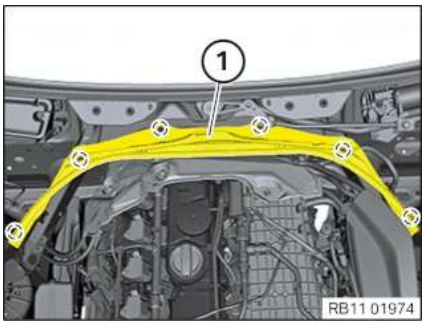
TECHNICAL INFORMATION

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

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- **If installed:** Remove tension strut on spring strut dome.
- Loosen screws (1) and (2).
- Remove tension strut (3) in the spring strut dome upwards.



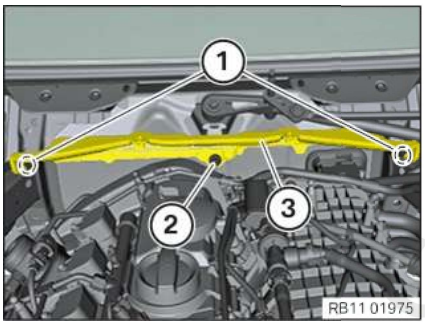
- Unscrew the bolts in the marked areas.
- Remove the centre bulkhead upper part (1).

10 – Removing acoustic cover at rear



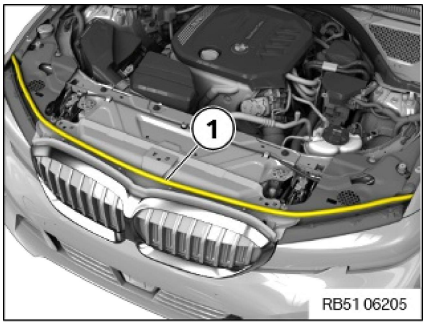
- Unclip the acoustic cover (1) in the marked areas and remove it to the top.

11 – Removing the centre bulkhead lower section



- Loosen screws (1).
- Loosen nut (2).
- Remove the centre bulkhead lower part (3).

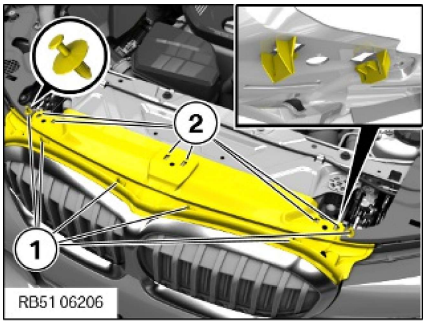
12 – Remove the seal for the bonnet in front



- Pull off front bonnet seal (1) upwards.

13 – Removing the centre engine compartment cover

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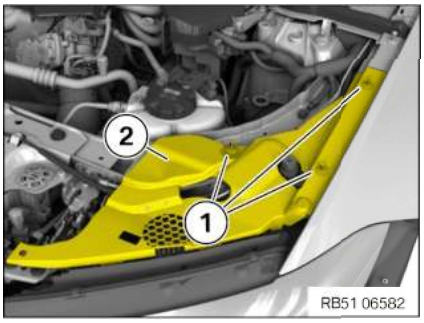
- Detach all expanding rivets (1).
- Release the cover of the centre engine compartment with the latch mechanisms (2) .
- Feed the cover for the centre engine compartment out to the rear.

14 – Partially remove the top left and right cover in the engine compartment

NOTICE

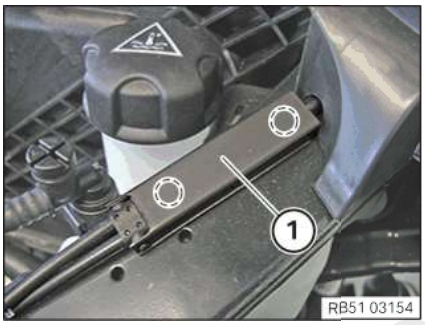
Description is for left component only. Procedure on the right side is identical.

▶ **Removing the cover in the engine compartment on top partially**

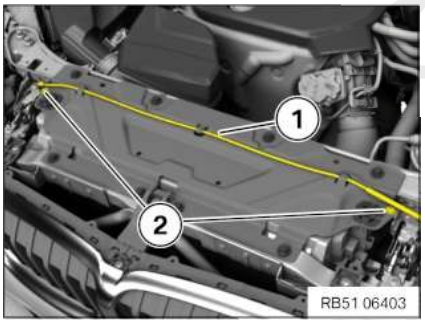


- Loosen the expanding rivet (1).
- Remove the cover in the engine compartment on top (2) partially.

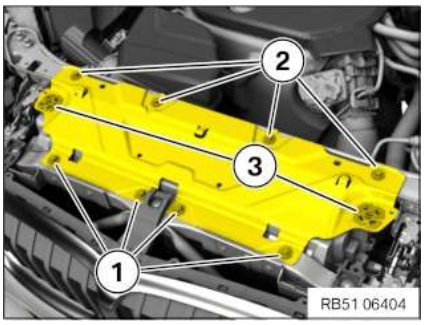
15 – Removing the top cross connection



- Release the housing for the coupling of the Bowden cables (1) from the body.



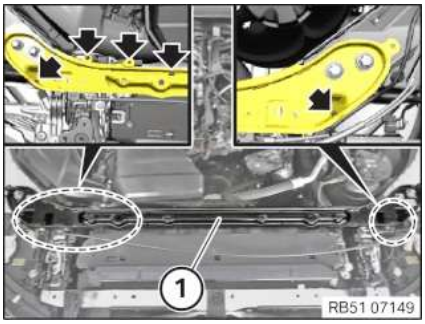
- Detach Bowden cable (1) at the top cross connection.
- Loosen screws (2).



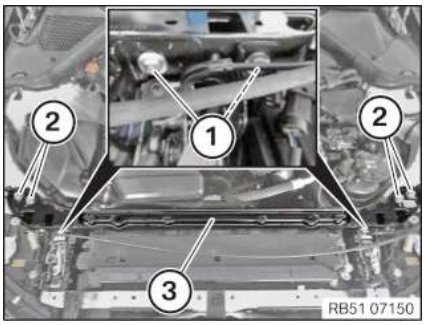
- Loosen screws (1) and (2).
- Remove the top cross connection with the holders(3) towards the top.

16 – Remove the rear top cross connection

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- Release the clips (arrows) in the marked areas from the top rear cross connection (1).

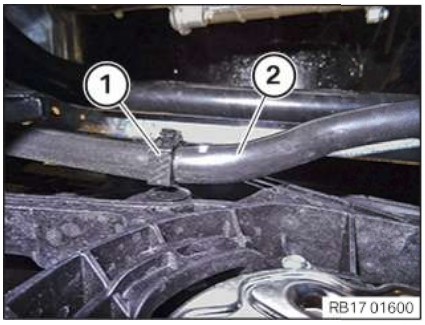


- Loosen screws (1).
- Loosen screws (2).
- Guide out and remove top rear cross connection (3).

17 – Remove fan cowl.

TECHNICAL INFORMATION

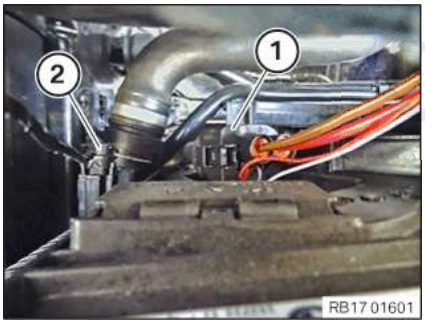
- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!



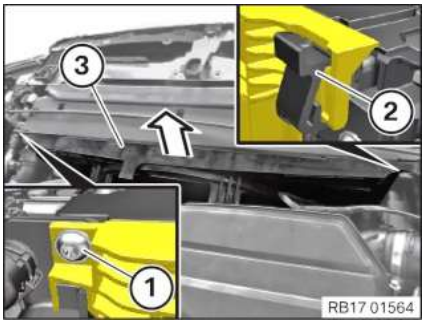
- **If installed:** Release transmission oil line (2).

  Unlock the holder (1).

  Thread out transmission oil line (2) and set aside.



- Unlock plug connection (1) and disconnect.
- Unlock plug connection (2) and disconnect.



- Loosen screw (1).
- Unlock lock (2).
- Guide out and remove fan cowl (3) **carefully** in the direction of the arrow.

18 – Removing intake silencer housing

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RISK OF DAMAGE

Damage to the clean air line. Damage to the air filter.

For changing the air filter insert, if the upper section of intake filter housing is only raised and not completely removed, the clean air line and the air filter insert may be damaged.

- Do not lift upper section of intake filter housing by force.
- Unfasten clamp.
- Remove upper section of intake filter housing completely.



- Unlock plug connection (1) and disconnect.
- Unfasten clamp (2).
- Pull out and remove the intake silencer housing (3) from the rubber mounts towards the top.

19 – Removing engine ventilation line

WARNING

Hot surfaces.

Risk of burning!

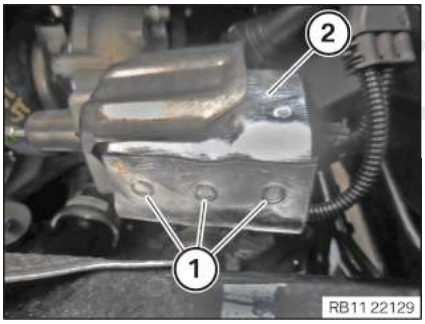
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

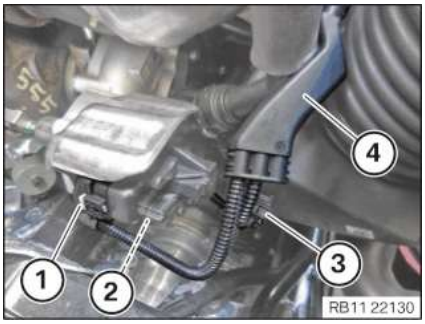
Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

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

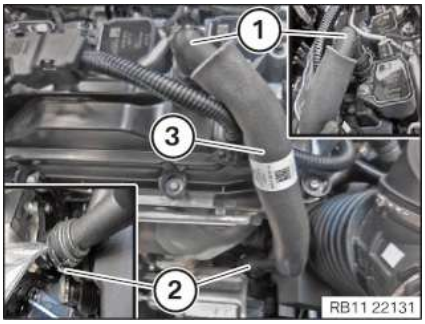


- Unlock the locks (1).
- Feed out and remove heat protection (2).

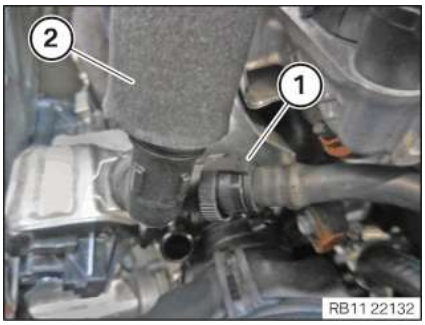


- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Loosen clamp (3).
- Feed out wiring harness section for sensor system **2** (4) and set it aside.

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- Unlock and loosen the locks (1).
- Unlock and loosen lock (2).
- Feed the engine ventilation line (3) out and set it aside.



- Unlock and release tank ventilation line (1).
- Feed out the engine ventilation line (2) and remove.

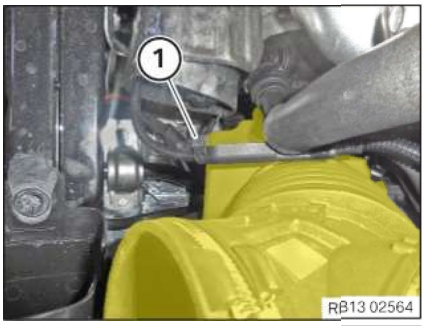
20 – Removing clean air pipe

WARNING

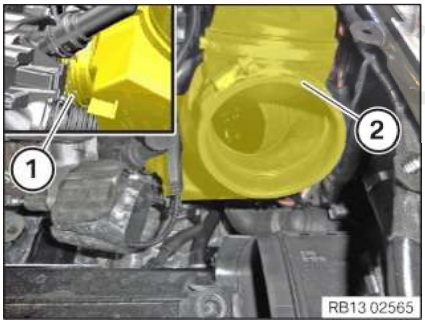
Hot surfaces.

Risk of burning!

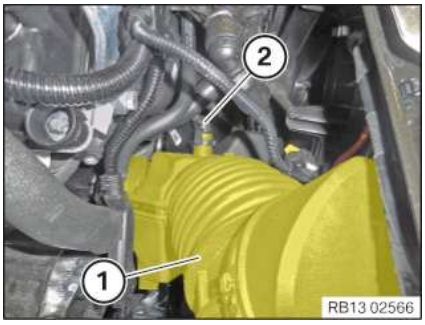
- Perform all work only on components that have cooled down.



- Loosen clamp (1).



- Unlock the clamp (1).
- Thread out clean air pipe (2) and set it aside.



- Position clean air pipe (1).
- Unlock and loosen engine ventilation line (2).
- Feed out clean air pipe and remove (1).

21 – Remove charge air line

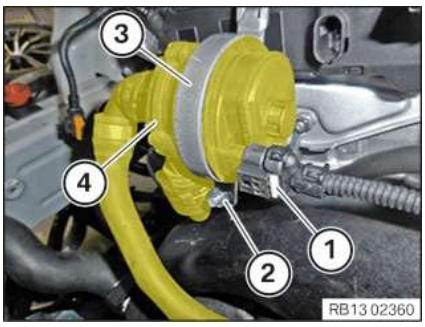
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WARNING

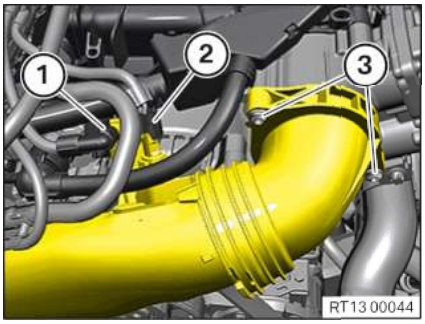
Hot surfaces.

Risk of burning!

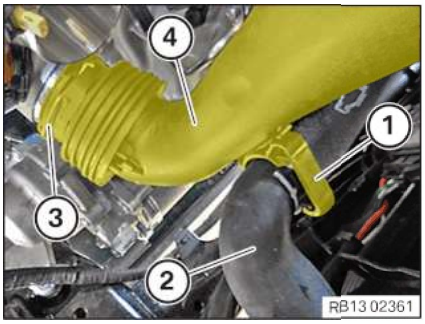
- Perform all work only on components that have cooled down.



- Unlock plug connection (1) and disconnect.
- Loosen nut (2).
- Guide the retaining bracket (3)out and remove.
- Guide out auxiliary coolant pump (4) and place it aside.



- Unlock plug connection (1) and disconnect.
- Unlock plug connection (2) and disconnect.
- Loosen screws (3).



- Unlock the clamp (1).
- Feed out the coolant hose (2) and set it aside.
- Unlock the clamp (3).
- Feed the charge air line (4) out upwards and remove it.

22 – Remove the adapter for engine ventilation line with heating element on exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

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

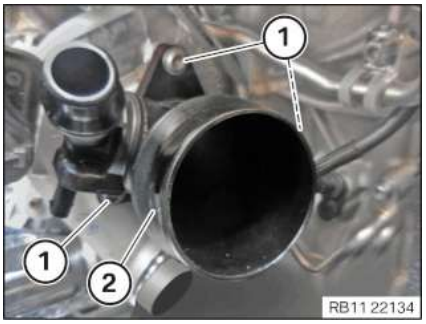
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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



- Loosen screws (1).
- Feed out the connecting branch (2) with heating element on the exhaust turbocharger and remove.

23 – Remove the front oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

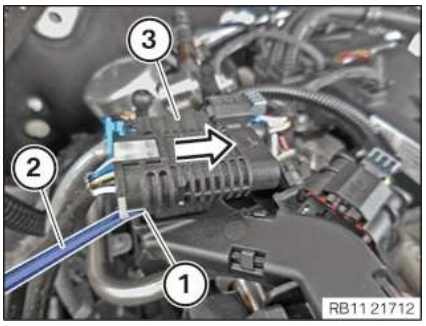
Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

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

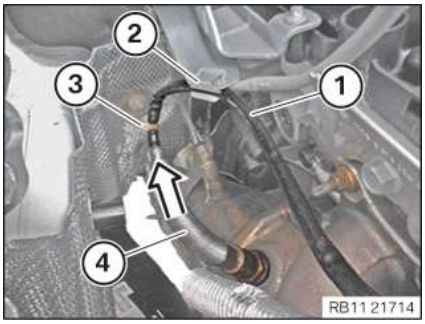


- Unlock and loosen connector (1).



- Unlock the locks (1) with a conventional screwdriver (2) and release.
- Feed out the connector (3) in **the direction of arrow** and set aside.

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- Detach the line of the front oxygen sensor (1) from the holder (2).
- Unfasten cable strap (3).
- Feed out the heat shield (4) **in direction of arrow** and set it aside.



- Release and remove the control sensor (1) with the special tool .

24 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

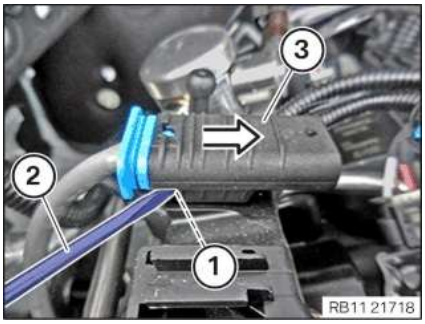
Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

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

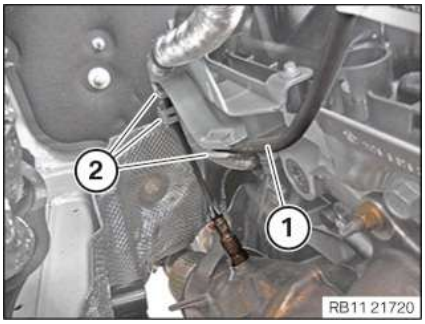


- Unlock and loosen connector (1).

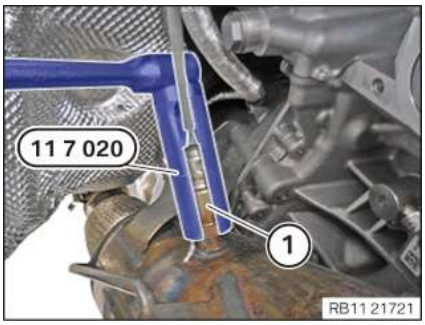


- Unlock the lock (1) with a suitable screwdriver (2).
- Feed out the connector (3) in the direction of the **arrow** and set it aside.

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- Detach the line of the monitoring oxygen sensor (1) from the holder (2).



- Release the monitoring oxygen sensor (1) using special tool .
- Remove the monitoring sensor (1).

25 – Remove all ignition coils.

NOTICE

The description is for one component only. The procedure is identical for all further components.

▸ **Removing the ignition coil**

WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

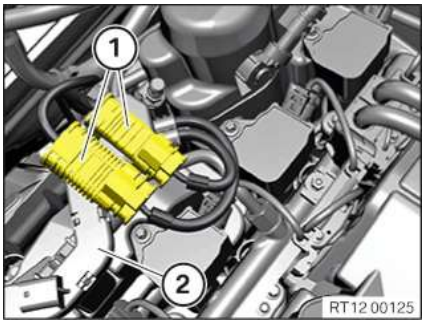
RISK OF DAMAGE

Electrostatic discharge.

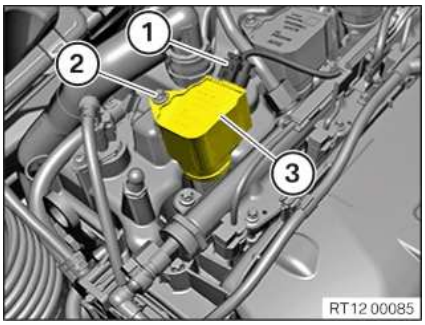
Damage to or destruction of electrical components.

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

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- Disconnect the connector (1) of the front oxygen sensor and the monitoring oxygen sensor from the cable channel (2) and set aside.



- Unlock plug connection (1) and disconnect.
- Loosen screw (2).
- Remove ignition coil (3).

26 – Removing all spark plugs

WARNING

Hot surfaces.

Risk of burning!

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

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

TECHNICAL INFORMATION

Clean spark plug slot with compressed air.

The spark plug shaft must be cleaned using compressed air after having removed the ignition coils and before removing the spark plugs. After having removed the spark plugs, once again check the sealing surface for contamination and (if necessary) clean using a moist cloth or clean using compressed air.

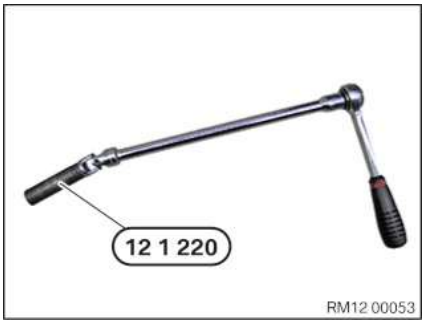
Deposits that are not removed according to instructions may enter the combustion chamber and lead to uncontrolled combustion. Remaining deposits on the spark plug sealing surfaces may lead to leaks and the spark plugs may come loose during engine operation.

Spark plug threads must not be greased or oiled. Insufficiently tightened spark plugs may cause leaks and the sparks plugs may come loose during engine operation.

NOTICE

The description is for one component only. The procedure is identical for all further components.

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TECHNICAL INFORMATION

Exclusively swivelling extensions may be used for the reversible ratchet. Rigid mounting tool and variable plug connections with rigid option may not be used; there is a risk that the insulator breaks.

- Mount the special tool 0 495 560 (12 1 220) on a pivoting extension.



- Unscrew spark plugs with the special tool 0 495 560 (12 1 220) and a pivoting extension.

27 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

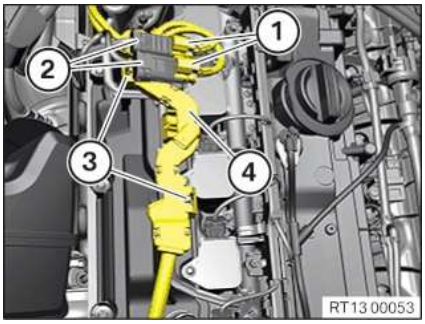
On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

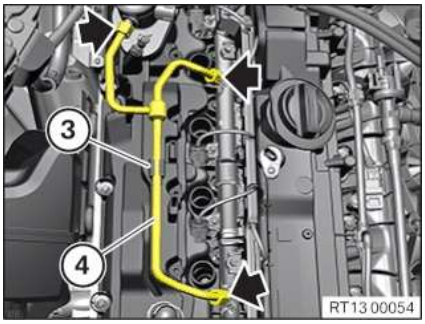
TECHNICAL INFORMATION

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



- Unlock and disconnect the plug connections (1) and (2).
- Unlock the locks (3).
- Guide out the wiring harness section of the engine wiring harness (4) and set it aside.

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- Position a lint-free rag under the union nuts.
- Unscrew union nuts (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Thread out the high pressure line (4) from the bracket (3) and remove it.
- Feed out and dispose of the lint-free cleaning clothes .

28 – Remove fuel delivery line

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

Contaminant or foreign body.

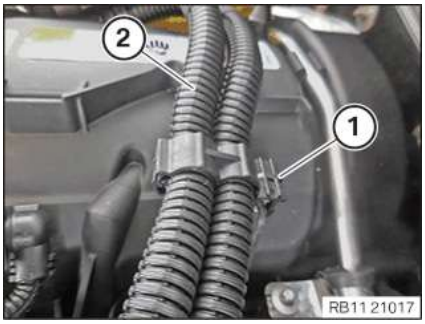
Contamination can result in malfunctions, operating failure or leaks.

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

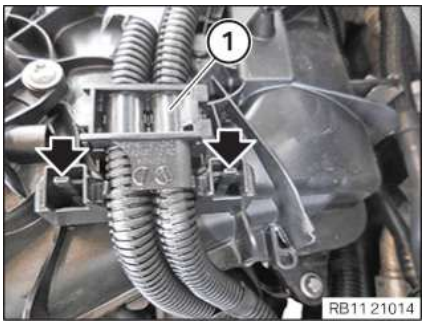
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

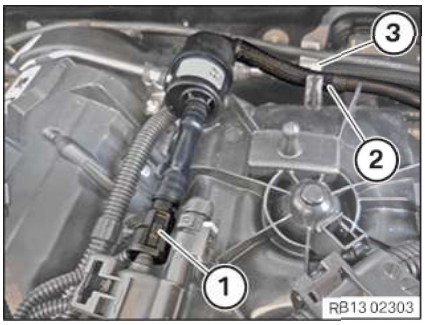
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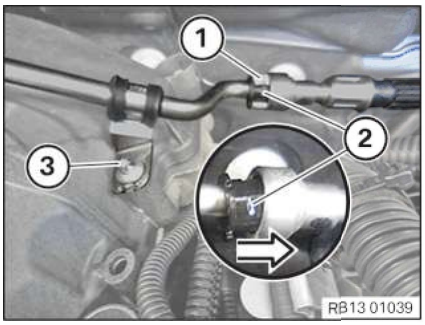
- Loosen clamp (1).
- Guide out wiring harness section (2) for the injectors and ignition coils and place it aside.



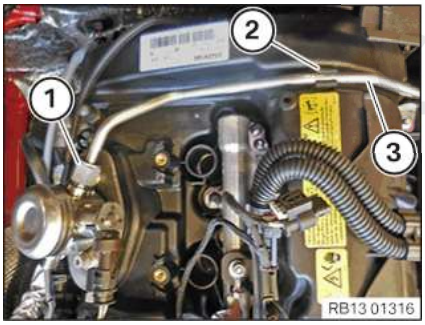
- Unlock the locks (arrows).
- Guide out wiring harness section (1) for the injectors and ignition coils and place it aside.



- Unlock and loosen lock (1).
- Guide tank ventilation line (2) out of clamp (3) and place it aside.



- Unlock and loosen clamp (1).
- Unlock and remove the snap fastener (2) in the direction of the arrow.
- Catch and dispose of escaping fuel.
- Seal the fuel lines with special tools 0 496 567 (13 5 161) and 0 496 568 (13 5 162) from the set of special tools 0 496 565 (13 5 160).
- Loosen screw (3).



- Slacken the union nut (1) on the high pressure pump.
- Catch and dispose of escaping fuel.
- Seal all openings with the special tool .
- Guide the fuel feed line (3) out and remove.
- Make sure that the rubber damper (2) is not lost.

29 – Remove high pressure pump

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

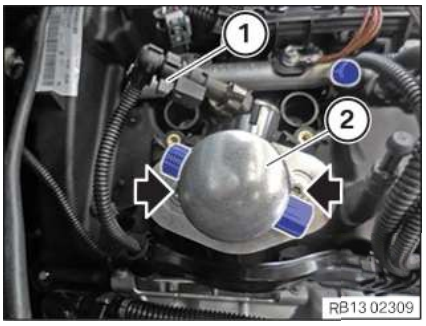
TECHNICAL INFORMATION

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

TECHNICAL INFORMATION

The high pressure pump can be pre-tensioned by camshaft cams. If when loosening the screws, the high pressure pump is forced out, the engine will have to be turned to bring the camshafts to a different position.

Before installing the high pressure pump, the cam of the high pressure pump drive must be turned to BDC. To do this, twist the engine if necessary in the direction of engine rotation to the central bolt of the crankshaft. Otherwise, it will not be possible to install the high-pressure pump.



- Unlock plug connection (1) and disconnect.
- Unscrew the bolts (arrows) **in alternating order**.
- Have a rag ready and catch any engine oil that may emerge.
- Feed out high pressure pump (2) and remove.

30 – Removing rail with injectors of cylinders 1 to 3

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

Damage to the injector tips and Teflon ring.

Improper handling of the injector tips and Teflon ring can lead to malfunctioning of the injector.

- Avoid mechanical contact with injector tip.
- When exchanging Teflon ring, hands and work surface must be clean and free of oil. Do not use any lubricating agents.
- Do not use fingernails to slide Teflon ring on.

RISK OF DAMAGE

Damage to injectors.

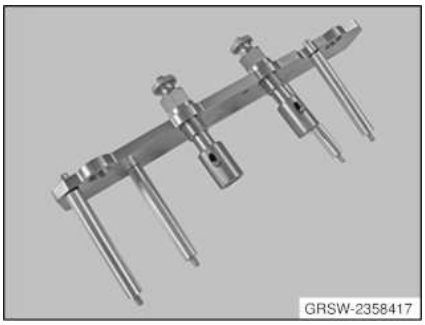
Excessive force may damage the injector and this means having to renew the injector.

- Twist the injectors with a maximum torsional movement of 13 Nm.

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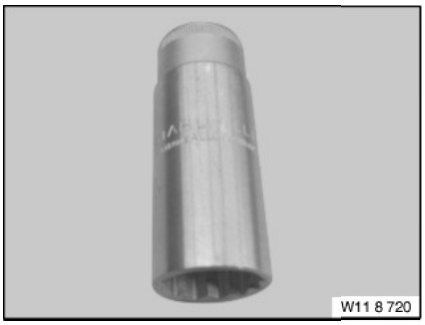
- Prepare special tool .



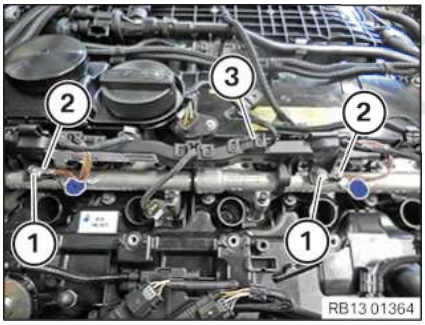
- Prepare special tool 2 358 417.



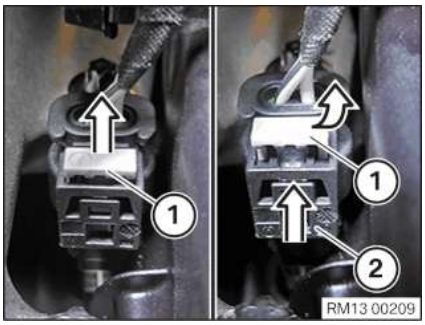
- Prepare special tool .



- Prepare special tool 0 496 106 (11 8 720).

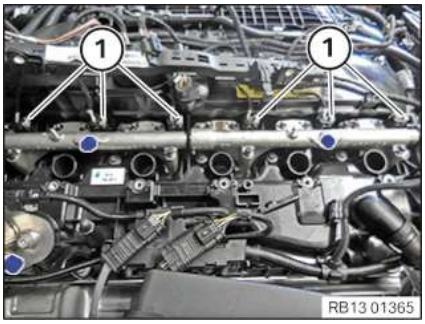


- Loosen nut (1).
- Feed out ground cable (2) and set it aside.
- Feed out cable channel (3) and set it aside.

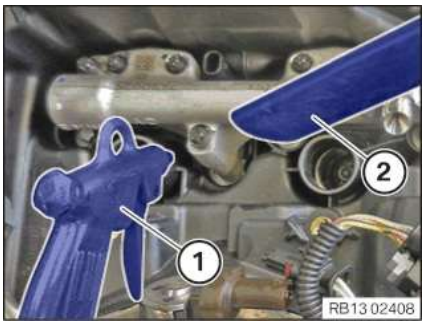


- Unlock lock (1) in direction of arrow from the top.
- Press lock (1) together and release.
- Pull out the connector (2) from the injectors.

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- Unlock and release all connectors (1) of the injectors.

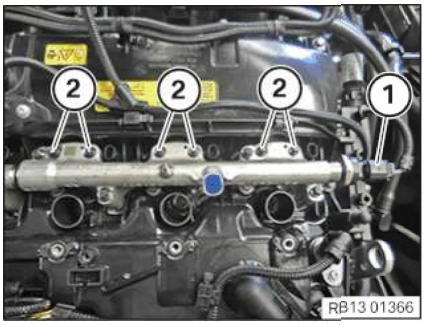


TECHNICAL INFORMATION

In case of dusty / sandy operating conditions of the vehicle, the injector shafts must be cleaned before removal.

For additional information see: 13 53 ... Cleaning the cylinder head in the area of the injectors in case of sandy / dusty contamination

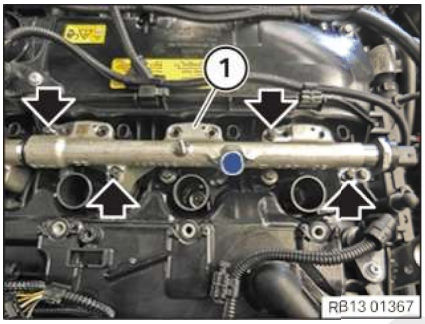
- Before releasing the high pressure lines: Blow out the injector shafts with an air gun(1) with less pressure.
- Simultaneously, draw off the dirt particles with an **explosion proof** vacuum cleaner (2).



- Unlock and loosen connector (1).
- Release screws (M5x30) (2).
- Remove screws (2).

  Do not reuse the bolts (2).

  Parts: Screws (M5x30)
- Catch and dispose of escaping fuel with suitable materials.

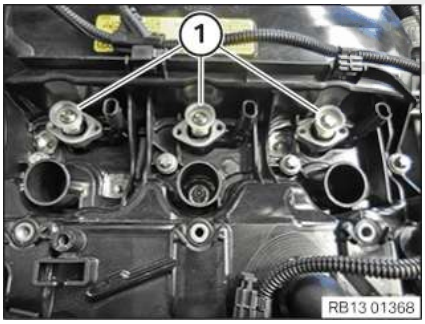


- Unscrew the screws (M6x30) (arrows).

  The screws may not be reused!
- Renew screws.

  Parts: Screws (M6x30)
- Remove rail (1) in upward direction.

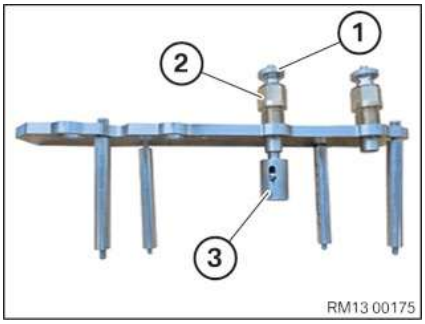
  The injectors remain in the cylinder head.



- Remove the gaskets (1).

  The seals (1) are only required during the initial assembly at the plant and will not be installed again.

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RISK OF DAMAGE

Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

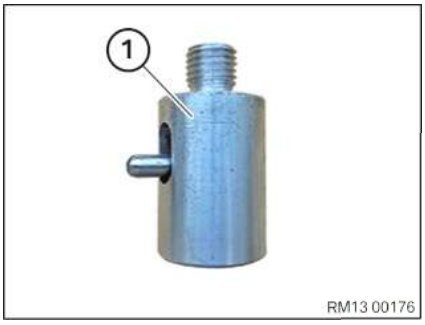
- Twist the injectors with a maximum torsional movement of 13 Nm.

- In the event that the specified value for the tensile force is exceeded: Replace injectors.
- Use the special tool 2 358 417to remove the injectors.

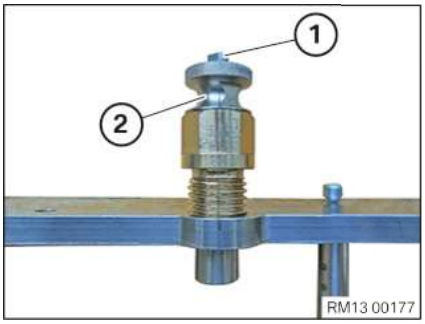
  The special tool 2 358 417 is used to ensure that the tensile force is not exceeded.

  Special tool 2 358 417 consists of:

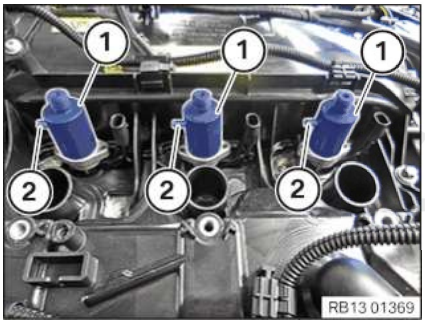
  - **(1)** Threaded sleeves
  - **(2)** Pull-out thread (left-hand thread)
  - **(3)** Mounting for the injectors



- Unscrew the fixture for the injectors (1) from the special tool 2 358 417.

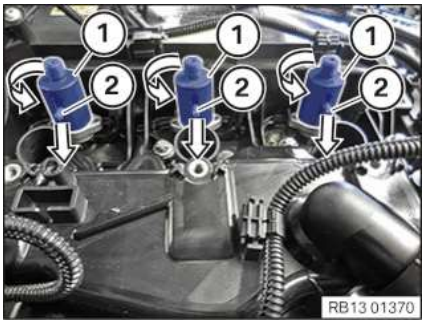


- Press the lock (1) in and remove threaded sleeve (2) from the special tool 2 358 417.



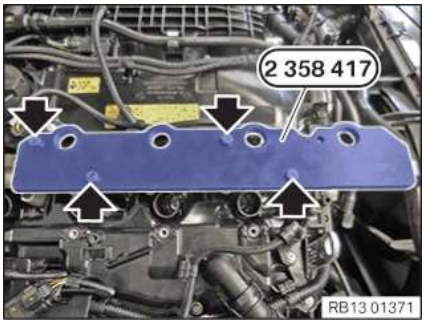
- Install all fixtures (1) for the injectors.

  The fixture (1) is not locked if the lever (2) is on the top.



- Turn fixtures (1) by 90° and lock the lever (2) downwards.

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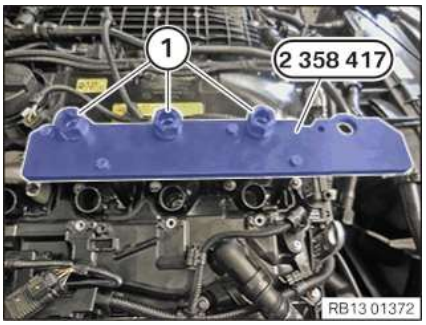
RISK OF DAMAGE

Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

- Do not use the puller plate as a support.

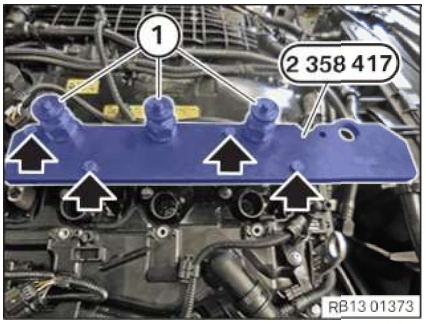
- Attach special tool 2 358 417 to cylinder head.
- Hand-tighten the bolts (arrows).



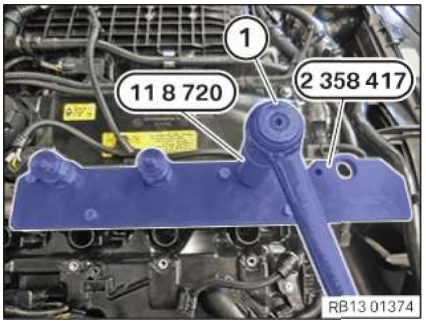
TECHNICAL INFORMATION

The extraction thread is a left-hand thread.

- Screw in pull-out thread (1) on the special tool 2 358 417fully.



- Insert threaded sleeves (1) again and screw threaded sleeves completely onto the fixtures for injectors.
- Then tighten screws (arrows) on special tool 2 358 417 to 5 Nm.

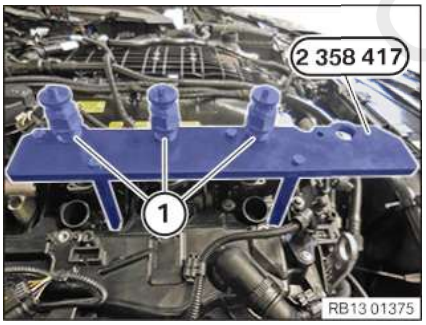


- Adjust torque wrench to 13 Nm **clockwise** .
- Turn torque wrench (1) in **clockwise** direction with special tool 0 496 106 (11 8 720)until the injector is pulled out.

TECHNICAL INFORMATION

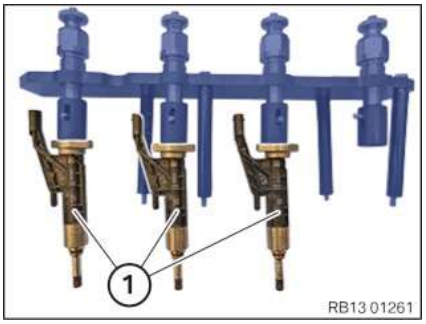
If the torque wrench makes a cracking noise when the injector is pulled out, **the injector must be renewed.**

- Disassemble all injectors individually.



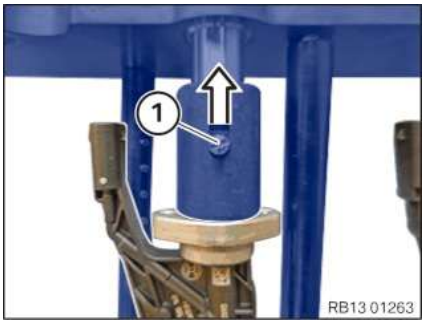
- Before removing the special tool 2 358 417 with the injectors, check if all the injectors were completely pulled out of the cylinder head.

  This can be recognised on the completely visible threads of the sleeves (1).
- Loosen screws on special tool 2 358 417.



- Carefully remove the special tool 2 358 417with injectors (1) from the cylinder head vertically upwards.
- Place the combination of the special tool 2 358 417 and the injectors (1) flat on a clean table.

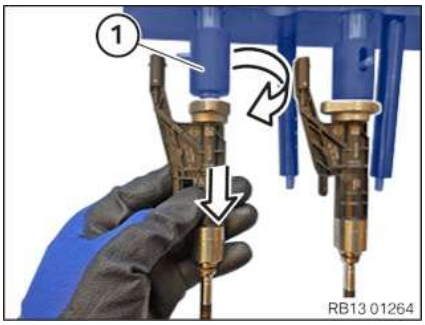
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NOTICE

The description is for one component only. The procedure is identical for all further components.

- Unlock the fixture lock (1) from the top.



- Turn the unlocked fixture (1) by 90°.
- Release and remove the injector downwards.

31 – Removing rail with injectors of cylinders 4 to 6

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

Damage to the injector tips and Teflon ring.

Improper handling of the injector tips and Teflon ring can lead to malfunctioning of the injector.

- Avoid mechanical contact with injector tip.
- When exchanging Teflon ring, hands and work surface must be clean and free of oil. Do not use any lubricating agents.
- Do not use fingernails to slide Teflon ring on.

RISK OF DAMAGE

Damage to injectors.

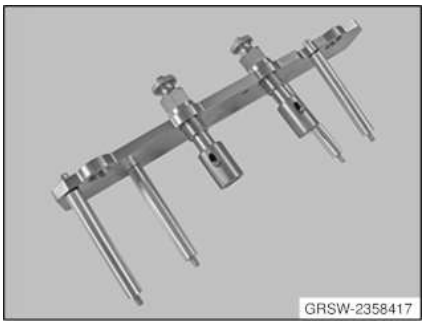
Excessive force may damage the injector and this means having to renew the injector.

- Twist the injectors with a maximum torsional movement of 13 Nm.

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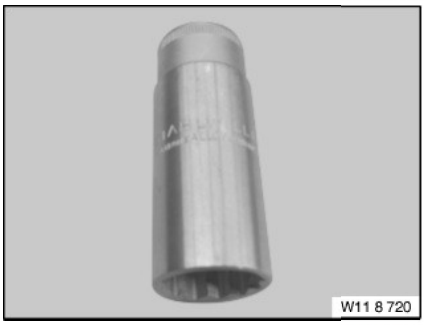
- Prepare special tool .



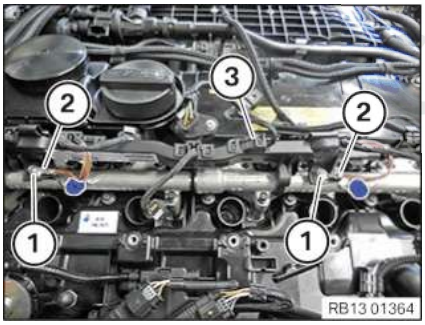
- Prepare special tool 2 358 417.



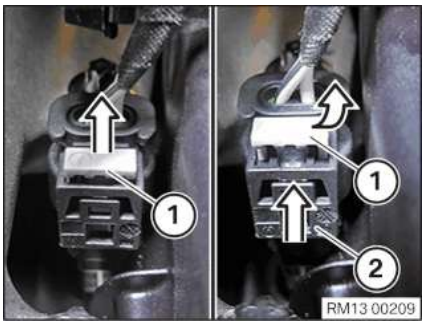
- Prepare special tool .



- Prepare special tool 0 496 106 (11 8 720).

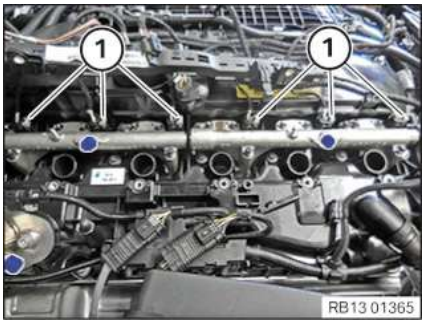


- Release nuts (1) .
- Feed out ground cable (2) and set aside.
- Feed out cable channel (3) and set it aside.

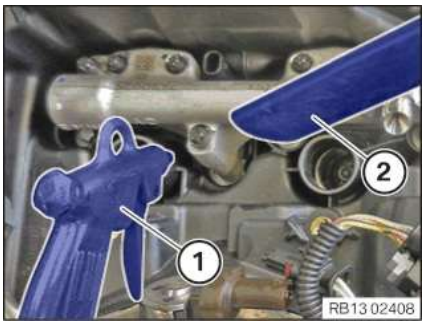


- Unlock lock (1) in direction of arrow upwards.
- Press lock (1) together and release.
- Disconnect the connector (2) from the injectors in the direction of the arrow.

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- Unlock and release all connectors (1) of the injectors.

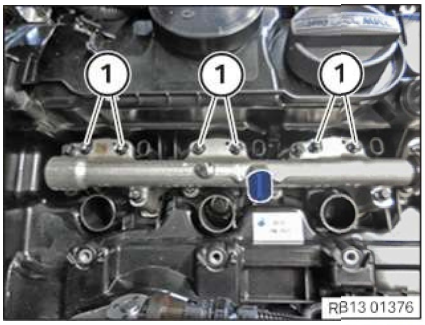


TECHNICAL INFORMATION

In case of dusty / sandy operating conditions of the vehicle, the injector shafts must be cleaned before removal.

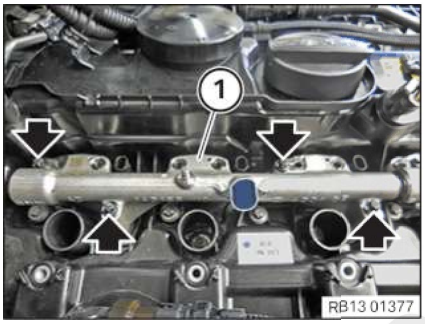
For additional information see: 13 53 ... Cleaning the cylinder head in the area of the injectors in case of sandy / dusty contamination

- Before releasing the high pressure lines: Blow out the injector shaft with an air gun (1) with less pressure.
- Simultaneously, draw the dirt particles off **using an** explosion proof (2) vacuum cleaner.



- Release screws (M5x30) (1).
- Remove screws (M5x30) (1) .

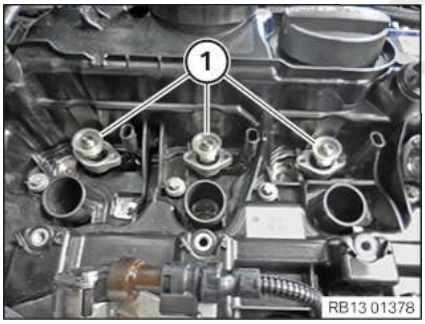
  Do **not** reuse screws (M5x30) (1).
- Catch and dispose of escaping fuel with suitable materials.



- Release screws (M6x30) (arrow).
- Remove screws (M6x30) (arrows).

  Do **not** reuse the screws (M6x30).
- Remove rail (1) upwards.

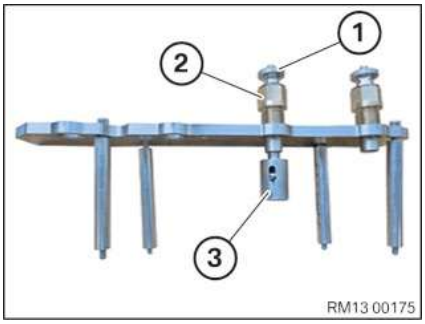
  The injectors remain in the cylinder head.



- Remove seals (1) .

  The seals (1) are required during first assembly within the plant only and will not be installed again.

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RISK OF DAMAGE

Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

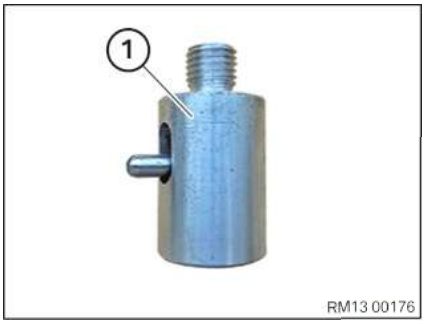
- Twist the injectors with a maximum torsional movement of 13 Nm.

- In the event that the specified value for the tensile force is exceeded: Replace injectors.
- Use the special tool 2 358 417 to remove the injectors.

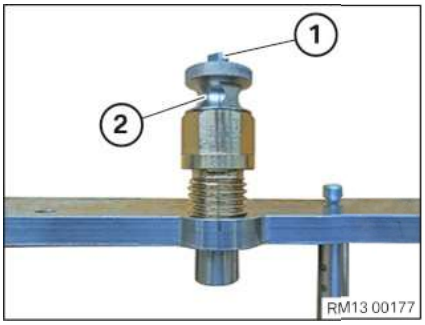
  The special tool 2 358 417 is used to ensure that the tensile force is not exceeded.

  The special tool 2 358 417 consists of:

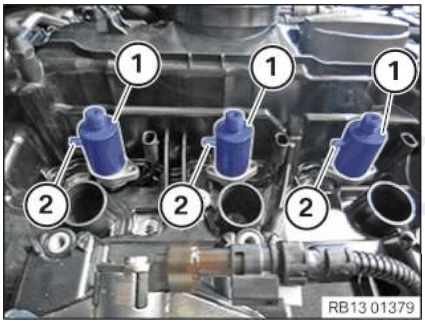
  - (1) Threaded sleeves
  - (2) Pull-out thread (left-hand thread)
  - (3) Mounting for the injectors



- Unscrew the fixture for injectors (1) from special tool 2 358 417.

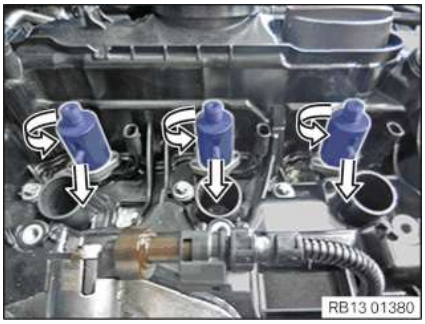


- Press lock (1) in and remove the threaded sleeve (2) from the special tool 2 358 417.



- Install all fixtures (1) for the injectors.

  The fixture (1) is not locked, if the lever is (2) on top.



- Turn fixtures (1) by 90° and lock the lever (2) downwards.

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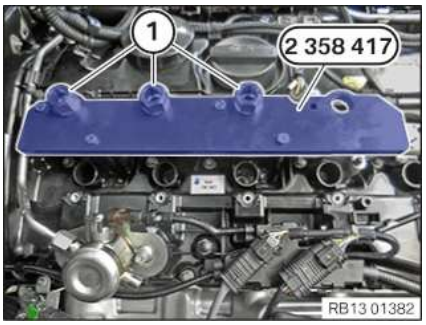
RISK OF DAMAGE

Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

- Do not use the puller plate as a support.

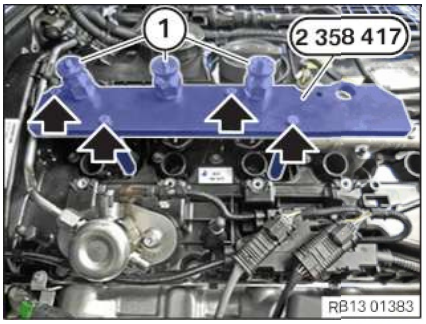
- Attach special tool 2 358 417 to cylinder head.
- Hand-tighten the bolts (arrows).



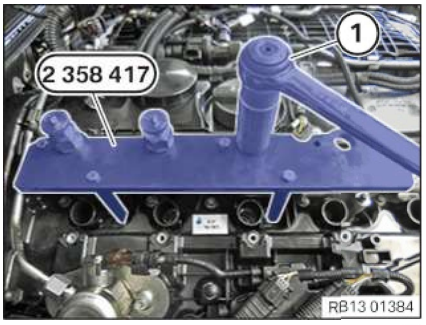
TECHNICAL INFORMATION

The extraction thread is a left-hand thread.

- Screw in pull-out thread (1) on the special tool 2 358 417 fully.



- Insert the threaded sleeves (1) again and screw threaded sleeves completely onto the fixtures for the injectors.
- Then tighten screws (arrows) on special tool 2 358 417 to 5 Nm.

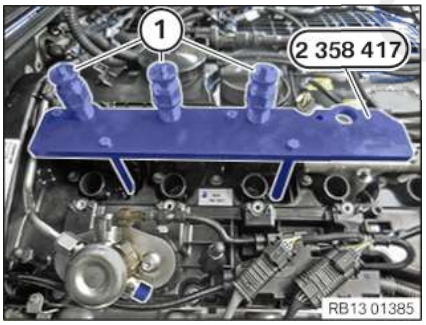


- Adjust torque wrench to 13 Nm **in clockwise** direction.
- Turn the torque wrench (1) with the special tool 0 496 106 (11 8 720) **clockwise**, until the injector is pulled out.

TECHNICAL INFORMATION

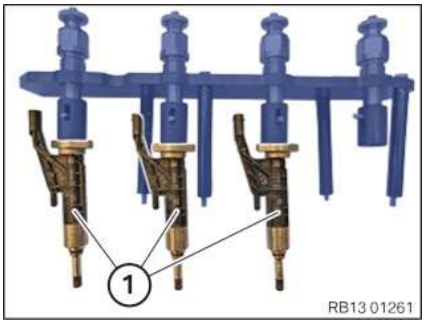
If the torque wrench makes a cracking noise when the injector is pulled out, **the injector must be renewed.**

- Disassemble all injectors individually.



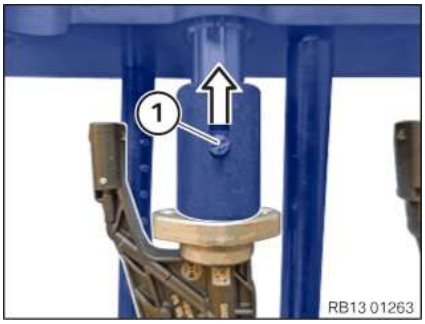
- Before removing the special tool 2 358 417 with the injectors, check if all the injectors were completely pulled out of the cylinder head.

  This can be recognised on the completely visible thread starts of the threaded sleeves (1).
- Loosen screws on special tool 2 358 417.



- Carefully remove the special tool 2 358 417 with the injectors (1) vertically straight up from the cylinder head.
- Place the combination of the special tool 2 358 417 and the injectors (1) flat onto a clean table.

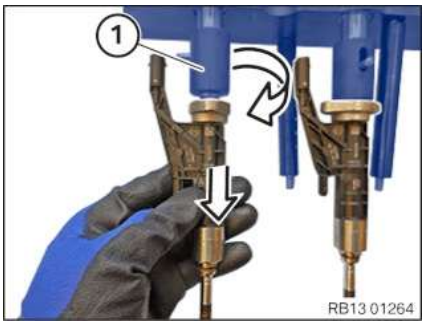
cardiagn.com



NOTICE

The description is for one component only. The procedure is identical for all further components.

- Unlock the fixture lock (1) from the top.



- Turn the unlocked fixture(1) by 90°.
- Release and remove the injector downwards.

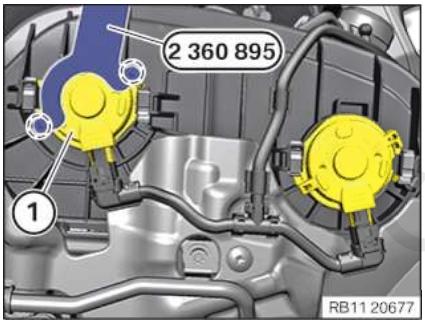
32 – Removing both actuators

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

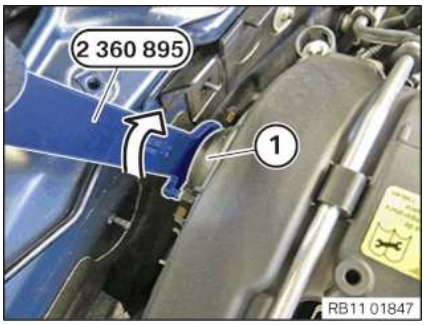
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the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



NOTICE

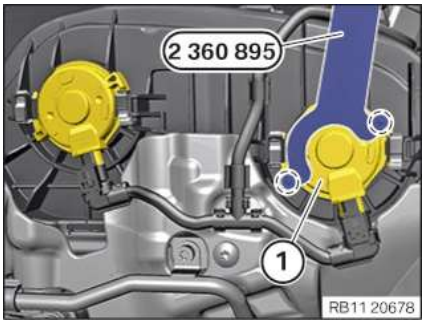
The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the intake side.



- Turn the actuator (1) on the intake side with the special tool 2 360 895 by about 50° in the direction of arrow and release it.

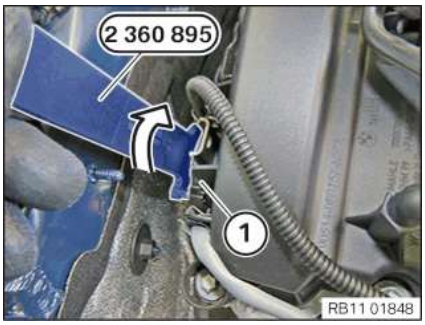
carsdiagn.com



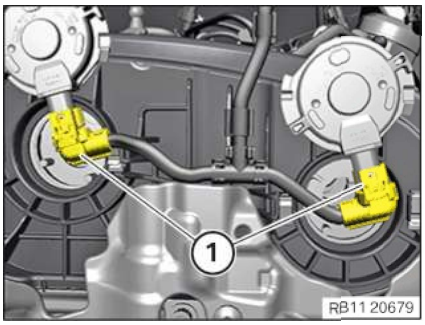
NOTICE

The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the exhaust side.



- Turn the actuator (1) on the exhaust side with the special tool 2 360 895 by about 50° in the direction of arrow and release it.



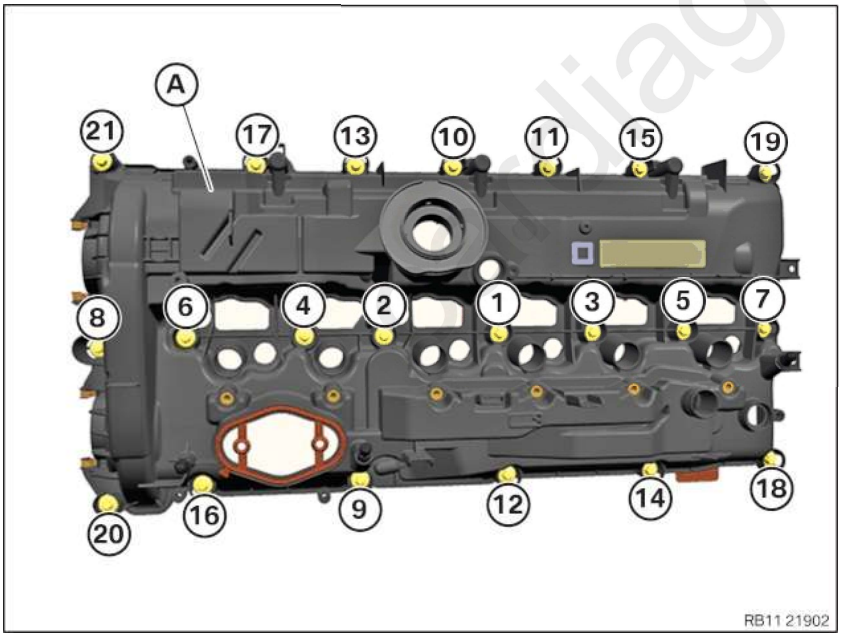
NOTICE

The figure shows the rear side of the engine.

- Unlock and disconnect both connectors (1).
- Feed out and remove both actuators.

33 – Removing the cylinder head cover

Overview: Bolts of the cylinder head cover



1 - 21 Bolts of the cylinder head cover

A Cylinder head cover

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

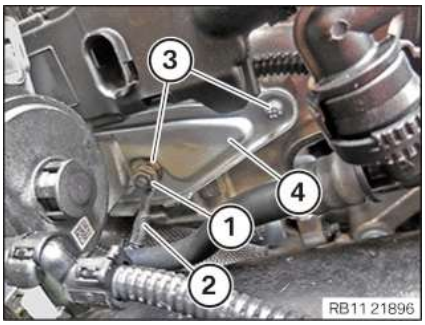
Sheared wires can cause a short circuit.

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

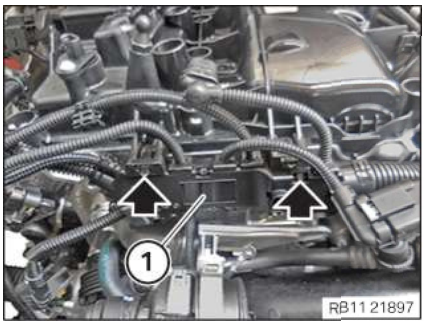
.com



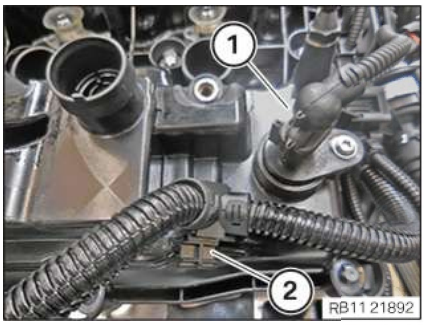
- Unlock the locks (1).
- Feed the engine ventilation line (2) out and set it aside.



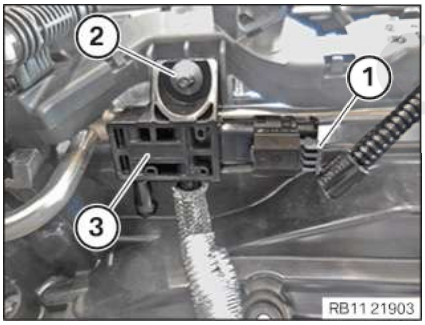
- Loosen nut (1).
- Feed out ground cable (2) and set it aside.
- Loosen screws (3).
- Thread out holder (4) and set aside.



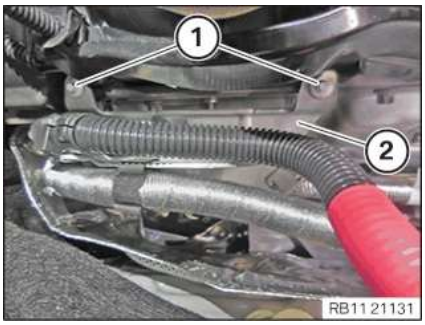
- Unlock and detach the locks (arrows).
- Guide out the wiring harness section (1) for the sensor system **2** and place to one side.



- Unlock and detach connector (1) on exhaust camshaft sensor .
- Loosen clamp (2).

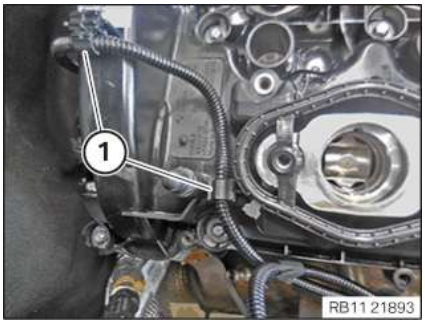


- **If installed:**
- Unlock and loosen connector (1).
- Loosen screw (2).
- Remove the differential pressure sensor (3) and put it to one side.

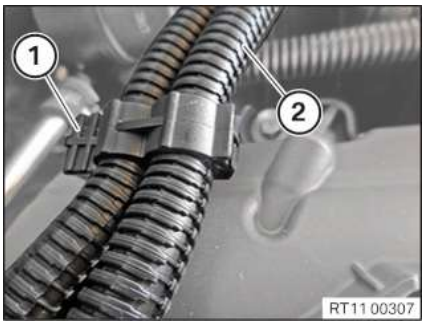


- Loosen screws (1).
- Feed out the bracket (2) of the positive battery cable and set it aside.

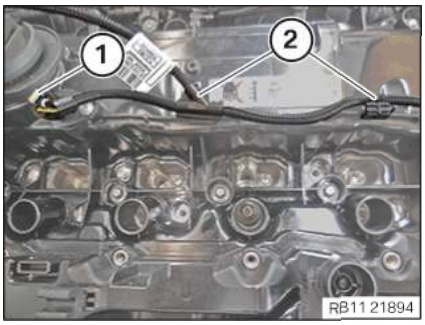
cardiagn.com



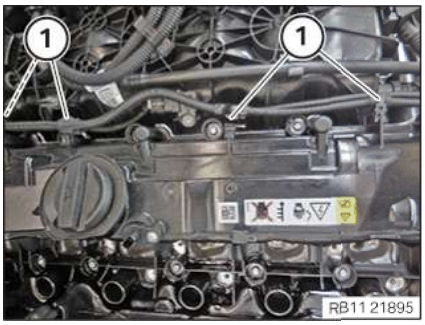
- Loosen clamps (1).



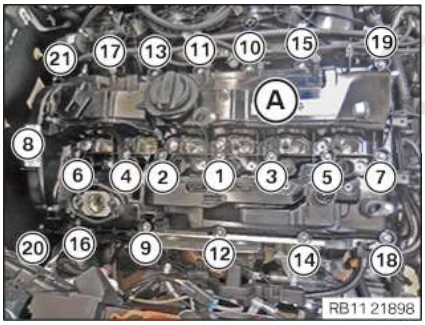
- Loosen clamp (1).
- Thread out the wiring harness section (2) for the injectors and ignition coils and set it aside.



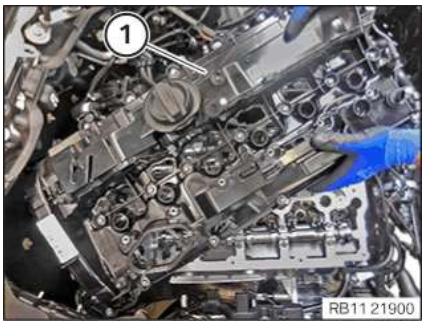
- Unlock and detach connector (1) on the intake camshaft sensor.
- Loosen clamps (2).



- Loosen clamps (1).



- Release all screws on the cylinder head cover (A) in the sequence (21) to (1).



- Guide the cylinder head cover (1) out and remove it.

34 – Removing integrated supply module (PDM)

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WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

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

RISK OF DAMAGE

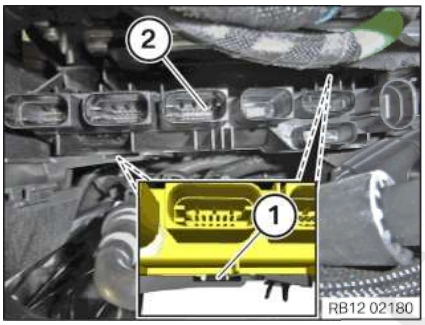
Electrostatic discharge.

Damage to or destruction of electrical components.

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



- Unlock and disconnect plug connections (1).



- Unlock the latch mechanisms (1).
- Guide out and remove integrated supply module (PDM) (2) upwards.

35 – Removing the DME control unit

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

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

TECHNICAL INFORMATION

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

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TECHNICAL INFORMATION

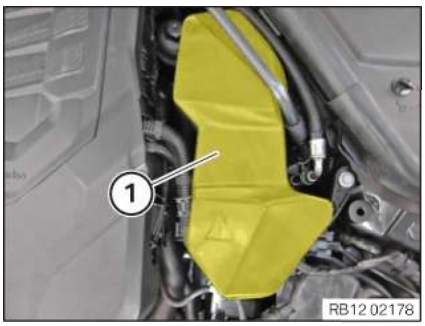
In a warranty case, you must always provide a fault memory printout with the defective part, even if the fault memory does not contain an entry.

TECHNICAL INFORMATION

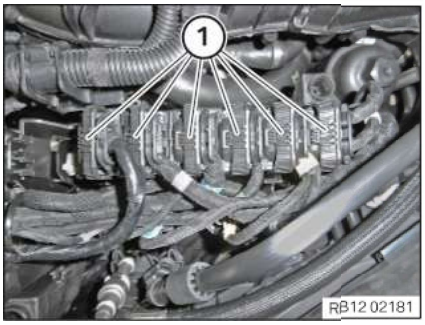
Control unit must be programmed after it is replaced.
For additional information see: 61 00 ... Programming/encoding control unit(s)

TECHNICAL INFORMATION

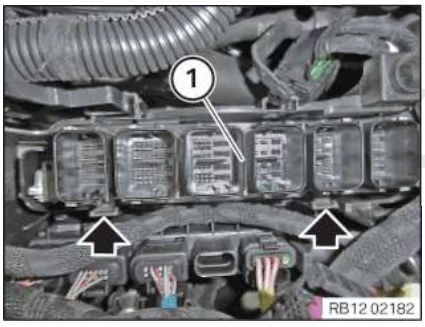
Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Pull the cover (1) towards the top and feed out.

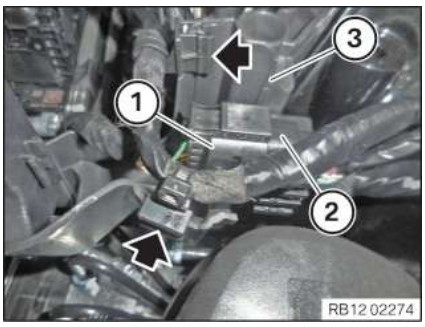


- Unlock and disconnect the plug connection (1).



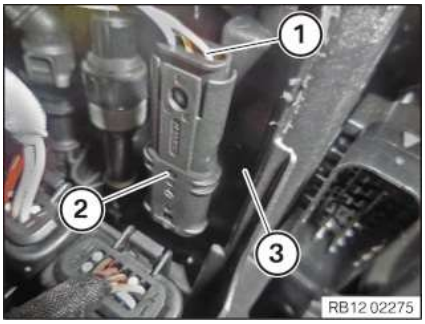
- Unlock the locks (arrows).
- Guide out and remove DME control unit (1).

36 – Removing the control unit holder

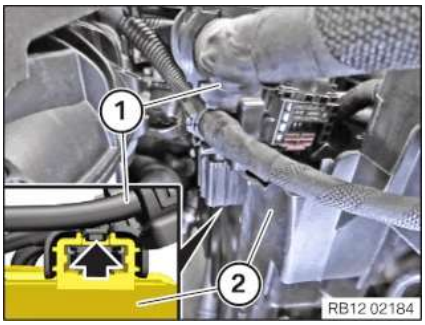


- Unlock plug connection (1) and disconnect.
- Unlock the connector (2) and disconnect from the control unit holder (3).
- Release the clamps (arrows).

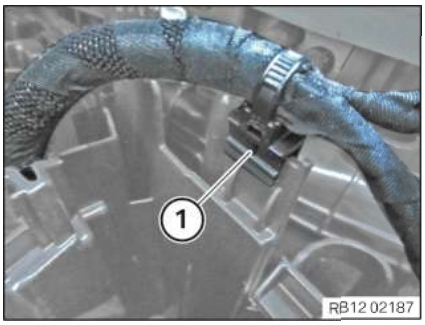
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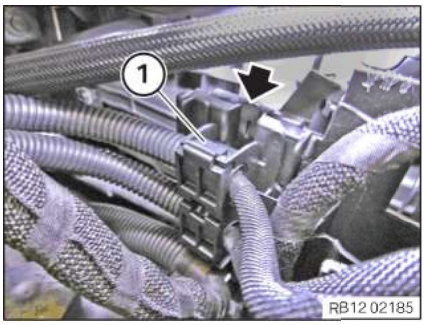
- Unlock plug connection (1) and disconnect.
- Unlock the connector and disconnect from the control unit holder (3).



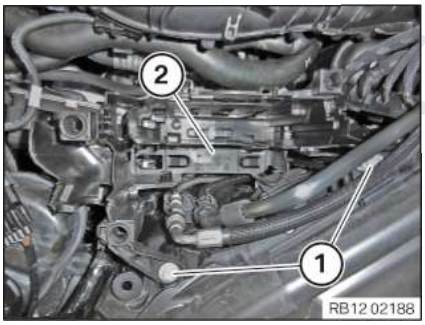
- Unlock the lock (arrow).
- Disconnect the cable holder (1) upwards from the control unit holder (2).



- Loosen clamp (1).

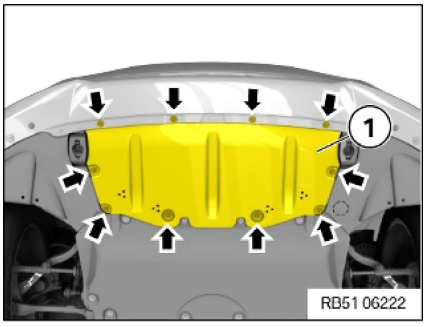


- Unlock the lock (arrow).
- Feed out the cable clip (1) upwards and set it aside.



- Loosen screws (1).
- Guide out and remove the control unit holder (2).

37 – Removing the front underbody protection

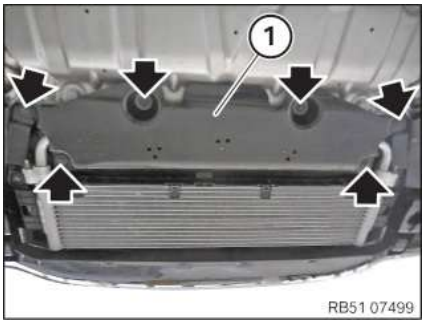


- **Version 1:**

  Remove screws (arrows).

  Feed front underbody protection (1) backwards out of the bumper panel.

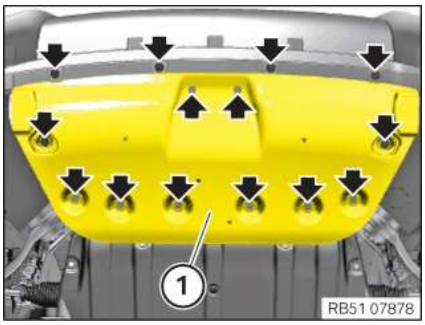
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- **Version 2:**

  Remove screws (arrows).

  Guide out front underbody protection (1) and remove it.



- **Version 3:**

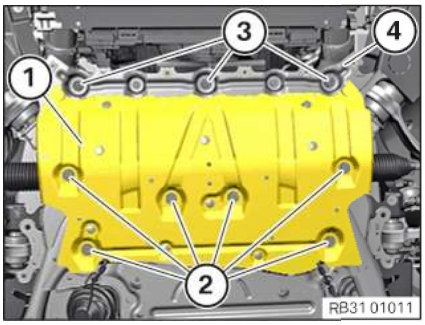
  Remove screws (arrows).

  Guide out front underbody protection (1) and remove it.

38 – Removing the stiffening plate

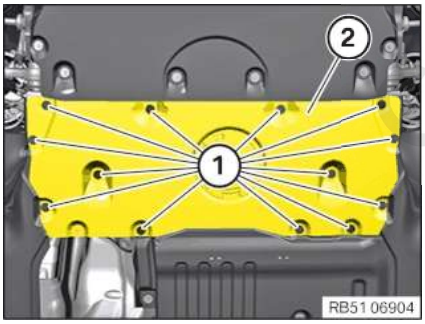
TECHNICAL INFORMATION

Driving without stiffening plate is not permissible.



- Loosen screws (3).
- Remove the holder of the underride protection (4).
- Loosen screws (2).
- Remove stiffening plate (1).

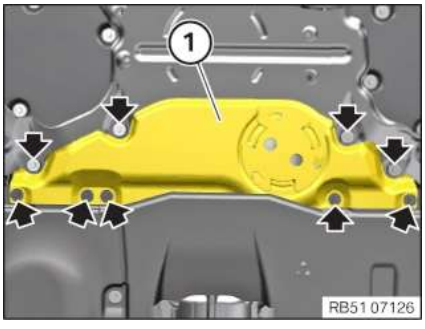
39 – Removing the centre underbody protection



- **Version with rear-wheel drive:**

  Loosen screws (1).

  Remove centre underbody protection (2) .



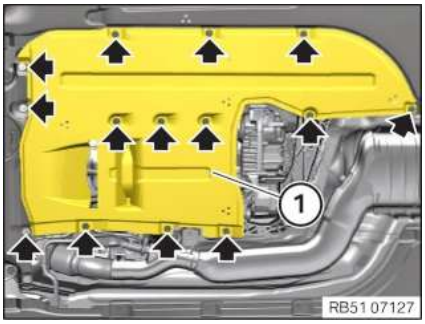
- **Version with all-wheel drive:**

  Remove screws (arrows).

  Feed out and remove the centre underbody protection (1).

40 – Remove rear underbody protection

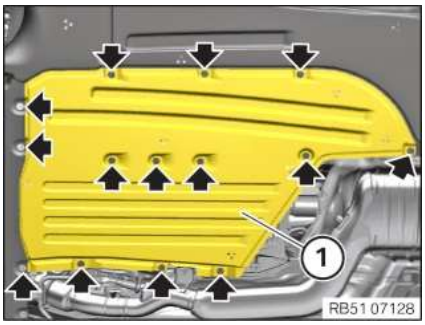
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- **Version 1:**

  Remove screws (arrows).

  Feed out the rear underbody protection (1).

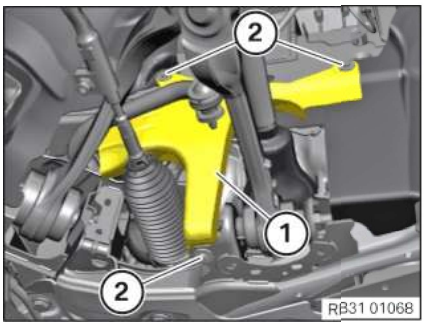


- **Version 2:**

  Remove screws (arrows).

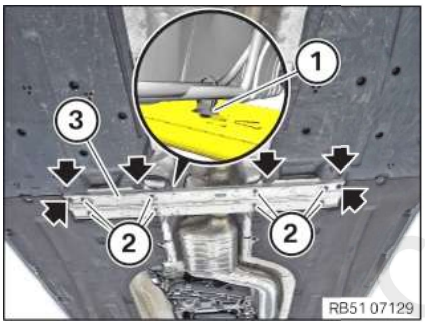
  Guide out rear underbody protection (1) and remove it.

41 – Remove the cover of the steering assembly



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

42 – Remove the connecting support from the tunnel



- Remove screws (arrows).
- **If installed:** Loosen clamp (1).
- Loosen screws (2).
- Guide out and remove connecting support (3) on the tunnel.

43 – Remove complete exhaust system

WARNING

Hot surfaces.

Risk of burning!

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

CAUTION

Component with heavy weight.

Danger of injury!

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

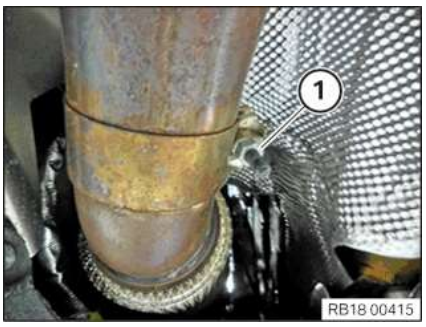
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CAUTION

Heavy component.

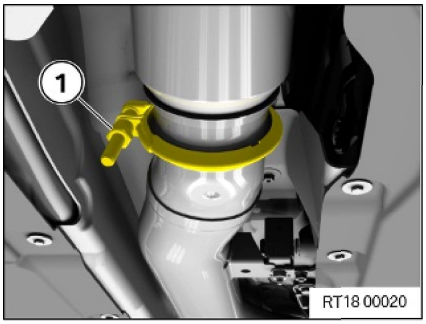
Heavy components can lead to injury or damage.

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



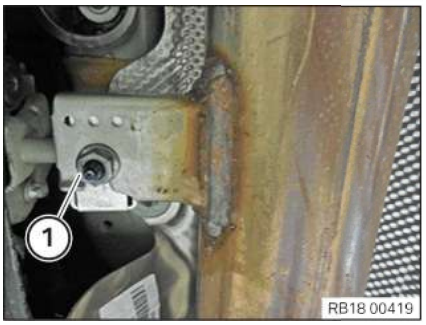
- **Equipment specification 1 (ribbon clamp)**

  Detach the ribbon clamp (1).

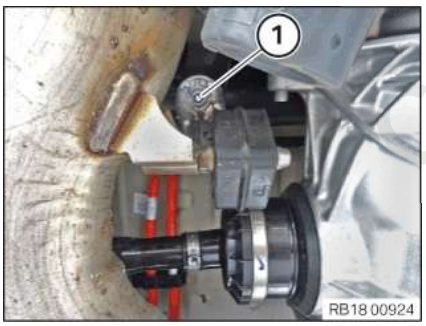


- **Equipment specification 2 (V-clips)**

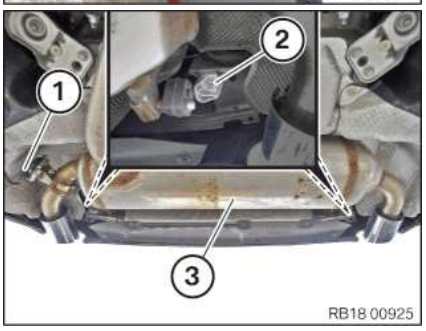
  Unfasten clamp (1).



- Loosen nut (1).



- Release nut (1) on the rear axle support.



- Unlock plug connection (1) and disconnect.
- Loosen nuts (2).
- Lower and remove the exhaust system (3) with the assistance of a second person.

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WARNING

Hot surfaces.

Risk of burning!

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

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

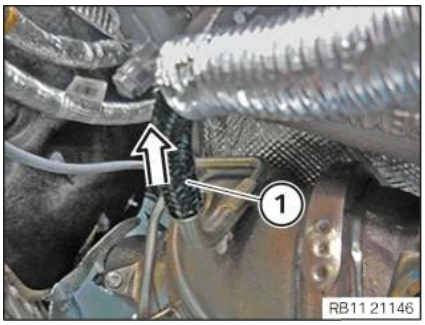
- Remove and install heavy components with the aid of another person/other persons.

CAUTION

Component with heavy weight.

Danger of injury!

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

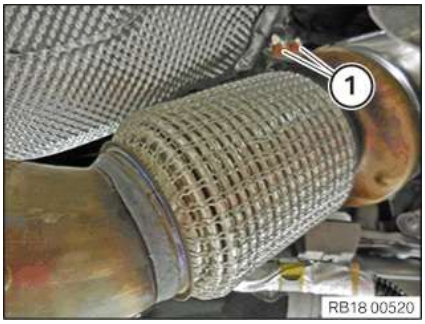


- **If installed: Disconnect pressure hose.**

  Pull off pressure hose (1) in direction of arrow and set it aside.



- Loosen V-band clamp (1).



- Loosen nuts (1).

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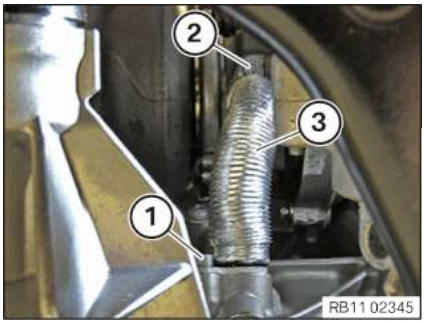


- Unlock and loosen clamp (1).
- Feed out catalytic converter and remove.

45 – Removing the oil return line for the exhaust turbocharger

TECHNICAL INFORMATION

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



- Have cleaning rags ready for any escaping engine oil.
- Loosen screws (1) and (2).
- Guide out and remove the oil return line (3).

46 – If installed: Partially release the engine oil cooler

WARNING

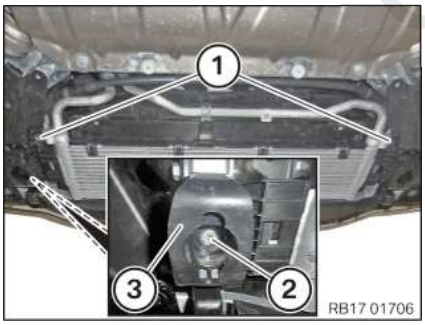
Hot surfaces.

Risk of burning!

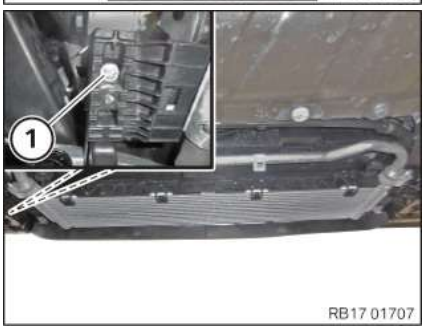
- Perform all work only on components that have cooled down.

TECHNICAL INFORMATION

The work must be performed with care to prevent component damage.

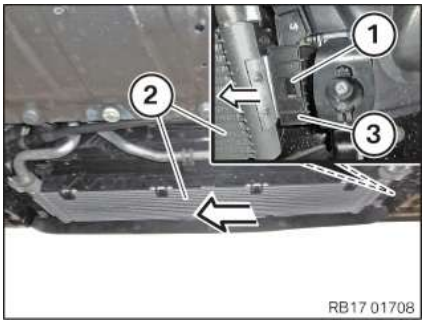


- Loosen screws (1).
- Drill out rivet on the left (2).
- Remove the left-hand damper (3).

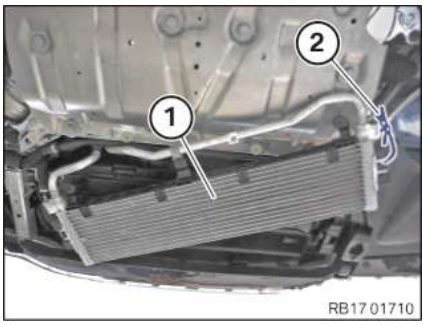


- Loosen screw (1).

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- Unlock lock (1).
- Feed out engine oil cooler (2) from the holder in the direction of arrow (3) and place to one side.



- Affix the engine oil cooler (1) with a cable strap (2) as shown.

47 – Draining the coolant from the low-temperature cooling system

WARNING

Hot surfaces.

Risk of burning!

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

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

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

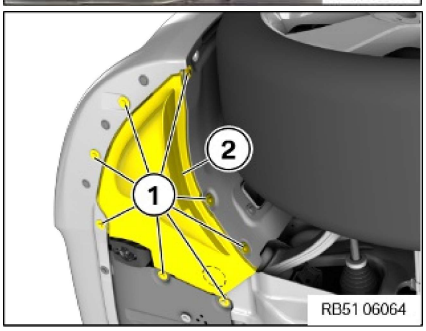
In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

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

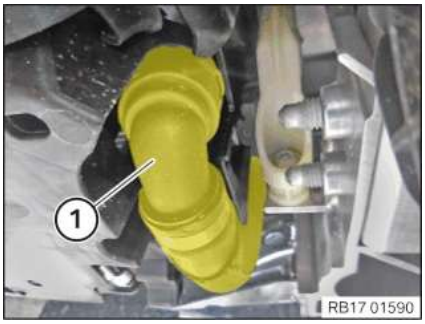


- Loosen sealing cap (1).



- Loosen screws (1).
- Guide out and remove bottom left cover (2) to the front.

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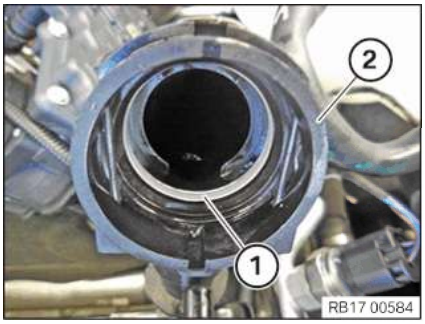


- Unlock and disconnect the coolant line (1).
- Catch and dispose of escaping coolant.

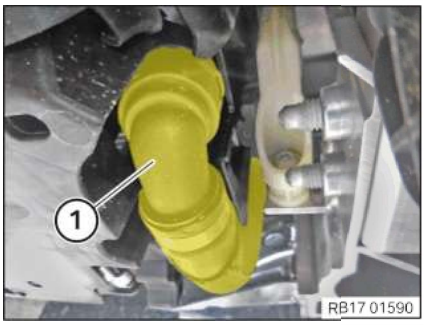
48 – Connecting the coolant lines for the low-temperature coolant circuit

TECHNICAL INFORMATION

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

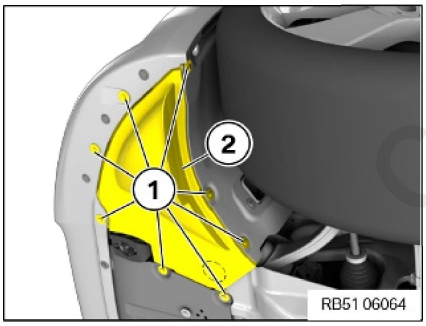


- Check the sealing rings (1) of the coolant lines (2) for damage and renew if necessary.



- Connect and lock the coolant line (1).

  The coolant line (1) must audibly engage.



- Feed in and install cover (2) at the bottom front left.
- Tighten the screws (1).

Cover, front bottom on side

Hexagon screw for thermoplastic		Tightening torque	3 Nm

49 – Draining the coolant from the high-temperature cooling system

WARNING

Hot fluids.

Risk of scalding!

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

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CAUTION

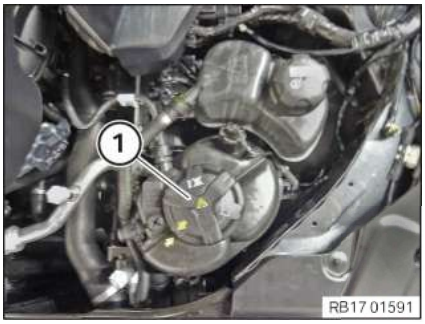
Materials harmful to health.

Contact with fluids harmful to health!

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

TECHNICAL INFORMATION

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



- Loosen sealing cap (1).

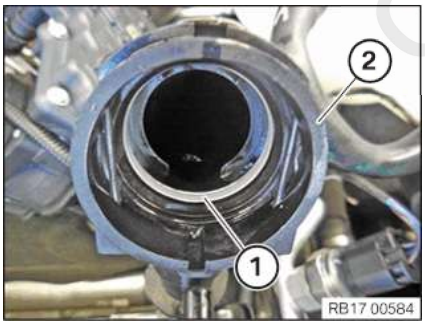


- Unlock lower right coolant hose (1) on the high-temperature coolant radiator and pull it off.
- Catch and dispose of escaping coolant.

50 – Connecting coolant hose to high-temperature coolant radiator

TECHNICAL INFORMATION

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



- Check the sealing rings (1) of the coolant lines (2) for damage and renew if necessary.



- Connect coolant hose (1), bottom right to the high-temperature coolant radiator and lock it audibly.

51 – Remove the coolant line between the cylinder head and the coolant pump

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WARNING

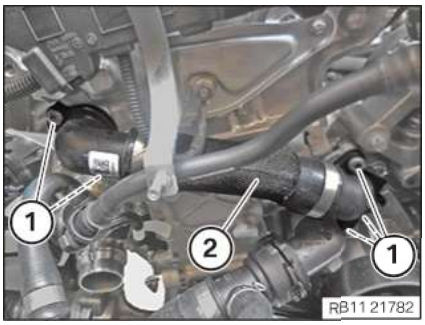
Hot surfaces.

Risk of burning!

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

TECHNICAL INFORMATION

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



- Loosen screws (1).
- Remove the coolant line (2).
- Catch and dispose of escaping coolant.

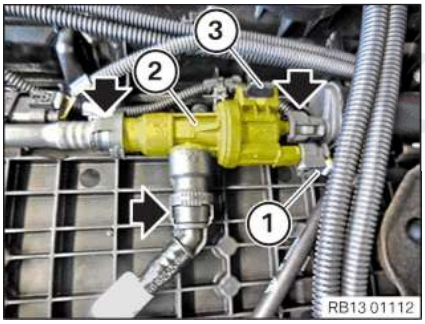
52 – Remove tank vent valve

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

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



- Unlock and disconnect connector (1).
- Unlock and disconnect the tank ventilation lines (arrows).
- Detach and remove the tank vent valve (2) from the holder (3).

53 – Removing the intake plenum

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

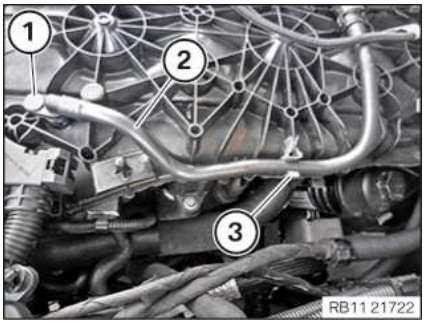
- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

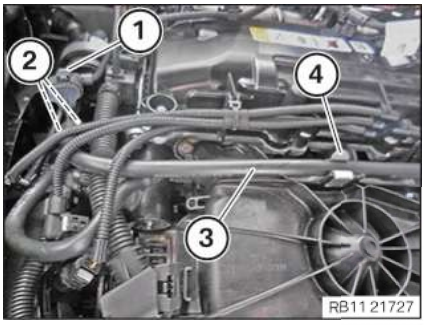
Additional coolant can escape. Make sure that no coolant enters the intake port of the cylinder head.

TECHNICAL INFORMATION

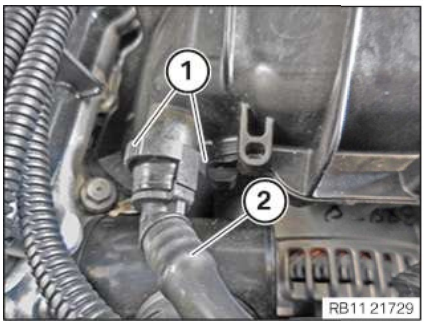
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



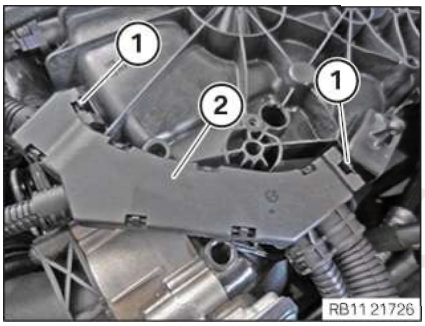
- Loosen screw (1).
- Guide tank ventilation line (2) out of clamp (3) and remove it.



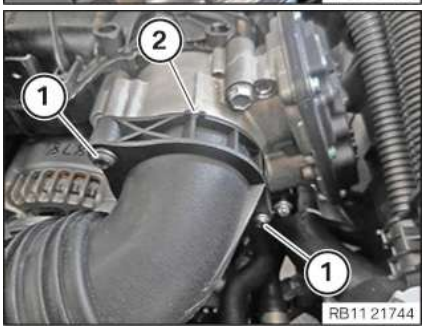
- Unlock and loosen connector (1).
- Unlock the locks (2).
- Guide tank ventilation line (3) out of clamp (4) and remove it.



- Unlock the locks (1).
- Feed the tank ventilation line (2) out and set it aside.

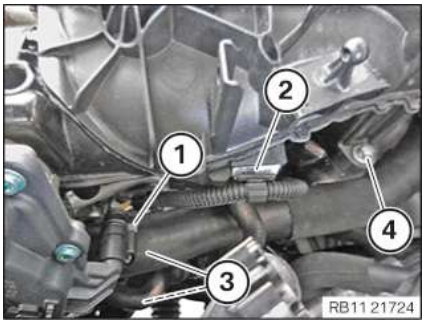


- Unlock the locks (1).
- Guide out the wiring harness section (2) for the sensor system **2** and place to one side.

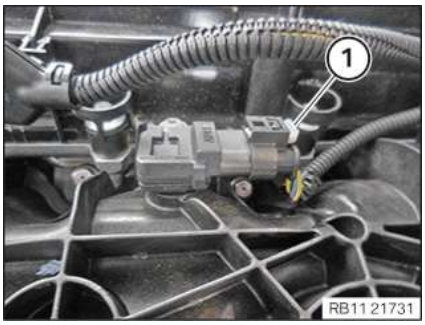


- Loosen screws (1).
- Feed out charge air line (2) and place to one side.

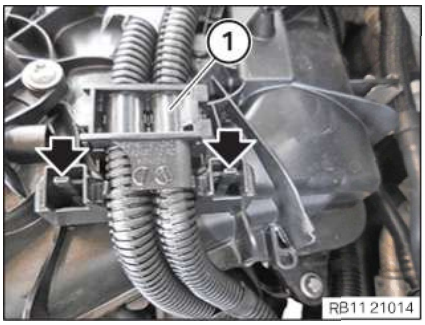
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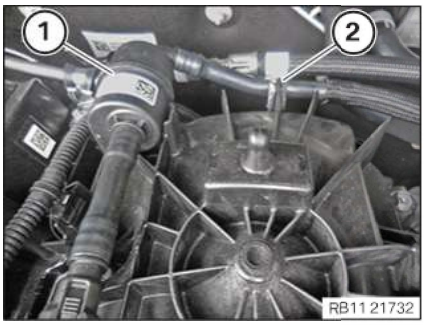
- Unlock and loosen connector (1).
- Loosen clamp (2).
- Thread off coolant line (3) and place to the side.
- Loosen screw (4).



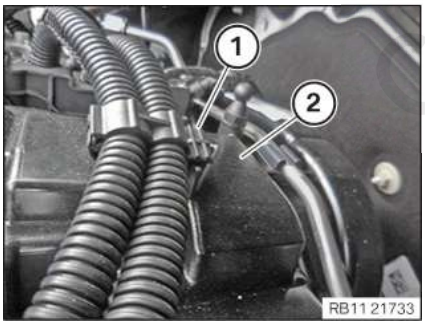
- Unlock and loosen connector (1).



- Unlock the locks (arrows).
- Thread out the wiring harness section (1) for the injectors and ignition coils and set it aside.



- Guide tank ventilation line (1) out of clamp (2) and place it aside.

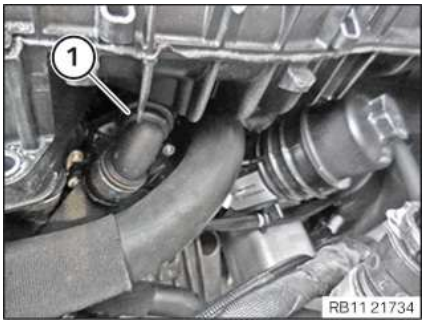


- Guide out the wiring harness section (1) for the injectors and ignition coils of the cylinder head cover (2) and set it aside.

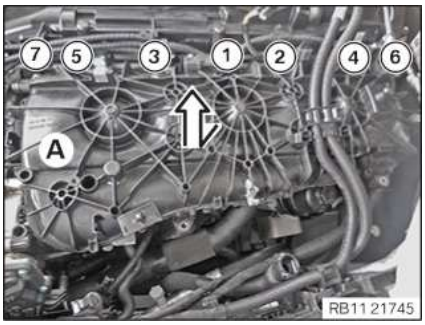


- Loosen screw (1).

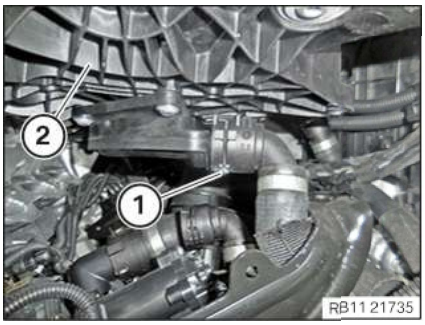
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- Unlock and loosen coolant line (1).
- Catch and dispose of escaping coolant.



- Loosen screws in the order (7) to (1).
- Slightly raise intake plenum (A) in direction of arrow.



TECHNICAL INFORMATION

Additional coolant can escape. Make sure that no coolant enters the intake port of the cylinder head.

- Unlock and release coolant line (1) below the intake plenum (2).
- Catch and dispose of escaping coolant.
- Thread out intake plenum (2) and remove.

54 – Block the engine with the special tool in TDC firing position



- Thread the sealing cap (1) out and remove.



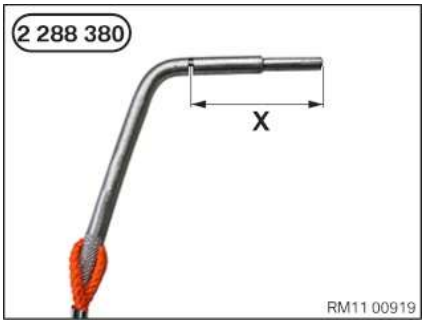
RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Turn the engine in **direction of arrow** with the special tool 0 493 380 (11 6 480) to the TDC firing position of **cylinder 1**.

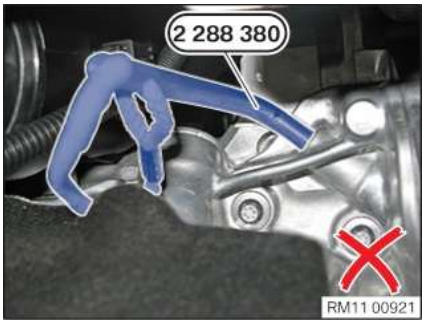


- **Vehicles with automatic transmission:**

  Dimension (X) = 66 mm

  The special tool 2 288 380 must be inserted in the dowel hole to dimension (X).

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- **Vehicles with automatic transmission:**

  Special tool 2 288 380 **incorrectly** positioned.

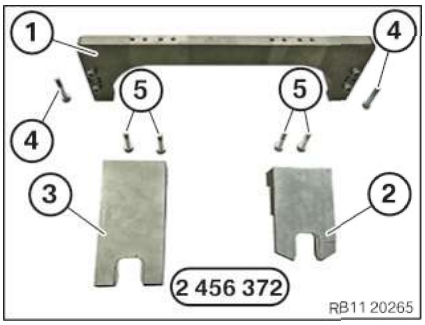
  The TDC firing position of cylinder 1 was **not** reached.



- **Vehicles with automatic transmission:**

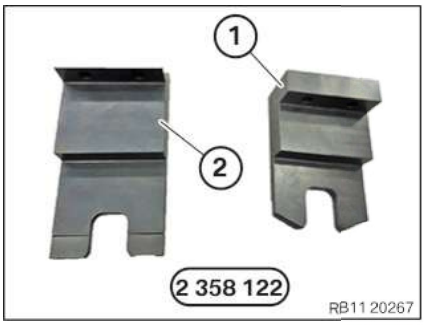
  Special tool 2 288 380 **correctly** positioned.

  The engine is in the TDC firing position of cylinder 1.



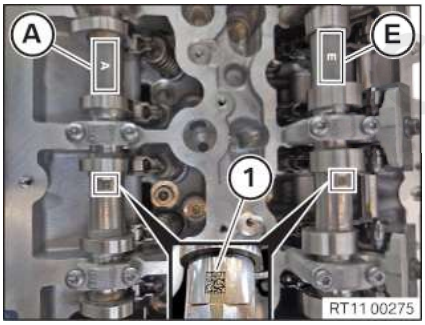
- Overview of the set of special tools 2 456 372:

Number	Description
1	Basic carrier
2	Setting gauge to adjust the intake camshaft
3	Setting gauge to adjust the exhaust camshaft
4	Basic carrier screws on cylinder head
5	Screw gauge on basic carrier

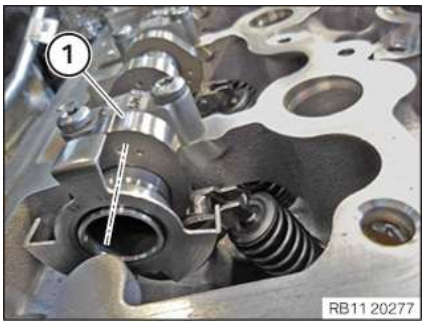


- Overview of the test gauges from the set of special tools 2 358 122:

Number	Description
1	Test gauge to fix the intake camshaft
2	Test gauge to fix the exhaust camshaft



- Turn intake camshaft (E) and exhaust camshaft (A) until marks (1) can be read from the top.

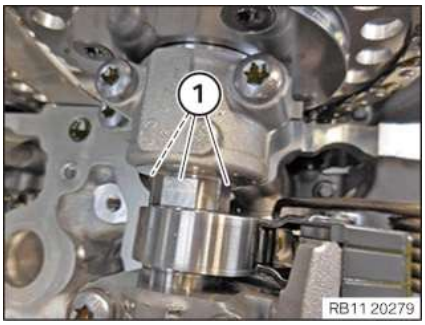


- Ensure that the cam (1) on the exhaust camshaft on **cylinder 1** points to the inside right at a slight angle.

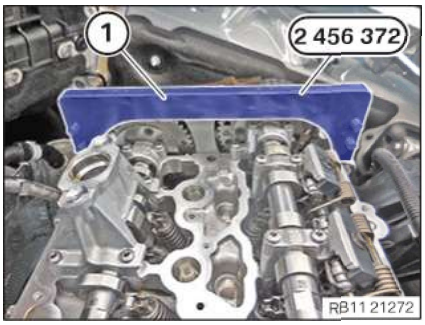
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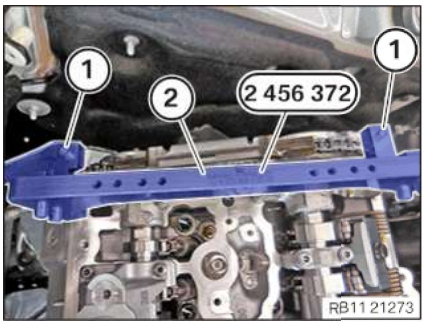
- Ensure that the cam (1) on the intake camshaft on **cylinder 1** points to the inside left at an angle.



- Ensure that the flattened areas (1) on the intake camshaft and the exhaust camshaft point upwards.



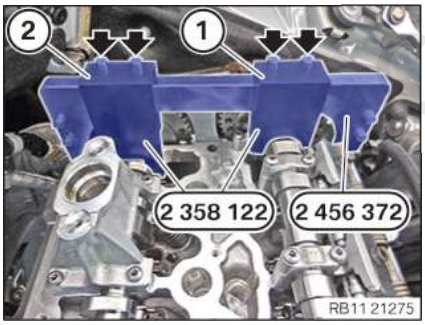
- Position basic carrier (1) from the set of special tools 2 456 372 on the cylinder head.



- Tighten the screws (1) from the set of special tools 2 456 372 on the basic carrier (2).

Basic carrier to cylinder head

M6		Tightening torque	8 Nm



- Position the test gauge (1) from the set of special tools 2 358 122 between the intake camshaft and the basic carrier from the set of special tools 2 456 372.
- Position the test gauge (2) from the set of special tools 2 358 122 between the exhaust camshaft and the basic carrier from the set of special tools 2 456 372.
- Tighten screws (arrows).

Test gauge to basic carrier

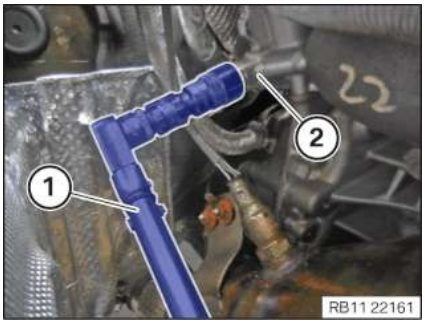
M6		Tightening torque	8 Nm

55 – Removing chain tensioner

TECHNICAL INFORMATION

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

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- A small amount on engine oil emerges when removing the chain tensioner (2), have a cleaning cloth ready.
- Release the chain tensioner (2) with conventional tools (1).



- Feed out and remove the chain tensioner (1).

56 – Releasing the VANOS central valve of the intake adjuster



- To release the VANOS central valve (1), use the reversible ratchet (2) from the special tool 0 496 855 with the special tool 2 450 487.



NOTICE

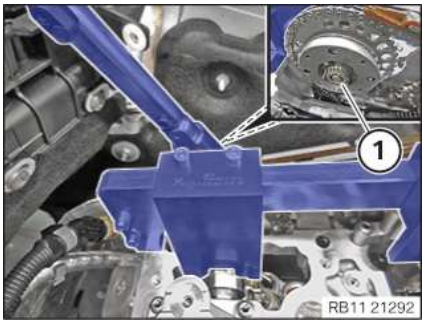
The figure shows the rear side of the engine.

- Release the VANOS central valve (1) of the intake adjuster.

57 – Releasing VANOS central valve of the exhaust camshaft adjuster



- To release the VANOS central valve (1), use the reversible ratchet (2) from the special tool 0 496 855 with the special tool 2 450 487.



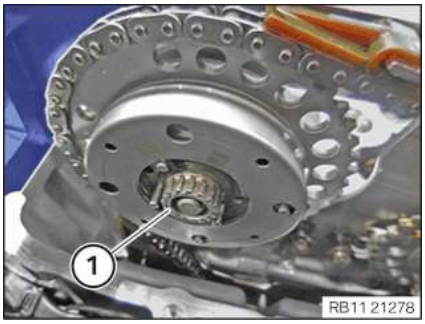
NOTICE

The figure shows the rear side of the engine.

- Release the VANOS central valve (1) of the exhaust camshaft adjuster.

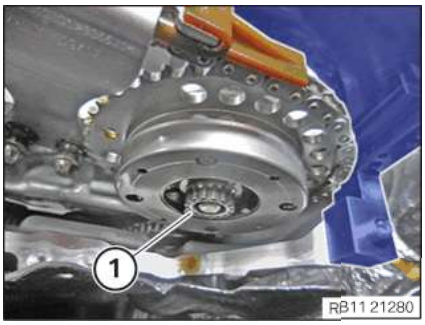
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58 – Removing the VANOS central valve of the intake adjuster



- Guide out and remove the VANOS central valve (1) of the intake adjuster.

59 – Remove the VANOS central valve of the exhaust camshaft adjuster

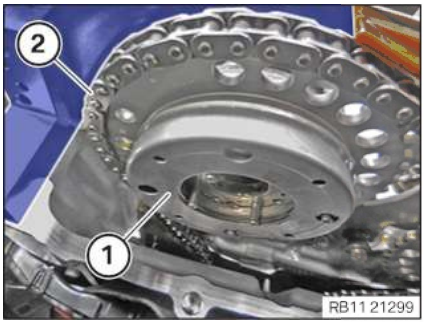


- Guide out and remove the VANOS central valve (1) of the exhaust camshaft adjuster.

60 – Removing intake adjuster

NOTICE

The figure shows the rear side of the engine.

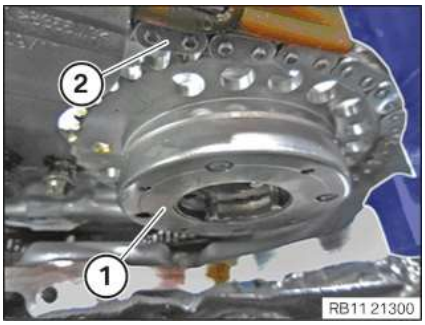


- Guide out the intake adjuster (1) from the timing chain (2) and remove.

61 – Remove exhaust camshaft adjuster

NOTICE

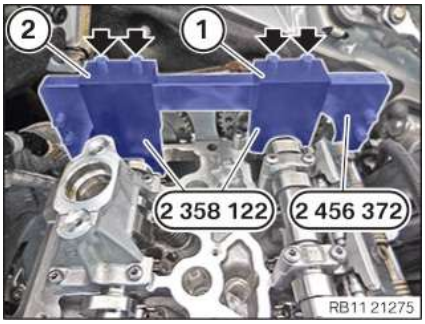
The figure shows the rear side of the engine.



- Guide out the exhaust camshaft adjuster (1) from the timing chain (2) and remove.

62 – Remove the test gauges to fix the camshafts

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- Remove screws (arrows).
- Guide out and remove test gauge (1) from the set of special tools 2 358 122 between the intake camshaft and the basic carrier of the set of special tools 2 456 372.
- Guide out and remove test gauge (2) from the set of special tools 2 358 122 between the exhaust camshaft and the basic carrier of the set of special tools 2 456 372.

MAIN WORK

63 – Remove cylinder head.

CAUTION

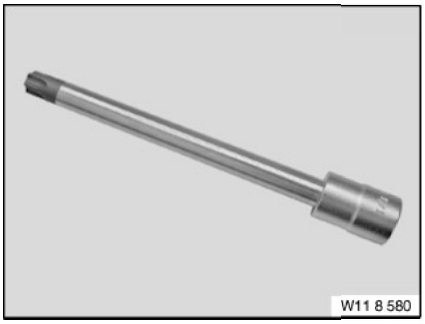
Heavy component.

Heavy components can lead to injury or damage.

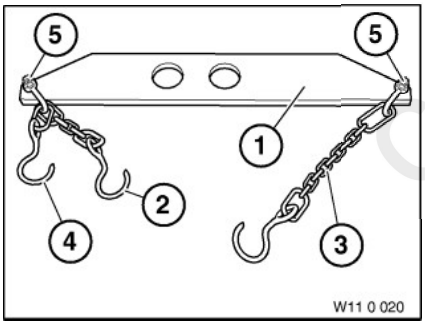
- Remove and install heavy components with the aid of another person/other persons.

TECHNICAL INFORMATION

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



- Prepare special tool 0 495 747 (11 8 580).



- Prepare special tool 0 490 567 (11 0 020).

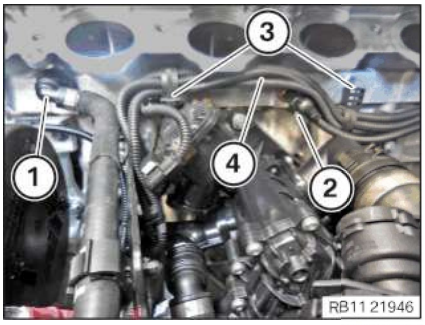
cardiagn.com



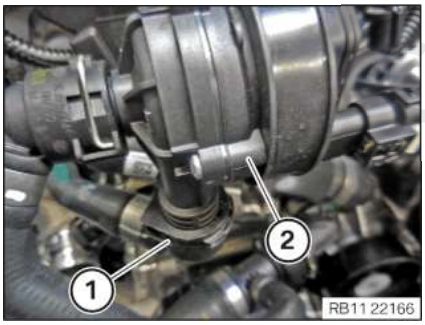
- Prepare the workshop crane 2 220 718.



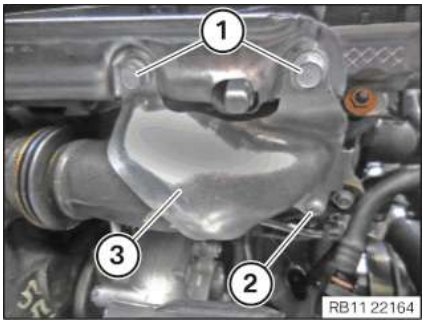
- Unlock plug connection (1) and disconnect.



- Unlock and loosen coolant line (1).
- Catch and dispose of escaping coolant.
- Unlock plug connection (2) and disconnect.
- Loosen clamps (3).
- Feed out wiring harness section (4) for sensor system **1** and set it aside.



- Unlock and release coolant return line (1) on coolant pump (2) for the exhaust turbocharger.
- Catch and dispose of escaping coolant.

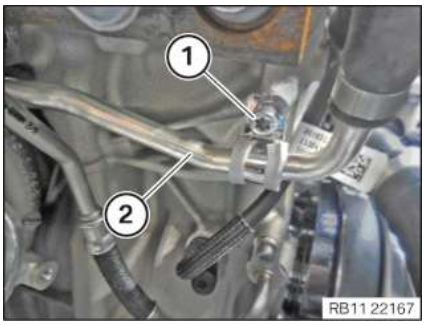


- Loosen screws (1).
- Loosen screw (2).
- Feed out and remove the heat shield (3).

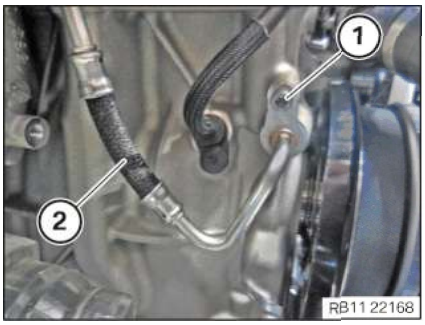
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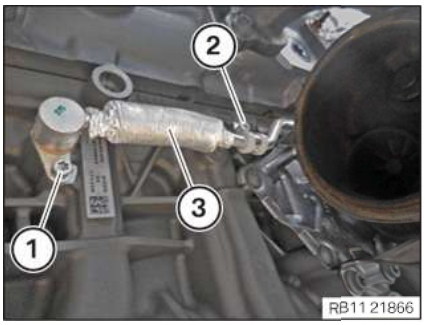
- Loosen screws (1).
- Feed out and remove the heat shield (2).



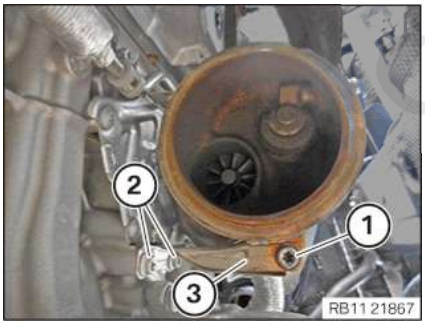
- Release screw (1) on coolant return line (2).



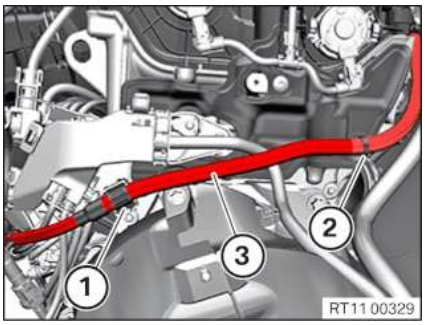
- Loosen screw (1).
- Guide out oil feed line (2) for the exhaust turbocharger and place it aside.
- Catch and dispose of emerging engine oil.



- Loosen screws (1) and (2).
- Guide the coolant feed line for exhaust turbocharger (3) from the crankcase and place it aside.
- Catch and dispose of escaping coolant.

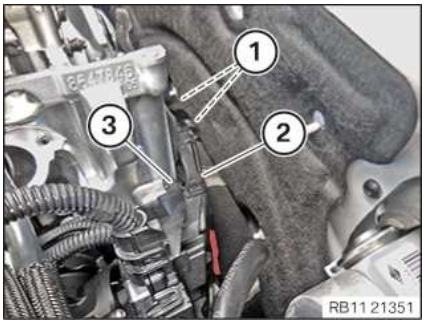


- Loosen screws (1) and (2).
- Feed the support (3) out and remove.

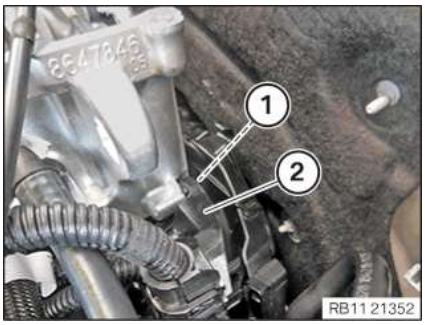


- Unlock and release clamps (1) and (2).
- Feed out positive battery cable (3) and put to one side.

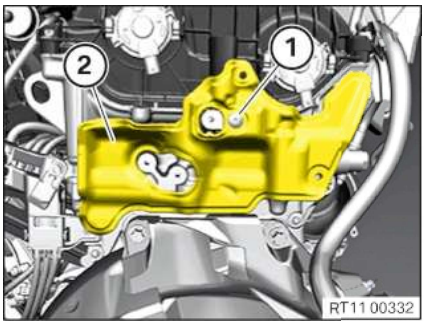
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- Loosen screws (1).
- Guide out transmission wiring harness (2) on wiring harness section (3) for sensor system 1 and set it aside.



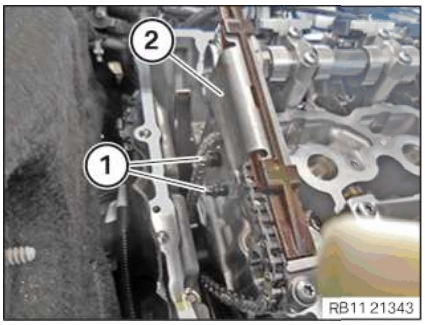
- Loosen screw (1).
- Guide out the wiring harness section (2) for sensor system 1 and place to one side.



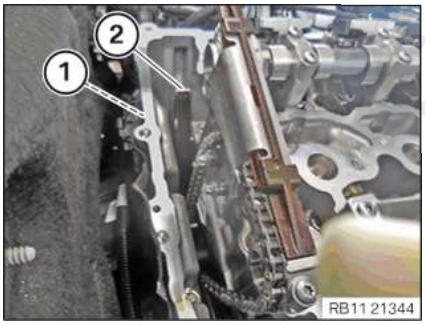
NOTICE

The figure shows the rear side of the engine.

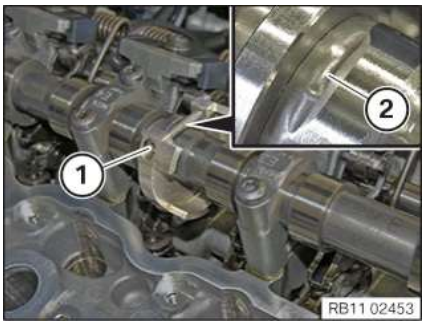
- Loosen screw (1).
- Guide out and remove the cover (2).



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



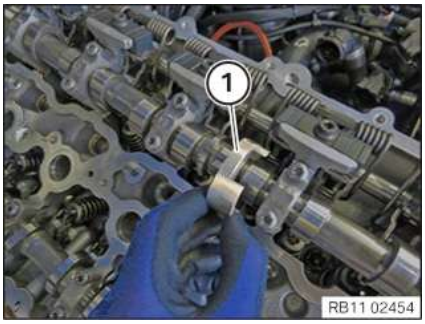
- Release the bearing journal (1) from the guide rail (2).



- Rotate intake camshaft, if necessary in the position shown.

  The recess (2) must point upwards.
- Loosen screw (1).

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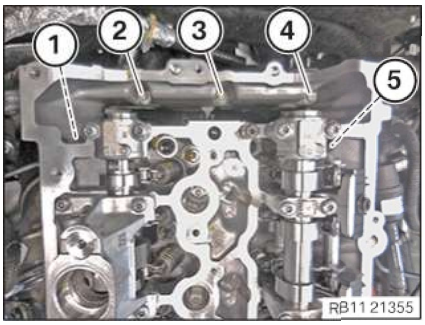
- Slide camshaft sensor wheel (1) in the direction of cylinder 1 and guide it out from the intake camshaft.



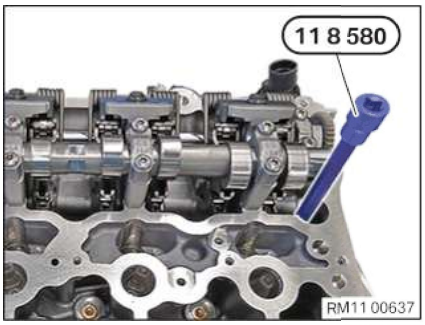
- Guide in and position special tool on the cylinder head.
- Tighten the screws (1) of special tool .

Special tool to cylinder head

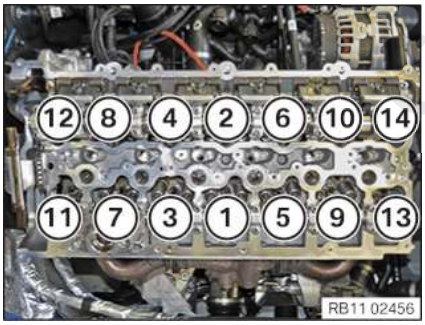
M8		Tightening torque	21,5 Nm



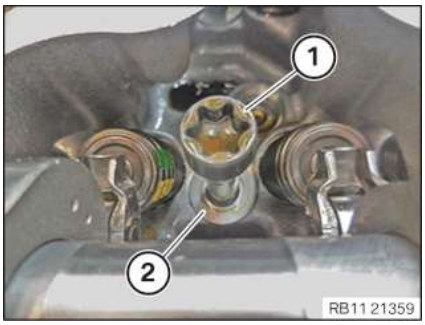
- Loosen the cylinder head bolts in the sequence from (5) to (1).



- Release cylinder head bolts with the special tool 0 495 747 (11 8 580).

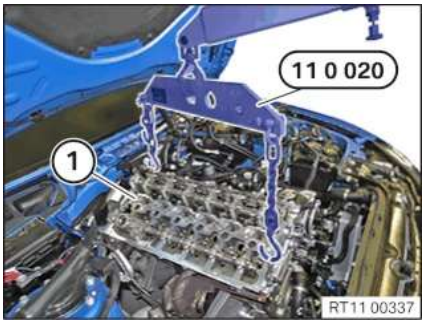


- Undo the screws using the special tool 0 495 747 (11 8 580) in the order (14) to (1) .



- Feed out and remove all the cylinder head bolts (1).
- Feed out and remove all the washers (2).

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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

RISK OF DAMAGE

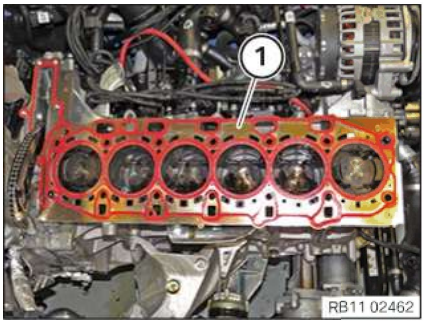
Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

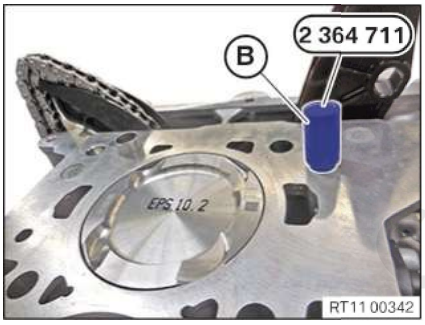
- Attach special tool 0 490 567 (11 0 020) to workshop crane.
- Lift out cylinder head (1) and the exhaust turbocharger with an auxiliary person, the workshop crane and special tool 0 490 567 (11 0 020).

64 – Removing the cylinder head gasket



- Thread out and remove cylinder head gasket (1).

65 – Sealing the oil duct



- Seal the oil duct using special tool (B) from the set of special tools 2 364 711.

66 – Clean sealing surfaces

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

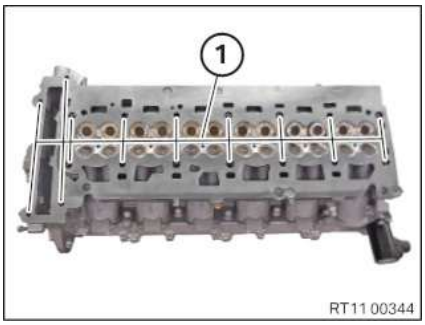


- Remove coarse backlogs from the sealing surfaces of the cylinder head using special tool 0 495 103 (11 4 471).

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- Remove fine residues from the sealing surfaces of the cylinder head using special tool 0 495 104 (11 4 472).



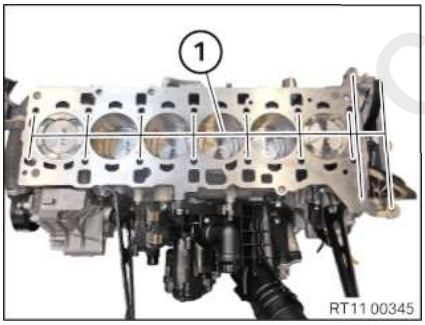
- Clean all blind holes (1) of the cylinder head.



- Remove coarse backlogs from the sealing surfaces of the crankcase using special tool 0 495 103 (11 4 471).



- Remove fine backlogs from the sealing surfaces of the crankcase using special tool 0 495 104 (11 4 472).
- Clean all blind holes of the crankcase.



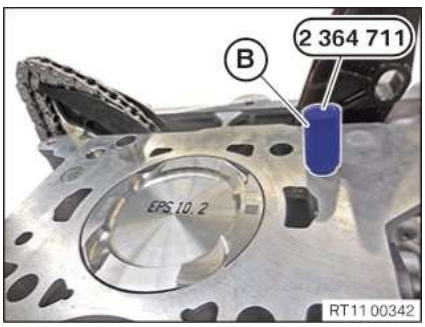
CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

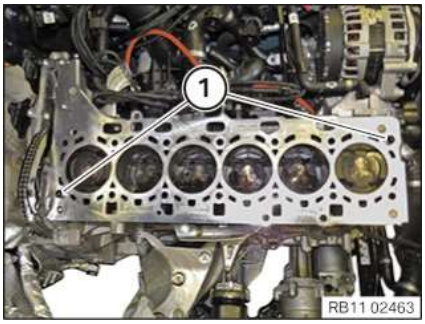
- Wear safety goggles.
- Clean all threaded holes (1) of the crankcase with compressed air.



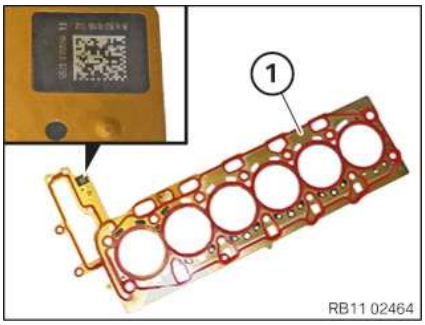
- Remove special tool (B) contained in the set of special tools 2 364 711.

67 – Installing the cylinder head gasket

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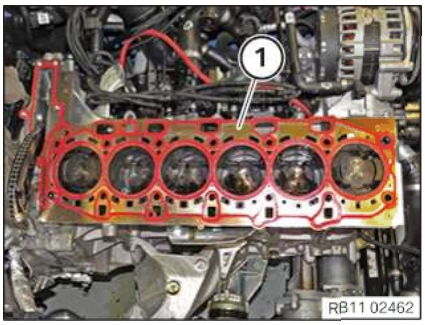


- Check the fitting sleeves (1) for damage and renew if necessary.



- Renew cylinder head gasket (1).

  Parts: Cylinder head gasket
- Install a thicker cylinder head gasket (1) with +0.3 mm in rebuilt cylinder heads.
- Check cylinder head gasket (1) using the part number.



- Install cylinder head gasket (1) and place it correctly on the fitting sleeves.

68 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

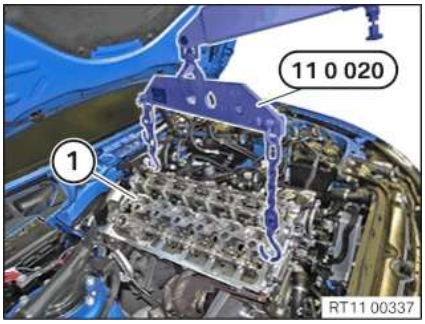
TECHNICAL INFORMATION

Do not remove bolt coating.

TECHNICAL INFORMATION

When replacing the cylinder head: The complete valve control and the Valvetronic servomotor are already pre-assembled for new cylinder heads.

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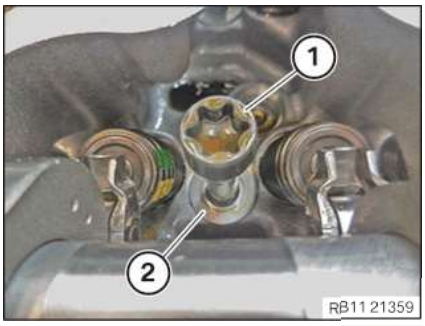
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

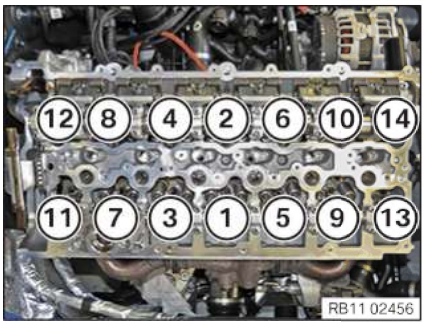
- Feed in, position and install cylinder head (1) and exhaust turbocharger with the help of an auxiliary person, the workshop crane and the special tool 0 490 567 (11 0 020).
- Ensure that the **guide rails** of the timing chain are **not** damaged.



- Insert and install washer (2).
- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do not wash off the coating (1) **of the cylinder head bolts** .
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of crankcase.
- Guide in and install cylinder head bolts (1).



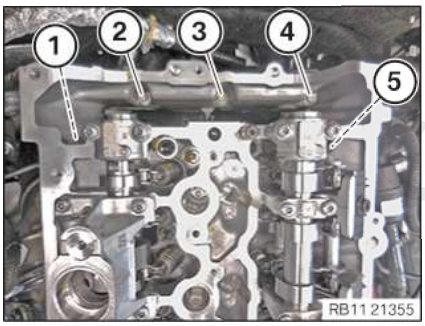
TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Screw in the cylinder head bolts in the sequence (1) to (14).
- Tighten the cylinder head bolts using the special tool 0 495 747 (11 8 580) and 0 490 504 (00 9 120) in the sequence (1) to (14).

Cylinder head to crankcase

M11	Observe tightening sequence. Fit new cylinder head bolts.	1. Jointing torque	30 Nm
		2. Angle of rotation	90 °
		3. Angle of rotation	180 °

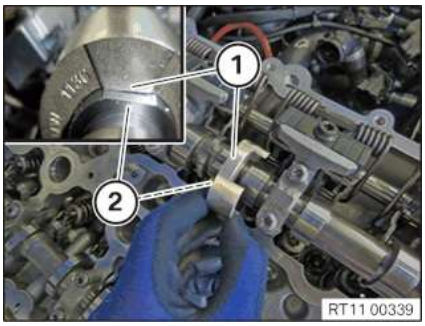


- Renew cylinder head bolts (1) to (5).

  Parts: Cylinder head bolts
- Make sure that there is **no** coolant, water or engine oil in the threaded holes of the timing case cover.
- Screw in cylinder head bolts (1) to (5).
- Tighten the cylinder head bolts in the order (1) to (5).

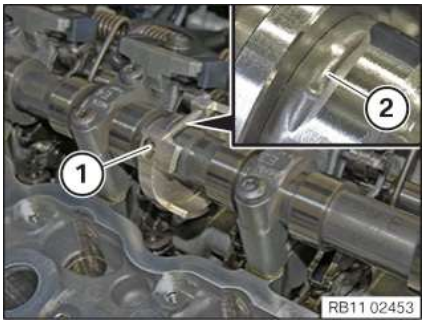
Cylinder head bolt *to timing case cover*

M8x40	Renew screws.	Tightening torque	19 Nm



- Feed in and position camshaft sensor wheel (1) on the intake camshaft (2).

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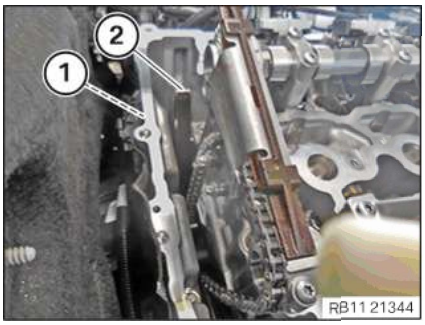
- Rotate intake camshaft, if necessary in the position shown.
  The recess (2) must point upwards.
- Tighten down screw (1).

Camshaft sensor wheel to intake camshaft

M4 x35		4,5 Nm



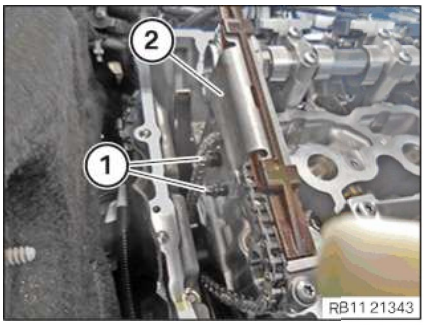
- Renew bearing journal (1).
  Parts: Bearing journal



- Feed in and install bearing journal (1) on the guide rail (2).
- Tighten the bearing journals (1).

Bearing journal to cylinder head

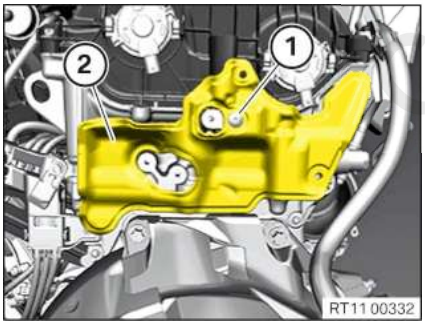
Bearing journal	Renew the bearing journal!	Tightening torque	20 Nm



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

Sliding rail to cylinder head

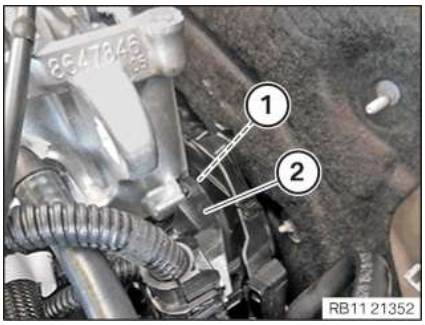
M6x16			8 Nm



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

Cover on rear cylinder head

M6		Tightening torque	8 Nm



RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

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

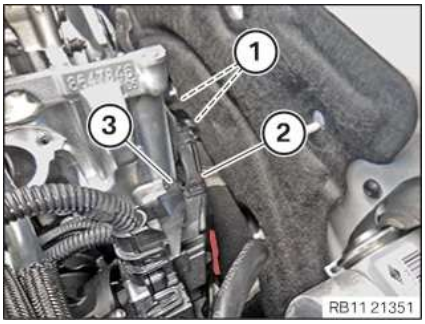
- Route all cables without abrasions, do not trap and crush.

- Guide in and install wiring harness section (2) for sensor system 1.
- Tighten down screw (1).

Cable routing to cylinder head, rear

M6 x 20		Tightening torque	8 Nm

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RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

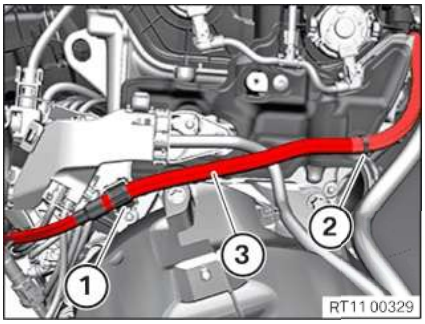
Trapped, crushed or damaged cables may cause short circuits and malfunctions.

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

- Guide in and install transmission wiring harness (2) on wiring harness section (3) for sensor system 1.
- Tighten the screws (1).

Cable routing to cylinder head, rear

M6 x 20		Tightening torque	8 Nm



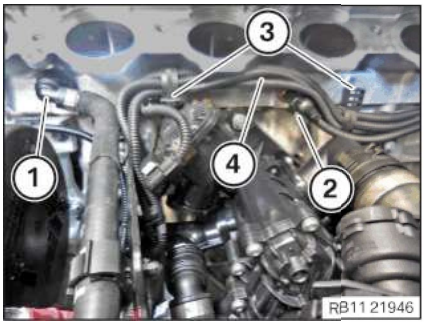
CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

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

- Insert and install the positive battery cable (3).
- Secure clamps (1) and (2).



RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

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

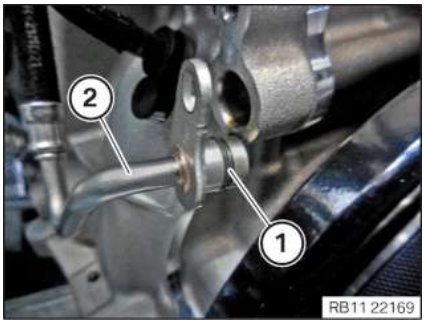
- Route all cables without abrasions, do not trap and crush.

- Connect connectors (2) and lock.

  The connector must engage audibly.
- Guide in and position the wiring harness section (4) of sensor system **1**.
- Secure clamps (3).
- Connect and lock coolant line (1).
- Make sure that the cooling line (1) engages audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

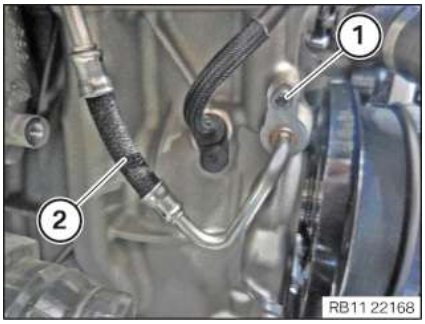




- Renew sealing ring (1) on the oil feed line (2) of the exhaust turbocharger with special tool 0 496 714 (00 9 030).

  Parts: Sealing ring

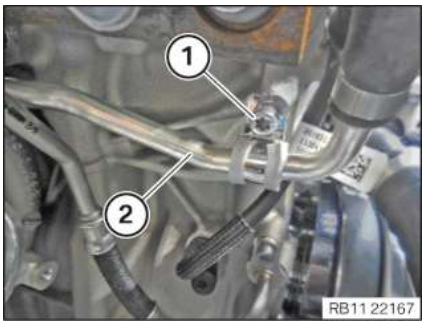
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- Feed in and install the oil feed line (2) for the exhaust turbocharger.
- Tighten down screw (1).

Oil feed line for exhaust turbocharger to crankcase

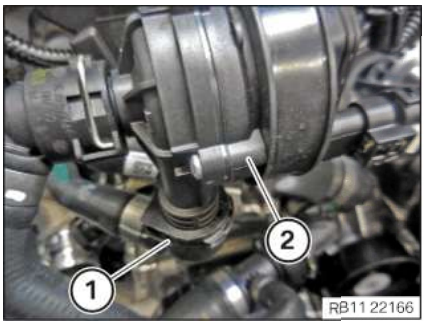
M6 x 12	Replace sealing ring.	Tightening torque	8 Nm



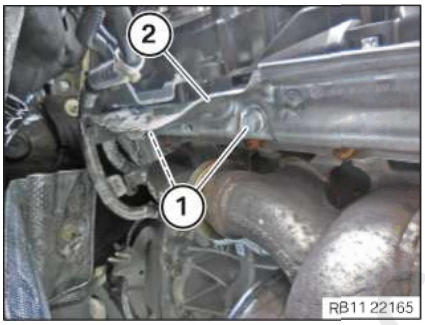
- Tighten screw (1) on the coolant return line (2).

Coolant return line holder bracket to crankcase

M6X12		Tightening torque	8 Nm



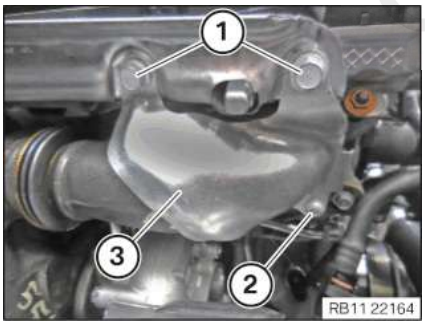
- Connect coolant return line (1) to the coolant pump (2) for the exhaust turbocharger and lock.
  The coolant return line (1) must engage audibly.
- Connect coolant return line (1) for the exhaust turbocharger and lock.
- Ensure the coolant return line (1) audibly engages.



- Feed in and install the heat shield (2).
- Renew screws (1).
  Parts: Bolts
  Tighten the screws (1).

Heat shield to cylinder head

M8X12	Renew screws.	Tightening torque	19 Nm



- Feed in and install the heat shield (3).
- Renew screws (1).
  Parts: Bolts
  Tighten the screws (1).

Heat shield to cylinder head

M8X12	Renew screws.	Tightening torque	19 Nm

- Renew the screw (2).
  Parts: Screw
  Tighten down screw (2).

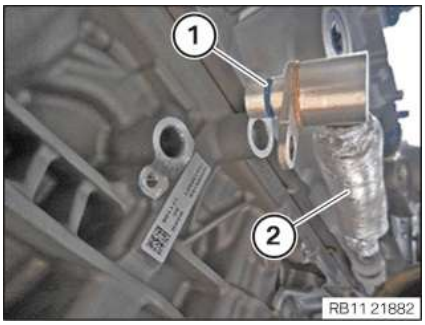
Heat shield to clamping strip

M6X16	Renew screw.	Tightening torque	8 Nm

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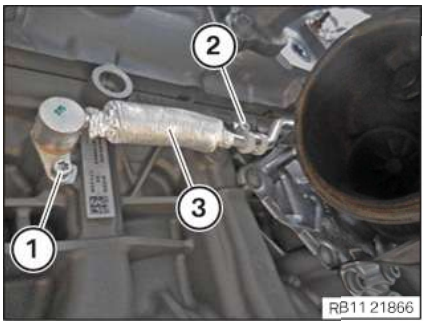


- Unscrew the bolts (1) of the special tool .
- Feed out the special tool at the cylinder head and remove.



- Renew sealing ring (1) on the coolant feed line (2) of the exhaust turbocharger with special tool 0 496 714 (00 9 030).

  Parts: Sealing ring



- Feed in and install coolant feed line for the exhaust turbocharger (3).
- Tighten down screw (1).

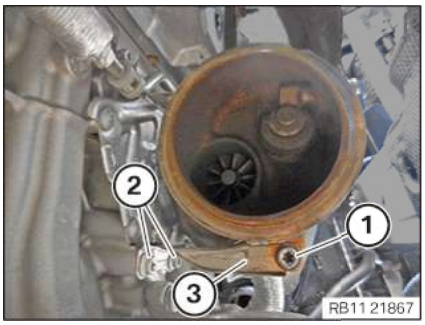
Coolant feed line to crankcase

M6X12		Tightening torque	8 Nm

- Tighten down screw (2).

Coolant feed line to crankcase

M6X12		Tightening torque	8 Nm



- Renew screws (1) and (2).

  Parts: Bolts
- Feed in and install support (3).
- Tighten the screws (2).

Exhaust turbocharger support to crankcase

M8 x 20	Renew screws.	19 Nm

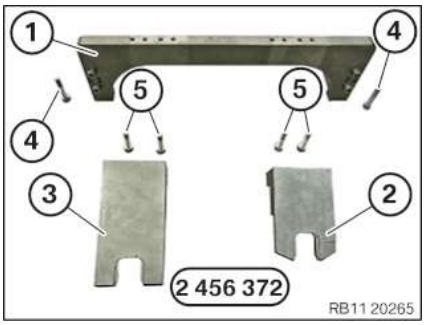
- Tighten the screws (1).

Exhaust turbocharger to support

M8 x 25	Renew screw.	19 Nm

POSTPROCESSES

69 – Adjust the camshafts with the special tool



- Overview of the set of special tools 2 456 372:

Number	Description
1	Basic carrier
2	Setting gauge to adjust the intake camshaft
3	Setting gauge to adjust the exhaust camshaft
4	Basic carrier screws on cylinder head
5	Screw gauge on basic carrier

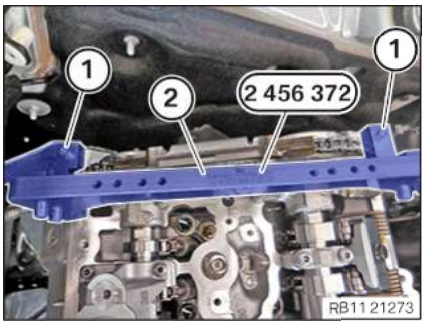
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- Use the setting gauge 0.7 ° (1) from the set of special tools 2 456 372 to adjust the intake camshaft.
- Use the setting gauge 0.5 ° (2) from the set of special tools 2 456 372 to adjust the exhaust camshaft.



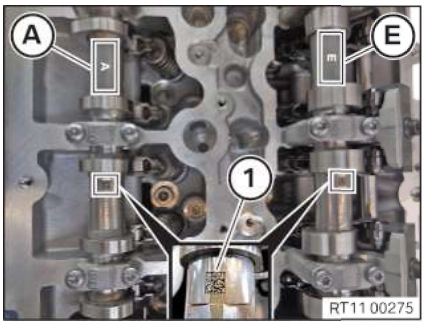
- Position the basic carrier (1) from the set of special tools 2 456 372 on the cylinder head.



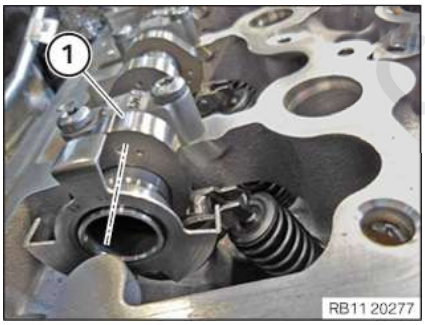
- Tighten the screws (1) from the set of special tools 2 456 372 on the basic carrier (2).

Basic carrier to cylinder head

M6		Tightening torque	8 Nm



- Turn the intake camshaft (E) and the exhaust camshaft (A) such that the marks (1) can be read from the top.

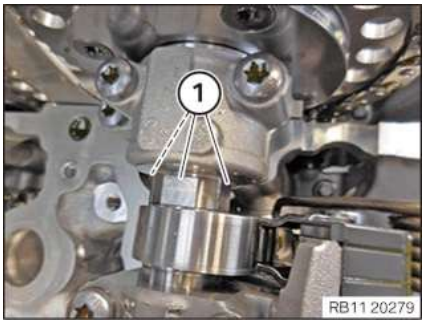


- Ensure that the cam (1) on the exhaust camshaft on **cylinder 1** points to the inside right at a slight angle.

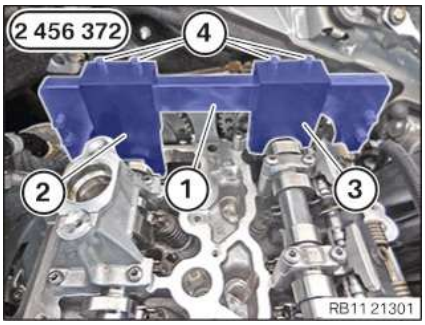


- Ensure that the cam (1) on the intake camshaft on **cylinder 1** points to the inside left at an angle.

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- Ensure that the flattened areas (1) on the intake camshaft and the exhaust camshaft point upwards.



- Position the setting gauge 0.5° (2) from the set of special tools 2 456 372 between the exhaust camshaft and the basic carrier (1) from the set of special tools 2 456 372.
- Position the setting gauge 0.7° (3) from the set of special tools 2 456 372 between the intake camshaft and the basic carrier (1) from the set of special tools 2 456 372.
- Tighten the screws (4).

Test gauge to basic carrier

M6		Tightening torque	8 Nm

70 – Installing the intake adjuster

NOTICE

The figure shows the rear side of the engine.

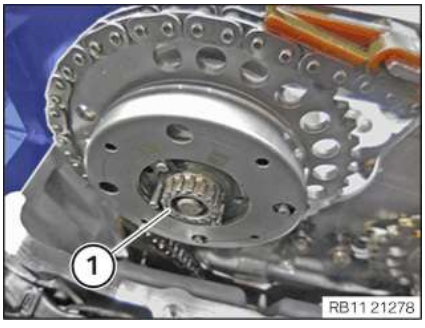


- Keep intake adjuster (1) marked IN ready.



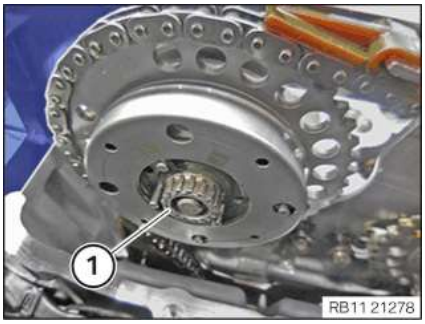
- Feed in intake adjuster (1) in the timing chain (2) and position on the intake camshaft .

71 – Install the VANOS central valve of the intake adjuster

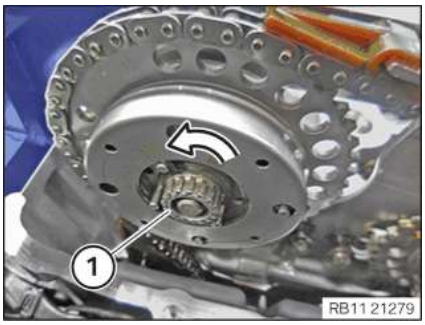


- Guide in the VANOS central valve (1) of the intake adjuster and install.

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- Hand-tighten the VANOS central valve (1) of the intake adjuster.



- Release the VANOS central valve (1) of the intake adjuster in the **direction of the arrow** by 60 °.

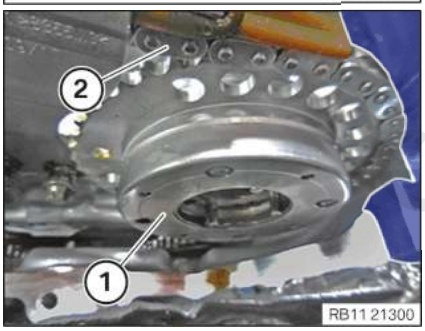
72 – Install exhaust camshaft adjuster

NOTICE

The figure shows the rear side of the engine.

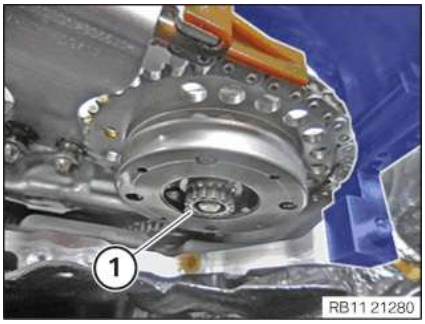


- Keep exhaust camshaft adjuster (1) marked EX ready.



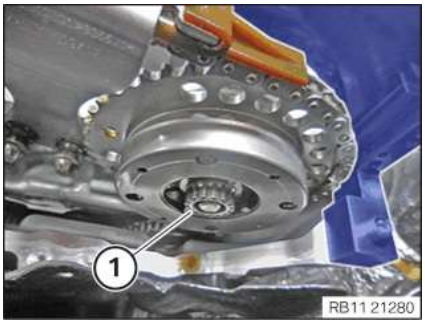
- Feed in exhaust camshaft adjuster (1) in the timing chain (2) and position on the exhaust camshaft .

73 – Installing the VANOS central valve of the exhaust camshaft adjuster

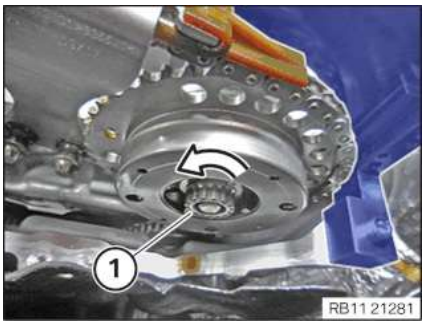


- Guide in the VANOS central valve (1) of the exhaust camshaft adjuster and install.

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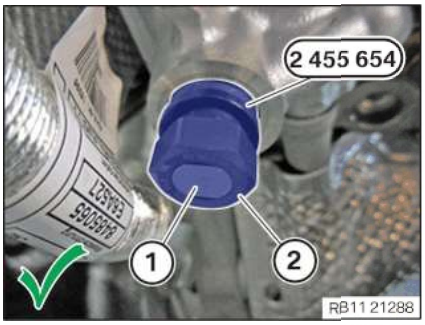


- Hand-tighten the VANOS central valve (1) of the exhaust camshaft adjuster.



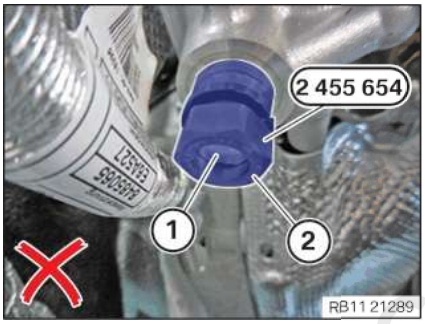
- Release the VANOS central valve (1) of the exhaust camshaft adjuster in the **direction of the arrow** by 60 °.

74 – Pretension the timing chain with the special tool



- Make sure that the timing chain is **correctly** pre-tensioned with the special tool 2 455 654.

  The pin (1) must align **precisely** with housing (2).



- Make sure that the preload of the timing chain is no **insufficient**.

  The preload is insufficient when the pin (1) of the special tool 2 455 654 is not aligned flush with the housing (2).

  The timing chain is **not correctly** pre-tensioned.



- Make sure that the preload of the timing chain is not **too high**.

  The preload is too high when the pin (1) of the special tool 2 455 654 is not aligned flush with the housing (2).

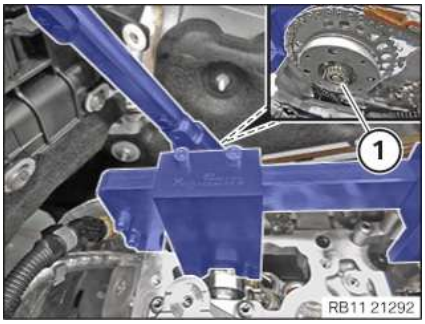
  The timing chain is **not correctly** pre-tensioned.

75 – Tightening the VANOS central valve of the exhaust camshaft adjuster



- To tighten the VANOS central valve (1), use the reversible ratchet (2) from the special tool 0 496 855 with special tool 2 450 487.

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- Tighten the VANOS central valve (1) of the exhaust camshaft adjuster.

VANOS central valve to camshaft

M20 x 1.5		1. Jointing torque	10 Nm
		2. Jointing torque	30 Nm
		3. Jointing torque	50 Nm
		4. Angle of rotation	35 °

76 – Tightening the VANOS central valve of the intake adjuster



- To tighten the VANOS central valve (1), use the reversible ratchet (2) from the special tool 0 496 855 with special tool 2 450 487.

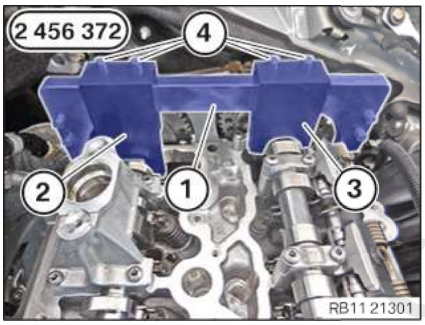


- Tighten the VANOS central valve (1) of the intake adjuster.

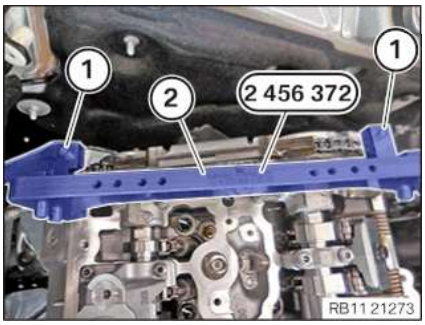
VANOS central valve to camshaft

M20 x 1.5		1. Jointing torque	10 Nm
		2. Jointing torque	30 Nm
		3. Jointing torque	50 Nm
		4. Angle of rotation	35 °

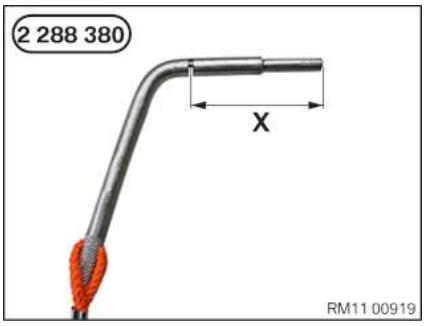
77 – Disassembling all special tools



- Unscrew the bolts (4) from the set of special tools 2 456 372.
- Feed out the setting gauge 0.5 ° (2) from the set of special tools 2 456 372 between the exhaust camshaft and the basic carrier (1) and remove.
- Feed out the setting gauge 0.7 ° (3) from the set of special tools 2 456 372 between the intake camshaft and the basic carrier (1) and remove.



- Unscrew the bolts (1) from the set of special tools 2 456 372.
- Thread the basic carrier (2) out of the special tool 2 456 372 and remove.



- Guide the special tool 2 288 380 out and remove.

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- Guide the special tool 0 493 380 (11 6 480) out and remove.



- Guide the special tool (1)2 455 654 out and remove.

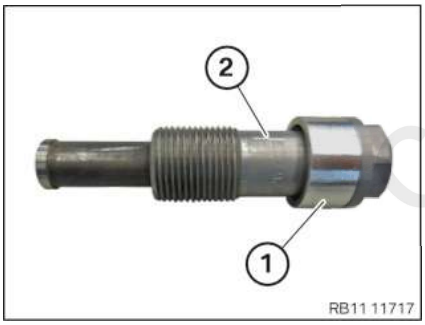
78 – Install chain tensioner

TECHNICAL INFORMATION

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



- Drain the oil chamber in the chain tensioner when reusing the chain tensioner.
- Place the chain tensioner on a level support and slowly compress and release it again in the direction of the arrow.
- Catch and dispose of emerging engine oil.
- Repeat process twice.



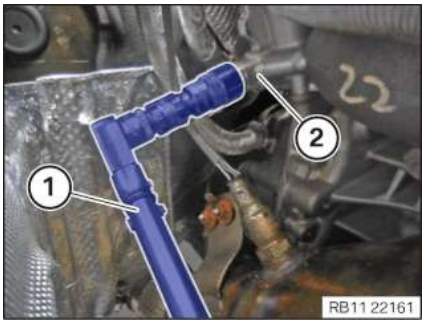
- Renew the sealing sleeve (1).

  Parts: Sealing sleeve
- Guide the sealing sleeve (1) onto the chain tensioner (2) and install.



- Insert and install the chain tensioner (1).

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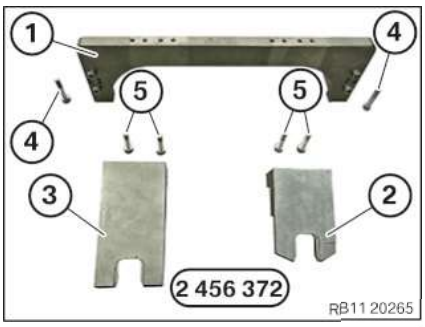


- Tighten the chain tensioner (2) using commercially available tools (1).

Chain tensioner to cylinder head

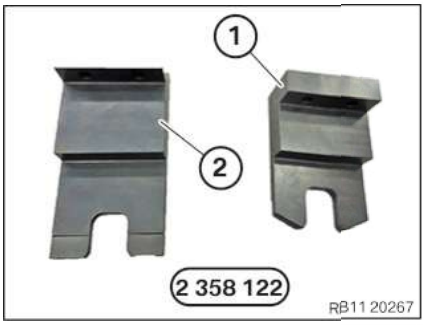
Chain tensioner		Tightening torque	20 Nm
		Angle of rotation	40 °

79 – Checking camshaft timing



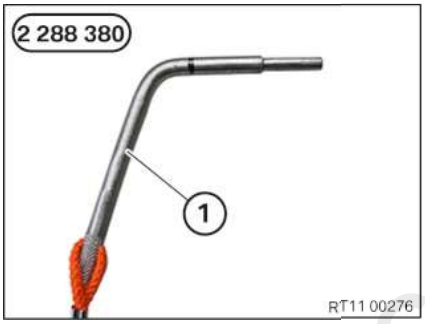
- Have the set of special tools 2 456 372 ready.

Number	Description
1	Basic carrier
2	0.7° setting gauge to adjust the intake camshaft
3	0.5° setting gauge to adjust the exhaust camshaft
4	Basic carrier screws on cylinder head
5	Screw gauge on basic carrier



- Keep the test gauge from the set of special tools 2 358 122 ready.

Number	Description
1	Test gauge to fix the intake camshaft
2	Test gauge to fix the exhaust camshaft



- Have the special tool 2 288 380 ready.

Number	Description
1	Locating stud



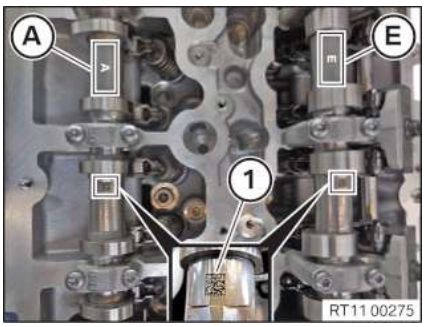
RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

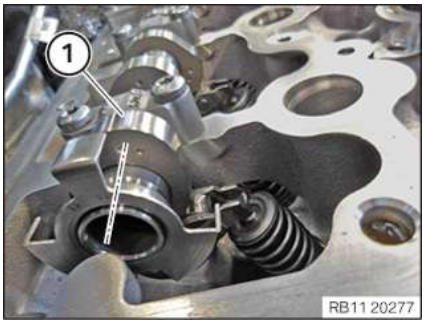
- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Turn the engine with the special tool 0 493 380 (11 6 480) to the TDC firing position of **cylinder 1**.



- Make sure that the marks (1) on the intake camshaft (E) and the exhaust camshaft (A) are legible from above.

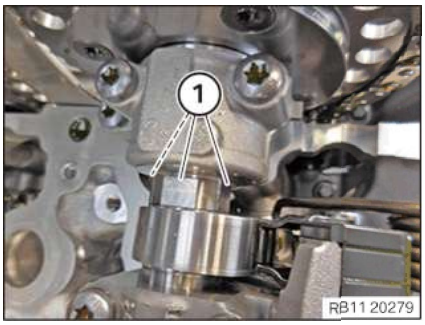
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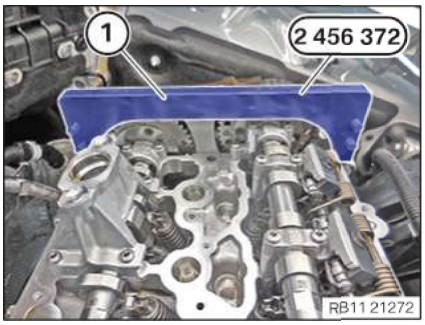
- Ensure that the cam (1) on the exhaust camshaft on **cylinder 1** points to the inside right at a slight angle.



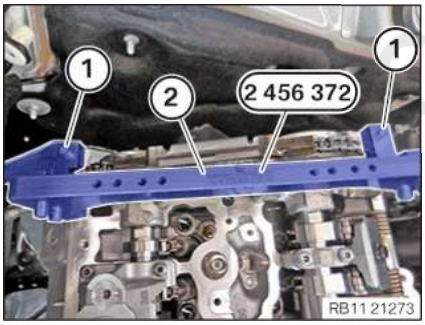
- Ensure that the cam (1) on the intake camshaft on **cylinder 1** points to the inside left at an angle.



- Ensure that the flattened areas (1) on the intake camshaft and the exhaust camshaft point upwards.



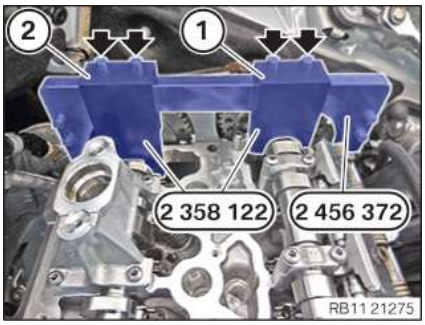
- Position the basic carrier (1) from the set of special tools 2 456 372 on the cylinder head.



- Tighten the screws (1) from the set of special tools 2 456 372 on the basic carrier (2).

Basic carrier to cylinder head

M6		Tightening torque	8 Nm



- Position the test gauge (1) from the set of special tools 2 358 122 between the intake camshaft and the basic carrier from the set of special tools 2 456 372.
- Position the test gauge (2) from the set of special tools 2 358 122 between the exhaust camshaft and the basic carrier from the set of special tools 2 456 372.
- Tighten screws (arrows).

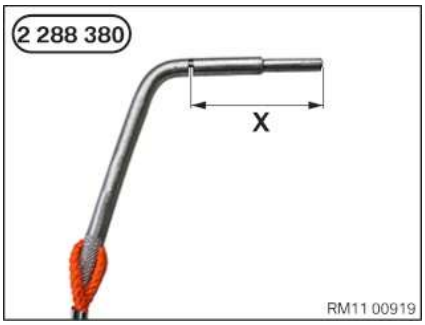
Test gauge to basic carrier

M6		Tightening torque	8 Nm

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- Thread the sealing cap (1) out and remove.



- **Vehicles with automatic transmission:**

  Dimensions (X) = 66 mm

  The special tool 2 288 380 must be inserted in the dowel hole to dimension (X).



- **Vehicles with automatic transmission:**

  Special tool 2 288 380 **incorrectly** positioned.

  The TDC firing position of cylinder 1 was **not** reached.



- **Vehicles with automatic transmission:**

  Special tool 2 288 380 has been **correctly** positioned.

  The engine **is in the** TDC firing position of cylinder 1.

80 – Installing the intake plenum

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

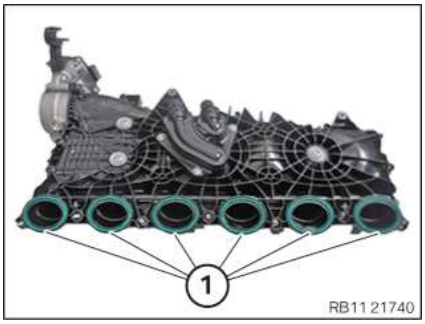
Trapped, crushed or damaged cables may cause short circuits and malfunctions.

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

TECHNICAL INFORMATION

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

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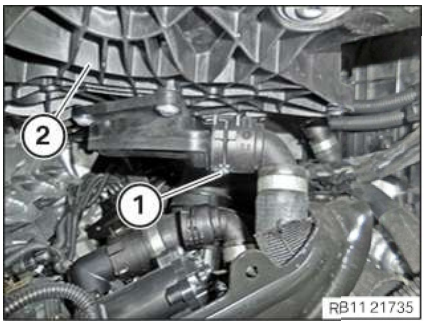


- Renew gaskets (1).

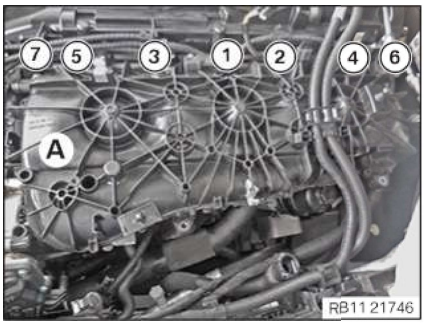
  Parts: Seals



- Clean contact surface (1).



- Feed in and position intake plenum (2).
- Connect and lock coolant line (1).
- Make sure that the cooling line (1) engages audibly.



TECHNICAL INFORMATION

Additional coolant can escape. Make sure that no coolant enters the intake port of the cylinder head.

- Position the intake plenum (A).
- Tighten screws in the order (1) to (7).

Note: Tighten the bolts in 360 degree steps.

Intake plenum to cylinder head

M6		Tightening torque	10 Nm



- Connect and lock coolant line (1).
- Make sure that the cooling line (1) engages audibly.

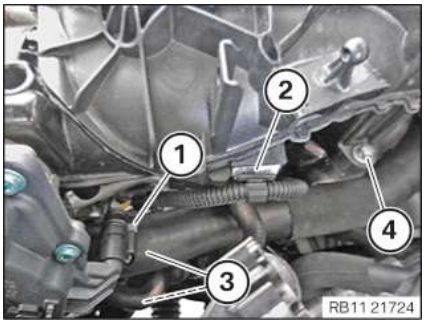


- Tighten down screw 1.

Intake plenum to support

M6X25		Tightening torque	8 Nm

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- Tighten down screw (4).

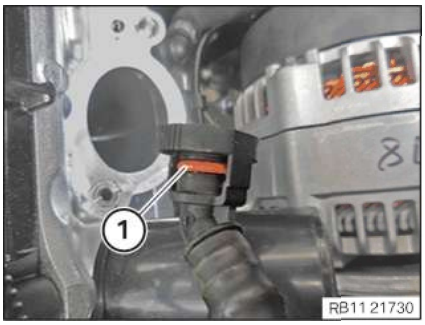
Intake plenum to support

M6X25		Tightening torque	8 Nm

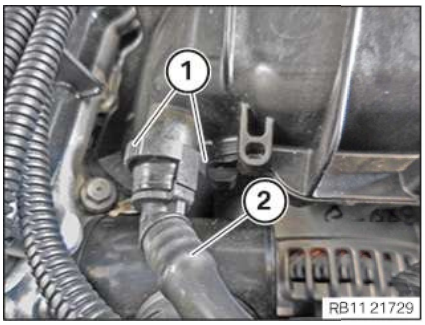
- Thread in and install coolant line (3).
- Secure clamps (2).
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.



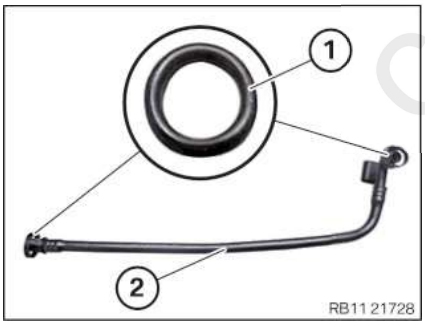
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.



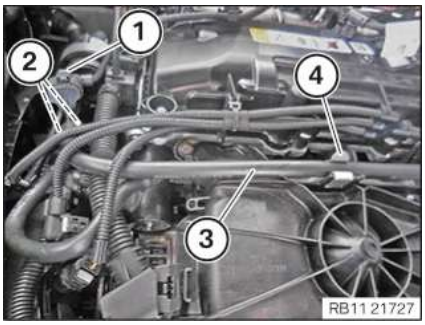
- Check sealing ring (1) for damage and renew tank ventilation line if necessary.



- Insert and install the tank ventilation line (2).
- Ensure that the locks (1) engage audibly.

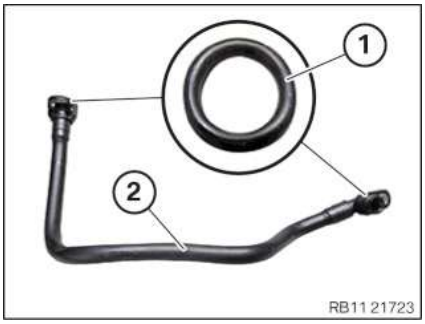


- Check sealing ring (1) for damage and renew tank ventilation line (2) if necessary.

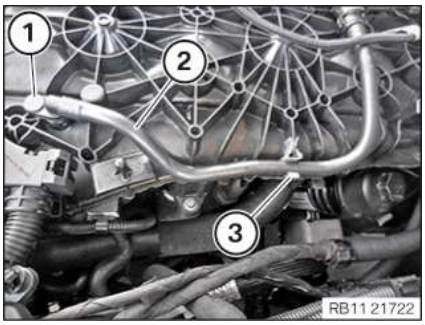


- Insert and install the tank ventilation line (3).
- Ensure that the locks (2) engage audibly.
- Secure the tank ventilation line (3) to the clamp (4).
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

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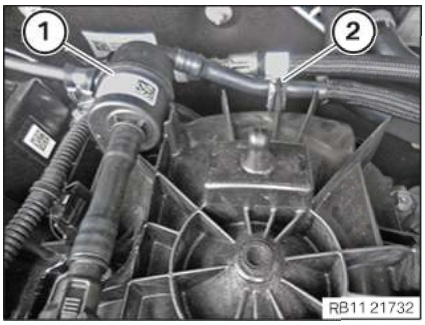
- Check sealing ring (1) for damage and renew tank ventilation line (2) if necessary.



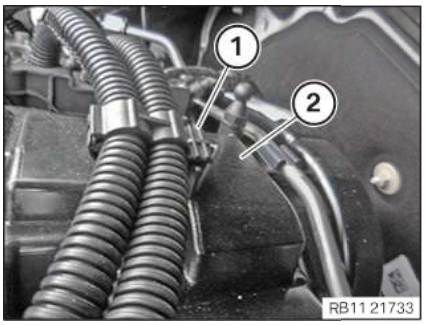
- Insert and install the tank ventilation line (2).
- Secure the tank ventilation line (2) to the clamp (3).
- Tighten down screw (1).

Tank ventilation line to intake plenum

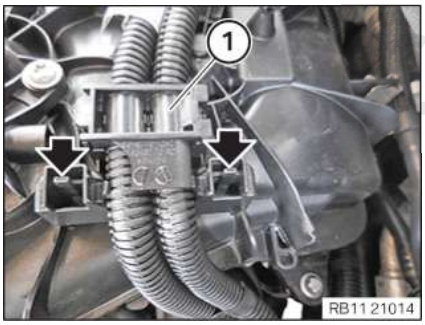
Oval-head screw		Tightening torque	3 Nm



- Insert and install the tank ventilation line (1).
- Secure the tank ventilation line (1) to the clamp (2).

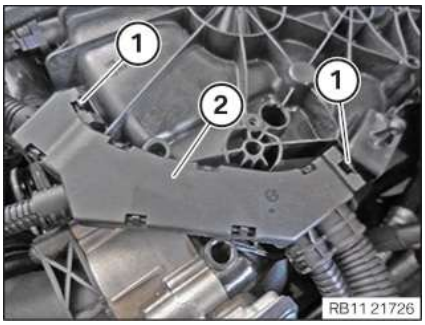


- Secure the wiring harness section(1) for the injectors and ignition coils on the cylinder head cover (2).



- Insert and install the wiring harness section (1) for the injectors and ignition coils.

  The locks (arrows) must engage audibly.

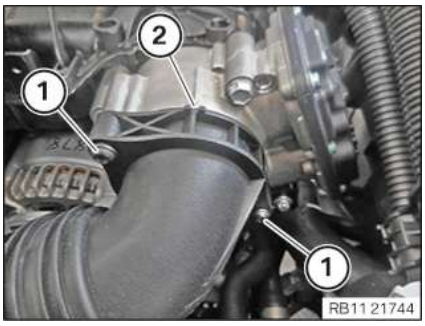


- Feed in and install wiring harness section (2) for sensor system **2**.
- Ensure that the locks (1) engage audibly.

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

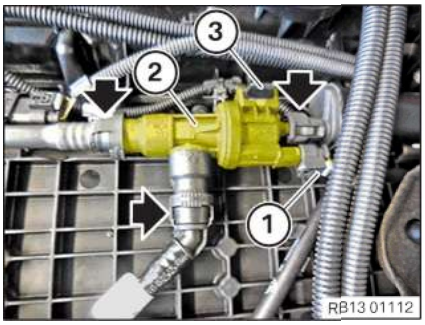


- Insert and install charge air line (2).
- Tighten the screws (1).

Charge air line to throttle valve

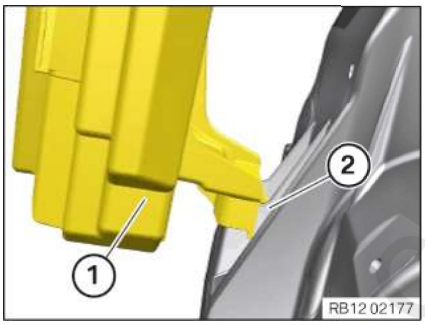
M6x30		Tightening torque	8 Nm

81 – Installing the tank vent valve

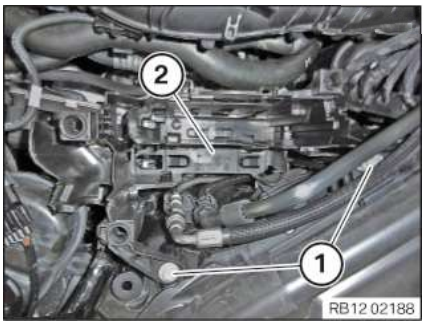


- Secure the tank vent valve (2) to the holder (3).
- Connect and lock the tank ventilation lines (arrows).
  The tank ventilation lines (arrows) must audibly engage.
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.

82 – Installing the control unit holder



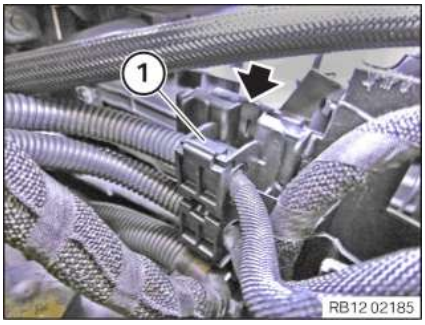
- Make sure the bottom control unit holder (1) is inserted correctly into the fixture (2).



- Guide in and install control unit holder (2).
- Tighten the screws (1).

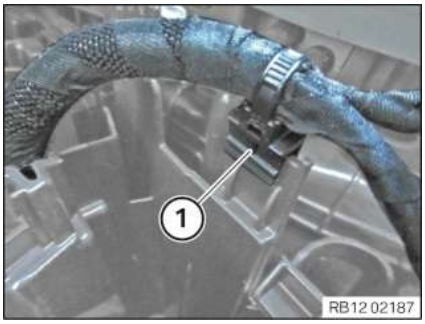
Control unit holder on spring strut dome

Hexagon screw		Tightening torque	8 Nm

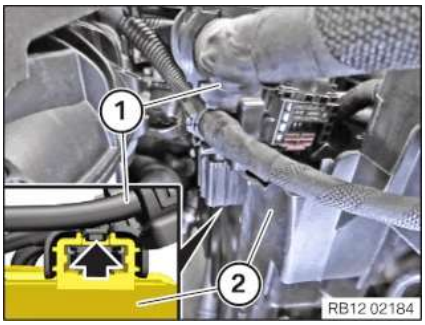


- Feed in and install the cable clip (1).
  Lock (arrow) must audibly engage.

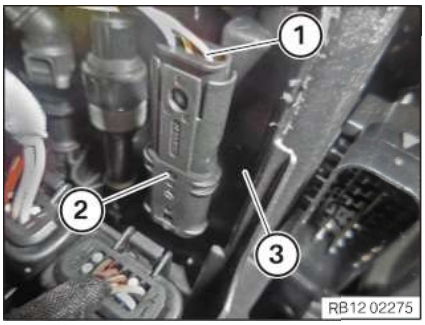
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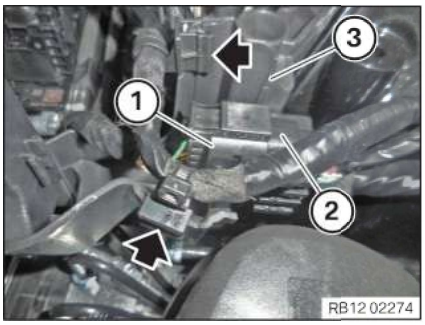
- Secure clamps (1).



- Connect the cable clip (1) with the control unit holder (2) and lock it.
  Lock (arrow) must audibly engage.

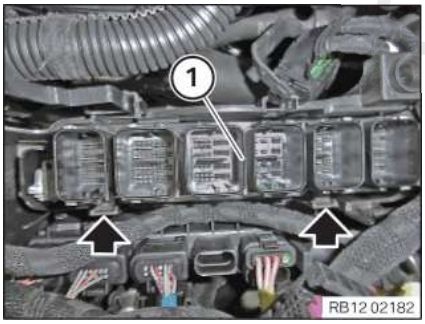


- Connect connector (2) to the control unit holder (3) and lock it.
  The connector (2) must engage audibly.
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.



- Connect and lock the connector (2) with the control unit holder (3).
  The connector (2) must engage audibly.
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.
- Secure the clamps (arrows).

83 – Installing the DME control unit

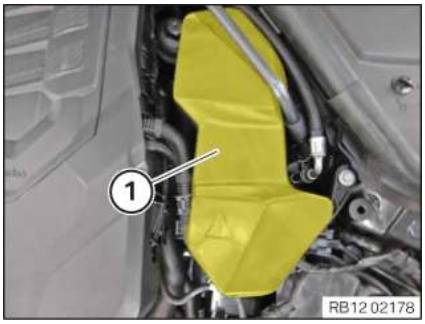


- Feed in and install DME control unit (1).
  The locks (arrows) must engage audibly.



- Connect connectors (1) and lock.
  All connectors (1) must engage audibly.

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- Insert and install cover (1) into guides.

84 – Installing the integrated supply module (PDM)

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

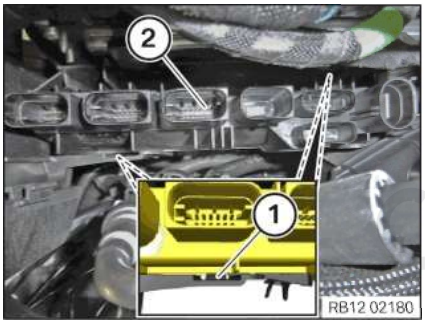
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

RISK OF DAMAGE

Electrostatic discharge.

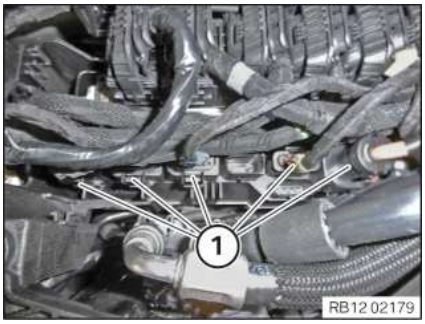
Damage to or destruction of electrical components.

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



- Insert and install the integrated supply module (PDM) (2).

  The latch mechanisms (1) must engage audibly.
- Unlock the latch mechanisms (1).

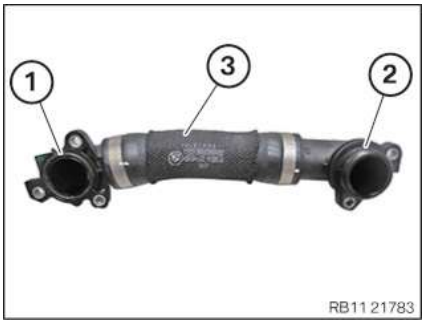


- Connect connectors (1) and lock.

  The connectors (1) must engage audibly.

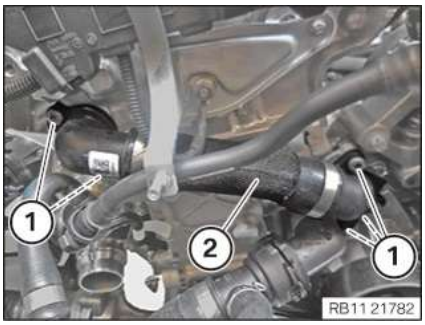
85 – Install the coolant line between the cylinder head and the coolant pump

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- Check sealing rings (1) and (2) for damage; renew coolant line (3) if necessary.

  Parts: Sealing ring



TECHNICAL INFORMATION

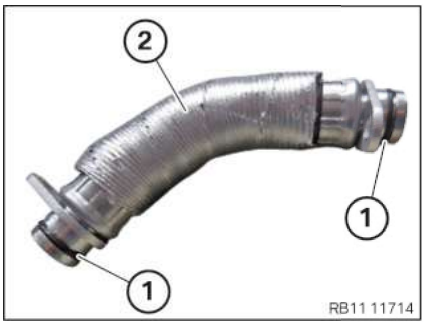
When assembling, it is essential to observe screwing sequences and tightening torques. Non-observance of these requirements may result in leaks and damage.

- Feed in and install coolant line (2).
- Hand-tighten the bolts (1).
- Tighten the screws (1).

Coolant line to coolant pump/cylinder head

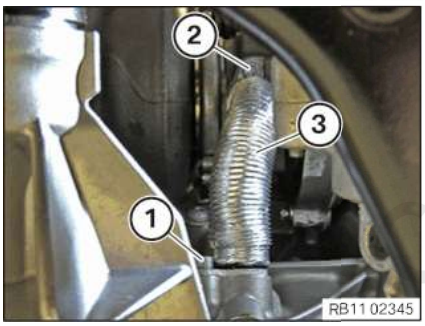
M6x20		Tightening torque	8 Nm

86 – Installing the oil return line for the exhaust turbocharger



- Renew the sealing rings (1) on the oil return line (2).

  Parts: Sealing ring



- Feed in and install the oil return line (3).
- Tighten down screw (2).

Oil return line to turbocharger

M6 x 12			8 Nm

- Tighten down screw (1).

Oil return line to crankcase

M6 x 12			8 Nm

87 – Install catalytic converter



- Renew the V-clip (1).

  Parts: V-band clamp

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- Renew the gasket (1).

  Parts: Gasket



- Feed in and install catalytic converter.
- Lock clamp (1).

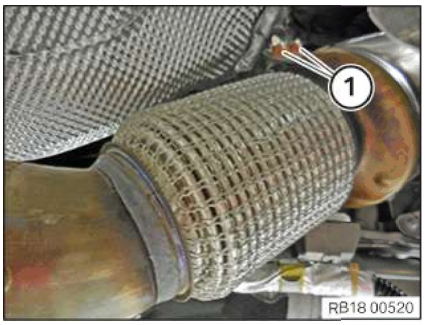
  The clamp (1) must engage audibly.



- Tighten V-band clamp (1).

Catalytic converter to turbocharger

V-band clamp	Replace V-band clamp.	Tightening torque	19 Nm

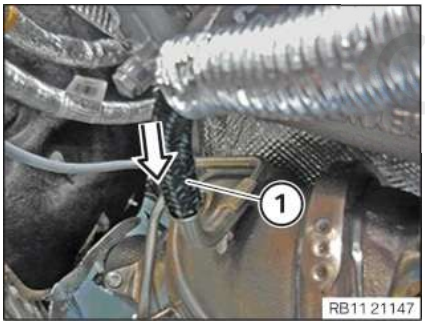


- Renew nuts (1).

  Parts: Nuts
- Tighten nuts (1).

Catalytic converter to holder

M8 nut	Renew nut.	Tightening torque	28 Nm



- **If installed: Connect pressure hose.**

  Renew pressure hose (1).

  Parts: Pressure hose
- Connect the pressure hose (1) in direction of arrow to the limit position.

88 – Installing the complete exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

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

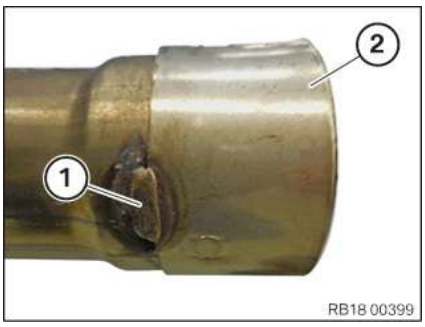
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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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



CAUTION

Swarf resulting from sawing or grinding components.

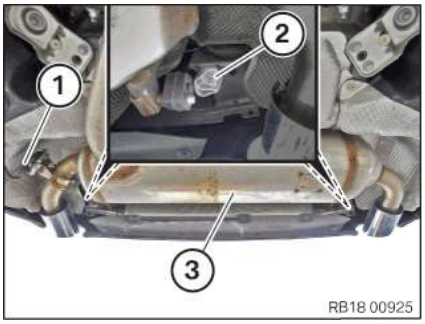
Danger of injury!

- Conduct all work in appropriate personal protective equipment only.
- Wear safety goggles and protective gloves.

- **Equipment specification 1 (ribbon clamp)**

  Open the weld seam (1) with a conventional tool.
- Remove ribbon clamp (2).
- Renew the (2) ribbon clamp.

  Parts: Ribbon cable clamp



- Feed in and install the exhaust system (3) with a second person.
- Renew nuts (2).

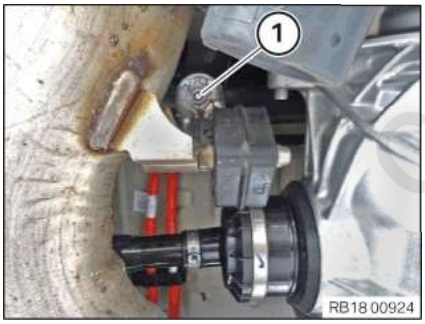
  Parts: Nuts
- Tighten nuts (2).

Rear silencer to body / bumper support

M8	Replace nuts.	Tightening torque	19 Nm

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.



- Renew nut (1).

  Parts: Nut
- Tighten the bolt (1) on the rear axle support.

Exhaust system to rear axle carrier

Nut M8	Renew nut.	Tightening torque	19 Nm



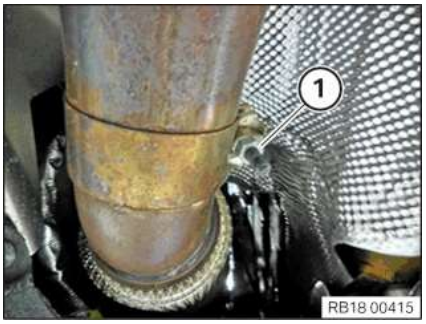
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Front pipe / petrol particulate filter on transmission holder

M8	Renew nut.	Tightening torque	19 Nm

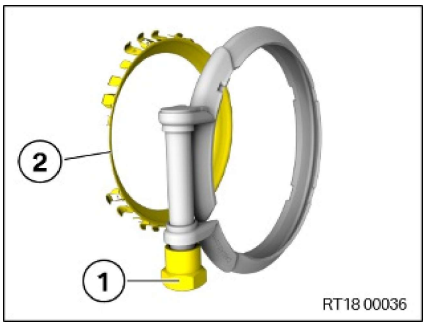
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- Tighten the ribbon clamp (1).

Exhaust system to catalytic converter

Ribbon cable clamp	Renew flat band clip.	Tightening torque	26 Nm

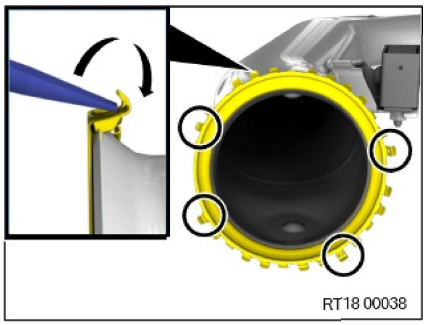


- **Equipment specification 2 (V-clips)**

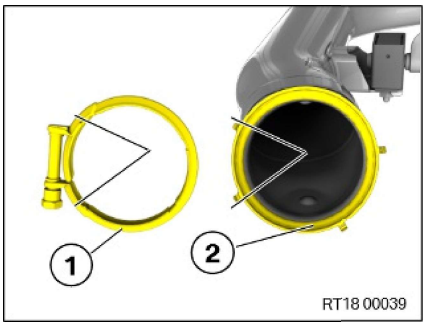
  Renew V-band clamp.

  Parts: V-band clamp

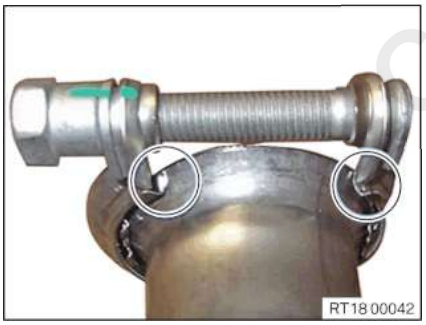
  Unscrew the nut (1) and remove the sealing ring (2).



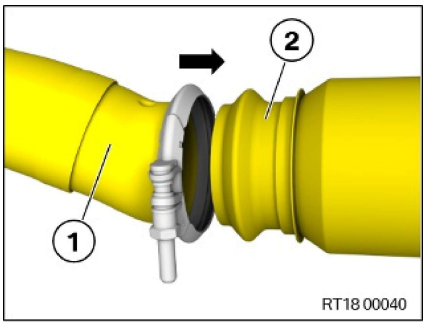
- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.



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

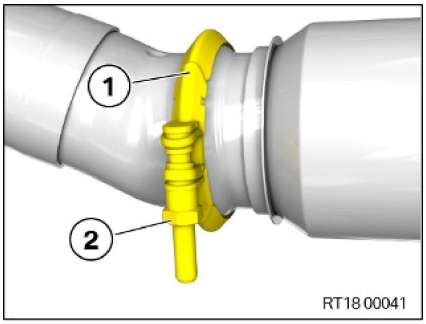


- Ensure that the V-clip rests against the sheet metal tabs in the marked areas after mounting.



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

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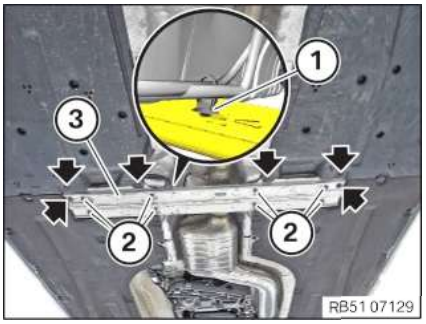


- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

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

89 – Install the connecting supports on the tunnel



- Guide in and install connecting support (3) on the tunnel.
- Tighten the screws (2).

Connecting support to tunnel

M8x25 screw		Tightening torque	20 Nm
Screw		Tightening torque	3 Nm

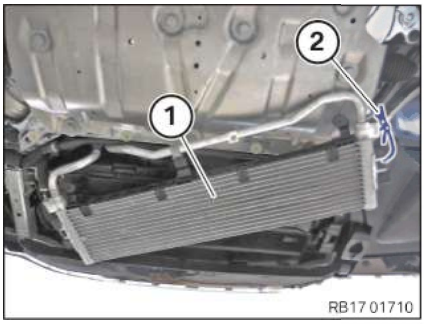
- Tighten screws (arrows).

Connecting support to tunnel

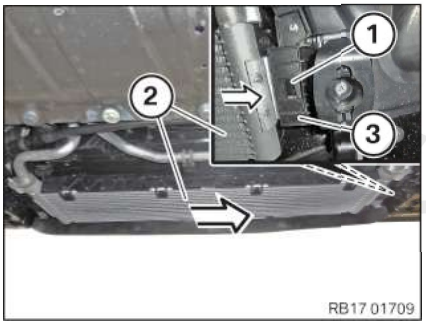
M8x25 screw		Tightening torque	20 Nm
Screw		Tightening torque	3 Nm

- **If installed:** Secure clamps (1).

90 – If installed: Secure engine oil cooler



- Remove the cable straps (2).
- Position engine oil cooler (1).



- Feed in and install the engine oil cooler (2) on the holder (3) in the direction of the arrow.
- Ensure that the lock (1)engages audibly.

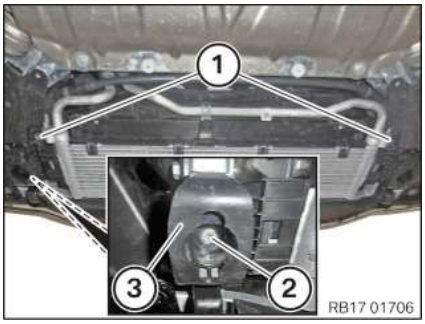


- Tighten down screw (1).

Engine oil cooler to bumper support

M6X25		Tightening torque	8 Nm

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- Renew rivet (2).

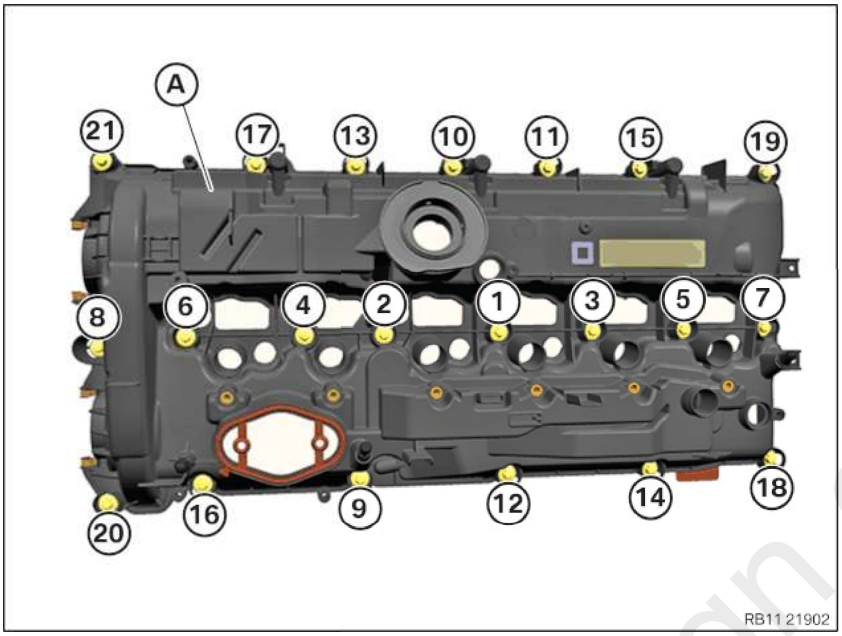
  Parts: Rivet
- Install and rivet damper (3).
- Tighten the screws (1).

Cover, front bottom on side

Hexagon screw for thermoplastic		Tightening torque	3 Nm

91 – Installing cylinder head cover

Overview: Bolts of the cylinder head cover



1 - 21 Bolts of the cylinder head cover

A Cylinder head cover

RISK OF DAMAGE

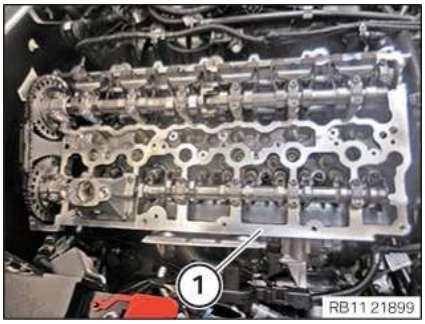
Improper routing of cables and wiring harnesses.

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

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

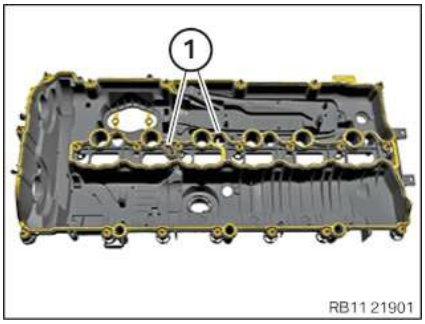
TECHNICAL INFORMATION

Latch mechanisms, guides and mounting elements must not be damaged or missing.



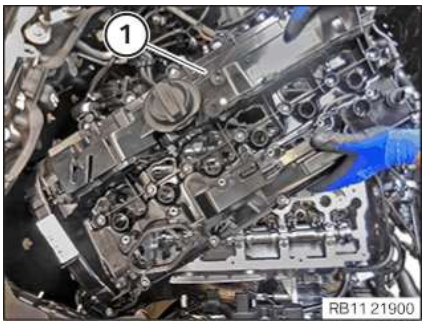
- Contact surface (1) must be free from oil and grease.

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- Replace the seals (1).

  Parts: Seals

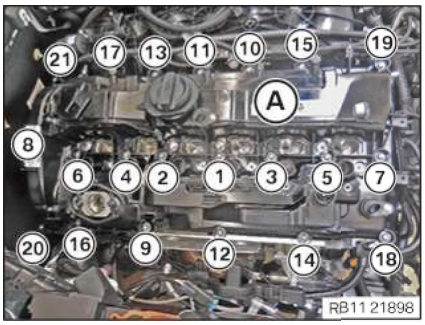


- Insert and install cylinder head cover (1).



- Ensure that the cylinder head cover (1) is installed in the **marked** area correctly on the high pressure pump bracket(2).

  The cylinder head cover (1) must not touch the high pressure pump bracket (2) in the **marked** area.



- Position the cylinder head cover (A).
- Make sure that the cylinder head cover (A) does not touch the high pressure pump bracket!
- Tighten all bolts in sequence (1) to (21).

Cylinder head cover to cylinder head

M6X30	Jointing torque	8 Nm

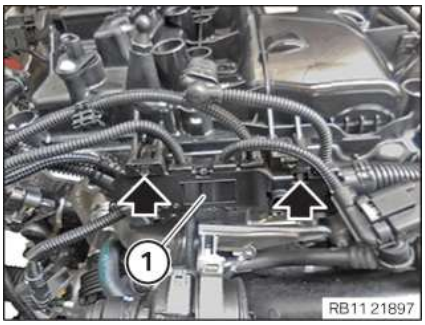
- Tighten all screws in a sequence from (1) to (21).

Cylinder head cover to cylinder head

M6X30		Tightening torque	11 Nm

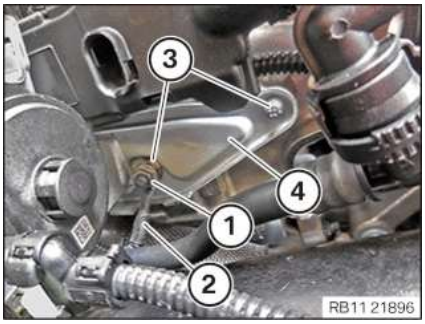


- Insert and install the engine ventilation line (2).
- Ensure that the locks (1) engage audibly.



- Feed in and install wiring harness section (1) for sensor system **2**.
- Make sure that you can hear the locks (arrows) engage.

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- Insert and position the holders (4).
- Tighten the screws (3).

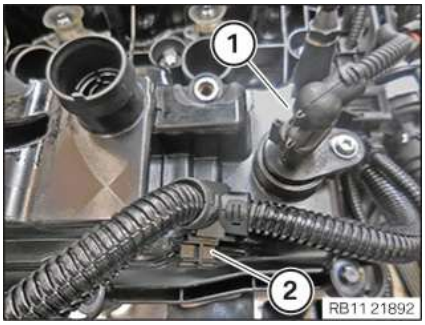
Auxiliary coolant pump holder to cylinder head

M6		Tightening torque	7 Nm

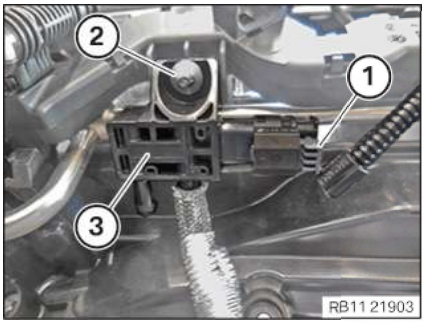
- Thread in ground cable (2) and install.
- Tighten nut (1).

Standard screw connection M6

M6			8 Nm



- Connect and lock the connector (1) on the exhaust camshaft sensor .
- Ensure that connector (1) on the exhaust camshaft sensor engages audibly.
- Secure clamps (2).

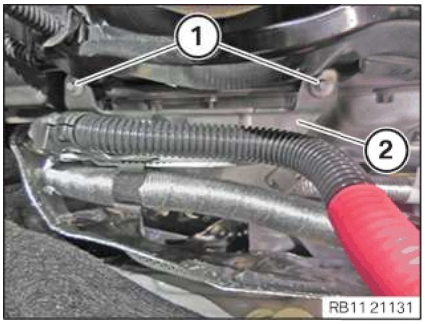


- **If installed:**
- Feed in and install the differential pressure sensor (3).
- Tighten down screw (2).

Differential pressure sensor to holder

TS6X18		Tightening torque	3,5 Nm

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



CAUTION

Improper routing of the positive battery cable.

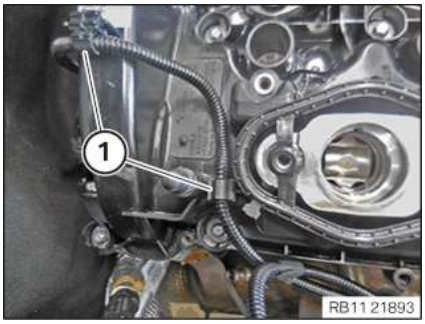
Risk of short circuits!

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

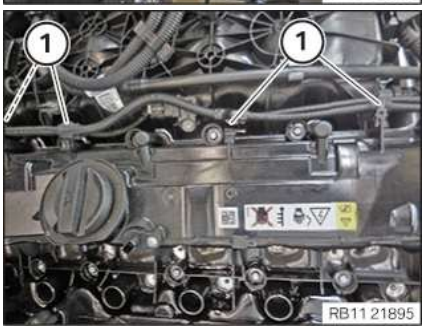
- Guide in and install holder (2) of the positive battery cable.
- Tighten the screws (1).

Holder, positive battery cable to cylinder head cover

6X18		Tightening torque	6 Nm

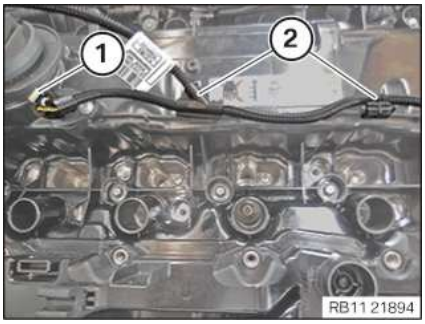


- Secure clamps (1).



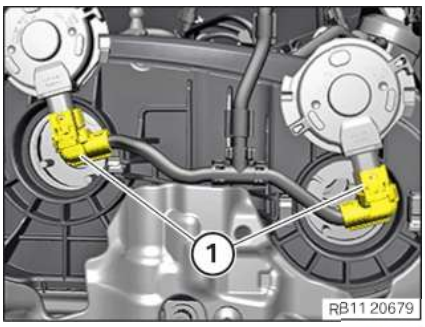
- Secure clamps (1).

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- Connect connector (1) to the intake camshaft sensor and lock it.
- Make sure the connector (1) engages audibly.
- Secure clamps (2).

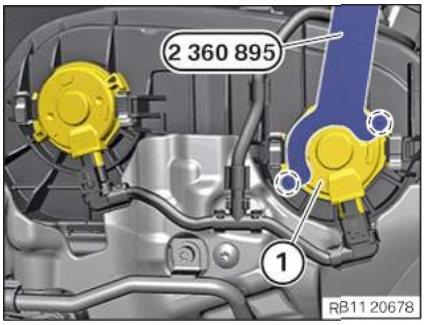
92 – Installing both actuators



NOTICE

The figure shows the rear side of the engine.

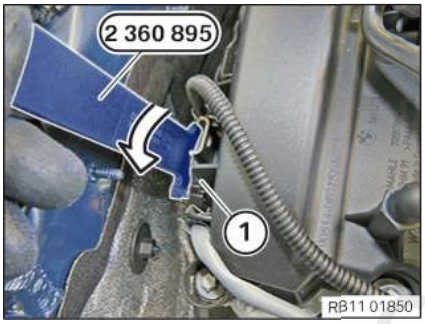
- Position both actuators.
- Connect and lock both connectors (1).
- Make sure the connectors (1) engage audibly.



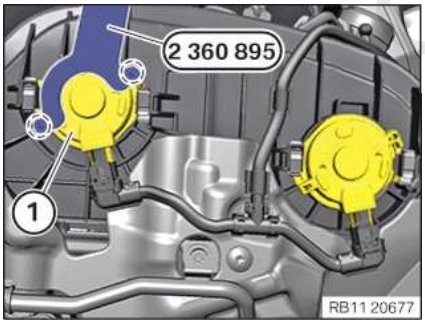
NOTICE

The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the exhaust side.



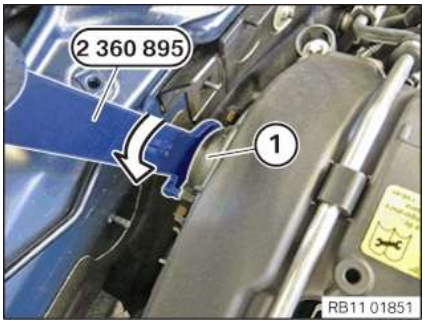
- Position the actuator (1) of the exhaust side and turn it in the direction of arrow with the special tool 2 360 895 until the limit stops touch the clamps.



NOTICE

The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the intake side.



- Position the actuator (1) of the intake side and turn it in the direction of arrow with the special tool 2 360 895 until the limit stops touch the clamps.

93 – Install high pressure pump

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RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

TECHNICAL INFORMATION

Only G05 and G07

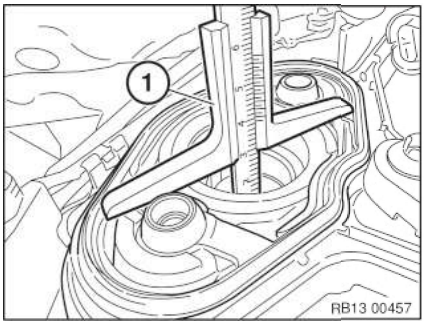
In vehicles with active anti-roll bar (ARS) the fan cowl must be removed in order to spin the engine.

For additional information see: 17 11 035 Removing and installing/replacing the fan cowl including electric fan

TECHNICAL INFORMATION

The high pressure pump can be pre-tensioned by camshaft cams. If when loosening the screws, the high pressure pump is forced out, the engine will have to be turned to bring the camshafts to a different position.

Before installing the high pressure pump, the cam of the high pressure pump drive must be turned to BDC. To do this, twist the engine if necessary in the direction of engine rotation to the central bolt of the crankshaft. Otherwise, it will not be possible to install the high-pressure pump.



- Place the depth gauge (1) flat onto the high pressure pump flange.
- Turn the engine at the central bolt in the direction of engine rotation until the BDC position of the camshaft is reached.

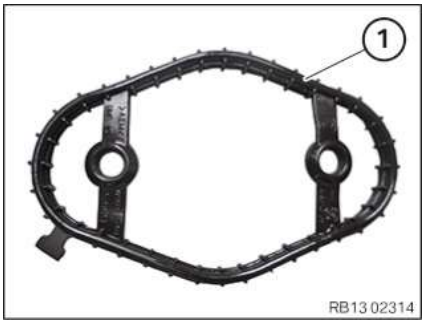
  The depth gauge (1) is in the deepest position.



- Rotate the engine with the special tool 0 493 380 (11 6 480) in the **direction of the arrow** until the cam of the high pressure pump drive is at the **BDC position** .



- Guide out and remove gasket (1).



- Renew the gasket (1).

  Parts: Gasket

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TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Check the threads (1) on the high pressure pump flange for sealing compound residue: Remove sealing compound residue as needed.
- Clean the thread (1) with a thread cutter **M6**.
- Make sure that no contamination enters the engine.
- Cover opening at the high pressure pump flange with suitable materials.



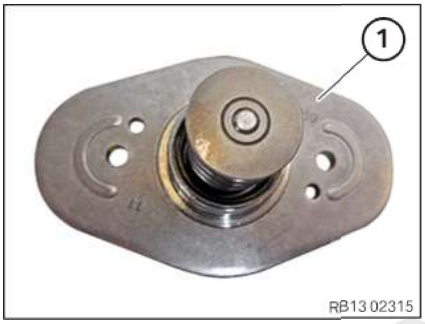
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Clean sealing surface (1).



- Insert and install the gasket (1).
- Make sure the seal (1) has been correctly positioned in the **highlighted** area.



RISK OF DAMAGE

Damage to the surface.

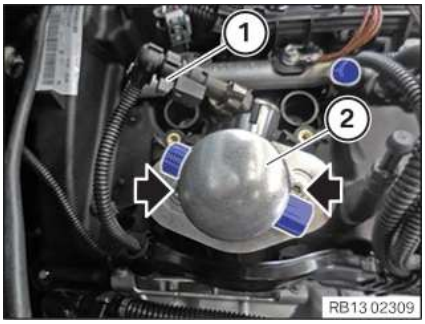
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Clean sealing surface (1).



- Feed in and install high pressure pump (2).
- Renew the bolts (arrows).

  Parts: Bolts
- Position screws (arrows) of the high pressure pump (2) and tighten **in alternating order** in **90°** increments.

  Compliance with this specification is imperative to make sure that the piston will not break due to twisting.

High pressure pump to high pressure pump flange

M6x25	*Renew screws.*	Jointing torque	12 Nm
		Tightening torque	90 °

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

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RISK OF DAMAGE

Damage to the injector tips and Teflon ring.

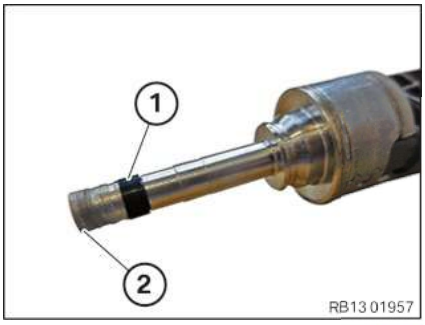
Improper handling of the injector tips and Teflon ring can lead to malfunctioning of the injector.

- Avoid mechanical contact with injector tip.
- When exchanging Teflon ring, hands and work surface must be clean and free of oil. Do not use any lubricating agents.
- Do not use fingernails to slide Teflon ring on.

TECHNICAL INFORMATION

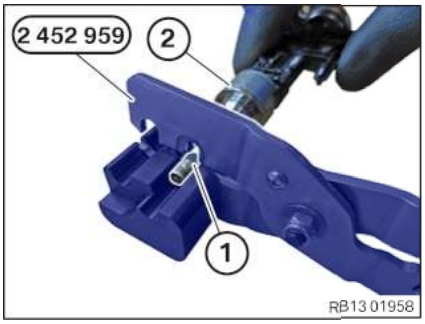
Before re-installing the injector, the Teflon ring must be renewed. Once a Teflon ring has been installed, it may not be re-used. New injectors are supplied with a new Teflon ring.

After the installation of a new Teflon ring on the injectors, the injector must be installed in the cylinder head within 10 minutes or protected with protective caps; otherwise, the Teflon ring will swell.



- Before installing the injectors: Renew the Teflon rings (1).

  Parts: Teflon rings
- Avoid mechanical contact with injector tip (2).



- Remove Teflon ring (1) by using special tool 2 452 959 from injector (2).
- If necessary, use a lint-free cloth to clean the cylindrical part of the injector tip. Do not use ultrasonic sound or other auxiliary materials.
- Do **not** clean the injector tip.

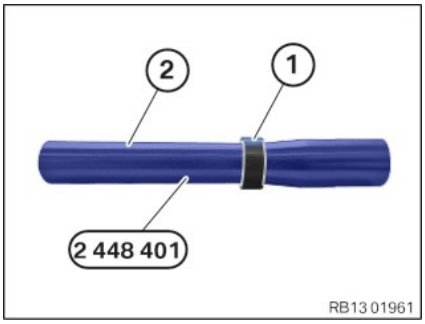


- For the installation of the new Teflon rings: Use the set of special tools 2 448 401:

  (1) Installation cone

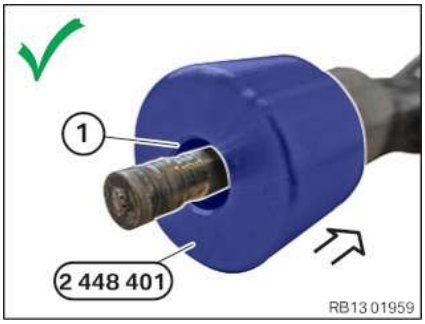
  (2) Sliding sleeve

  (3) Assembly sleeve



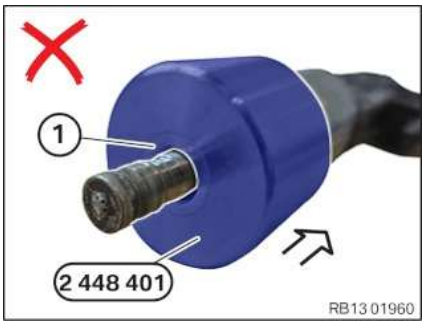
- Slide the new Teflon ring (1) onto the installation cone (2) from the set of special tools 2 448 401.

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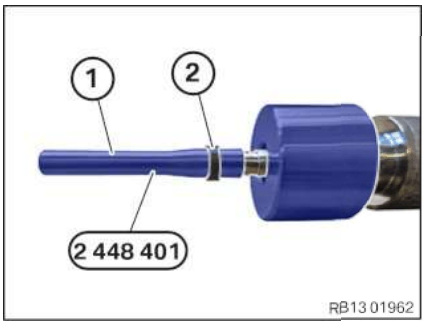
- Make sure the installation position of the assembly sleeve (1) from the set of special tools 2 448 401 is correct:

  The larger diameter of the assembly sleeve (1) must point to the injector tip.

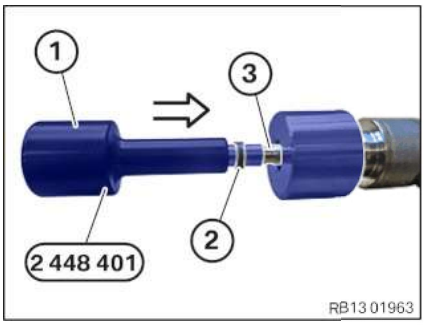


- Make sure the installation position of the assembly sleeve (1) from the set of special tools 2 448 401 is correct:

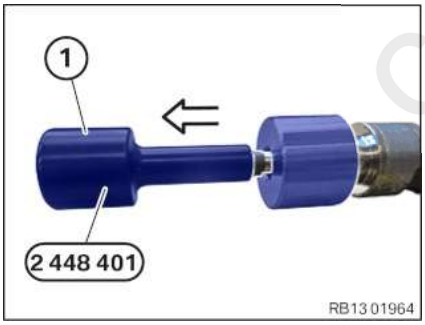
  The assembly sleeve (1) is **not** mounted correctly when the smaller diameter points to the injector tip.



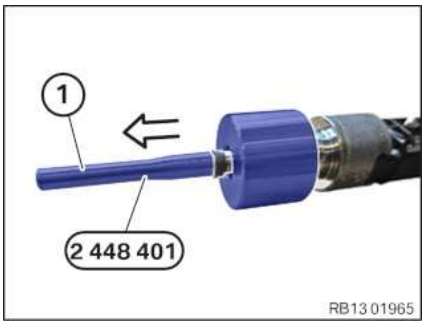
- Mount the Teflon ring (2) with the installation cone (1) from the set of special tools 2 448 401 on the injector tip .



- Use the sliding sleeve (1) from the set of special tools 2 448 401 to push the Teflon ring (2) into the groove (3) on the injector in the direction of the arrow.

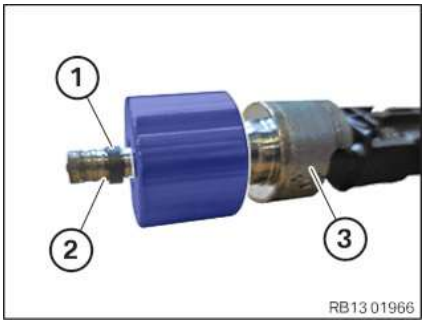


- Thread out the sliding sleeve (1) from the set of special tools 2 448 401 in the direction of the arrow and remove.

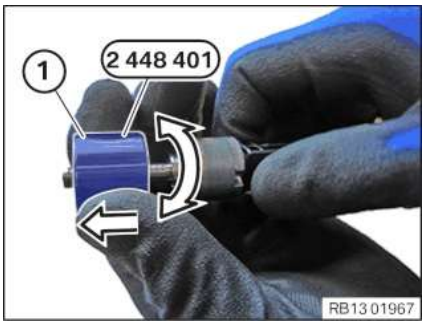


- Thread out the installation cone (1) from the set of special tools 2 448 401 in the direction of the arrow and remove.

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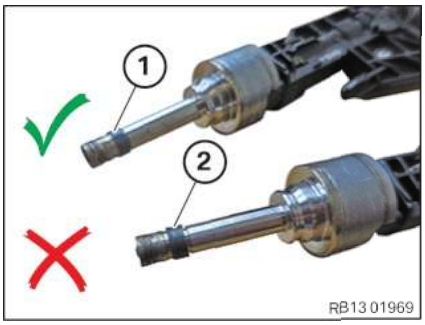


- Make sure that the expanded Teflon ring (1) is properly inserted in the groove (2) of the injector (3) and can be moved easily with your fingers.



- Calibrate the expanded Teflon ring with the assembly sleeve (1) from the set of special tools 2 448 401 to the installation dimension in the direction of the arrow.
- Perform **rotational movements** in increments of 180° synchronous to the **pull-off movement**. Perform the movements slowly and **not** jerky.

  This calibrates the Teflon ring (1) to the installation dimension.
- Thread out and remove the assembly sleeve (1).

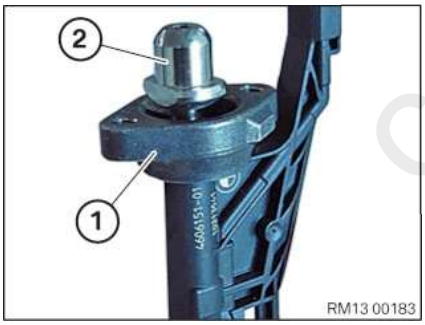


- Check the correct installation dimension of the Teflon ring (1):
  - (1) indicates a correct installation dimension of the Teflon ring.
  - (2) indicates an incorrect installation dimension of the Teflon ring.

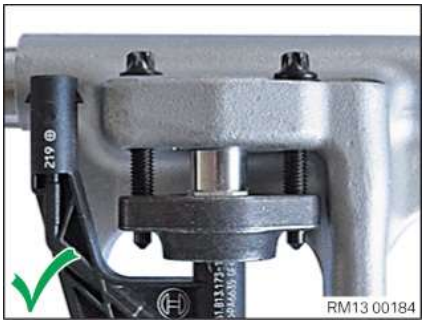
95 – Installing the high-pressure rail with injectors of the cylinders 4 to 6

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.



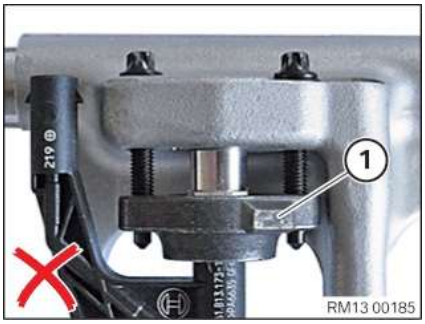
- Mount the holder (1) above the bayonet fitting (2) on the injector.
- **If the holder**(1) **has a cast lug**: Make sure that the holder is installed in the correct position.



- If applicable, note the position of the cast lug:

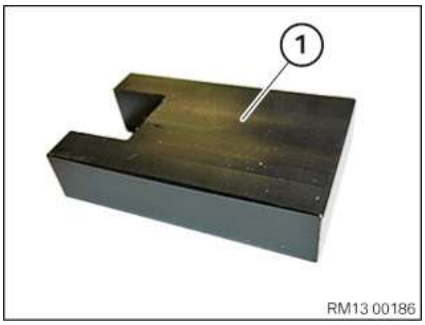
  The holder is mounted **correctly** when the cast lug is located at the rear.

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- If applicable, note the position of the cast lug:

  The holder is mounted **incorrectly** when the cast lug (1) is in front.



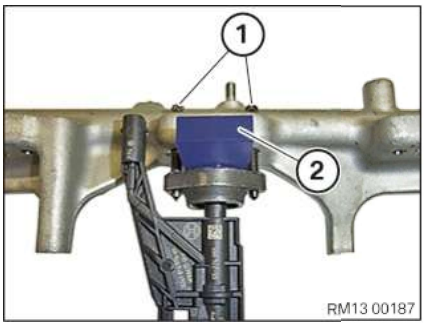
RISK OF DAMAGE

Damage to injectors.

Weld seams on the injector may tear due to incorrect distances between the rail and injector so that the injector must be renewed.

- Insertion of the distance gauge is compulsory.
- Replace distance gauge, if a thickness of 8.5 mm is no longer given in the distance gauge.

- Use the special tool (distance gauge) 2 358 022 (1).



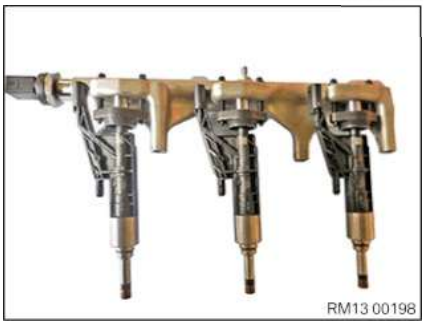
- Replace (M5x30) screws.

  Parts: Screws (M5x30)
- Mount the injectors with the holders and the bolts (M5x30) (1) on the rail.
- Keep the rail on a clean table in such a way that the openings on the rail for the injectors point upwards.

  The electrical injector connections must point to the fuel pressure sensor.
- Slide the special tool (distance gauge) 2 358 022 (2) between the holders and the rail onto the injector head.
- Make sure that the special tool (distance gauge) 2 358 022 (2) rests flat on the retaining bridge.
- Hand-tighten both screws (M5x30) (1) evenly until the special tool (distance gauge) 2 358 022 (2) rests flat against the rail and the holder.



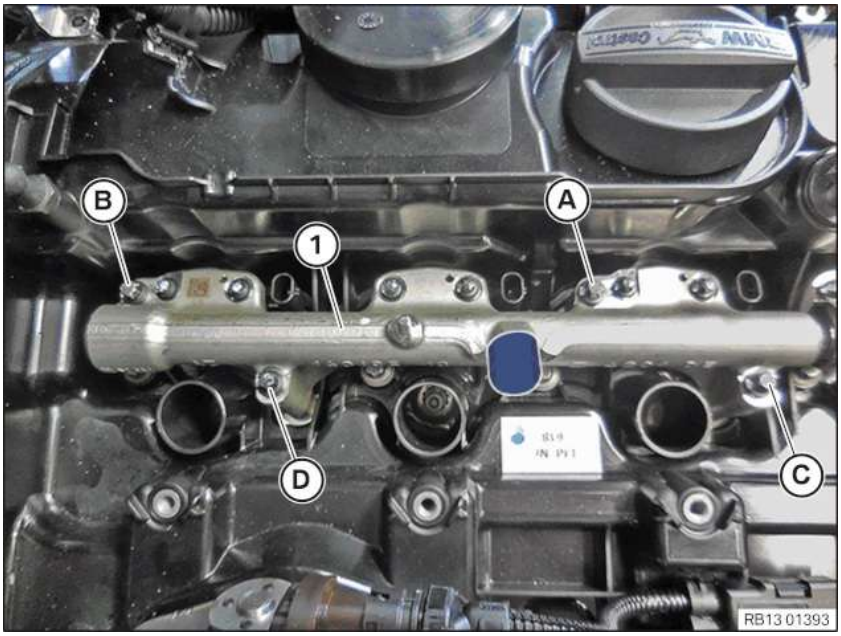
- Remove the special tool (distance gauge) 2 358 022 (1).
- Repeat this operation for all injectors.



- Check injectors for loose fit at the rail.
- Align the electrical injector connections parallel to the rail.

  The injectors must move freely.

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- Renew screws (A) to (D).

  Parts: Bolts
- Attach the rail (1) with the injectors to the cylinder head from the top.
- Make sure the injector tips catch the corresponding holes in the cylinder head.
- Make sure the guides on the injector are properly inserted into the guide bores in the cylinder head.
- Press the rail (1) down until a resistance can be felt; join and hand-tighten the bolts (M6x30) (A) and (B).
- Set the torque wrench to 2 Nm.
- Tighten the screws (A) and (B) in alternating order by **180°** each with the torque wrench until the rail is positioned flush on the cylinder head.

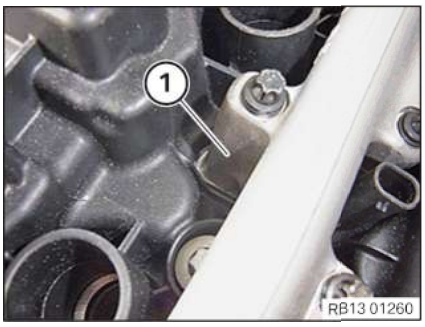
  The figure shows the rail resting flat against the cylinder head.
- Insert bolts (C) and (D).

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

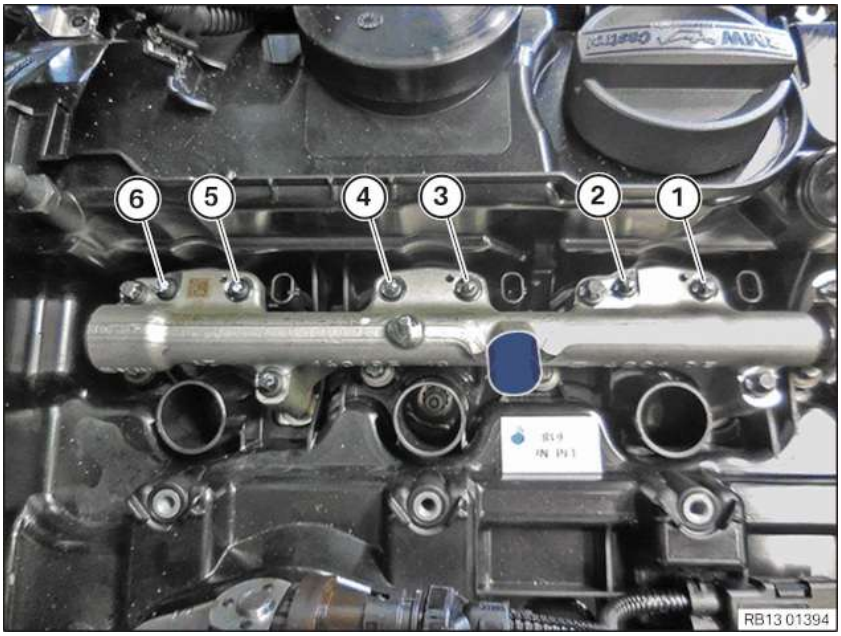
Non-observance of these requirements may result in leaks and damage.

- Tighten bolt (A) to 5 Nm.
- Tighten bolt (D) to 5 Nm.
- Tighten bolt (B) to 5 Nm.
- Tighten bolt (C) to 5 Nm.



- Make sure that the rail (1) rests flat against the cylinder head.

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- Attach a socket to an extension.

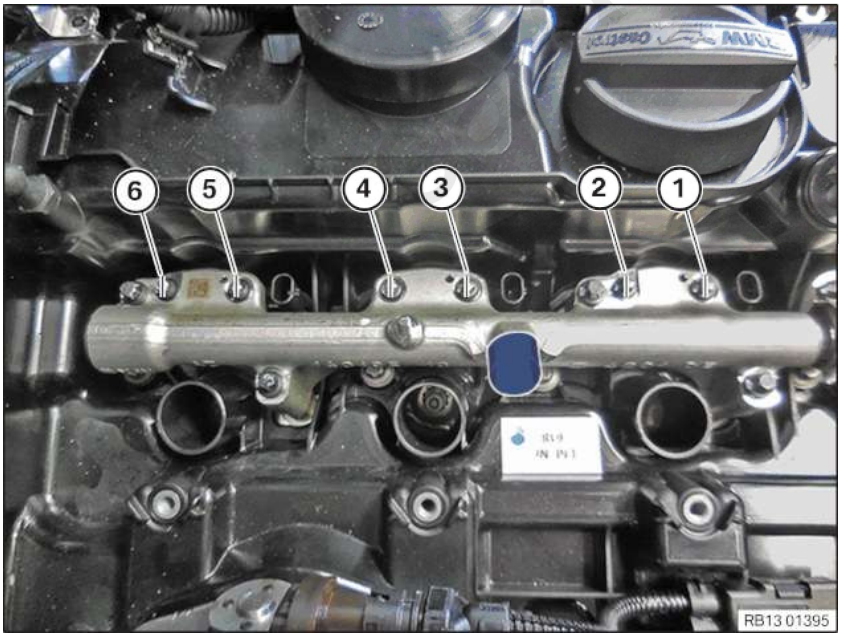
  Do not use a reversible ratchet or torque wrench.
- Tighten the bolts (M5x30) in pairs ((1) with (2), (3) with (4), (5) with (6)) in alternating order **90° hand-tight**.
- Set the torque wrench to 5 Nm.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- **Screw the (M5x30) bolts according to the following plan:**
  - **Fuel injector 4:**
  - Tighten screw (1) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (2) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (1) and (2) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 5:**
  - Tighten screw (3) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (4) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (3) and (4) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 6**:
  - Tighten screw (5) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (6) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (5) and (6) until both bolts reach a torque of 5 Nm.



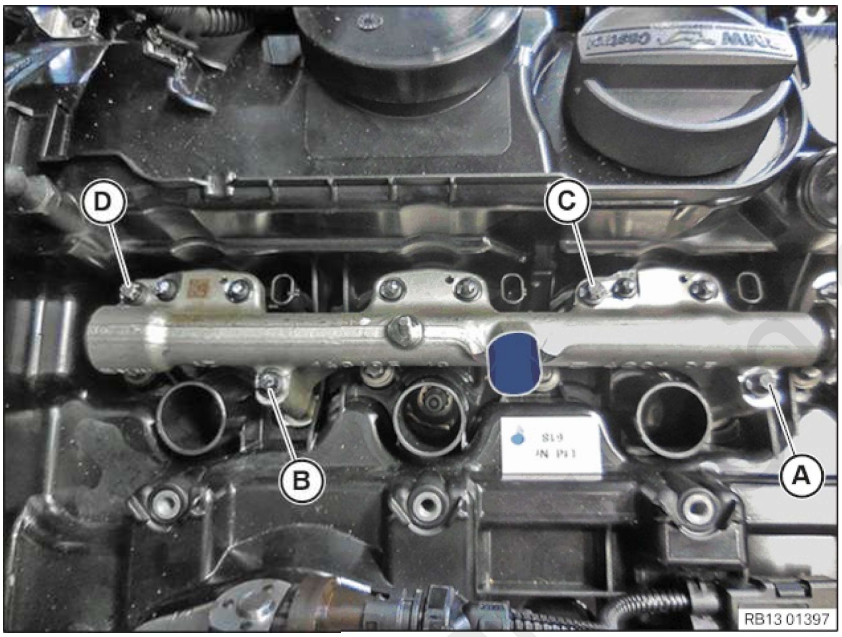
- Mark all bolts (1) to (6) with a vertical line (see figure).
- **Tighten screws using an angle of rotation.**
  - Tighten the screw (1) with an angle of rotation of 90° ±15°.
  - Tighten the screw (2) with an angle of rotation of 90° ±15°.
  - Tighten the screw (3) with an angle of rotation of 90° ±15°.
  - Tighten the screw (4) with an angle of rotation of 90° ±15°.
  - Tighten the screw (5) with an angle of rotation of 90° ±15°.
  - Tighten the screw (6) with an angle of rotation of 90° ±15°.

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- Check if all bolts (1) to (6) have been tightened with a 90° ±15° angle of rotation.

  All marks (lines) must be horizontal (see figure).



- Unscrew the bolts (M6x70) (A) to (D).

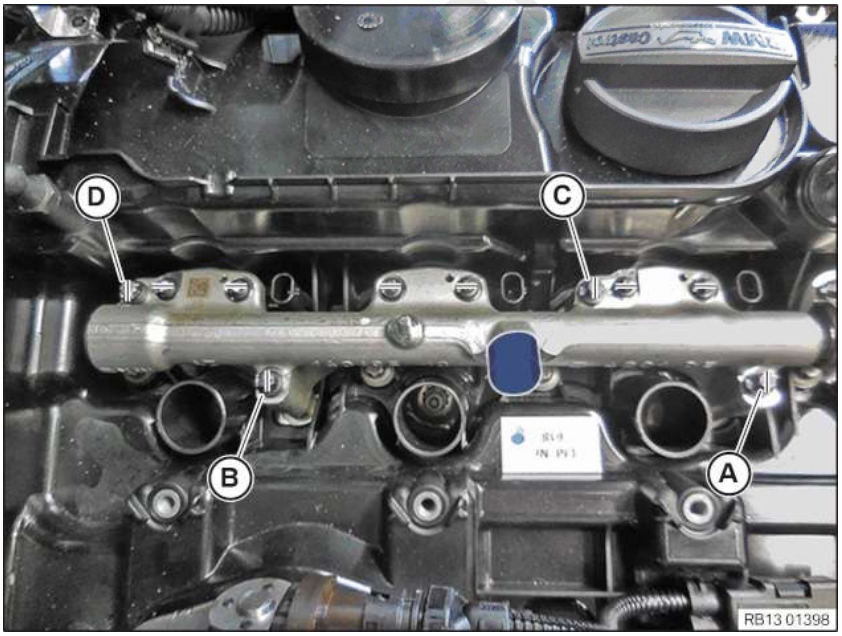
  It is imperative that the bolts are unscrewed.

TECHNICAL INFORMATION

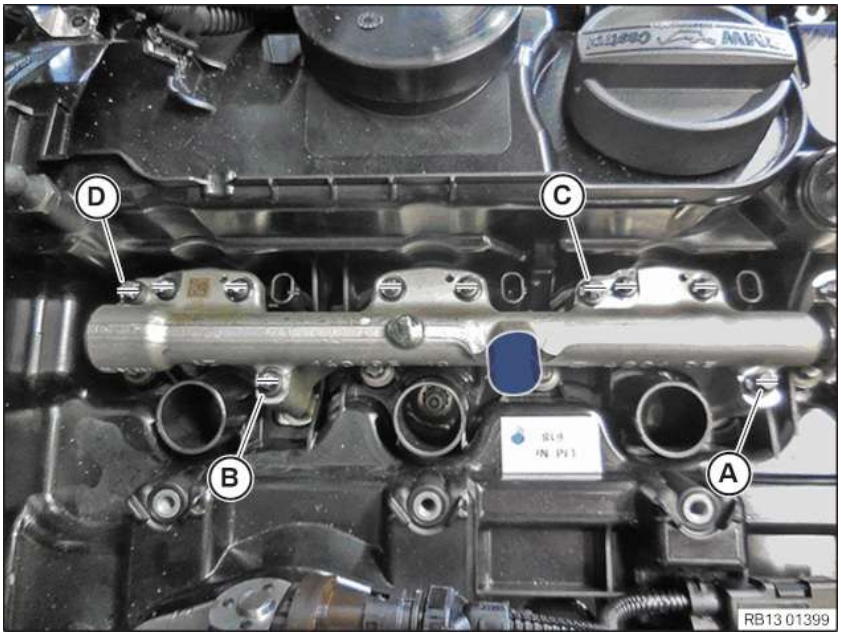
When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten bolt (A) to 5 Nm.
- Tighten bolt (D) to 5 Nm.
- Tighten bolt (B) to 5 Nm.
- Tighten bolt (C) to 5 Nm.

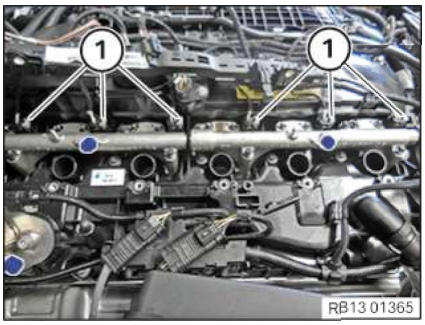


- Mark all bolts (A) to (D) with a vertical line (see figure).
- Tighten bolts (M6x70) (A) to (D) to a 90° angle of rotation.



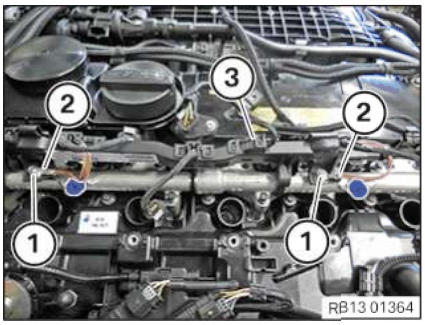
- Check if all bolts (A) to (D) have been tightened with a 90° angle of rotation.

  All marks (lines) must be horizontal (see figure).



- Connect and lock all connectors (1) to the injectors.

  All connectors (1) must engage audibly.



- Thread in cable channel (3) and install.
- Thread in ground cable (2) and install.
- Tighten nuts (1).

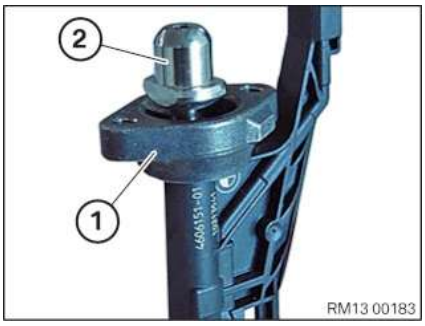
Ground cable to rail

M6		5 Nm

96 – Installing rail with injectors of cylinders 1 to 3

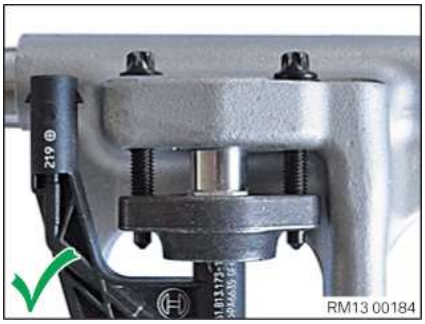
TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.



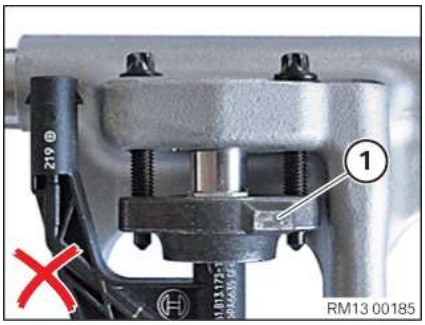
- Mount the holder (1) above the bayonet fitting (2) on the injector.
- **If there is a cast lug on the holder** (1) **:** Make sure that the holder is installed in the correct position.

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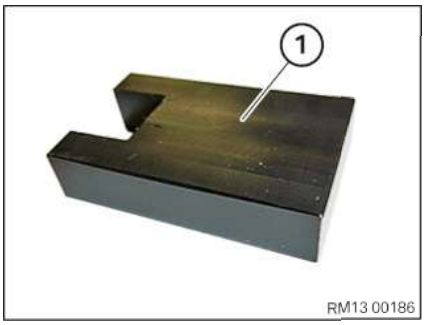
- Observe position of cast lug:

  The holder is mounted **correctly** when the cast lug is located at the rear.



- Observe position of cast lug:

  The holder is mounted **incorrectly** when the cast lug (1) is in front.



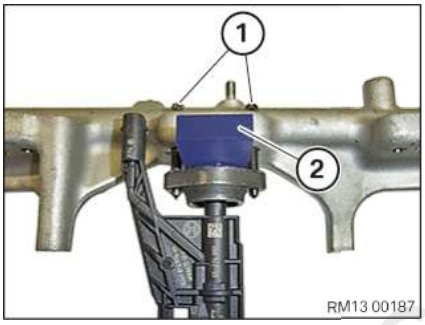
RISK OF DAMAGE

Damage to injectors.

Weld seams on the injector may tear due to incorrect distances between the rail and injector so that the injector must be renewed.

- Insertion of the distance gauge is compulsory.
- Replace distance gauge, if a thickness of 8.5 mm is no longer given in the distance gauge.

- Use special tool 2 358 022(1) .



- Replace (M5x30) screws.

  Parts: Screws (M5x30)
- Mount the injectors with the holders and the bolts (M5x30) (1) on the rail.
- Keep the rail on a clean table in such a way that the openings on the rail for the injectors point upwards.

  The electrical injector connections must point to the fuel pressure sensor.
- Slide special tool 2 358 022 (2) between the holders and the rail onto the injector head.
- Make sure the special tool 2 358 022 (2) rests flat on the retaining bridge.
- Hand-tighten both screws (M5x30) (1) uniformly until the special tool 2 358 022 (2) rests flat against the rail and the holder.



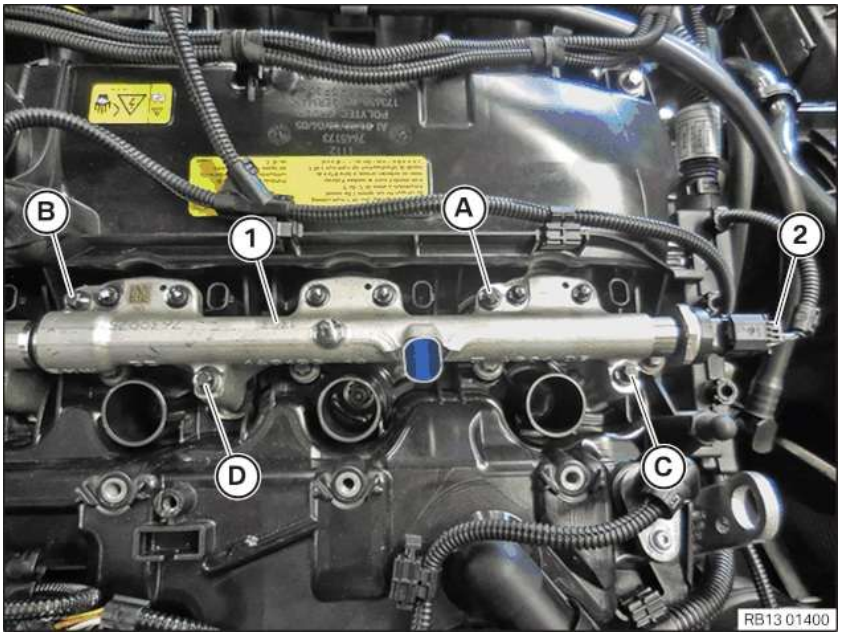
- Remove special tool 2 358 022(1) .
- Repeat this operation for all injectors.



- Check injectors for loose fit at the rail.
- Align the electrical injector connections parallel to the rail.

  The injectors must move freely.

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- Renew screws (A) to (D).

  Parts: Bolts
- Attach the rail (1) with the injectors to the cylinder head from the top.
- Make sure the injector tips catch the corresponding holes for the injectors in the cylinder head.
- Make sure the guides on the injector are properly inserted into the guide bores in the cylinder head.
- Press rail (1) down until a resistance can be felt; join and hand-tighten screws (M6x30) (A) and (B).
- Tighten screws (A) and (B) alternately by **180°** each with the torque wrench until the rail is positioned on the cylinder head.

  The figure shows the rail resting flat against the cylinder head.
- Insert screws (C) and (D).

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

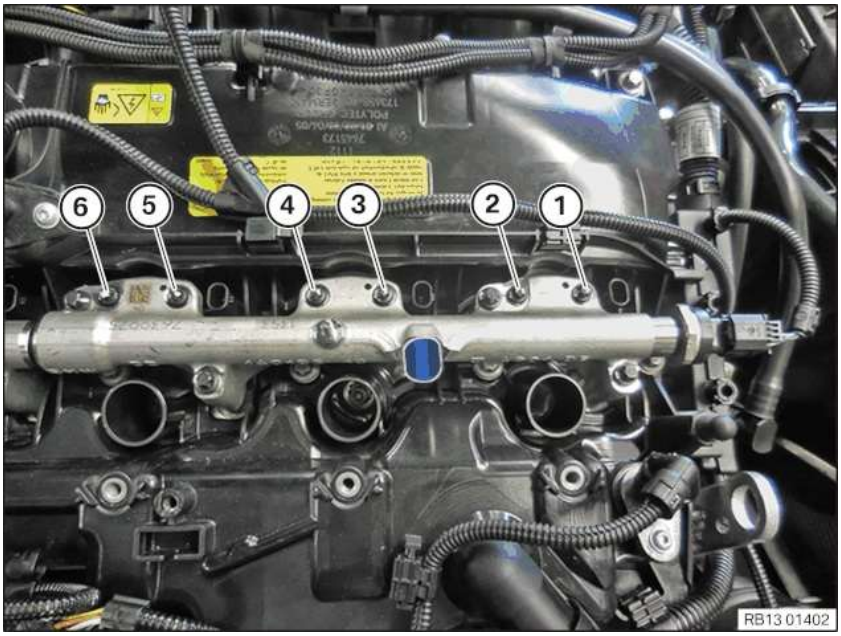
- Tighten screw (A) to 5 Nm.
- Tighten screw (D) to 5 Nm.
- Tighten screw (B) to 5 Nm.
- Tighten screw (C) to 5 Nm.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.



- Make sure that the rail (1) rests flat against the cylinder head.

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- Attach a socket to an extension.

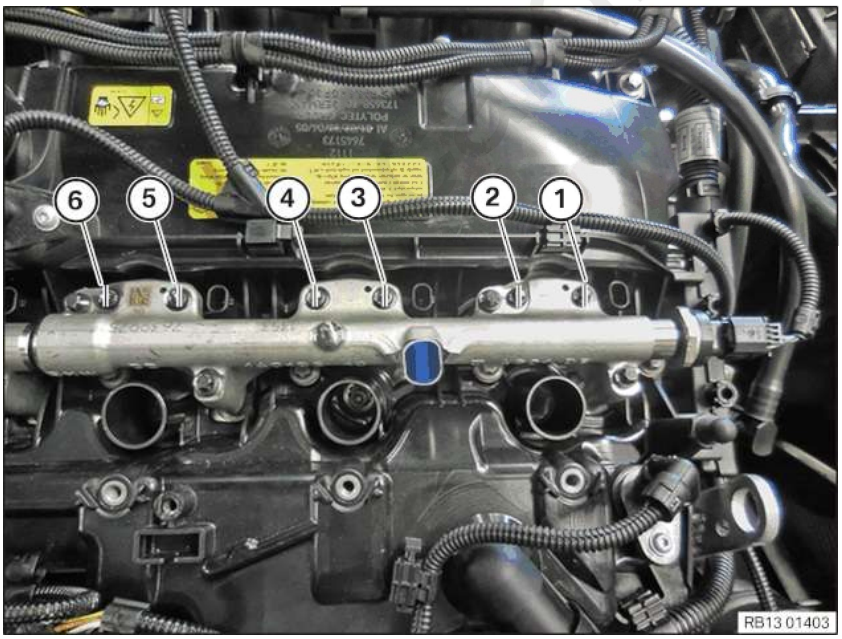
  Do not use a reversible ratchet or torque wrench.
- Hand-tighten screws (M5x30) in pairs ((1) with (2), (3) with (4), (5) with (6)) alternately by **90°**.
- Set torque wrench to 5 Nm.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

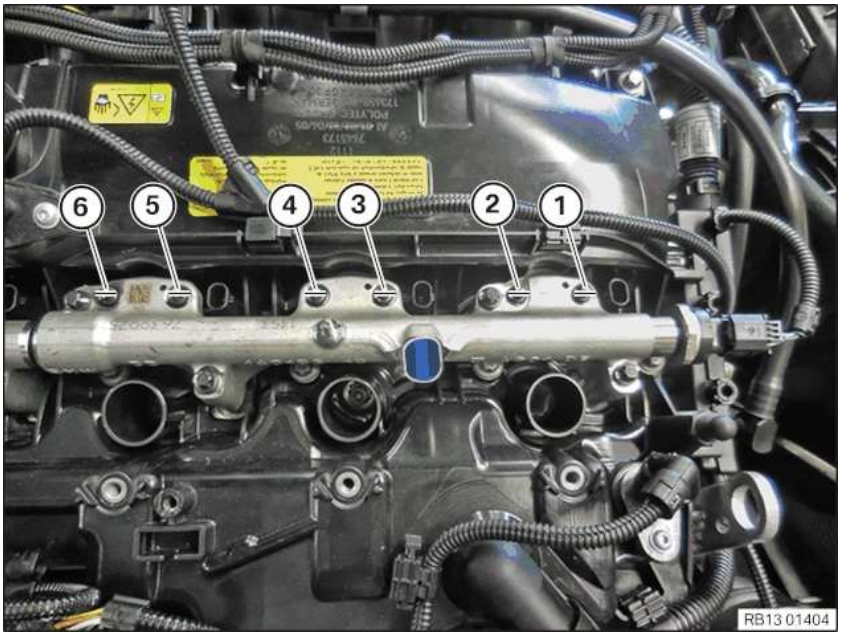
Non-observance of these requirements may result in leaks and damage.

- **Screw the (M5x30) bolts according to the following plan:**
  - **Fuel injector 1:**
  - Tighten screw (1) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (2) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (1) and (2) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 2:**
  - Tighten screw (3) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (4) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (3) and (4) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 3**:
  - Tighten screw (5) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (6) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (5) and (6) until both bolts reach a torque of 5 Nm.



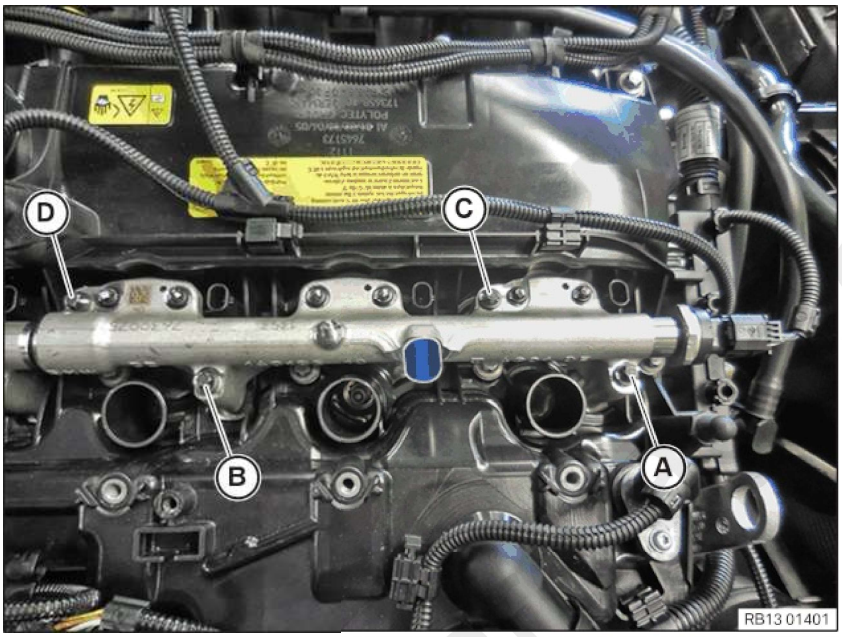
- Mark all bolts (1) to (6) with a line (see figure).
- **Tighten screws using an angle of rotation.**
  - Tighten the screw (1) with an angle of rotation of 90° ±15°.
  - Tighten the screw (2) with an angle of rotation of 90° ±15°.
  - Tighten the screw (3) with an angle of rotation of 90° ±15°.
  - Tighten the screw (4) with an angle of rotation of 90° ±15°.
  - Tighten the screw (5) with an angle of rotation of 90° ±15°.
  - Tighten the screw (6) with an angle of rotation of 90° ±15°.

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- Check if all bolts (1) to (6) have been tightened with a 90° ±15° angle of rotation.

  All markings (lines) must be horizontal (see Figure).



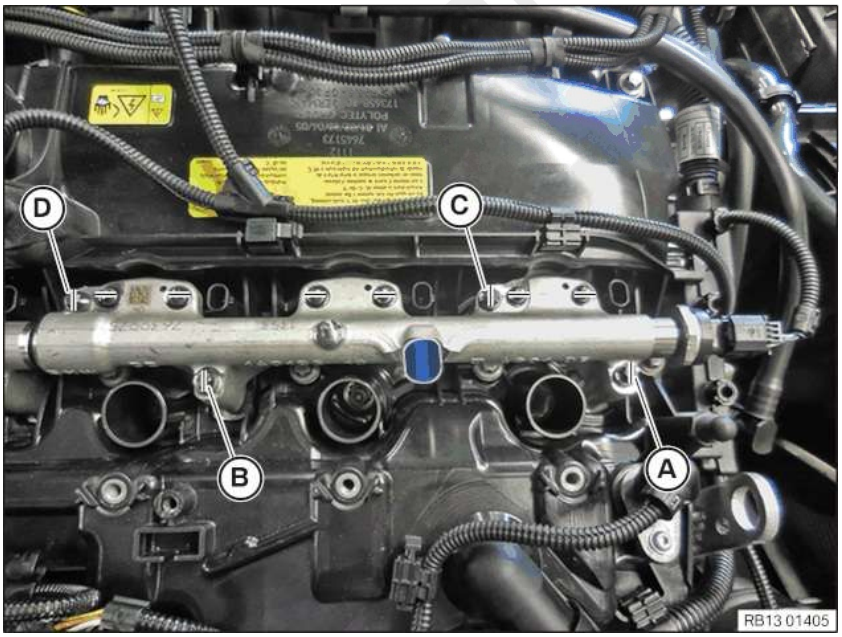
- Release screws (M6x70) (A) to (D) **without fail**.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten screw (A) to 5 Nm.
- Tighten screw (D) to 5 Nm.
- Tighten screw (B) to 5 Nm.
- Tighten screw (C) to 5 Nm.

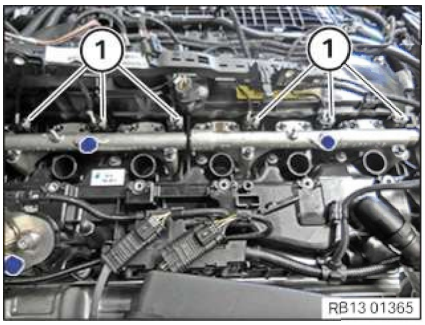


- Mark all the bolts (A) to (D) with a vertical line (see Figure).
- Tighten bolts (M6x70) (A) to (D) with an angle of rotation of 90°.



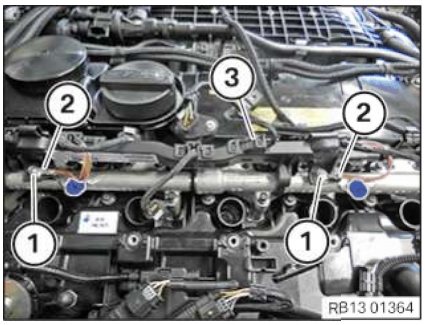
- Check whether all screws (A) to (D) have been tightened with an angle of rotation of 90°.

  All marks (lines) must be horizontal (see figure).



- Connect and lock all the connectors (1) to the injectors.

  All connectors (1) must engage audibly.

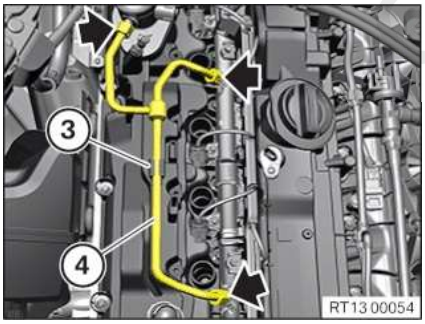


- Thread the cable channel (3) in and install.
- Thread in ground cable (2) and install.
- Tighten nuts (1).

Ground cable to rail

M6		5 Nm

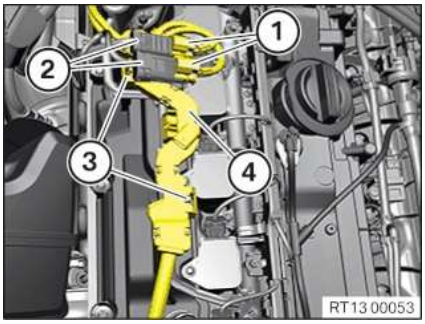
97 – Installing high pressure line between rail and high pressure pump



- Insert the high pressure line (4) into the holder (3) and install.
- Tighten union nuts (arrows) with the special tool .

High pressure line between rail and high pressure pump

M14x1,5		Tightening torque	33 Nm



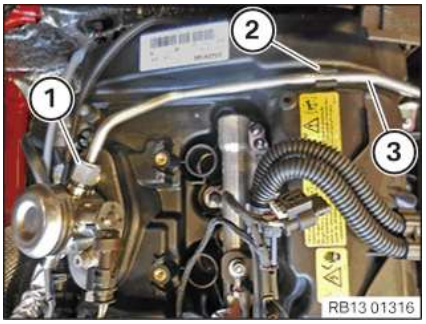
- Insert and install the wiring harness section of the engine wiring harness (4).

  The locks (3) must engage audibly.
- Connect connectors (1) and (2) and lock.

  The connectors (1) and (2) must audibly engage.

98 – Installing fuel delivery line

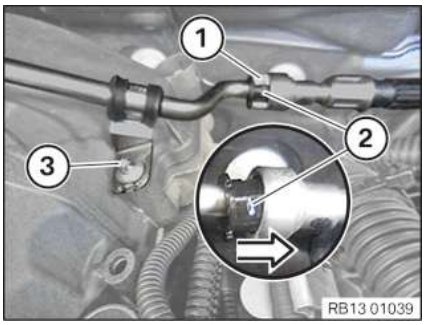
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- Guide the fuel delivery line (3) in and install.
- Install rubber damper (2).
- Check the rubber damper (2) for the correct fit.
- Tighten the union nut (1) hand-tight.
- Tighten union nut (1).

Fuel delivery line to high pressure pump

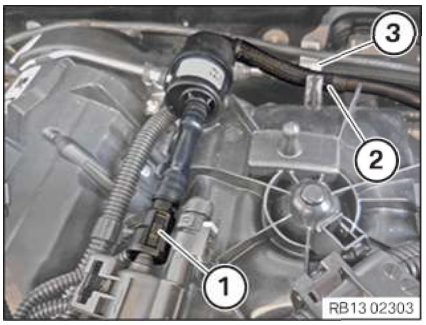
M14		Tightening torque	31 Nm



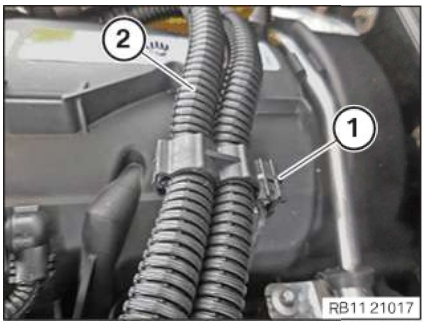
- Slide in and lock the fuel feed line in the direction of the arrow in the snap fastener (2).
  The fuel feed line must be audibly engage in the snap fastener (2).
- Secure clamps (1).
- Tighten down screw (3).

Fuel line to cylinder head cover

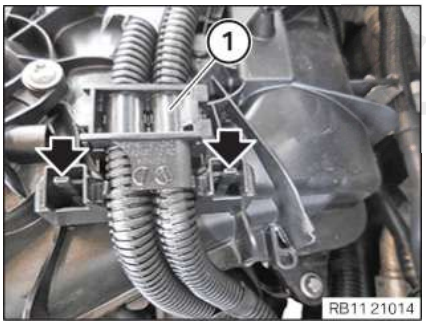
6x18		Tightening torque	6,5 Nm



- Insert and install the tank ventilation line (2).
- Lock (1) must engage audibly.
- Secure the tank ventilation line (2) to the clamp (3).



- Insert and install wiring harness section (2) for injectors and ignition coils.
- Secure clamps (1).



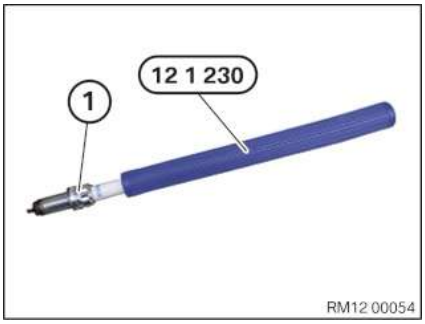
- Insert and install wiring harness section (1) for injectors and ignition coils.
- The locks (arrows) must engage audibly.

99 – Installing all spark plugs

NOTICE

The description is for one component only. The procedure is identical for all further components.

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- Insert spark plug (1) into special tool 0 496 065 (12 1 230).



TECHNICAL INFORMATION

Do not drop spark plug into spark plug shaft! This can lead to a reduction of the electrode gap and can thus impair smooth running of the engine, especially in idle position.

- Screw in the spark plugs in the engine with the special tool 0 496 065 (12 1 230) until hand-tight.



TECHNICAL INFORMATION

Exclusively swivelling extensions may be used for the reversible ratchet. Rigid mounting tool and variable plug connections with rigid option may not be used; there is a risk that the insulator breaks.

- Tighten the spark plugs with the torque wrench, the special tool 0 495 560 (12 1 220) and a swivelling extension.

Spark plugs

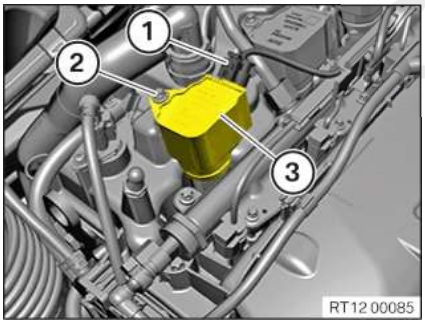
M12x1.25		Tightening torque	23 Nm

100 – Install all ignition coils

NOTICE

The description is for one component only. The procedure is identical for all further components.

▸ **Install ignition coil.**



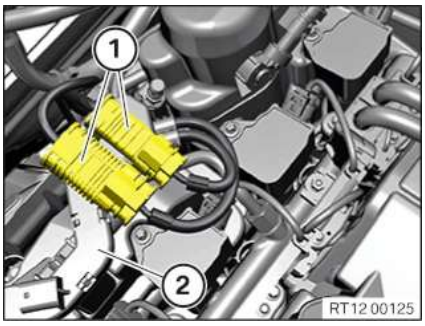
- Install ignition coil (3).
- Tighten down screw (2).

Ignition coil

Screw		Tightening torque	8 Nm

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.



- Connect the connector (1) of the front oxygen sensor and the monitoring oxygen sensor on the cable shaft (2).

101 – Install engine ventilation line adapter with heating element on the exhaust turbocharger

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

RISK OF DAMAGE

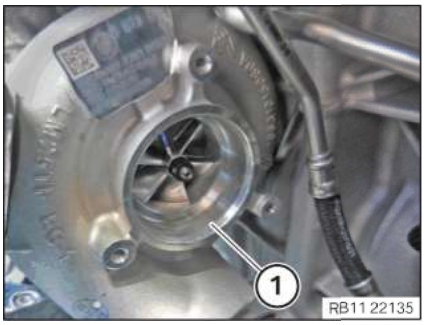
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

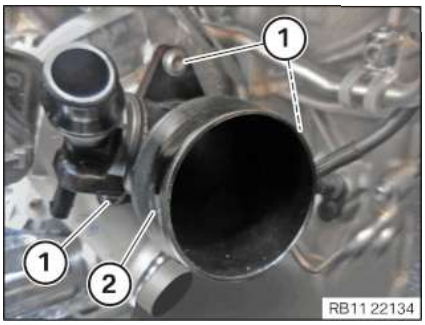


- Clean sealing surface (1).



- Renew the seal (1) using the special tool 0 496 714 (00 9 030).

  Parts: Gasket



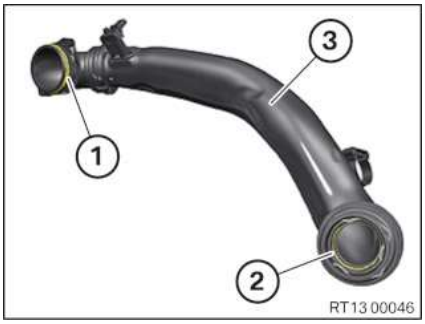
- Feed in and install connecting branch with heating element (2) on exhaust turbocharger.
- Tighten the screws (1).

Engine ventilation line adapter with heating element to exhaust turbocharger

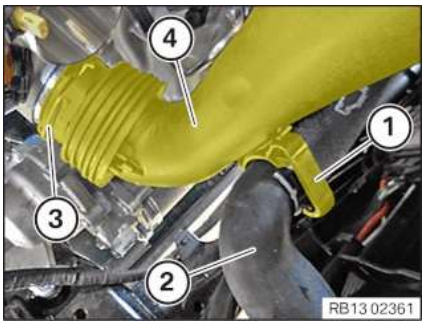
M6x26 screw		Tightening torque	8 Nm

102 – Install charge air line

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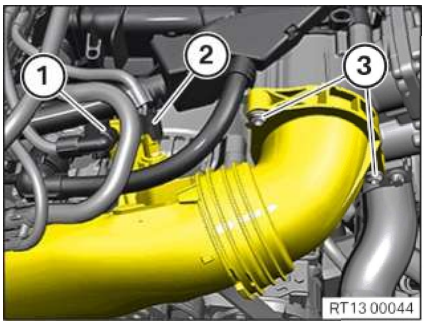


- Check the sealing ring (1) on the charge air line (3) for damage and renew it with the special tool 0 496 714 (00 9 030), if necessary.
- Check the sealing ring (2) on the charge air line (3) for damage and renew it with the special tool 0 496 714 (00 9 030), if necessary.



- Insert and install charge air line (4).
- Lock clamp (3).

  The clamp (3) must engage audibly.
- Insert and install the coolant hose (2).
- Lock clamp (1).



- Tighten the screws (3).

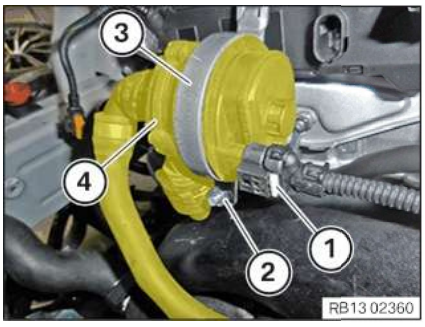
Charge air line to throttle valve

M6x30		Tightening torque	8 Nm

- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.



- Insert and position the additional coolant pump (4).
- Insert and position the retaining bracket (3).
- Tighten nut (2).

Electric coolant pump to holder

M6		Tightening torque	8 Nm

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

103 – Installing clean air pipe



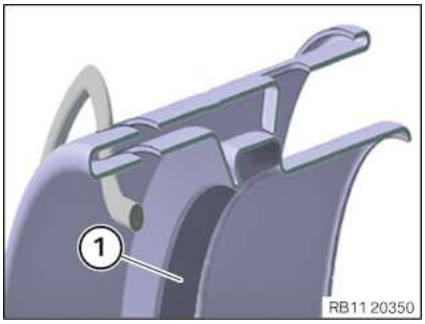
- Check the seal (1) for damage and renew if necessary.

▸ **Replace damaged gasket**

TECHNICAL INFORMATION

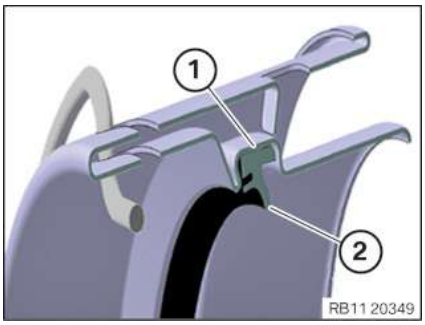
Do not use pointed or sharp-edged tools for the installation and/or removal.

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

  The gasket groove (1) must be clean.



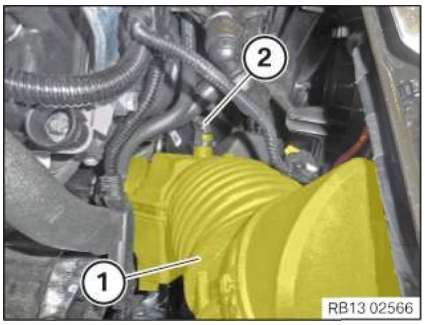
- Renew gasket.

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

TECHNICAL INFORMATION

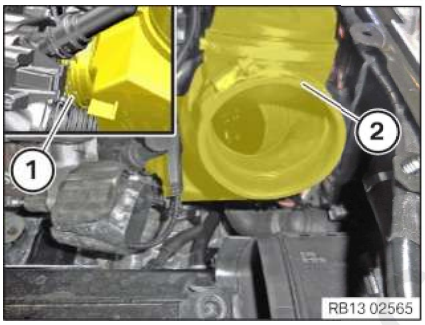
Incorrect assembly is possible. Ensure correct installation position.

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



- Guide in and position clean air pipe (1).
- Connect engine ventilation line (2) and lock.

  The engine ventilation line (2) must engage audibly.



- Install the clean air pipe (2).
- Lock clamp (1).

  The clamp (1) must engage audibly.



- Secure clamps (1).

104 – Install engine ventilation line

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

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

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

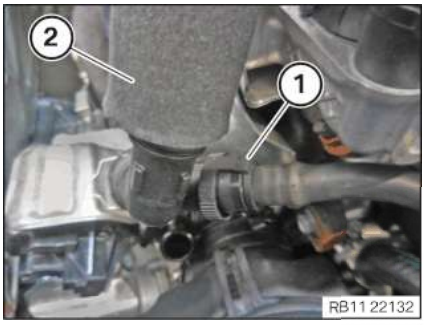
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TECHNICAL INFORMATION

Check the retaining lug on the connector for damage and perform a tension check as needed.

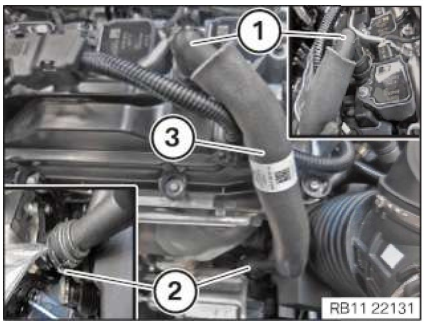


- Check sealing ring (1) for damage and renew tank ventilation line if necessary.

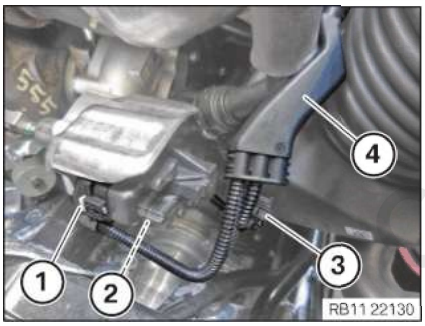


- Insert and position the engine ventilation line (2).
- Insert and install the tank ventilation line (1).

  Tank ventilation line (1) must engage audibly into place.

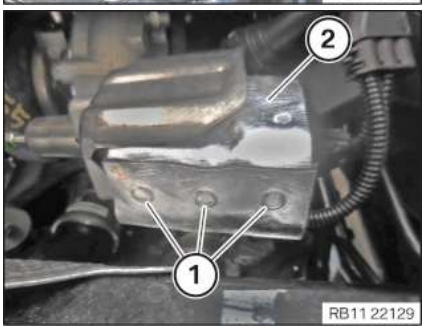


- Insert and install the engine ventilation line (3).
- Make sure you can hear the locks (1) and (2) engage.



- Feed in and position the wiring harness section of sensor system **2** (4).
- Connect connectors (2) and lock.
- Connect connectors (1) and lock.

  The connectors (1) and (2) must audibly engage.
- Secure clamps (3).

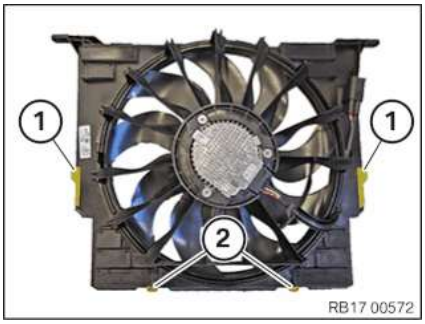


- Feed in and install heat shield (2).
- Lock the locks (1).

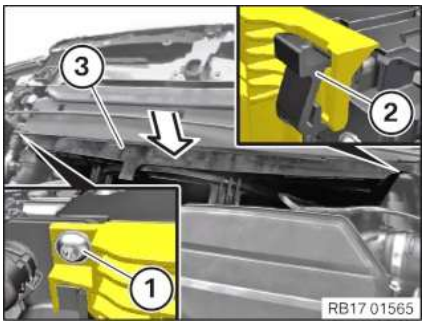
  Locks (1) must engage audibly.

105 – Install fan cowl

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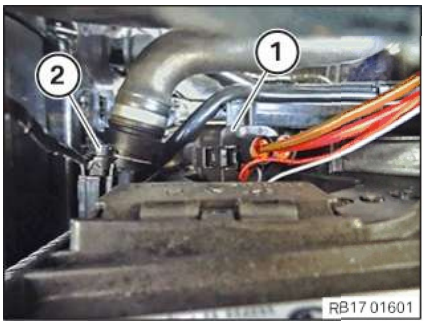
- Feed guides (1) into the radiator.
- Feed guides (2) into the charge air cooler.



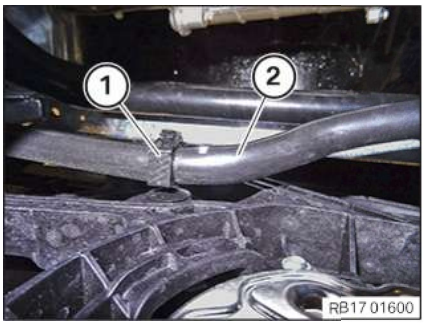
- Guide in and install fan cowl (3) **carefully** in the direction of the arrow.
- Ensure that the lock (2)engages audibly.
- Tighten down screw (1).

Fan cowl with electric fan on radiator

TS6x20		Tightening torque	6,5 Nm

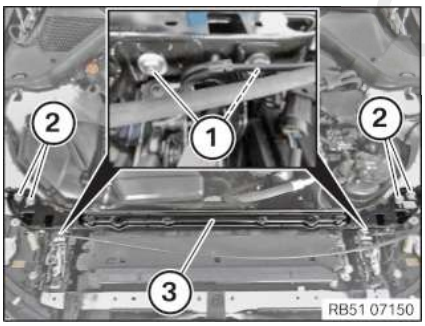


- Connect connectors (2) and lock.
  The connector (2) must engage audibly.
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.



- **If installed:** Secure the transmission oil line (2).
  Insert and install the transmission oil line (2).
  Lock holder (1).

106 – Install the rear top cross connection



- Guide in and position the top rear cross connection (3).
- Tighten the screws (1).

Top rear cross connection to bonnet catch support

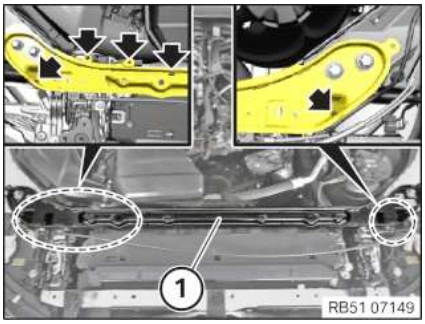
Flat-head screw M6x20		Tightening torque	11,8 Nm

- Renew screws (2).
  Parts: Bolts
- Tighten the screws (2).

Rear top cross connection to wheel arch carrier support

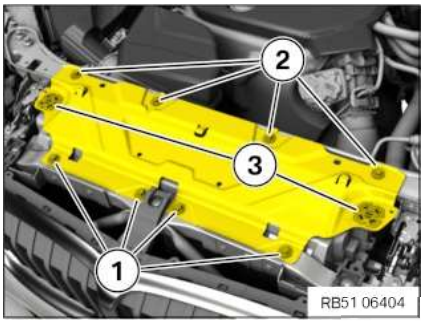
M10x20 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

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- Secure the clips (arrows) in the marked areas to the top rear cross connection (1).

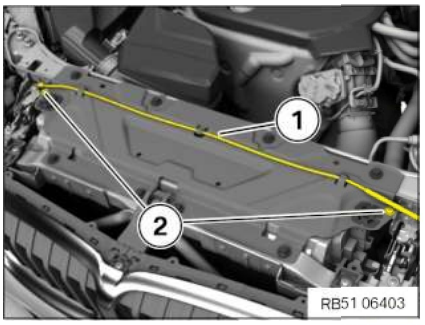
107 – Installing the top cross connection



- Set and position upper cross connection with holders (3) from above.
- Tighten down screws (1) and (2).

Cross connection, top

M8x20		Tightening torque	28 Nm

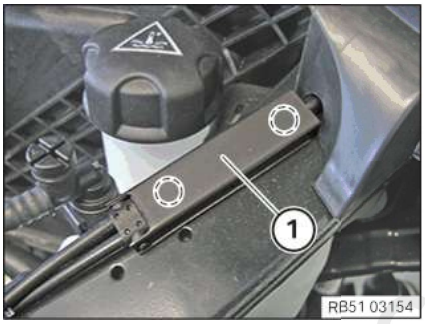


- Tighten down screws (2).

Cross connection, top

M6x20		Tightening torque	11,8 Nm

- Attach Bowden cable (1) on the upper cross connection.



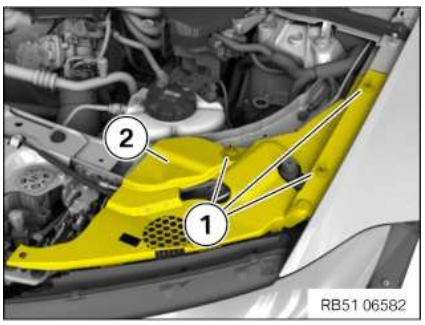
- Clip in the housing for the coupling of the Bowden cables (1).

108 – Install the cover in the engine compartment at top left and right partially

NOTICE

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

▸ **Installing the cover in the engine compartment on top partially**

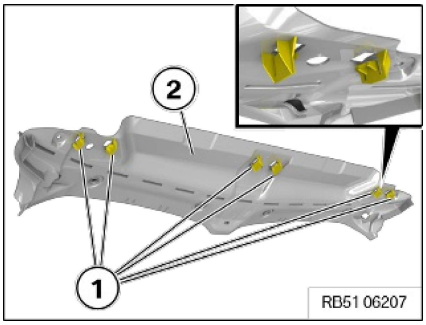


- Install the cover in the engine compartment on top (2).
- Secure expanding rivet (1).

109 – Installing cover for engine compartment centre

Check

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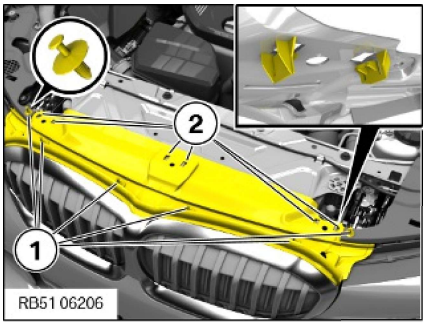
- Check latch mechanisms (1) of cover for engine compartment centre (2) for damage.

Result

» The latch mechanism (1) is damaged.

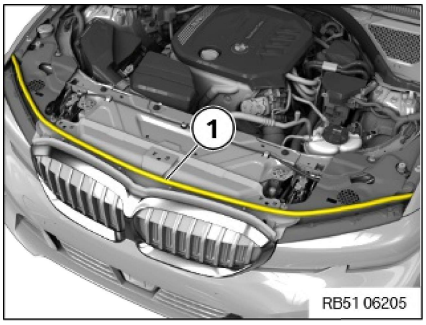
Measure

- Renew cover for engine compartment centre (2).



- Guide in the cover for the engine compartment centre from the rear and position it.
- Clip in the cover for the engine compartment centre with latch mechanisms (2).
- Mount all expanding rivets (1).

110 – Install the seal for the front bonnet



- Position the bonnet seal(1) and connect it on the mounting on the bumper and on the headlights.

111 – Install the monitoring oxygen sensor

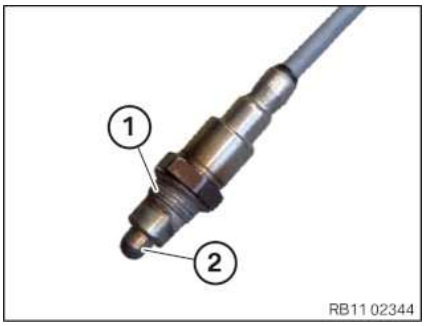
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue



- Prepare the oxygen sensor.

  Do not damage the sensor ceramics.

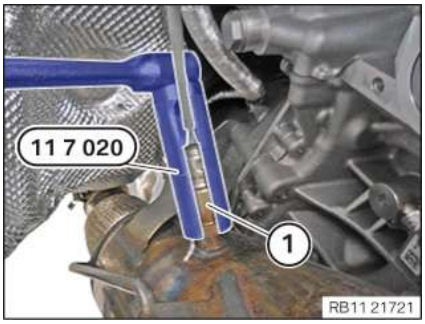
  (1) = Thread

  (2) = Sensor ceramics
- Grease the thread (1) of the Lambda monitoring oxygen sensor thinly and evenly.

Expendable materials

Brake block paste * TU = Trade Unit. TU numbers cannot be ordered! For invoicing purposes only.	3 g, Bag	83192158851
	100 g, Tube	83192158852
	5 g, TU*	83230140233

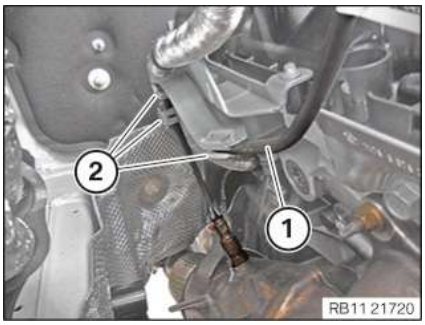
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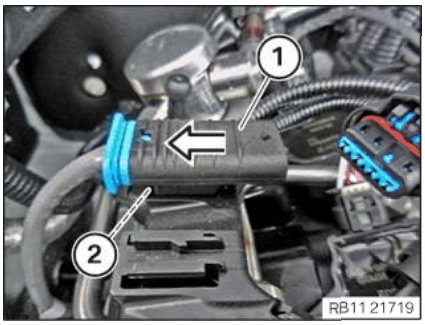
- Feed in the monitoring oxygen sensor (1) and install.
- Tighten monitoring oxygen sensor (1) using special tools 0 493 751 (11 9 150) and 0 491 075 (11 7 030) .

Monitoring oxygen sensor to catalytic converter

M18X1.5		Tightening torque	50 Nm



- Guide monitoring oxygen sensor line (1) into holder (2) and install it.



- Insert and install the connector (1) in the **direction of arrow**.
- Ensure that the lock (2)engages audibly.



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

112 – Install the front oxygen sensor

TECHNICAL INFORMATION

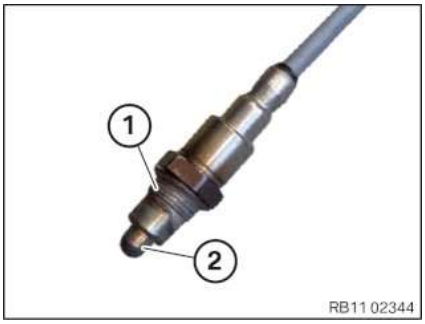
New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

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- Prepare the oxygen sensor.

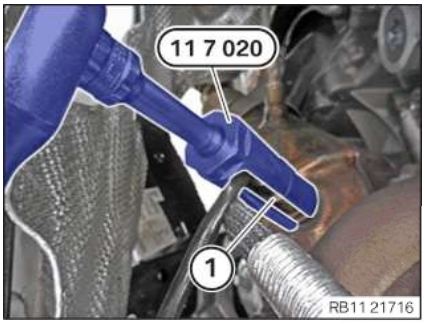
  Do not damage the sensor ceramics.

  (1) = Thread

  (2) = Sensor ceramics
- Apply a thin and even coat of grease to the thread (1) of the front oxygen sensor.

Expendable materials

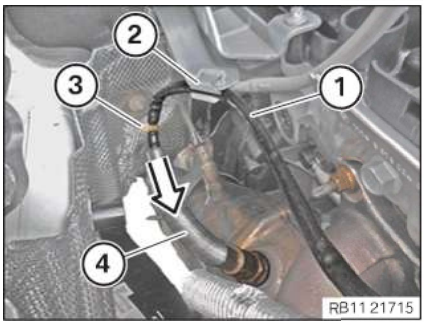
Brake block paste * TU = Trade Unit. TU numbers cannot be ordered! For invoicing purposes only.	3 g, Bag	83192158851
	100 g, Tube	83192158852
	5 g, TU*	83230140233



- Screw the control sensor (1) in and tighten it with the special tool .

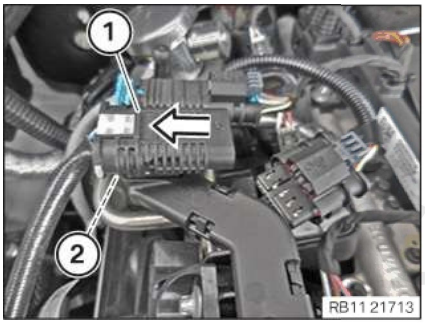
Front oxygen sensor to catalytic converter

M18X1.5		Tightening torque	50 Nm



- Guide in the heat protection (4) in the **direction of arrow** and install.
- Renew the cable straps (3).

  Parts: Cable strap
- Guide in and install the cable strap (3).
- Feed in and install the line of the front oxygen sensor (1) in the holder (2).



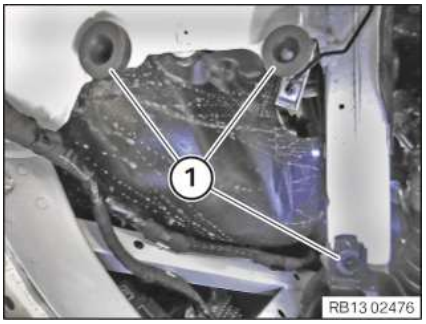
- Insert and install the connector (1) in the **direction of arrow**.
- Ensure that the lock (2)engages audibly.



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

113 – Installing intake silencer housing

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- Check the rubber mount (1) for correct fit.



- Feed the intake filter housing (3) in and engage it in the rubber mounts.
- Tighten clamp (2).

Clean air pipe to upper section of intake filter housing

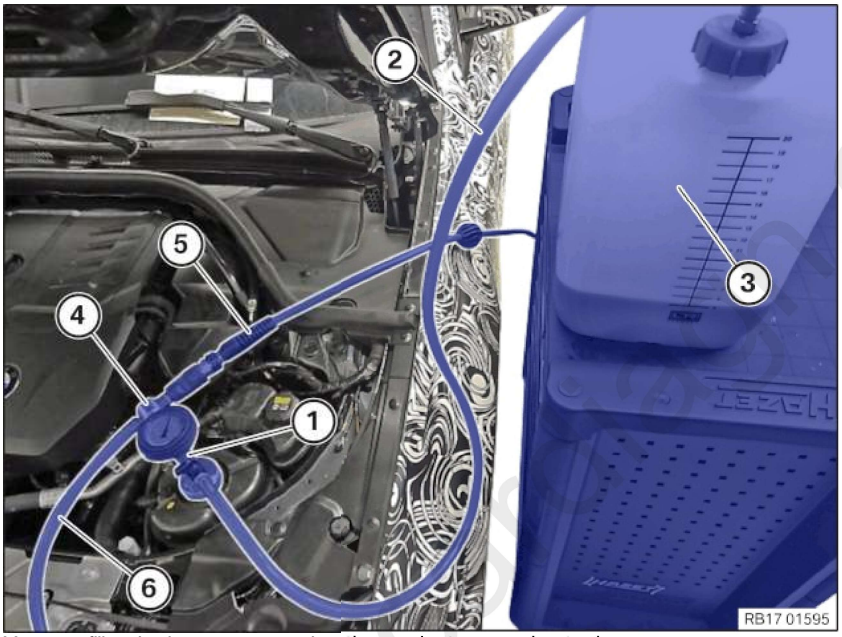
Clamp		Tightening torque	3 Nm

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

114 – Fill the high-temperature cooling system with the vacuum filler device

Vacuum filler device



Vacuum filler device - connected to the coolant expansion tank

1 Vacuum filler device with pressure gauge and shutoff valves

2 Filling hose

3 Fluid tank with coolant

4 Venturi nozzle

5 Compressed air connection (maximum of 6 bar)

6 Out-going hose (lead out-going hose into a collecting vessel)

Prerequisite

The coolant expansion tank for the cooling system must be empty. The fluid tank of the vacuum filler device must have a sufficient quantity of premixed coolant, 1 l to 2 l more than the specified capacity for the vehicle. The fluid tank of the vacuum filler device must be positioned at the same height as the coolant expansion tank. The compressed air connection must have a pressure of 6 bar. Ignition is switched off.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.
For additional information see:
Main group 17
17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

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

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

TECHNICAL INFORMATION

Mixing different coolants is not permitted.

TECHNICAL INFORMATION

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

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

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

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

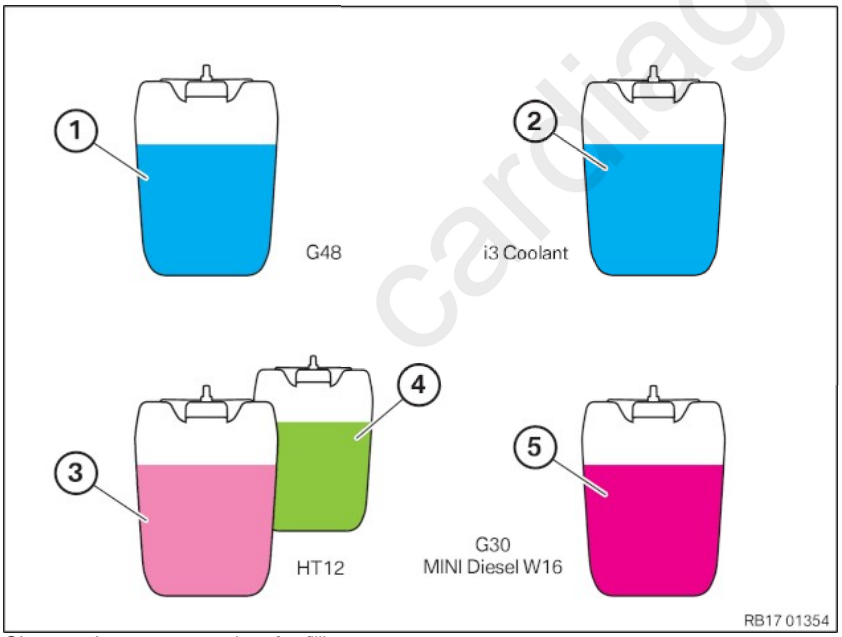
A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

TECHNICAL INFORMATION

Make sure that the ignition (terminal 15) is switched off prior to creating the vacuum with the vacuum filler device.

▸ **Observe the coolant type**

Coolant in the vacuum filler device container



Choose the correct coolant for filling

A vehicle must be filled with the coolant with which it is delivered ex works

1. **G48 (Blue)** G48 must not be mixed with the i3Coolant or the G30 MINI diesel fuelW16.
2. **i3 coolant (blue)** is used only for the i3 heater circuit. i3 coolant must not be filled in the other coolant circuits or mixed with the other coolants.
3. **HT12 (Pink)** HT12 must not be mixed with the i3 coolant or the G30 MINI diesel fuel W16.
4. **HT12 (Green)** HT12 must not be mixed with the i3 coolant or the G30 MINI diesel fuel W16.
5. **G30 (Pink)** must be used only for the **MINI diesel fuel W16**. G30 must not be filled in the other coolant circuits or mixed with the other coolants.

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RISK OF DAMAGE

Damage to the engine.

The use of an incorrect coolant may lead to corrosion or gelling in the engine.

- Use only approved coolants for the specific vehicle.
- Fill the vehicle only with the coolant with which it was delivered ex works.
- Mix only compatible coolants. The colour does not allow any assessment about the compatibility of coolants.
- Selection of the correct coolant only by means of the part number.

- Select a suitable adapter (Y) from the set of special tools 0 494 417 (17 0 100):

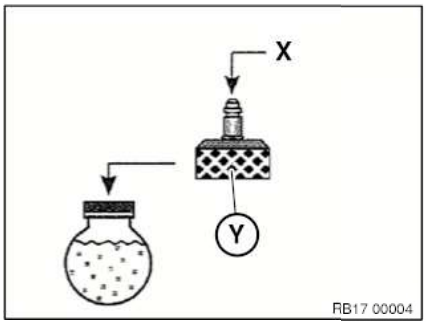
Type	Engine	Adapter (Y) from 17 0 100
G20/G29	B46 / B48 /B58	17 0 113

- The fluid tank of the vacuum filler device must be filled with 1 l to 2 l more than the specified capacity of coolant for the vehicle.

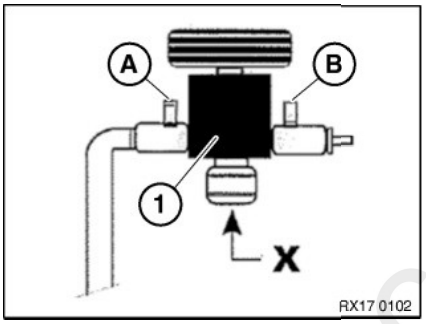
Capacity of high-temperature coolant circuit G20/G29

B58B30O1	10,5 l

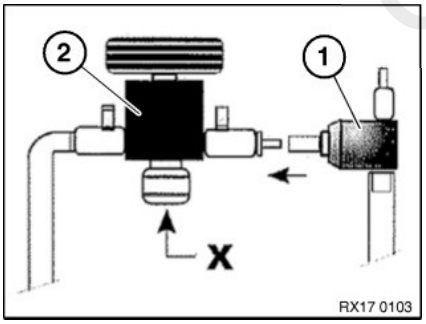
Expendable materials: Technically suitable antifreeze and corrosion inhibitor



- Connect the selected adapter (Y) to the coolant expansion tank.
- Connect vacuum filler device to connection (X) of the adapter.

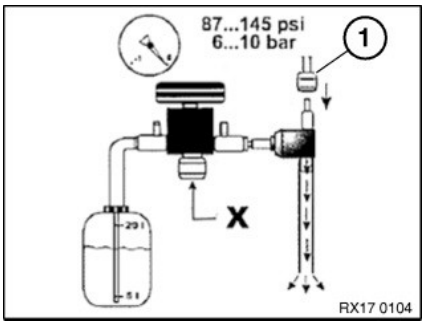


- Check whether shut-off valves (A) and (B) of the vacuum filler device (1) are closed.
- Connect and lock connection (X) to the coolant expansion tank.



- Connect Venturi nozzle (1) to the vacuum filler device (2).

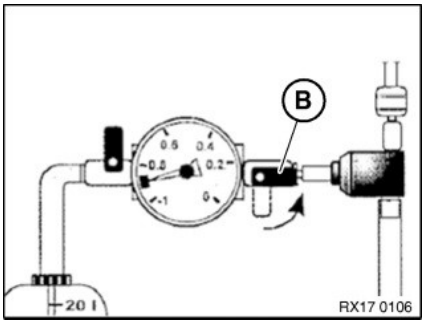
  (X)is the connection on the coolant expansion tank.



- Connect compressed air (1).

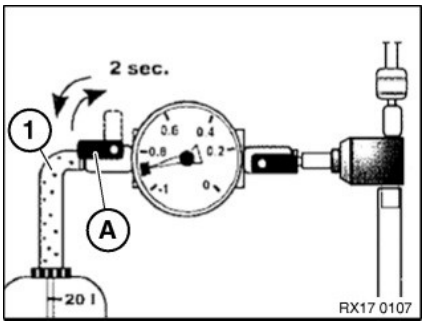
  (X)is the connection on the coolant expansion tank.

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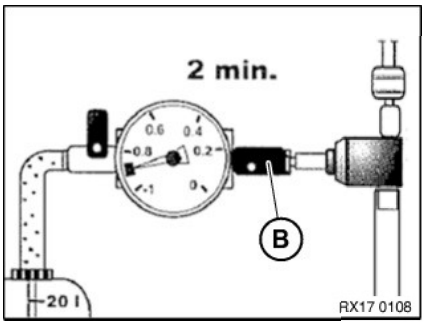
- Open shut-off valve (B).

  The venturi nozzle produces a flow noise.



- Open shutoff valve (A) until the fuel filling hose (1) is full without bubbles.
- Close shutoff valve (A) again.

» The filling hose (1) has now been bled.

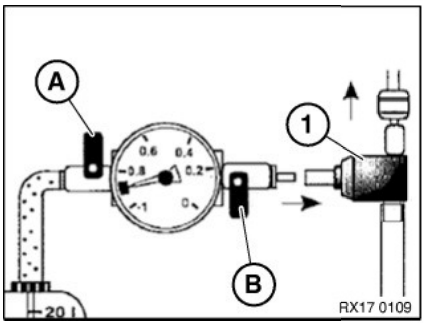


- Check the coolant hoses for porosity and renew porous coolant hoses as required.

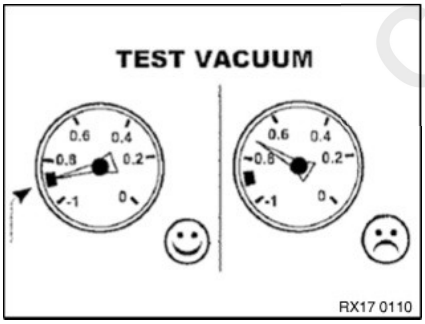
TECHNICAL INFORMATION

The coolant hoses contract during vacuum build-up.

- After having established a vacuum in the coolant circuit of between -0.7 to -0.95 bar (duration approximately 2 min), close the shut-off valve (B).



- Check whether the shutoff valves (A) and (B) are closed.
- Disconnect the Venturi nozzle (1).



Check

- Make sure the vacuum in the coolant circuit is maintained for at least 30 seconds.

Result

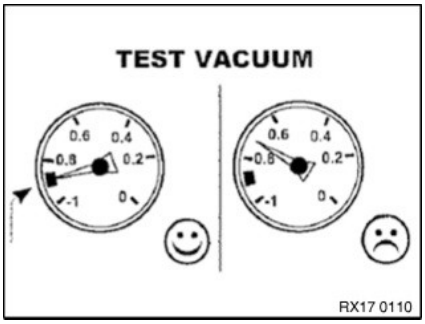
» Vacuum drops.

Measure

- Look for the leak, repair it and start the filling procedure from the beginning.

Check

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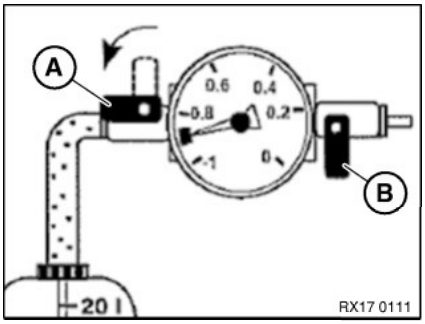
- Make sure the vacuum in the coolant circuit is maintained for at least 30 seconds.

Result

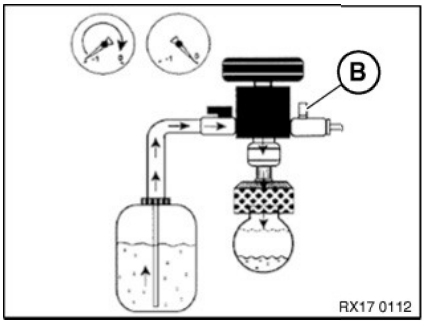
» Vacuum remains constant.

Measure

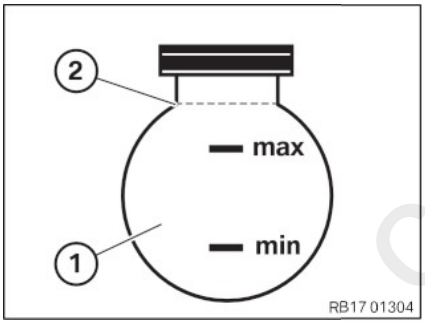
- Continue with filling.



- Keep shutoff valve (B) closed during the filling process.
- To fill the cooling system, open the shutoff valve (A) to the fluid tank of the vacuum filler device.



- Stop the filling procedure when the needle in the pressure measuring device is on 0 bar or it no longer drops.
- If necessary, reduce remaining vacuum. In order to do so, open shutoff valve (B).

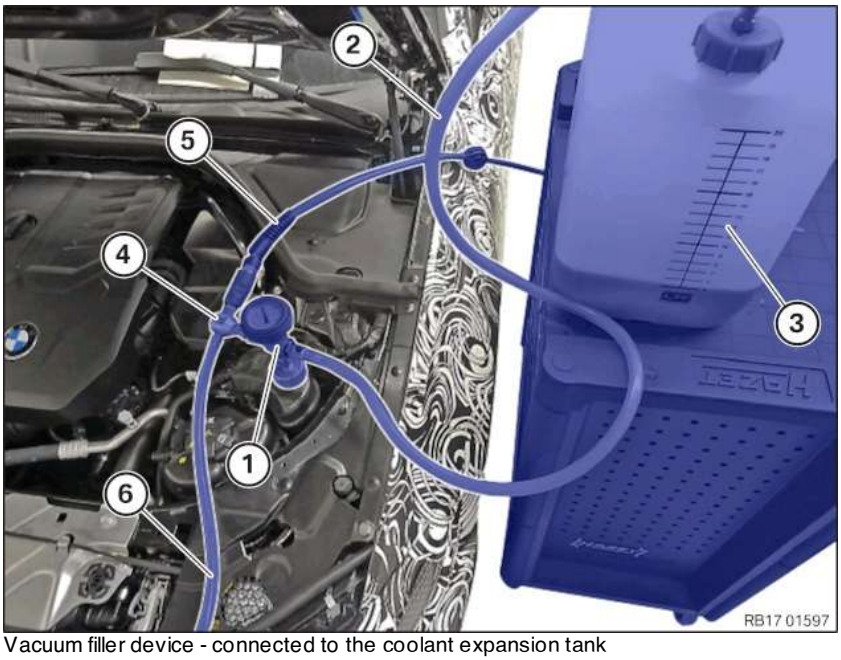


- Remove the vacuum filler device with the adapter from the high temperature coolant expansion tank (1).
- Top up the coolant level in the high temperature coolant expansion tank (1) to the lower edge of the coolant filler neck (2) in the high temperature coolant expansion tank (1).
- After filling the cooling system with the vacuum filler device, **also** run the cooling system bleeding routine.

115 – Filling the low-temperature cooling system with the vacuum filler device

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Vacuum filler device



Vacuum filler device - connected to the coolant expansion tank

1 Vacuum filler device with pressure gauge and shutoff valves

2 Filling hose

3 Fluid tank with coolant

4 Venturi nozzle

5 Compressed air connection (maximum of 6 bar)

6 Out-going hose (lead out-going hose into a collecting vessel)

Prerequisite

The coolant expansion tank for the cooling system must be empty. The fluid tank of the vacuum filler device must have a sufficient quantity of premixed coolant, 1 l to 2 l more than the specified capacity for the vehicle. The fluid tank of the vacuum filler device must be positioned at the same height as the coolant expansion tank. The compressed air connection must have a pressure of 6 bar. Ignition is switched off.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

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

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

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

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

TECHNICAL INFORMATION

Mixing different coolants is not permitted.

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TECHNICAL INFORMATION

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

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

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

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

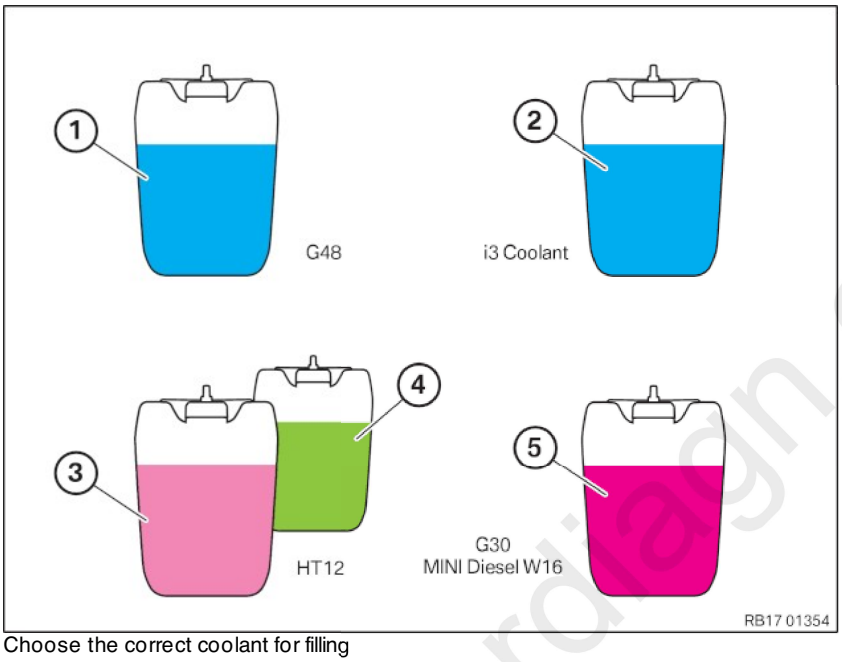
A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

TECHNICAL INFORMATION

Make sure that the ignition (terminal 15) is switched off prior to creating the vacuum with the vacuum filler device.

▸ **Observe the coolant type**

Coolant in the vacuum filler device container



Choose the correct coolant for filling

A vehicle must be filled with the coolant with which it is delivered ex works

1. **G48 (Blue)** G48 must not be mixed with the i3Coolant or the G30 MINI diesel fuelW16.
2. **i3 coolant (blue)** is used only for the i3 heater circuit. i3 coolant must not be filled in the other coolant circuits or mixed with the other coolants.
3. **HT12 (Pink)** HT12 must not be mixed with the i3 coolant or the G30 MINI diesel fuel W16.
4. **HT12 (Green)** HT12 must not be mixed with the i3 coolant or the G30 MINI diesel fuel W16.
5. **G30 (Pink)** must be used only for the **MINI diesel fuel W16**. G30 must not be filled in the other coolant circuits or mixed with the other coolants.

RISK OF DAMAGE

Damage to the engine.

The use of an incorrect coolant may lead to corrosion or gelling in the engine.

- Use only approved coolants for the specific vehicle.
- Fill the vehicle only with the coolant with which it was delivered ex works.
- Mix only compatible coolants. The colour does not allow any assessment about the compatibility of coolants.
- Selection of the correct coolant only by means of the part number.

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- Select a suitable adapter (Y) from the set of special tools 0 494 417 (17 0 100):

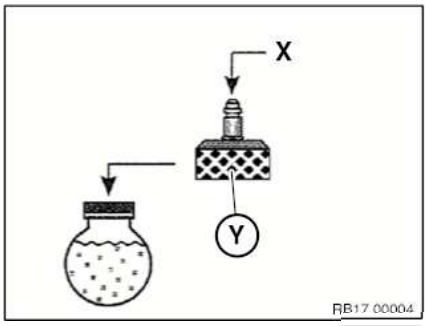
Type	Engine	Adapter (Y) from 17 0 100
G20/G29	B46 / B48 /B58	17 0 109

- The fluid tank of the vacuum filler device must be filled with 1 l to 2 l more than the specified capacity of coolant for the vehicle.

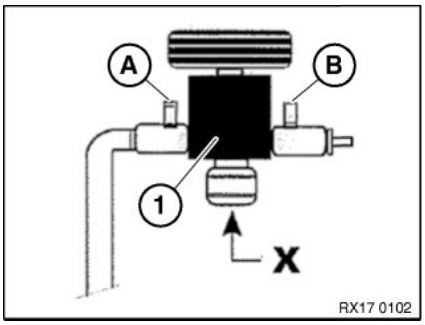
Capacity of low-temperature coolant circuit G20/G29

B58B30O1	4,5 l

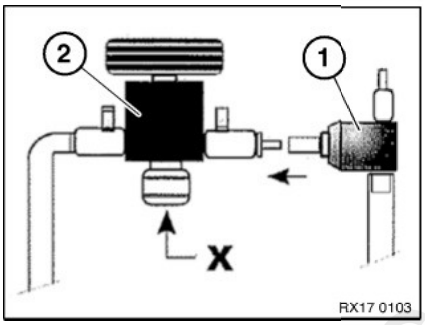
Expendable materials: Technically suitable antifreeze and corrosion inhibitor



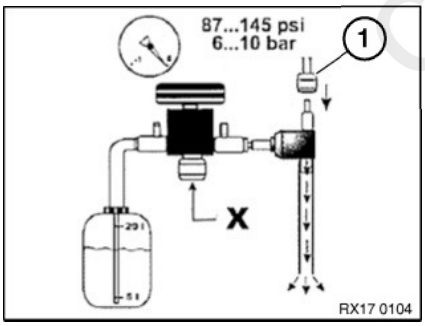
- Connect the selected adapter (Y) to the coolant expansion tank.
- Connect vacuum filler device to connection (X) of the adapter.



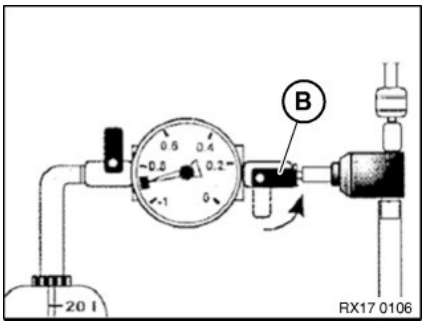
- Check that shutoff valves (A) and (B) of the vacuum filler device (1) are closed.
- Connect and lock connection (X) to the coolant expansion tank.



- Connect Venturi nozzle (1) to the vacuum filler device (2).
  (X)is the connection on the coolant expansion tank.

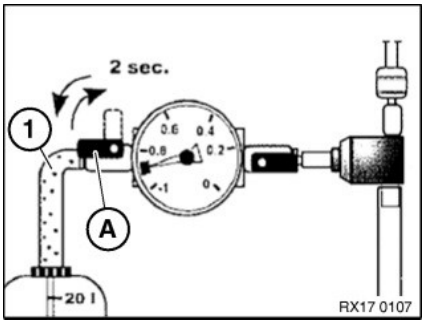


- Connect compressed air (1).
  (X)is the connection on the coolant expansion tank.



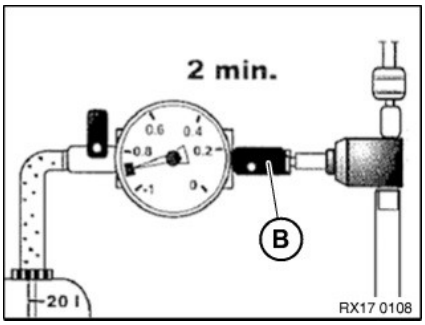
- Open shut-off valve (B).
  The venturi nozzle produces a flow noise.

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- Open shutoff valve (A) until the fuel filling hose (1) is full without bubbles.
- Close shutoff valve (A) again.

» The filling hose (1) has now been bled.

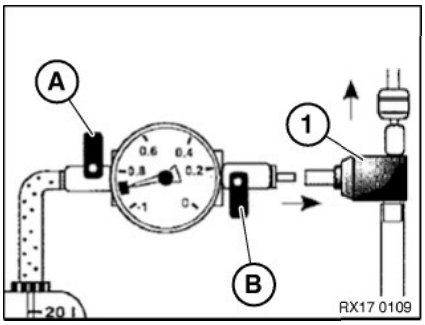


- Check the coolant hoses for porosity and renew porous coolant hoses as required.

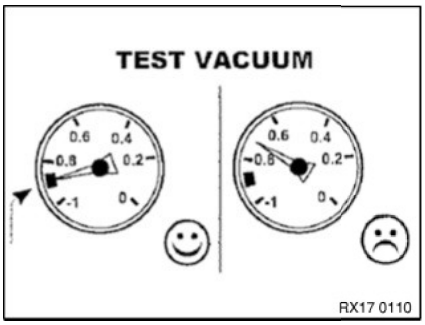
TECHNICAL INFORMATION

The coolant hoses contract during vacuum build-up.

- After a vacuum of -0.7 to -0.95 bar has been created in the coolant circuit (duration approx. 2 min), shut the shutoff valve (B).



- Check whether the shutoff valves (A) and (B) are closed.
- Disconnect the Venturi nozzle (1).



Check

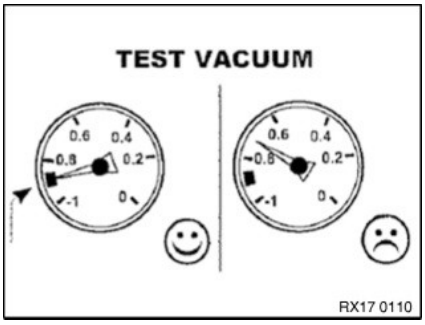
- The vacuum in the coolant circuit must be maintained for at least 30 seconds.

Result

» Vacuum drops.

Measure

- Look for the leak, repair it and start the filling procedure from the beginning.



Check

- The vacuum in the coolant circuit must be maintained for at least 30 seconds.

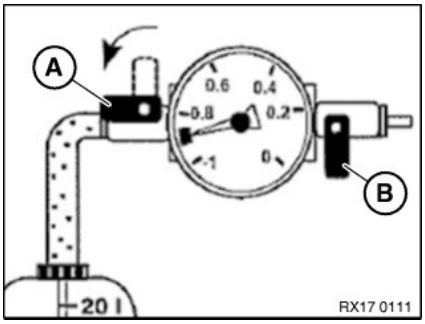
Result

» Vacuum remains constant.

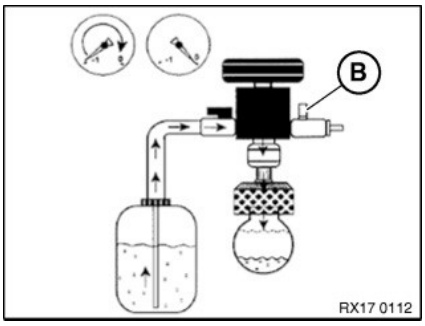
Measure

- Continue with filling.

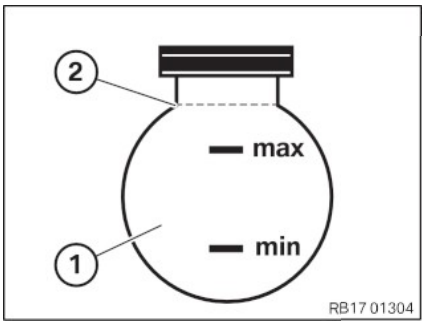
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- Keep shutoff valve (B) closed during the filling process.
- To fill the cooling system, open the shutoff valve (A) to the fluid tank of the vacuum filler device.



- Stop the filling procedure when the needle in the pressure measuring device is on 0 bar or it no longer drops.
- If necessary, reduce remaining vacuum. In order to do so, open shutoff valve (B).



- Remove the vacuum filler device with the adapter from the low-temperature coolant expansion tank (1).
- Adjust the coolant level in the low-temperature coolant expansion tank (1) up to the lower edge of the coolant filler neck (2) of the low-temperature coolant expansion tank (1).
- After filling the cooling system with the vacuum filler device, **also** run the cooling system bleeding routine.

116 – Disconnecting all battery earth leads



- See additional information.

117 – Bleed the high-temperature coolant circuit

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

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

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

TECHNICAL INFORMATION

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

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

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

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

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

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TECHNICAL INFORMATION

Before starting the automatic cooling system bleeding routine, make sure that **all coolant circuits** are **filled**. If the cooling system bleeding routine is started while one of the coolant circuits is empty, there is a risk of damage to the electric coolant pump when running it dry.

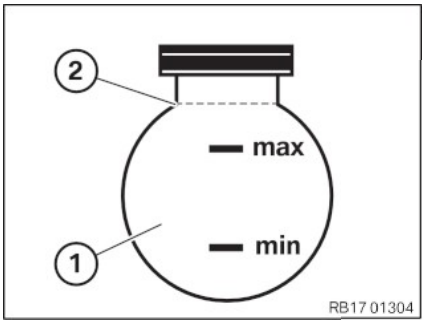
Make sure that terminal 15 is not disconnected for the bleeding procedure. Switch on low-beam headlights and hazard warning lights. If the low-beam headlights and hazard warning lights are not switched on, the ignition (terminal 15) will switch off automatically after a certain period of time and interrupt the bleeding procedure.

TECHNICAL INFORMATION

The electrical fan is activated during the entire cooling system bleeding routine.

TECHNICAL INFORMATION

The driving experience switch must not be set to the ECO PRO switch position.



- Open the bleeder screw on the coolant expansion tank for the high-temperature coolant circuit and close it again after approx. **10 s**.

  You can close the bleeder screw prior to expiry of the 10 s once coolant escapes.
- Adjust the coolant level in the high temperature coolant expansion tank (1) to the lower edge (2) of the coolant filler neck of the the high temperature coolant expansion tank (1) .
- Close the sealing cap on the coolant expansion tank of the high--temperature cooling circuit.
- Make sure the bonnet is **closed**.
- Make sure that the wheels touch the ground.
- Engage the parking brake.
- Do not engage any gear in manual-shift gearbox, and engage the gear to "P" or "N" automatic transmission.
- Connect battery charger.
- Switch on the ignition and make sure that it remains **switched on** (for example, activate the low-beam headlight and the **hazard warning light at the same time**).

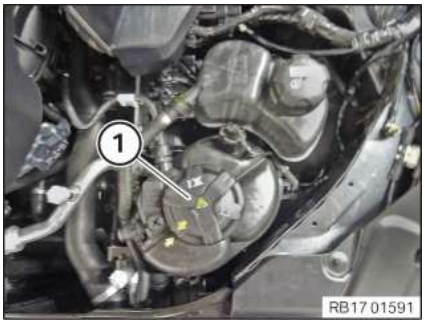
  If the low-beam headlight and the hazard warning light are **not** switched on, the ignition (**terminal 15**) will switch off automatically after some time and interrupts the bleeding procedure.
- Check that the driving experience control is **not** in the **"ECO-PRO"** switch position.
- Adjust the heating to **maximum** temperature and adjust the blower to the **lowest** stage.
- Hold the accelerator pedal down to the limit position for at least **10 s** and do **no** kick the brake pedal.
- Start engine.
- Start the cooling system bleeding routine, pay attention to the display on the instrument cluster (KOMBI). ("Service function started")

  The engine speed (up to 3500 rpm) and the actuators in the cooling system are activated **automatically** for 11 minutes according to a cooling system bleeding routine.

  The cooling system bleeding routine ends approx. 11 min **after** the engine starts.

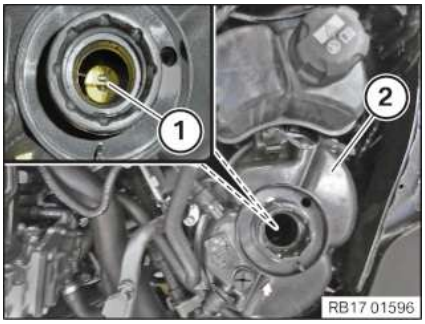
  The engine speed **drops** to the idle speed.
- Observe the display in the instrument cluster (KOMBI).

  If the service function is interrupted, the cooling system bleeding routine **must** be repeated.
- Switch off engine.
- Allow the coolant temperature to cool down to **< 50°C**.



- Loosen sealing cap (1).

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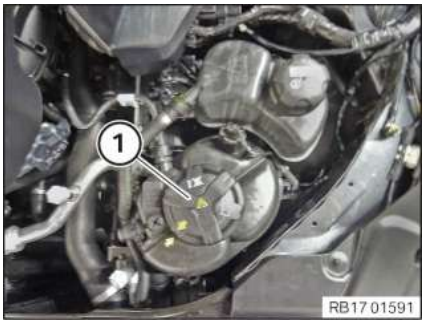
TECHNICAL INFORMATION

After the cooling system bleeding routine, the cooling system is topped up above the maximum mark.

Overfilling the cooling system serves to balance the remaining air in the cooling system.

The normal filling level of the coolant is reached while driving.

- Adjust the filling level in the coolant expansion tank (2) of the high-temperature coolant circuit to **200 ml** over the **maximum mark**(1) .



- Close sealing cap (1).
- Close the sealing cap (1) until the **arrows** are flush.

118 – Bleeding the low-temperature cooling system

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

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

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

TECHNICAL INFORMATION

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

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

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

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

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

TECHNICAL INFORMATION

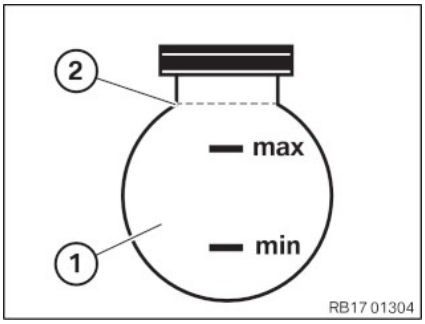
Before starting the automatic cooling system bleeding routine, make sure that **all coolant circuits** are **filled**. If the cooling system bleeding routine is started while one of the coolant circuits is empty, there is a risk of damage to the electric coolant pump when running it dry.

Make sure that terminal 15 is not disconnected for the bleeding procedure. Switch on low-beam headlights and hazard warning lights. If the low-beam headlights and hazard warning lights are not switched on, the ignition (terminal 15) will switch off automatically after a certain period of time and interrupt the bleeding procedure.

TECHNICAL INFORMATION

The driving experience switch must not be set to the ECO PRO switch position.

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- Adjust the coolant level in the low-temperature coolant expansion tank (1) up to lower edge (2) of the coolant filler neck of low-temperature coolant expansion tank (1).
- Close the sealing cap on the coolant expansion tank of the low-temperature coolant circuit.
- Ensure that the bonnet is **open**.
- Connect battery charger.
- Switch on the ignition and ensure that it remains **switched on** (for example, activate the low-beam headlight and the hazard warning lights **at the same time**).
- If the low-beam headlight and the hazard warning light are **not** switched on, the ignition (**terminal 15**) will switch off automatically after some time and interrupts the bleeding procedure.
- Ensure that the Driving Experience Control is **not** in the **"ECO-PRO"** switch position.
- Adjust the heating to **maximum** temperature and adjust the blower to the **lowest** stage.
- Hold the accelerator pedal down to the limit position for at least **10 s** and do **not** press on the brake pedal.
- Do **not** start engine.

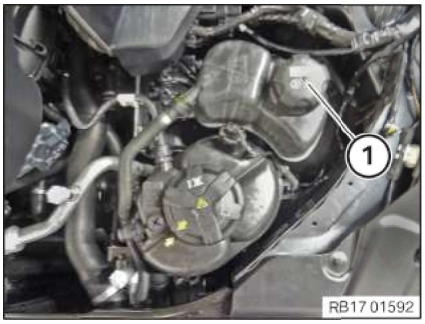
  The cooling system bleeding routine will start.

  The electric coolant pump in the low-temperature coolant circuit is activated for 11 minutes according to a cooling system bleeding routine.

  The cooling system bleeding routine ends after 11 minutes.

  The electric coolant pump is **no** longer activated.
- Note the display in the instrument cluster (KOMBI).

  If the service function is interrupted, the cooling system bleeding routine **must** be repeated.
- Allow the coolant temperature to cool down to **< 50°C**.



- Loosen sealing cap (1).



TECHNICAL INFORMATION

After the cooling system bleeding routine, the cooling system is topped up above the maximum mark.
Overfilling the cooling system serves to balance the remaining air in the cooling system.
The normal filling level of the coolant is reached while driving.

- Adjust the filling level in coolant expansion tank (2) of the low-temperature coolant circuit to **100 ml** above the **maximum mark** (1) .
- Close sealing cap (1).

119 – Check the high-temperature cooling system for watertightness

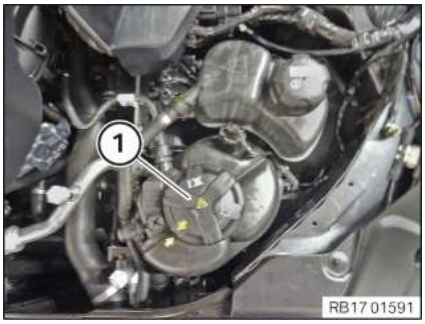
WARNING

Hot surfaces.

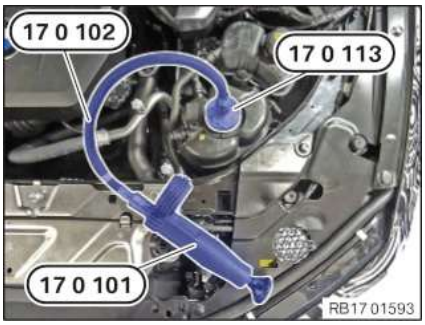
Risk of burning!

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

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- Loosen sealing cap (1).



- Attach the special tool 0 494 418 (17 0 101) with special tools 0 494 419 (17 0 102) and 0 494 642 (17 0 113) from the set of special tools 0 494 417 (17 0 100).
- Build up excess pressure and wait for approximately 2 minutes.

Opening pressure of sealing cap / test pressure of high-temperature coolant circuit cooling system

Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure.	max. 0,1 bar
Test pressure for cooling system (gauge pressure)	1,5 bar



TECHNICAL INFORMATION

If the described test step is not completed successfully: repeat test step twice. Only replace the sealing cap after three tests with an incorrect opening pressure.

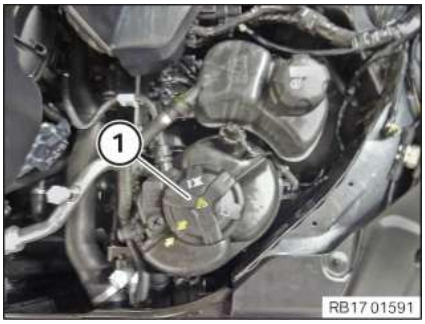
When driving at high ambient temperatures, the design may cause the pressure relief valve in the sealing cap to open slightly and air to escape together with dissolved coolant. This coolant vapour condenses on the surface of the coolant expansion tank and leaves traces of coolant when the vehicle has cooled down. These traces of coolant do not indicate whether the sealing cap is defective or not.

Escaping coolant vapours when the vehicle is at standstill may cause the pressure relief valve to stick to the sealing cap. This may cause an incorrect opening pressure.

- Screw on sealing cap (1) on special tool 0 494 643 (17 0 114) from the set of special tools 0 494 417 (17 0 100).
- Build up the pressure with special tools 0 494 418 (17 0 101) and 0 494 419 (17 0 102) from the set of special tools 0 494 417 (17 0 100).
- Observe on the pressure measuring device when the opening pressure has been reached.

Opening pressure of sealing cap / test pressure of high-temperature coolant circuit cooling system

Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure.	max. 0,1 bar
Test pressure for cooling system (gauge pressure)	1,5 bar



- Close sealing cap (1).
- Close the sealing cap (1) until the **arrows** are flush.

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WARNING

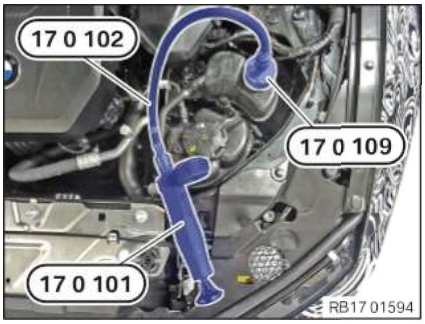
Hot surfaces.

Risk of burning!

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



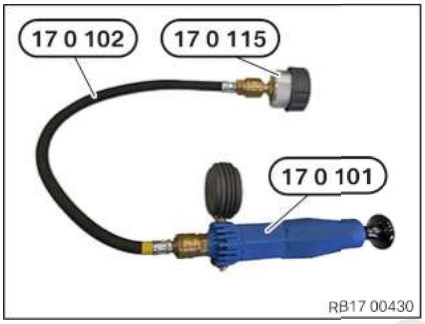
- Loosen sealing cap (1).



- Attach the special tool 0 494 418 (17 0 101) with special tools 0 494 419 (17 0 102) and 0 494 426 (17 0 109) from the set of special tools 0 494 417 (17 0 100).
- Build up excess pressure and wait for approximately 2 minutes.

Opening pressure of sealing cap / test pressure of high-temperature coolant circuit cooling system

Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure.	max. 0,1 bar
Test pressure for cooling system (gauge pressure)	1,5 bar



TECHNICAL INFORMATION

If the described test step is not completed successfully: repeat test step twice. Only replace the sealing cap after three tests with an incorrect opening pressure.

When driving at high ambient temperatures, the design may cause the pressure relief valve in the sealing cap to open slightly and air to escape together with dissolved coolant. This coolant vapour condenses on the surface of the coolant expansion tank and leaves traces of coolant when the vehicle has cooled down. These traces of coolant do not indicate whether the sealing cap is defective or not.

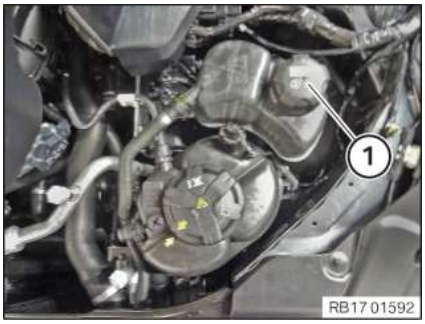
Escaping coolant vapours when the vehicle is at standstill may cause the pressure relief valve to stick to the sealing cap. This may cause an incorrect opening pressure.

- Screw on sealing cap (1) on special tool 0 495 889 (17 0 115) from the set of special tools 0 494 417 (17 0 100).
- Build up the pressure with special tools 0 494 418 (17 0 101) and 0 494 419 (17 0 102) from the set of special tools 0 494 417 (17 0 100).
- Observe on the pressure measuring device when the opening pressure has been reached.

Opening pressure of sealing cap / test pressure of high-temperature coolant circuit cooling system

Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure.	max. 0,1 bar
Test pressure for cooling system (gauge pressure)	1,5 bar

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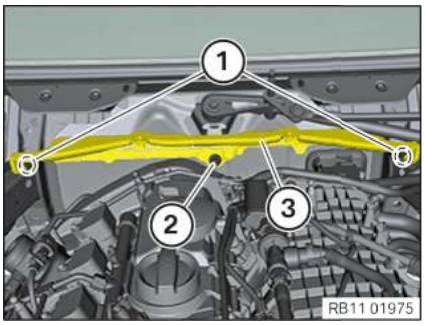


- Close sealing cap (1).

121 – Check engine oil level

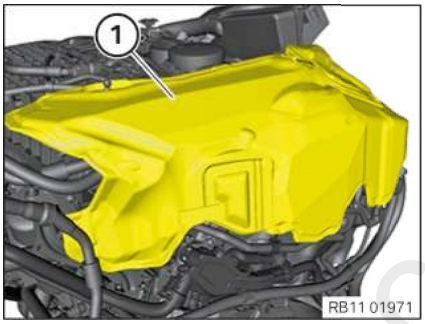
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.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

122 – Installing centre bulkhead lower section



- Position the centre bulkhead lower part (3).
- Tighten nut (2) and screws (1).

123 – Installing acoustic cover at rear

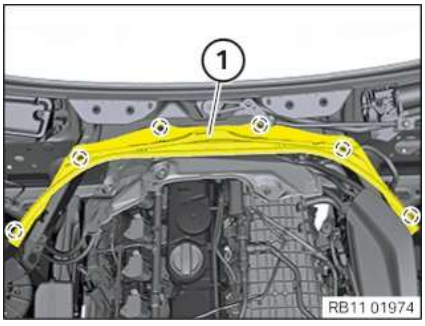


- Make sure the acoustic cover (1) is correctly positioned on the rear side of the engine.



- Install the acoustic cover (1) from the top and clip it in into the marked areas.

124 – Installing the centre bulkhead upper part

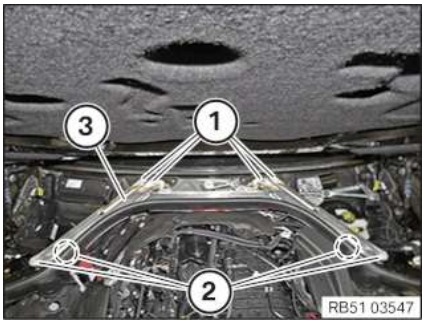


- Position the centre bulkhead upper part (1).
- Tighten the bolts in the marked areas.

Bulkhead upper part to bottom bulkhead

	Tightening torque	3 Nm

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- **If installed:** Install tension strut on spring strut dome.
- Install the tension strut (3) on the spring strut dome.
- Tighten the screws (1).

Tension strut on bulkhead

M10x25 screw		Tightening torque	56 Nm

- Renew screws (2).

  Parts: Bolts
- Tighten the screws (2).

Tension strut to spring strut dome

Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

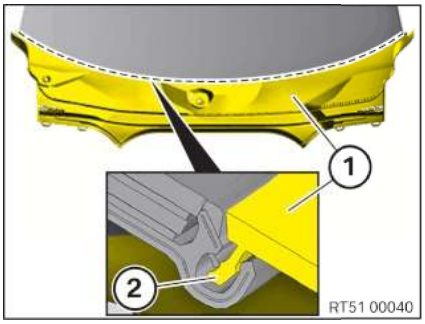
125 – Installing cowl panel cover

RISK OF DAMAGE

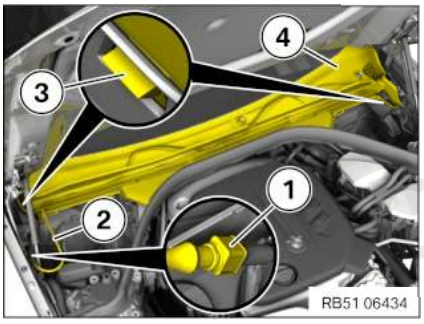
Damage caused by water ingress into the vehicle.

Water ingress into the vehicle may result in damage to components, malfunctions and corrosion.

- Ensure correct installation of the components.
- Only use undamaged components.

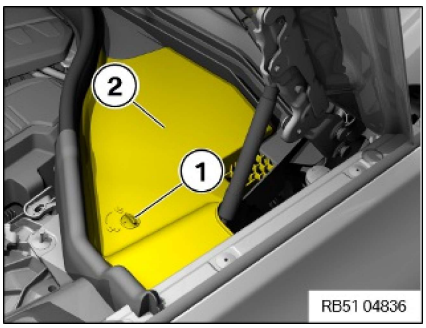


- Push the cowl panel cover (1) into the latch mechanism (2) beginning on the side.



- Clip cowl panel cover (4)in by means of the latch mechanisms (3).
- Position windscreen wash hose (2) and connect windscreen wash hose (1)quick lock.

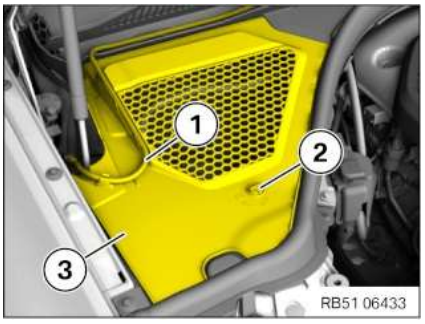
126 – Install the cover of the engine compartment on the rear left



- Position the engine compartment cover at the rear left (2) .
- Close lock (1).

127 – Install the rear right engine compartment cover

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- Position the cover of the engine compartment on the rear right (3).
- Close lock (2).
- Insert washer fluid hose (1) into the guides.

128 – Installing both wiper arms

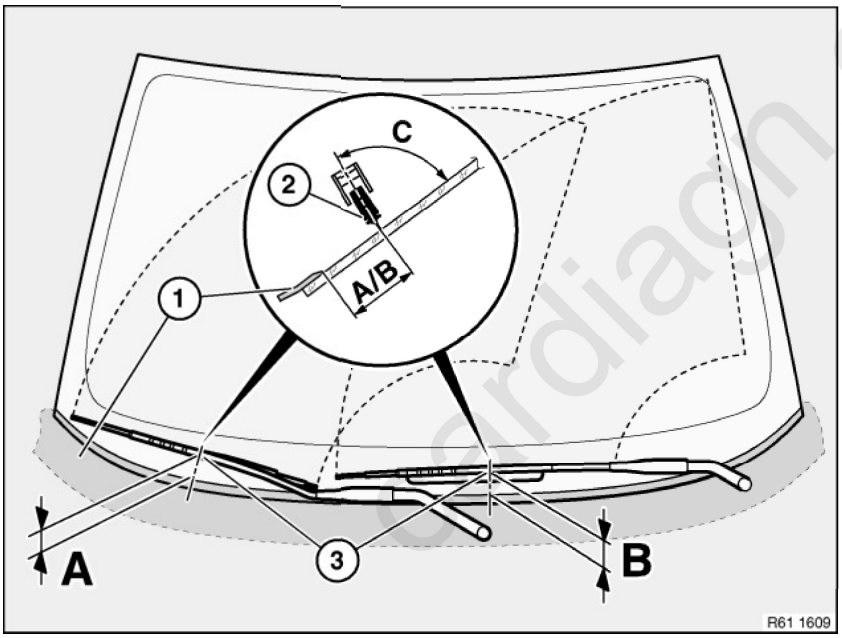
NOTICE

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

▸ **Install the wiper arm**

TECHNICAL INFORMATION

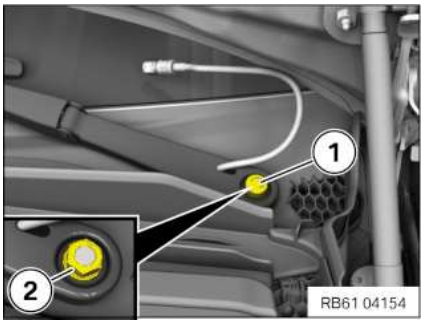
The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).

Distance from window pane edge to wiper blade

Wiper arm right (A)	57,5 ±5 mm
Wiper arm left (B)	63,3 ±4 mm

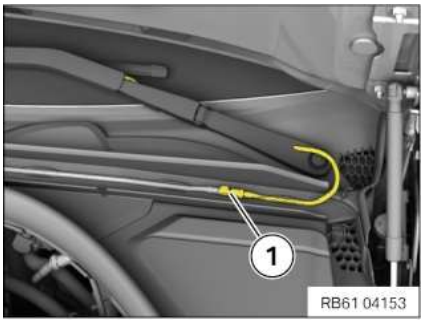


- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).



- Insert windscreen wash hose (1) into the cowl and connect at the separating point.

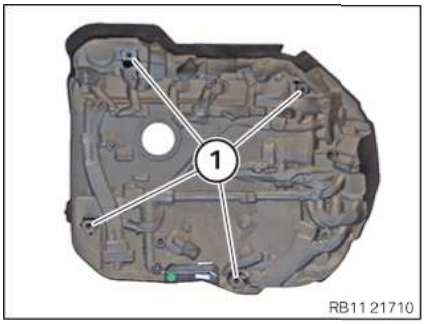
129 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

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

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



- Check the rubber mount (1) for correct fit in the acoustic cover.



- Install acoustic cover (1) and fix in the rubber mounts (marks).

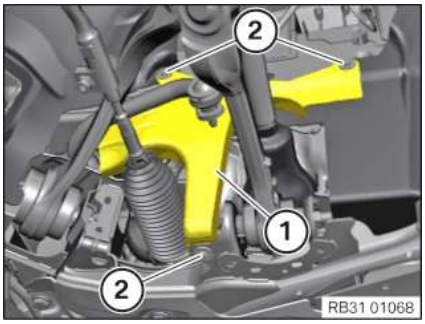
130 – Install the seal for the bonnet



- Press the rear bonnet seal (2) into the guide.
- Feed in cable (1) into the brackets.
- Check that the rear bonnet seal (2) and the cable (1) are seated correctly.

131 – Install the cover of the steering assembly

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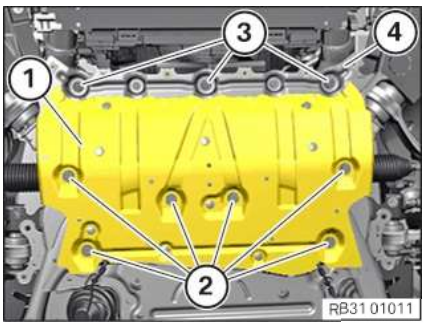


- Position the cover (1).
- Tighten the screws (2).

Cover, steering unit

Screw		Tightening torque	3 Nm

132 – Installing the stiffening plate

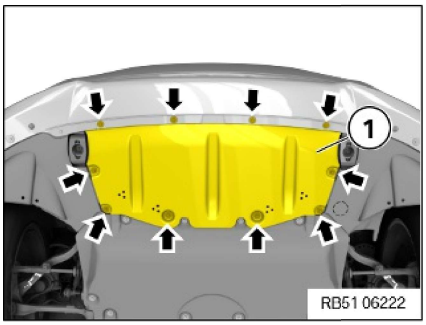


- Position stiffening plate (1).
- Screw screws (2) in.
- Position holder of underride protection (4).
- Screw screws (3) in.
- Tighten down screws (2) and (3).

Stiffening plate to front axle support

M10		Tightening torque	56 Nm

133 – Installing the front underbody protection



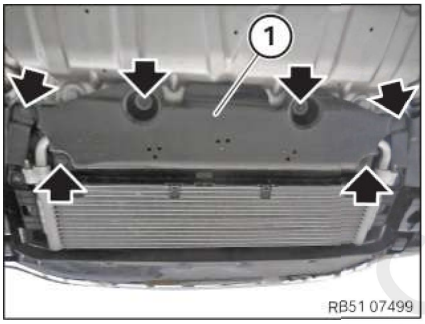
- **Version 1:**

  Feed in the front underbody protection (1) towards the front under the bumper panel and position.

  Tighten screws (arrows).

Underbody protection front

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



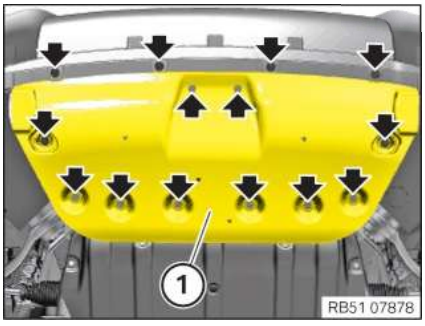
- **Version 2:**

  Feed in and position the front underbody protection (1).

  Tighten screws (arrows).

Underbody protection front

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



- **Version 3:**

  Feed in and install front underbody protection (1).

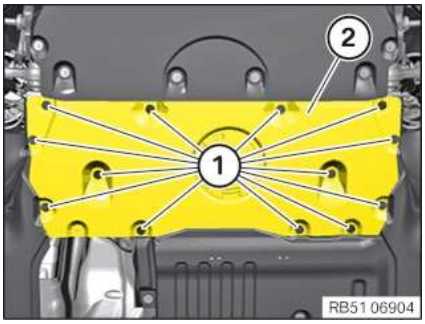
  Tighten screws (arrows).

Underbody protection front

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

134 – Installing the centre underbody protection

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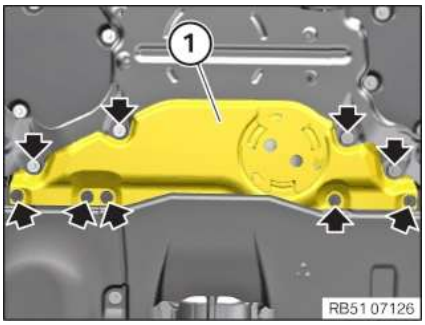
- **Version with rear-wheel drive:**

  Position central underbody protection (2).

  Tighten the screws (1).

Underbody protection

Hexagon screw		Tightening torque	3 Nm



- **Version with all-wheel drive:**

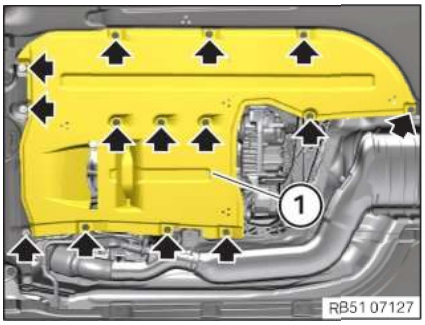
  Guide in and install the centre of underbody protection (1).

  Tighten screws (arrows).

Underbody protection

Hexagon screw		Tightening torque	3 Nm

135 – Installing underbody protection at rear



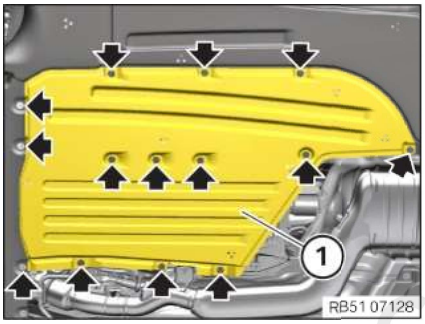
- **Version 1:**

  Insert and install the rear underbody protection (1).

  Tighten screws (arrows).

Underbody protection

Hexagon screw		Tightening torque	3 Nm



- **Version 2:**

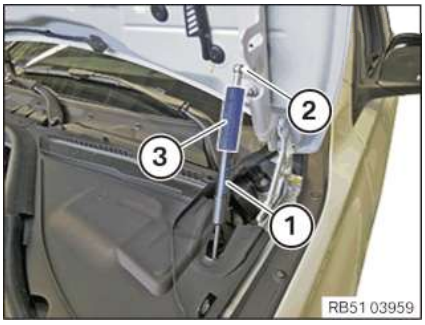
  Insert and install the rear underbody protection (1).

  Tighten screws (arrows).

Underbody protection

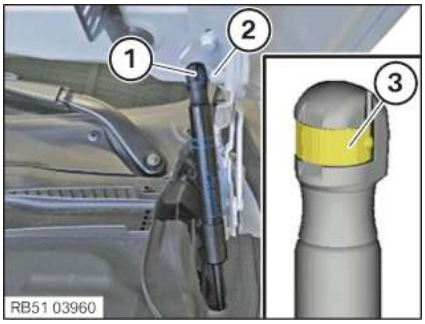
Hexagon screw		Tightening torque	3 Nm

136 – Take bonnet out of the service position



- Support the bonnet by hand.
- Remove the special tool (3) from the ball pin (2).
- Pull off the special tool (3) from the gas pressure spring (1).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.

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CAUTION

Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.

- Check the clamp (3) is fitted correctly.
- Connect ball socket (1) to ball pin (2).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.

Additional Information

Overview of Tightening Torques

Cover, front bottom on side — Used in step 4890

Hexagon screw for thermoplastic		Tightening torque	3 Nm

Basic carrier to cylinder head — Used in step 546979

M6		Tightening torque	8 Nm

Test gauge to basic carrier — Used in step 546979

M6		Tightening torque	8 Nm

Special tool to cylinder head — Used in step 63

M8		Tightening torque	21,5 Nm

Cylinder head to crankcase — Used in step 68

M11	Observe tightening sequence. Fit new cylinder head bolts.	1. Jointing torque 2. Angle of rotation 3. Angle of rotation	30 Nm 90 ° 180 °

Cylinder head bolt to timing case cover — Used in step 68

M8x40	Renew screws.	Tightening torque	19 Nm

Camshaft sensor wheel to intake camshaft — Used in step 68

M4 x35			4,5 Nm

Bearing journal to cylinder head — Used in step 68

Bearing journal	Renew the bearing journal!	Tightening torque	20 Nm

Sliding rail to cylinder head — Used in step 68

M6x16			8 Nm

Cover on rear cylinder head — Used in step 68

M6		Tightening torque	8 Nm

Cable routing to cylinder head, rear — Used in step 68

M6 x 20		Tightening torque	8 Nm

Oil feed line for exhaust turbocharger to crankcase — Used in step 68

M6 x 12	Replace sealing ring.	Tightening torque	8 Nm

Coolant return line holder bracket to crankcase — Used in step 68

M6X12		Tightening torque	8 Nm

Heat shield to cylinder head — Used in step 68

M8X12	Renew screws.	Tightening torque	19 Nm

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Heat shield to clamping strip — Used in step 68

M6X16	Renew screw.	Tightening torque	8 Nm

Coolant feed line to crankcase — Used in step 68

M6X12		Tightening torque	8 Nm

Exhaust turbocharger support to crankcase — Used in step 68

M8 x 20	Renew screws.		19 Nm

Exhaust turbocharger to support — Used in step 68

M8 x 25	Renew screw.		19 Nm

VANOS central valve to camshaft — Used in step 7576

M20 x 1.5		1. Jointing torque	10 Nm
		2. Jointing torque	30 Nm
		3. Jointing torque	50 Nm
		4. Angle of rotation	35 °

Chain tensioner to cylinder head — Used in step 78

Chain tensioner		Tightening torque	20 Nm
		Angle of rotation	40 °

Intake plenum to cylinder head — Used in step 80

M6		Tightening torque	10 Nm

Intake plenum to support — Used in step 80

M6X25		Tightening torque	8 Nm

Tank ventilation line to intake plenum — Used in step 80

Oval-head screw		Tightening torque	3 Nm

Charge air line to throttle valve — Used in step 80102

M6x30		Tightening torque	8 Nm

Control unit holder on spring strut dome — Used in step 82

Hexagon screw		Tightening torque	8 Nm

Coolant line to coolant pump/cylinder head — Used in step 85

M6x20		Tightening torque	8 Nm

Oil return line to turbocharger — Used in step 86

M6 x 12			8 Nm

Oil return line to crankcase — Used in step 86

M6 x 12			8 Nm

Catalytic converter to turbocharger — Used in step 87

V-band clamp	Replace V-band clamp.	Tightening torque	19 Nm

Catalytic converter to holder — Used in step 87

M8 nut	Renew nut.	Tightening torque	28 Nm

Rear silencer to body / bumper support — Used in step 88

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust system to rear axle carrier — Used in step 88

Nut M8	Renew nut.	Tightening torque	19 Nm

Front pipe / petrol particulate filter on transmission holder — Used in step 88

M8	Renew nut.	Tightening torque	19 Nm

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Exhaust system to catalytic converter			Used in step 88
Ribbon cable clamp	Renew flat band clip.	Tightening torque	26 Nm

V-clip to catalytic converter			Used in step 88
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Connecting support to tunnel			Used in step 89
M8x25 screw		Tightening torque	20 Nm
Screw		Tightening torque	3 Nm

Engine oil cooler to bumper support			Used in step 90
M6X25		Tightening torque	8 Nm

Cylinder head cover to cylinder head			Used in step 91
M6X30		Jointing torque	8 Nm

Cylinder head cover to cylinder head			Used in step 91
M6X30		Tightening torque	11 Nm

Auxiliary coolant pump holder to cylinder head			Used in step 91
M6		Tightening torque	7 Nm

Standard screw connection M6			Used in step 91
M6			8 Nm

Differential pressure sensor to holder			Used in step 91
TS6X18		Tightening torque	3,5 Nm

Holder, positive battery cable to cylinder head cover			Used in step 91
6X18		Tightening torque	6 Nm

High pressure pump to high pressure pump flange			Used in step 93
M6x25	*Renew screws.*	Jointing torque	12 Nm
		Tightening torque	90 °

Ground cable to rail			Used in step 9596
M6			5 Nm

High pressure line between rail and high pressure pump			Used in step 97
M14x1,5		Tightening torque	33 Nm

Fuel delivery line to high pressure pump			Used in step 98
M14		Tightening torque	31 Nm

Fuel line to cylinder head cover			Used in step 98
6x18		Tightening torque	6,5 Nm

Spark plugs			Used in step 99
M12x1.25		Tightening torque	23 Nm

Ignition coil			Used in step 100
Screw		Tightening torque	8 Nm

Engine ventilation line adapter with heating element to exhaust turbocharger			Used in step 101
M6x26 screw		Tightening torque	8 Nm

Electric coolant pump to holder			Used in step 102
M6		Tightening torque	8 Nm

Fan cowl with electric fan on radiator			Used in step 105
TS6x20		Tightening torque	6,5 Nm

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Top rear cross connection to bonnet catch support			Used in step 106
Flat-head screw M6x20		Tightening torque	11,8 Nm

Rear top cross connection to wheel arch carrier support			Used in step 106
M10x20 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Cross connection, top			Used in step 107
M8x20		Tightening torque	28 Nm

Cross connection, top			Used in step 107
M6x20		Tightening torque	11,8 Nm

Monitoring oxygen sensor to catalytic converter			Used in step 111
M18X1.5		Tightening torque	50 Nm

Front oxygen sensor to catalytic converter			Used in step 112
M18X1.5		Tightening torque	50 Nm

Clean air pipe to upper section of intake filter housing			Used in step 113
Clamp		Tightening torque	3 Nm

Bulkhead upper part to bottom bulkhead			Used in step 124
		Tightening torque	3 Nm

Tension strut on bulkhead			Used in step 124
M10x25 screw		Tightening torque	56 Nm

Tension strut to spring strut dome			Used in step 124
Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

Windscreen wiper arm			Used in step 128
Combination hexagon nut		Tightening torque	35 Nm

Cover, steering unit			Used in step 131
Screw		Tightening torque	3 Nm

Stiffening plate to front axle support			Used in step 132
M10		Tightening torque	56 Nm

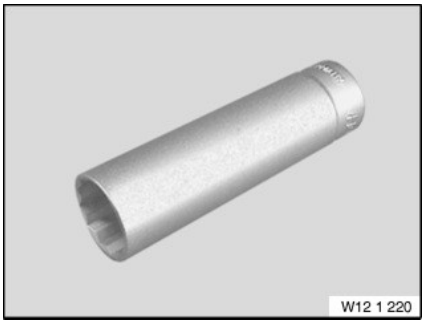
Underbody protection front			Used in step 133
Hexagon screw for thermoplastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Underbody protection			Used in step 134135
Hexagon screw		Tightening torque	3 Nm

Overview of Special Tools

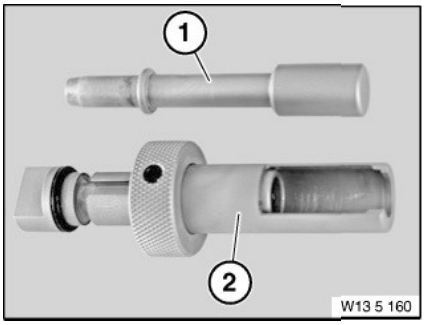
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0 495 560 (12 1 220) Socket



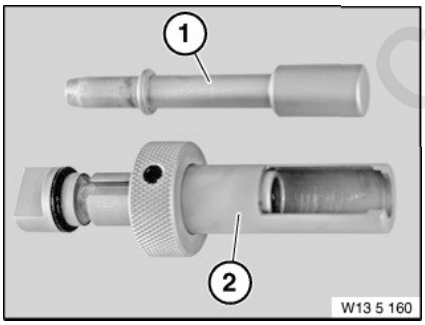
Common	Used in step 2699
Usage	For removing and installing the spark plugs (WAF 14 bihexal).
Included in the tool or work	
Storage location	C18
Replaced by	
In connection with	
SI-Number	01 20 06 (299)

0 496 567 (13 5 161) Fastener



Common	Used in step 28
Usage	(Cap (2 piece)) For sealing the quick connectors Deletion, only available via tool set
Included in the tool or work	0 496 565
Storage location	
Replaced by	
In connection with	
SI-Number	

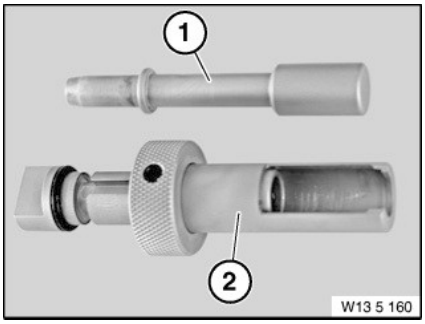
0 496 568 (13 5 162) Fastener



Common	Used in step 28
Usage	(Cap (2 x)) To close off the fuel lines. Discontinued, can only be ordered using complete tool
Included in the tool or work	0 496 565
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 496 565 (13 5 160) Fastener

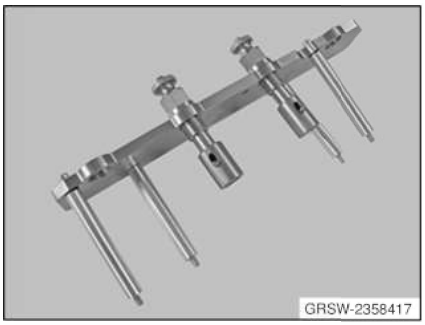


Common	Used in step 28
Usage	(Caps (2x)) To close off the fuel lines when removing and installing the engine.
Included in the tool or work	
Storage location	B26
Replaced by	
In connection with	
SI-Number	01 22 08 (498)

Consisting of

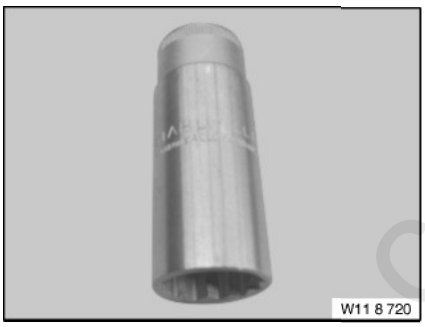
Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 567 (13 5 161)		**Fastener** (Cap (2 piece)) For sealing the quick connectors Deletion, only available via tool set	
2	0 496 568 (13 5 162)		**Fastener** (Cap (2 x)) To close off the fuel lines. Discontinued, can only be ordered using complete tool	

2 358 417 Device



Common	Used in step 3031
Usage	For removing and installing injectors. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A57
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

0 496 106 (11 8 720) Socket WAF 46



Common	Used in step 3031
Usage	(Long socket SW24) For removal and installation of oil pressure sensor. (Stahlwille or HAZET)
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 04 07 (352)

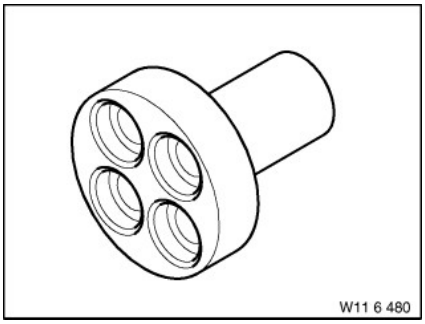
2 360 895 Pin wrench



Common	Used in step 3292
Usage	For removal and installation of the magnetic actuator. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

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0 493 380 (11 6 480) Connector



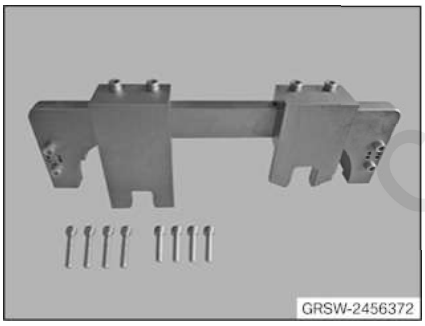
Common	Used in step 54777993
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud



Common	Used in step 547779
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

2 456 372 Gauge



Common	Used in step 5462697779
Usage	For securing camshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B57
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 358 122 Gauge



Common	Used in step 546279
Usage	For securing camshaft at TDC. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A57
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

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0 496 855 Ratchet handle



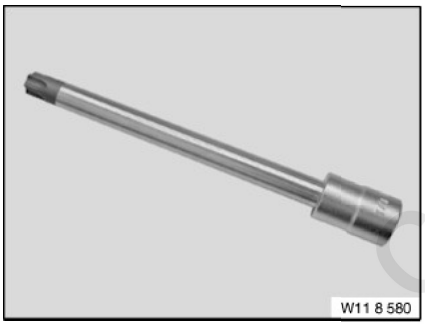
Common	Used in step 56577576
Usage	Insert reversible ratchet with nut for installation and disassembly of the VANOS- SW22. (only in longitudinal installation). Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A55
Replaced by	
In connection with	
SI-Number	01 34 15 (306)

2 450 487 Socket



Common	Used in step 56577576
Usage	For removing and installing the VANOS adjuster. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B55
Replaced by	
In connection with	0496855
SI-Number	01 07 17 (487)

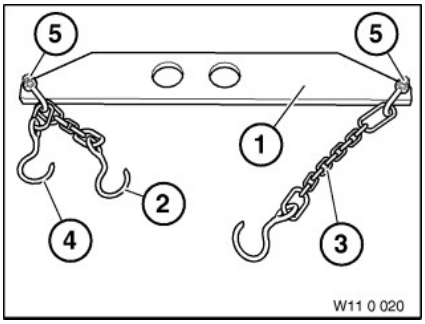
0 495 747 (11 8 580) Socket wrench



Common	Used in step 6368
Usage	(wrench socket Torx T60) For removing and installing cylinder head (outside diameter 13.5 mm).
Included in the tool or work	
Storage location	A19
Replaced by	
In connection with	
SI-Number	01 20 06 (299)

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0 490 567 (11 0 020) Lifting gear



Common Used in step 6368

Usage	For removing and installing the engines. 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
5	0 490 572 (11 0 029)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 568 (11 0 021)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 569 (11 0 022)		**Chain** (Chain) As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 570 (11 0 023)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
4	0 490 571 (11 0 024)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	

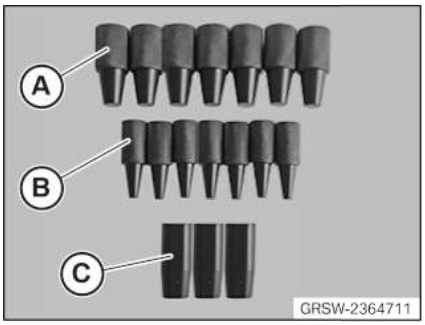
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2 220 718 Workshop crane



Common	Used in step 63
Usage	WSK 1000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	06 01 11 (701)

2 364 711 Plug



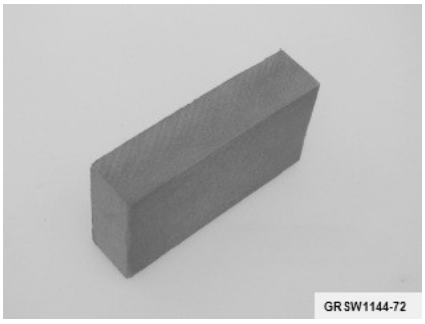
Common	Used in step 6566
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper



Common	Used in step 66
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

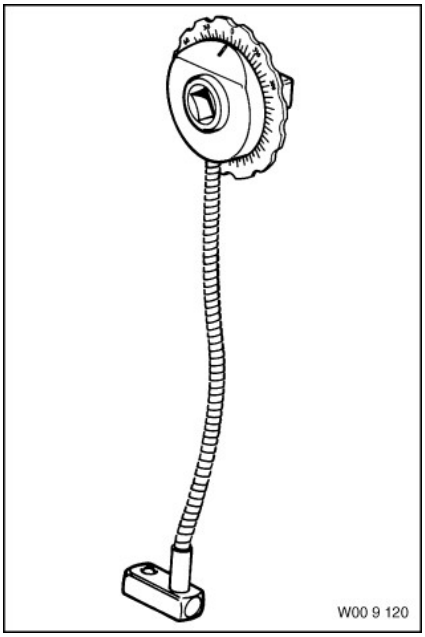
0 495 104 (11 4 472) Extractor



Common	Used in step 66
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

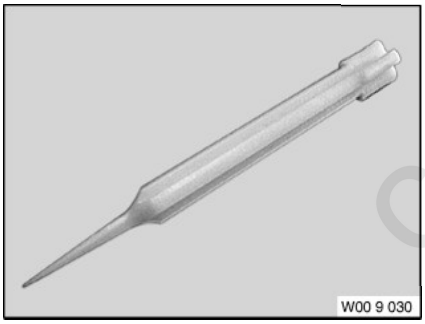
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0 490 504 (00 9 120) Torque angle measuring dial



Common	Used in step 68
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 496 714 (00 9 030) Wedge



Common	Used in step 68101102
Usage	For dismantling O-rings, gaskets and trim panels. This special tool replaces special tool 00 9 316.
Included in the tool or work	
Storage location	A50
Replaced by	
In connection with	
SI-Number	01 20 09 (581)

2 455 654 Tensioning tool



Common	Used in step 7477
Usage	To pretension the timing chain when adjusting the timings. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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2 452 959 Pliers



Common	Used in step 94
Usage	For disassembly of the PTFE sealing rings on the injector HDEV5 & HDEV6. Replaces 0495757 (SWZ number 13 0 191). Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A5
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 448 401 Fitting aid



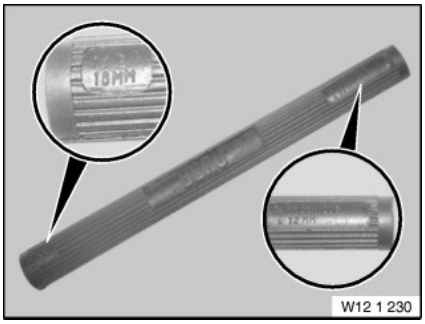
Common	Used in step 94
Usage	For installation of PTFE rings on injector. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C55
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 358 022 Gauge



Common	Used in step 9596
Usage	To position the injector during installation. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

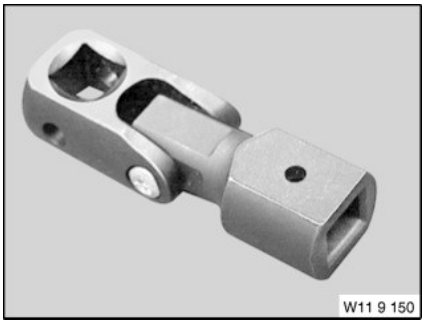
0 496 065 (12 1 230) Fitting aid



Common	Used in step 99
Usage	Fitting aid for spark plug installation. Original BERU ZMH 001 rubber hose 0 890 00 001.
Included in the tool or work	
Storage location	individual
Replaced by	
In connection with	
SI-Number	01 04 07 (352)

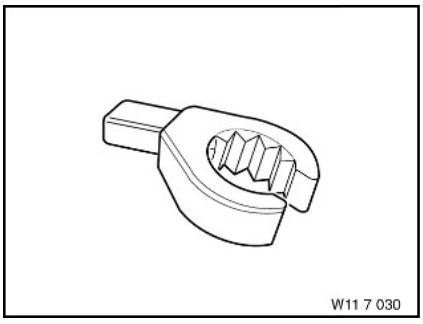
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0 493 751 (11 9 150) Extension



Common	Used in step 111
Usage	(Socket wrench extension) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	C41
Replaced by	
In connection with	
SI-Number	01 15 00 (609)

0 491 075 (11 7 030) Socket wrench insert

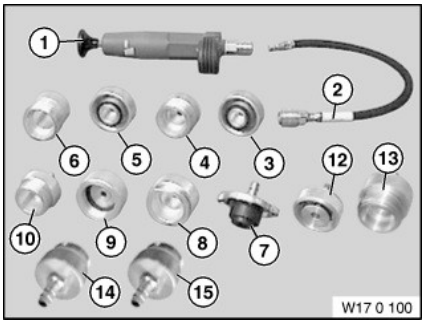


Common	Used in step 111
Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 95 (963)

0 494 417 (17 0 100) Tester

Used in step 114115119120

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Common

Usage	For checking engine cooling system on watertightness. For checking radiator cap.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 02 (884)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
5	0 494 422 (17 0 105)		**Adapter** For radiator cap (sawtooth thread)	
10	0 494 427 (17 0 111)		**Adapter** For radiator cap R53/W11, R50/W17 adapter replaced 17 0 052.	
1	0 494 418 (17 0 101)		**Pump**	
2	0 494 419 (17 0 102)		**Hose** (hose with quick-release coupling)	
3	0 494 420 (17 0 103)		**Adapter** For radiator cap (normal thread)	
4	0 494 421 (17 0 104)		**Adapter** For radiator cap (normal thread)	
6	0 494 423 (17 0 106)		**Adapter** For radiator cap (sawtooth thread)	
7	0 494 424 (17 0 107)		**Adapter** For radiator cap R50 / W10	
8	0 494 425 (17 0 108)		**Adapter** For radiator cap R50 / W10	
9	0 494 426 (17 0 109)		**Adapter** For radiator connection R53/W11, R50/W17 adapter corresponds to 17 0 051	
11	0 494 428 (17 0 112)		**Case**	
12	0 494 642 (17 0 113)		**Adapter** For radiator cap Model series: E60, E61, E63, E64 SI no.: 1 08 03 (988)	
13	0 494 643 (17 0 114)		**Adapter** For radiator cap Model series: E60, E61, E63, E64 SI no.: 1 08 03 (988)	
14	0 495 889 (17 0 115)		**Adapter** For radiator cap Model series: N12, N14	

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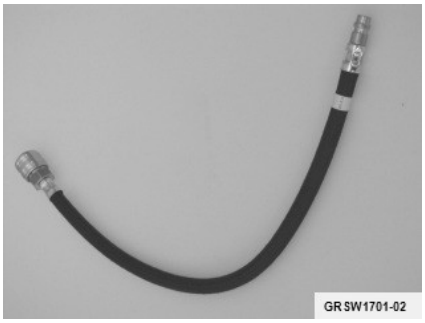
0 494 418 (17 0 101) Pump



Common Used in step 119120

Usage	
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 419 (17 0 102) Hose



Common	Used in step 119120
Usage	(hose with quick-release coupling)
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 642 (17 0 113) Adapter



Common	Used in step 119
Usage	For radiator cap Model series: E60, E61, E63, E64 SI no.: 1 08 03 (988)
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 643 (17 0 114) Adapter



Common	Used in step 119
Usage	For radiator cap Model series: E60, E61, E63, E64 SI no.: 1 08 03 (988)
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

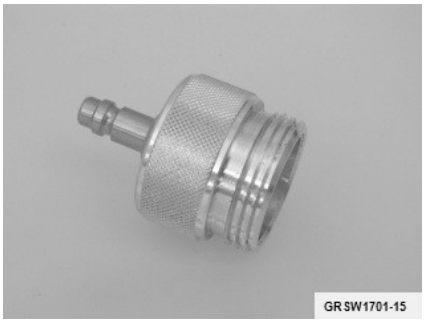
0 494 426 (17 0 109) Adapter



Common	Used in step 120
Usage	For radiator connection R53/W11, R50/W17 adapter corresponds to 17 0 051
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 889 (17 0 115) Adapter



Common		Used in step 120
Usage	For radiator cap Model series: N12, N14	
Included in the tool or work	0 494 417	
Storage location		
Replaced by		
In connection with		
SI-Number	01 26 06 (321)	

Overview Technical Data

Opening pressure of sealing cap / test pressure of high-temperature coolant circuit cooling system	Used in step 119120
Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure.	max. 0,1 bar
Test pressure for cooling system (gauge pressure)	1,5 bar

Distance from window pane edge to wiper blade	Used in step 128
Wiper arm right (A)	57,5 ±5 mm
Wiper arm left (B)	63,3 ±4 mm

Capacity of high-temperature coolant circuit G20/G29	Used in step 114
B58B30O1	10,5 l
Expendable materials: Technically suitable antifreeze and corrosion inhibitor	

Capacity of low-temperature coolant circuit G20/G29	Used in step 115
B58B30O1	4,5 l
Expendable materials: Technically suitable antifreeze and corrosion inhibitor	

Links

General repair instructions	Used in step
12 00 ... Instructions for removal and replacement of control units	3583
11 00 ... Overview of consumables (Electronic Parts Catalogue)	111112

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1116
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1116
61 20 900 Disconnecting and connecting battery earth lead	1116

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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1116
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
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61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
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61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 35 ... Notes on ESD protection (Electro Static Discharge)	22253234355284
13 53 ... Clean the cylinder heads in the area of injectors to prevent sand/dust contamination.	3031
61 35 ... Notes on ESD protection (Electro Static Discharge)	32
61 00 730 Encode/program control unit(s) (after vehicle test)	83
17 11 035 Removing and installing/replacing fan cowl with electric fan	93
17 00 ... Notes for working on cooling system.	114115

Operating materials	**Used in step**
Main group 17	114115

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11 12 000 Removing and installing/sealing cylinder head cover

WARNING

Hot surfaces.

Risk of burning!

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

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

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

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Damage to battery terminal, the safety battery terminal or the intelligent battery sensor (IBS).

Damaged battery terminals can lead to malfunctions or vehicle electrical system faults.

- Pull off battery terminal from battery pole by carefully moving to and fro. Do not pry off using a tool.

TECHNICAL INFORMATION

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

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

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- See additional information.

2 – Bring front compartment lid in the service position

Prerequisite

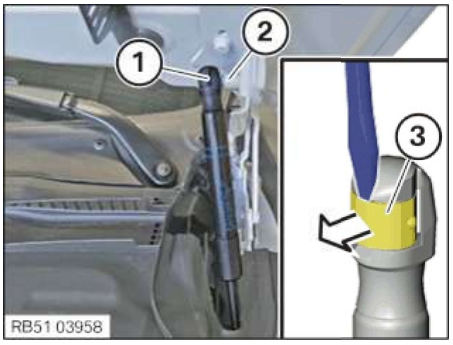
Engine compartment lid is open.

CAUTION

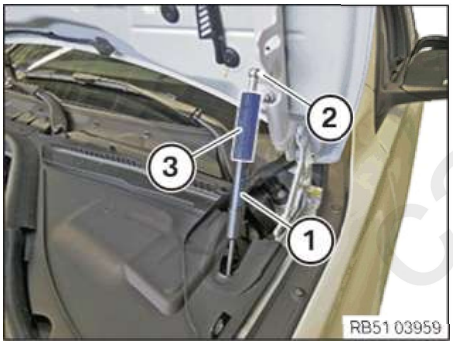
Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.



- Lift clamp (3) slightly using a screwdriver, in the direction of the arrow.
- Lift off ball socket (1) from ball pin (2).
- Repeat the operation on the other side of vehicle.



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Remove the bonnet support and open the bonnet further.
- Push special tool or (3) over gas pressure spring (1).
- Place special tool on the ball pin (2) and engage using force.
- Repeat the operation on the other side of vehicle.

3 – Remove the seal for the rear bonnet



- Feed the cable (1) out of the brackets toward the front.
- Remove the rear bonnet seal (2) from the guide toward the inside.

4 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

Damage to the acoustic cover.

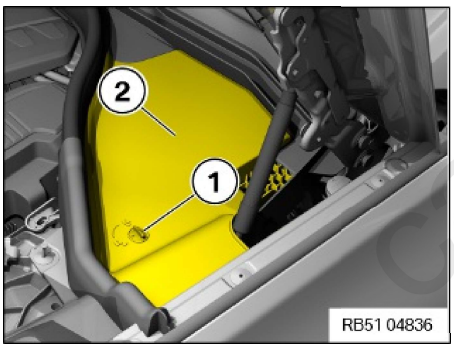
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

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



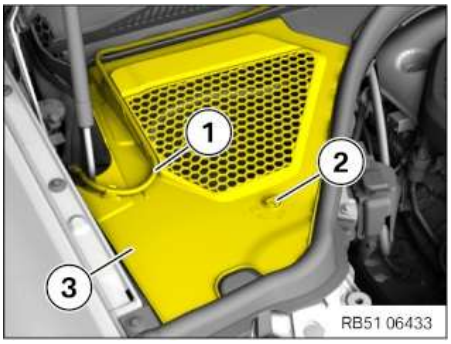
- Release the acoustic cover (1) towards the top from the rubber mounts (marks).

5 – Remove the cover of the engine compartment at the rear left



- Loosen the lock (1).
- Remove rear left cover of engine compartment (2).

6 – Remove the cover of the rear right engine compartment



- Release washer fluid hose (1) from the guides.
- Loosen the lock (2).
- Remove the cover of rear right engine compartment (3).

7 – Removing both wiper arms

NOTICE

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

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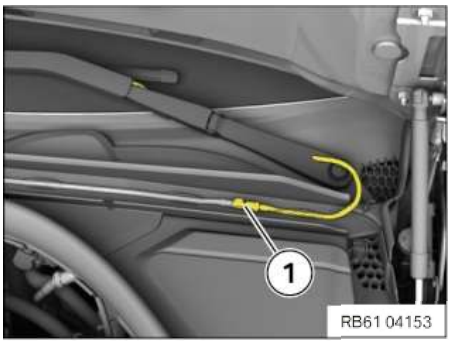
▸ **Remove the wiper arm**

RISK OF DAMAGE

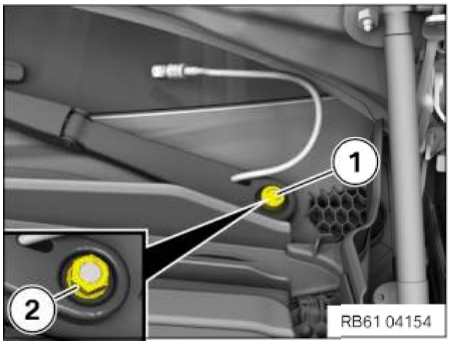
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

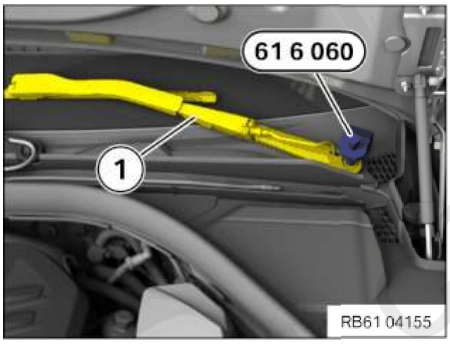
- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Disconnect the windscreen wash hose(1) at the separation point and remove from the cowl guide.

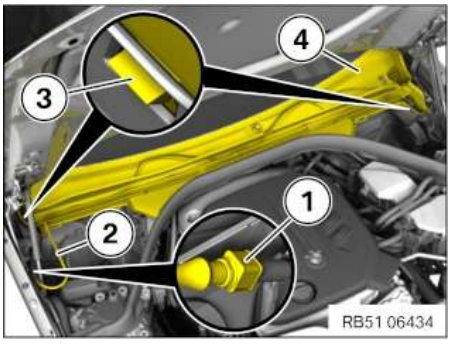


- Remove the protective cap (1).
- Loosen nut (2).



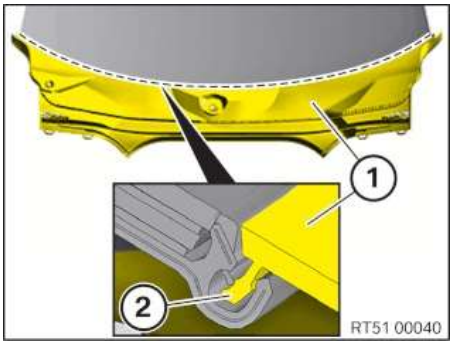
- Pull off the wiper arm (1) using special tool .

8 – Remove cowl panel cover



- Release snap fastener of the washer fluid hose (1) and put the washer fluid hose(2) to one side.
- Unclip clips (3) on the cowl panel cover (4).

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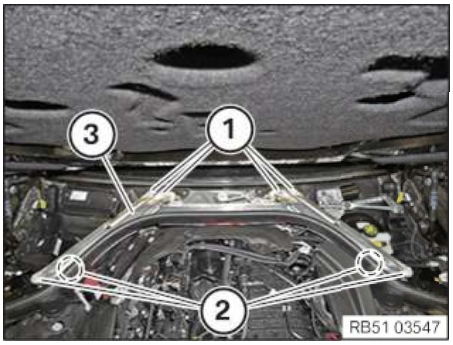


- Pull the cowl panel cover (1) upward out of the latch mechanism (2) beginning on the side.

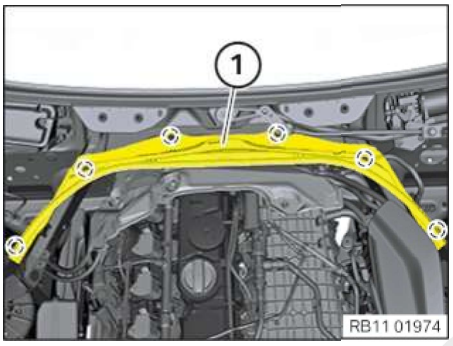
9 – Removing the centre bulkhead upper part

TECHNICAL INFORMATION

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



- **If installed:** Remove tension strut on spring strut dome.
- Loosen screws (1) and (2).
- Remove tension strut (3) in the spring strut dome upwards.



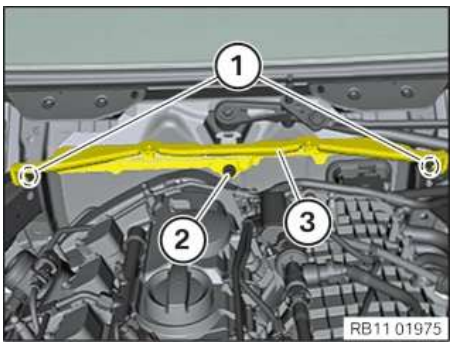
- Unscrew the bolts in the marked areas.
- Remove the centre bulkhead upper part (1).

10 – Removing acoustic cover at rear



- Unclip the acoustic cover (1) in the marked areas and remove it to the top.

11 – Removing the centre bulkhead lower section



- Loosen screws (1).
- Loosen nut (2).
- Remove the centre bulkhead lower part (3).

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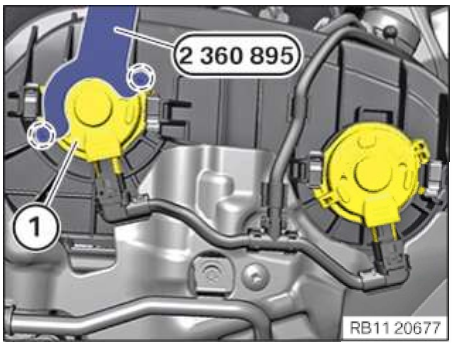
12 – Removing both actuators

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

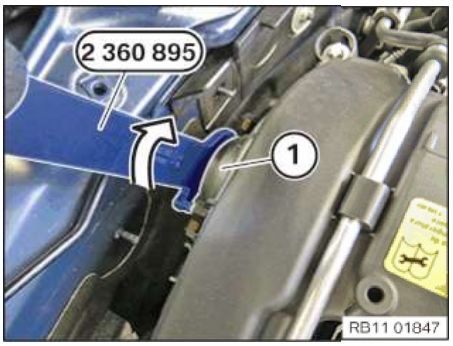
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the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



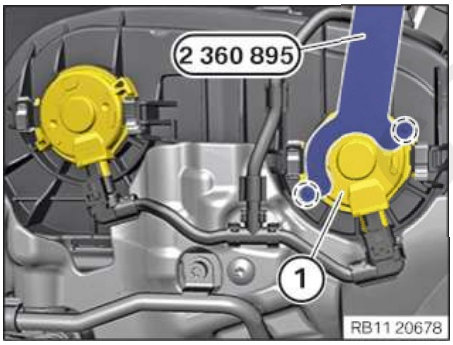
NOTICE

The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the intake side.



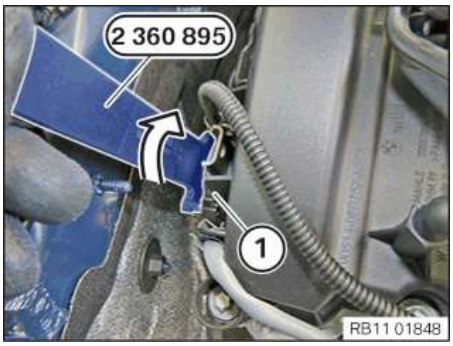
- Turn the actuator (1) on the intake side with the special tool 2 360 895 by about 50° in the direction of arrow and release it.



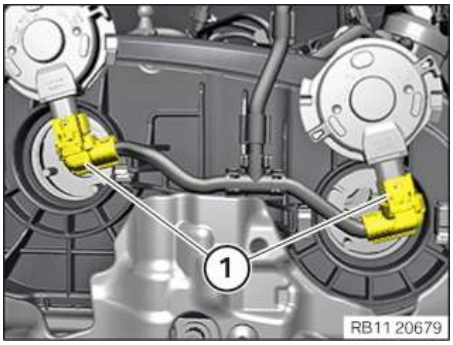
NOTICE

The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the exhaust side.



- Turn the actuator (1) on the exhaust side with the special tool 2 360 895 by about 50° in the direction of arrow and release it.

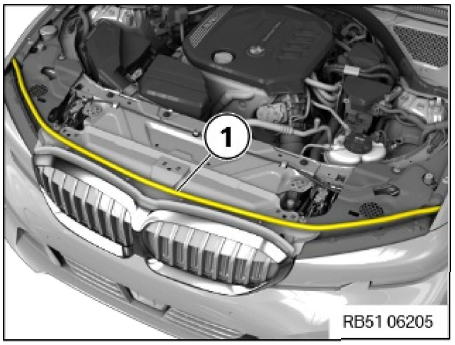


NOTICE

The figure shows the rear side of the engine.

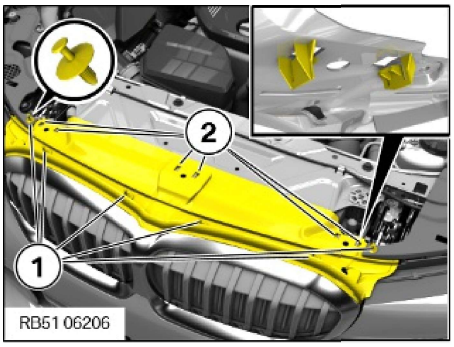
- Unlock and disconnect both connectors (1).
- Feed out and remove both actuators.

13 – Remove the seal for the bonnet in front



- Pull off front bonnet seal (1) upwards.

14 – Removing the centre engine compartment cover



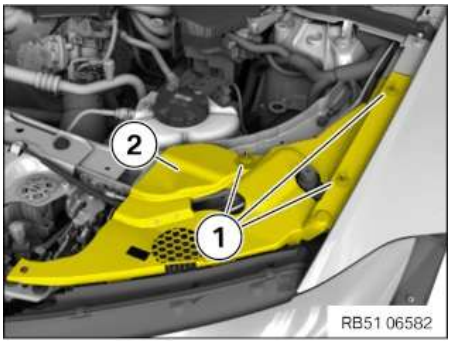
- Detach all expanding rivets (1).
- Release the cover of the centre engine compartment with the latch mechanisms (2) .
- Feed the cover for the centre engine compartment out to the rear.

15 – Partially remove the top left and right cover in the engine compartment

NOTICE

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

▶ **Removing the cover in the engine compartment on top partially**



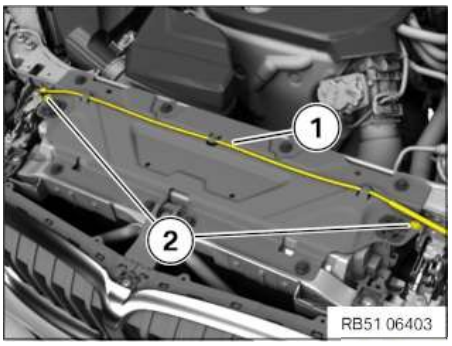
- Loosen the expanding rivet (1).
- Remove the cover in the engine compartment on top (2) partially.

16 – Removing the top cross connection

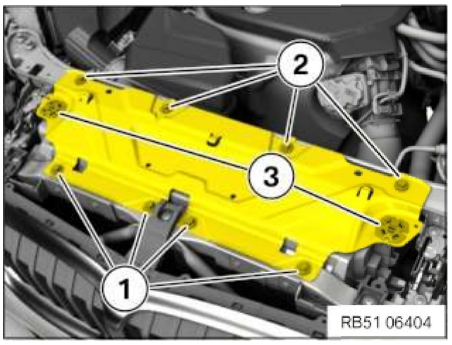
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- Release the housing for the coupling of the Bowden cables (1) from the body.

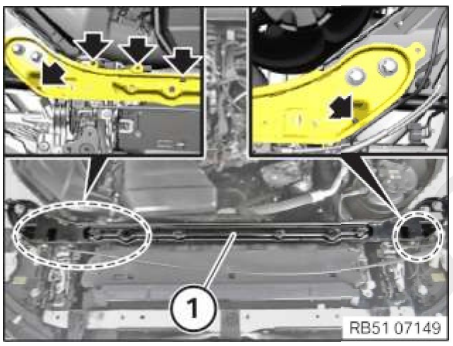


- Detach Bowden cable (1) at the top cross connection.
- Loosen screws (2).

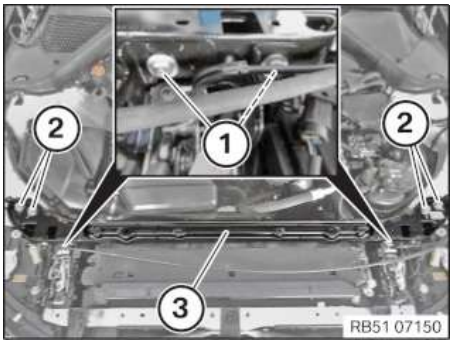


- Loosen screws (1) and (2).
- Remove the top cross connection with the holders(3) towards the top.

17 – Remove the rear top cross connection



- Release the clips (arrows) in the marked areas from the top rear cross connection (1).



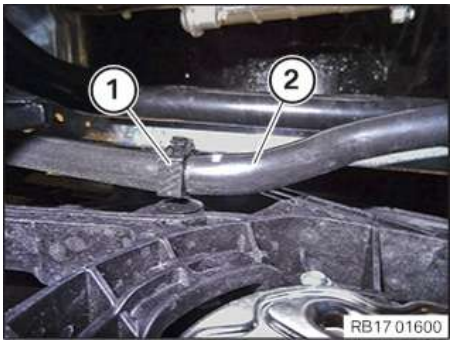
- Loosen screws (1).
- Loosen screws (2).
- Guide out and remove top rear cross connection (3).

18 – Remove fan cowl.

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TECHNICAL INFORMATION

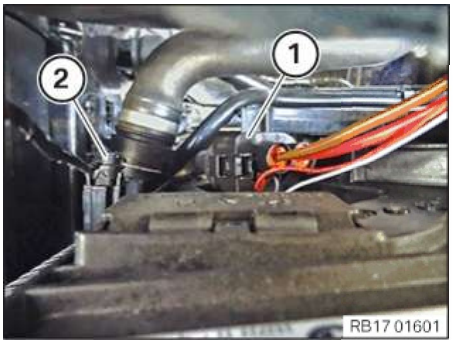
- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!



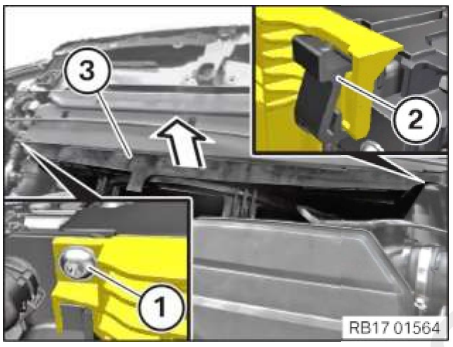
- **If installed:** Release transmission oil line (2).

  Unlock the holder (1).

  Thread out transmission oil line (2) and set aside.



- Unlock plug connection (1) and disconnect.
- Unlock plug connection (2) and disconnect.



- Loosen screw (1).
- Unlock lock (2).
- Guide out and remove fan cowl (3) **carefully** in the direction of the arrow.

19 – Remove all ignition coils.

NOTICE

The description is for one component only. The procedure is identical for all further components.

▸ **Removing the ignition coil**

WARNING

Hot surfaces.

Risk of burning!

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

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RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

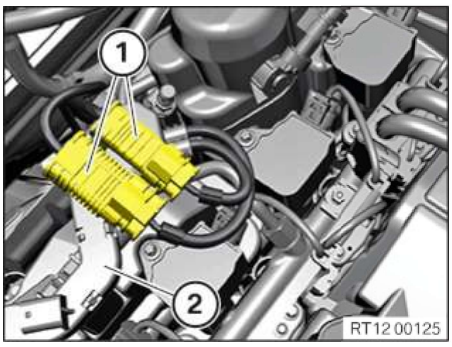
- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

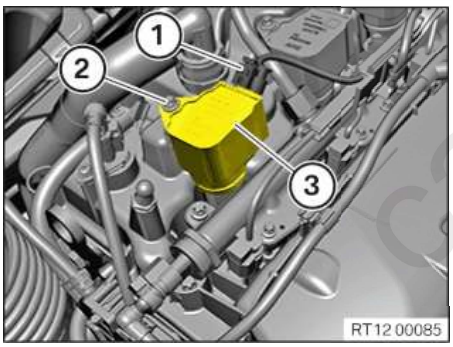
Electrostatic discharge.

Damage to or destruction of electrical components.

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



- Disconnect the connector (1) of the front oxygen sensor and the monitoring oxygen sensor from the cable channel (2) and set aside.



- Unlock plug connection (1) and disconnect.
- Loosen screw (2).
- Remove ignition coil (3).

20 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

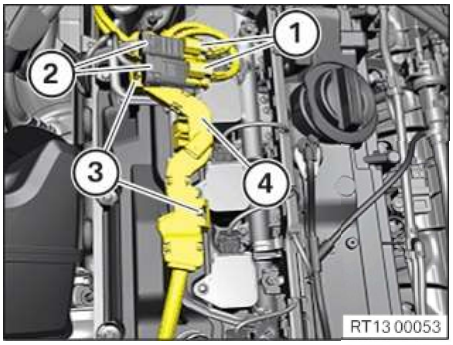
On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

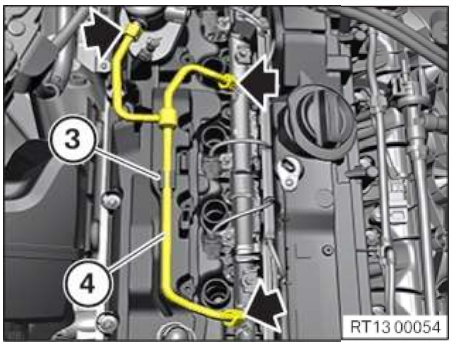
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

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



- Unlock and disconnect the plug connections (1) and (2).
- Unlock the locks (3).
- Guide out the wiring harness section of the engine wiring harness (4) and set it aside.



- Position a lint-free rag under the union nuts.
- Unscrew union nuts (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Thread out the high pressure line (4) from the bracket (3) and remove it.
- Feed out and dispose of the lint-free cleaning clothes .

21 – Remove fuel delivery line

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

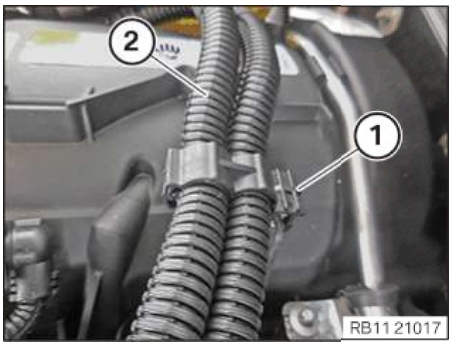
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

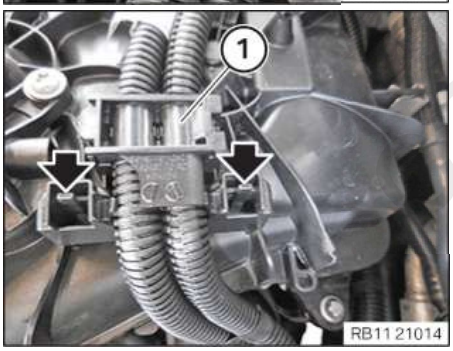
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

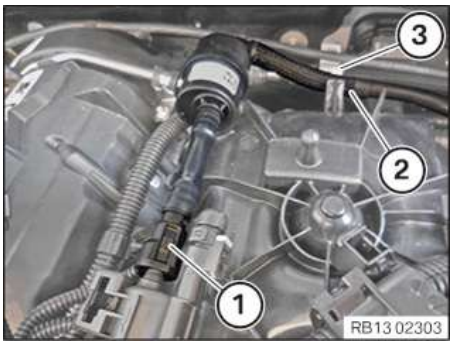
Reset special tool in early to avoid bending pressure lines.



- Loosen clamp (1).
- Guide out wiring harness section (2) for the injectors and ignition coils and place it aside.

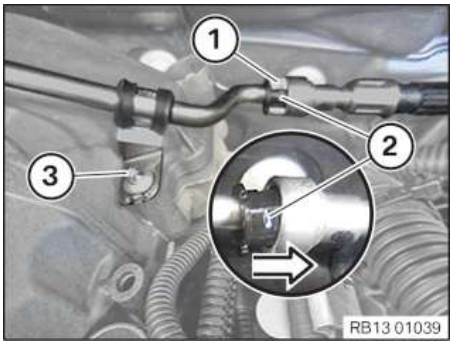


- Unlock the locks (arrows).
- Guide out wiring harness section (1) for the injectors and ignition coils and place it aside.

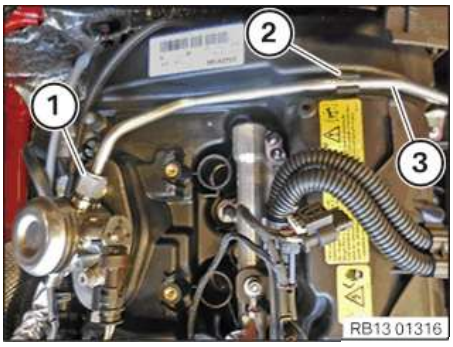


- Unlock and loosen lock (1).
- Guide tank ventilation line (2) out of clamp (3) and place it aside.

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- Unlock and loosen clamp (1).
- Unlock and remove the snap fastener (2) in the direction of the arrow.
- Catch and dispose of escaping fuel.
- Seal the fuel lines with special tools 0 496 567 (13 5 161) and 0 496 568 (13 5 162) from the set of special tools 0 496 565 (13 5 160).
- Loosen screw (3).



- Slacken the union nut (1) on the high pressure pump.
- Catch and dispose of escaping fuel.
- Seal all openings with the special tool .
- Guide the fuel feed line (3) out and remove.
- Make sure that the rubber damper (2) is not lost.

22 – Remove high pressure pump

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

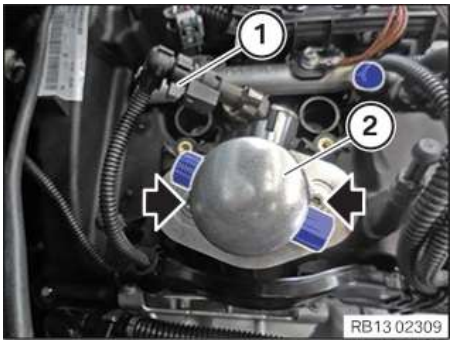
TECHNICAL INFORMATION

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

TECHNICAL INFORMATION

The high pressure pump can be pre-tensioned by camshaft cams. If when loosening the screws, the high pressure pump is forced out, the engine will have to be turned to bring the camshafts to a different position.

Before installing the high pressure pump, the cam of the high pressure pump drive must be turned to BDC. To do this, twist the engine if necessary in the direction of engine rotation to the central bolt of the crankshaft. Otherwise, it will not be possible to install the high-pressure pump.



- Unlock plug connection (1) and disconnect.
- Unscrew the bolts (arrows) **in alternating order**.
- Have a rag ready and catch any engine oil that may emerge.
- Feed out high pressure pump (2) and remove.

23 – Removing rail with injectors of cylinders 1 to 3

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

Damage to the injector tips and Teflon ring.

Improper handling of the injector tips and Teflon ring can lead to malfunctioning of the injector.

- Avoid mechanical contact with injector tip.
- When exchanging Teflon ring, hands and work surface must be clean and free of oil. Do not use any lubricating agents.
- Do not use fingernails to slide Teflon ring on.

RISK OF DAMAGE

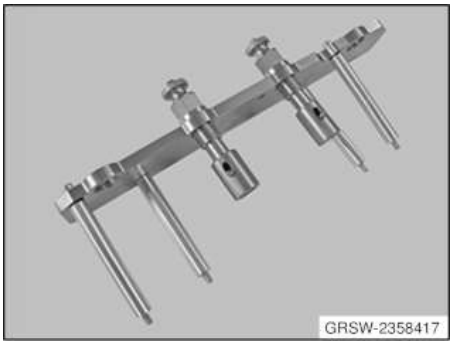
Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

- Twist the injectors with a maximum torsional movement of 13 Nm.



- Prepare special tool .

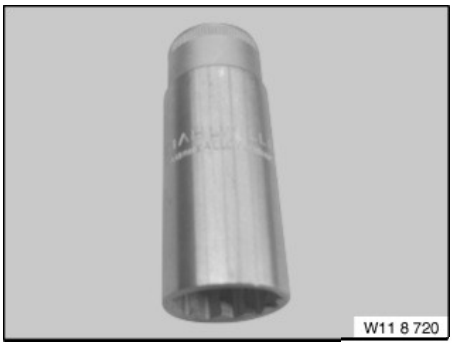


- Prepare special tool 2 358 417.

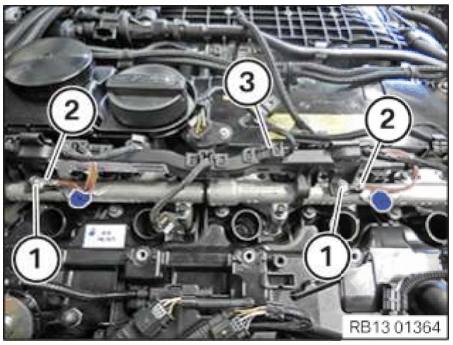
carsdiagn.com



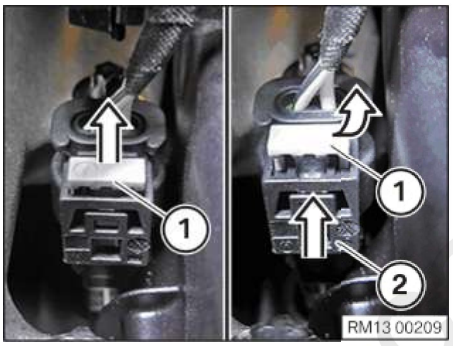
- Prepare special tool .



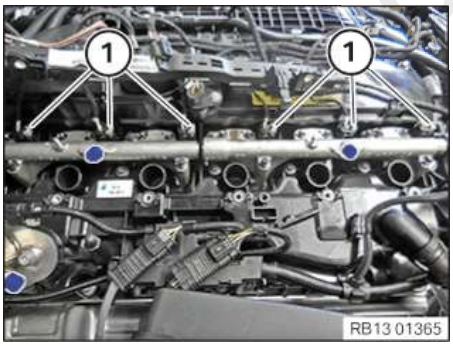
- Prepare special tool 0 496 106 (11 8 720).



- Loosen nut (1).
- Feed out ground cable (2) and set it aside.
- Feed out cable channel (3) and set it aside.

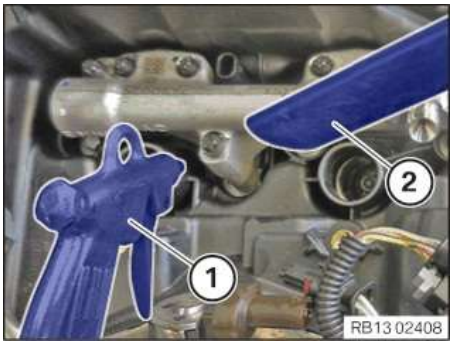


- Unlock lock (1) in direction of arrow from the top.
- Press lock (1) together and release.
- Pull out the connector (2) from the injectors.



- Unlock and release all connectors (1) of the injectors.

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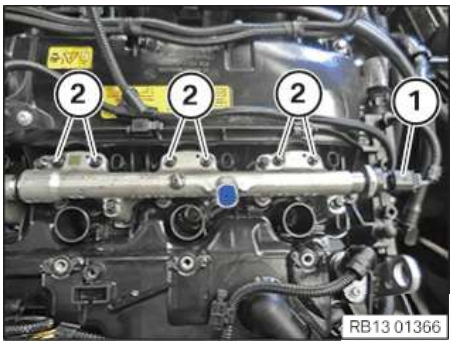


TECHNICAL INFORMATION

In case of dusty / sandy operating conditions of the vehicle, the injector shafts must be cleaned before removal.

For additional information see: 13 53 ... Cleaning the cylinder head in the area of the injectors in case of sandy / dusty contamination

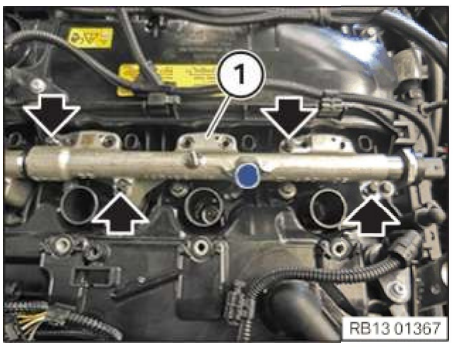
- Before releasing the high pressure lines: Blow out the injector shafts with an air gun(1) with less pressure.
- Simultaneously, draw off the dirt particles with an **explosion proof** vacuum cleaner (2).



- Unlock and loosen connector (1).
- Release screws (M5x30) (2).
- Remove screws (2).

  Do not reuse the bolts (2).

  Parts: Screws (M5x30)
- Catch and dispose of escaping fuel with suitable materials.

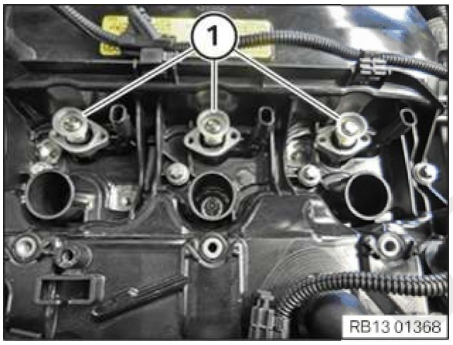


- Unscrew the screws (M6x30) (arrows).

  The screws may not be reused!
- Renew screws.

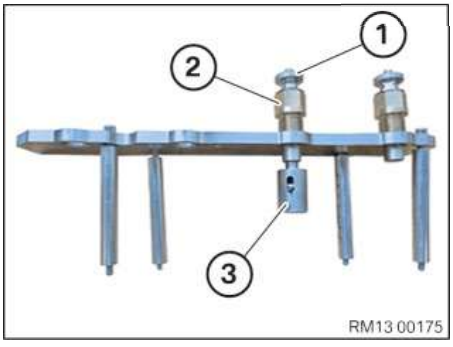
  Parts: Screws (M6x30)
- Remove rail (1) in upward direction.

  The injectors remain in the cylinder head.



- Remove the gaskets (1).

  The seals (1) are only required during the initial assembly at the plant and will not be installed again.



RISK OF DAMAGE

Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

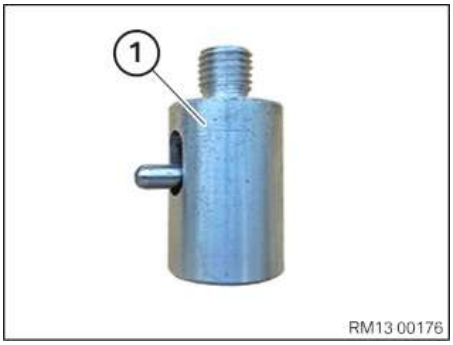
- Twist the injectors with a maximum torsional movement of 13 Nm.
- In the event that the specified value for the tensile force is exceeded: Replace injectors.
- Use the special tool 2 358 417to remove the injectors.

  The special tool 2 358 417 is used to ensure that the tensile force is not exceeded.

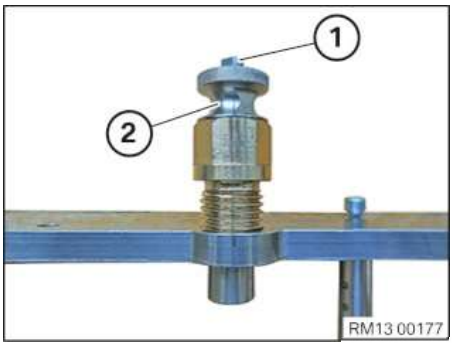
  Special tool 2 358 417 consists of:

  - **(1)** Threaded sleeves
  - **(2)** Pull-out thread (left-hand thread)
  - **(3)** Mounting for the injectors

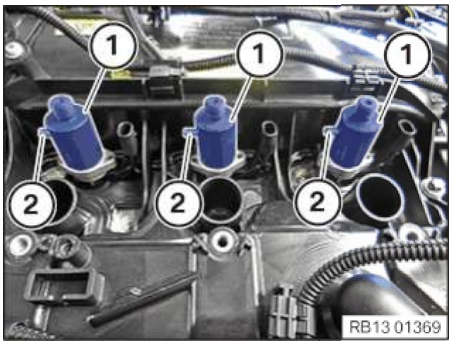
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- Unscrew the fixture for the injectors (1) from the special tool 2 358 417.

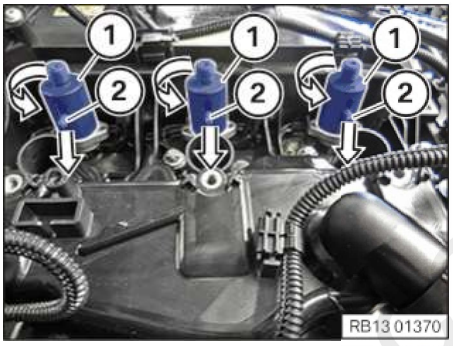


- Press the lock (1) in and remove threaded sleeve (2) from the special tool 2 358 417.

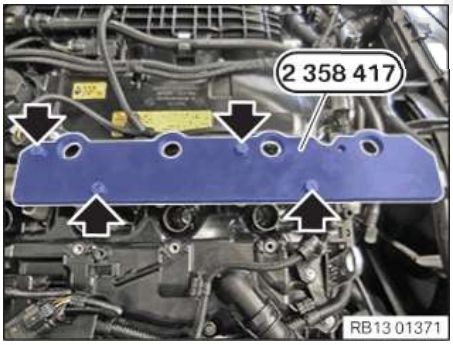


- Install all fixtures (1) for the injectors.

  The fixture (1) is not locked if the lever (2) is on the top.



- Turn fixtures (1) by 90° and lock the lever (2) downwards.



RISK OF DAMAGE

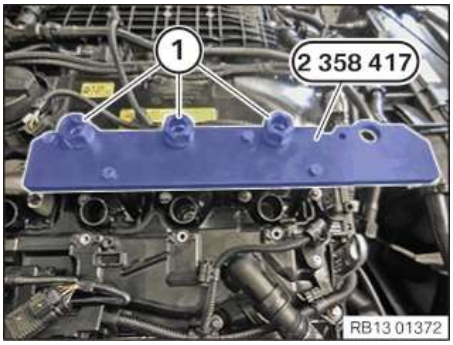
Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

- Do not use the puller plate as a support.

- Attach special tool 2 358 417 to cylinder head.
- Hand-tighten the bolts (arrows).

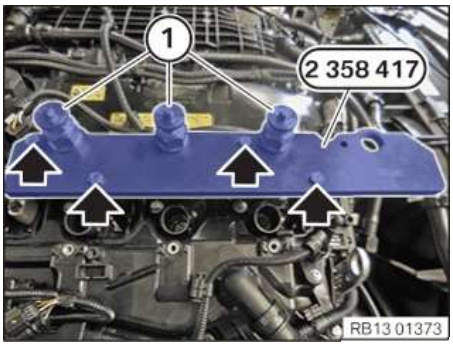
cardiagn.com



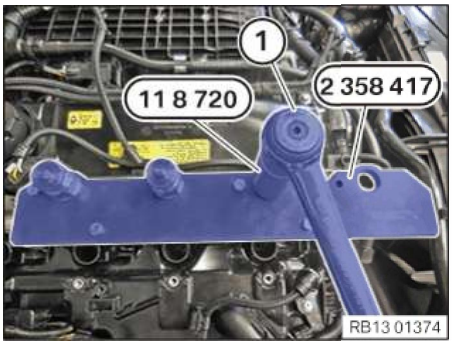
TECHNICAL INFORMATION

The extraction thread is a left-hand thread.

- Screw in pull-out thread (1) on the special tool 2 358 417fully.



- Insert threaded sleeves (1) again and screw threaded sleeves completely onto the fixtures for injectors.
- Then tighten screws (arrows) on special tool 2 358 417 to 5 Nm.

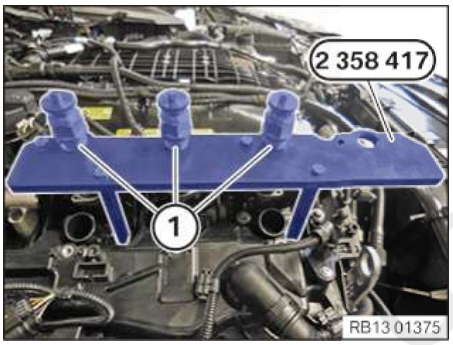


- Adjust torque wrench to 13 Nm **clockwise** .
- Turn torque wrench (1) in **clockwise** direction with special tool 0 496 106 (11 8 720)until the injector is pulled out.

TECHNICAL INFORMATION

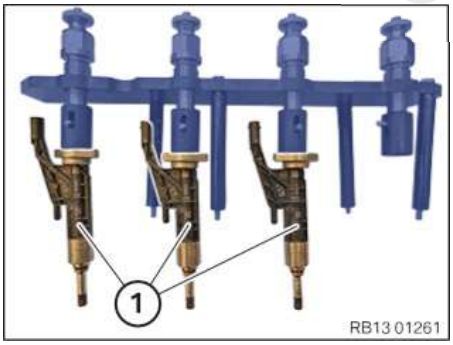
If the torque wrench makes a cracking noise when the injector is pulled out, **the injector must be renewed.**

- Disassemble all injectors individually.

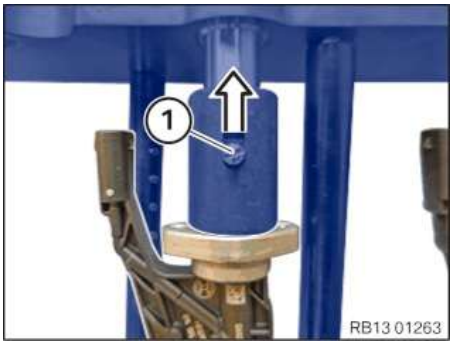


- Before removing the special tool 2 358 417 with the injectors, check if all the injectors were completely pulled out of the cylinder head.

  This can be recognised on the completely visible threads of the sleeves (1).
- Loosen screws on special tool 2 358 417.



- Carefully remove the special tool 2 358 417with injectors (1) from the cylinder head vertically upwards.
- Place the combination of the special tool 2 358 417 and the injectors (1) flat on a clean table.

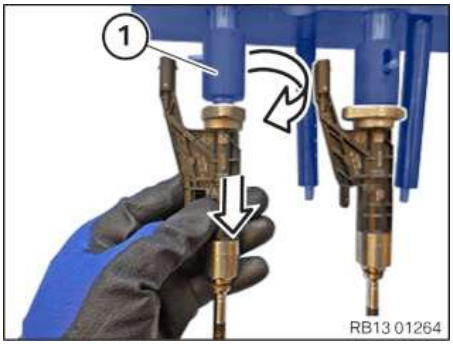


NOTICE

The description is for one component only. The procedure is identical for all further components.

- Unlock the fixture lock (1) from the top.

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- Turn the unlocked fixture (1) by 90°.
- Release and remove the injector downwards.

24 – Removing rail with injectors of cylinders 4 to 6

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

Damage to the injector tips and Teflon ring.

Improper handling of the injector tips and Teflon ring can lead to malfunctioning of the injector.

- Avoid mechanical contact with injector tip.
- When exchanging Teflon ring, hands and work surface must be clean and free of oil. Do not use any lubricating agents.
- Do not use fingernails to slide Teflon ring on.

RISK OF DAMAGE

Damage to injectors.

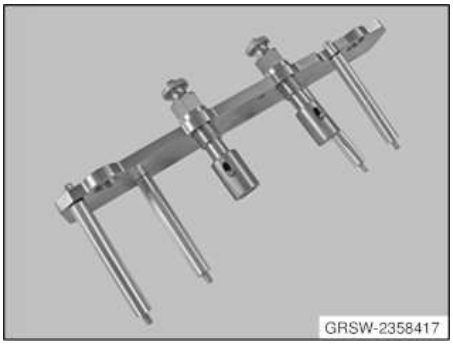
Excessive force may damage the injector and this means having to renew the injector.

- Twist the injectors with a maximum torsional movement of 13 Nm.



- Prepare special tool .

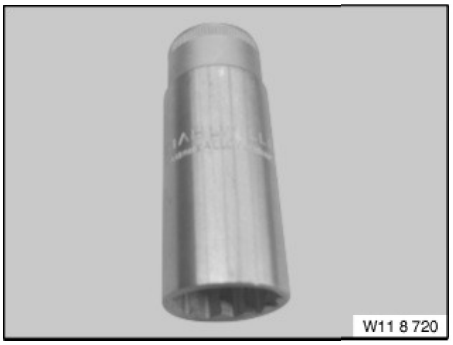
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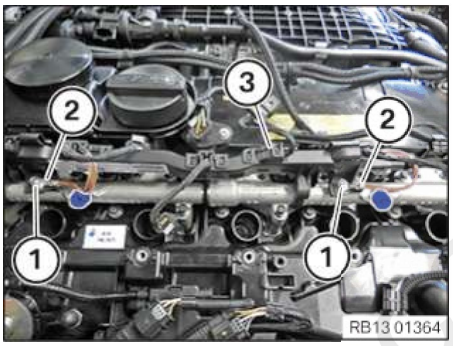
- Prepare special tool 2 358 417.



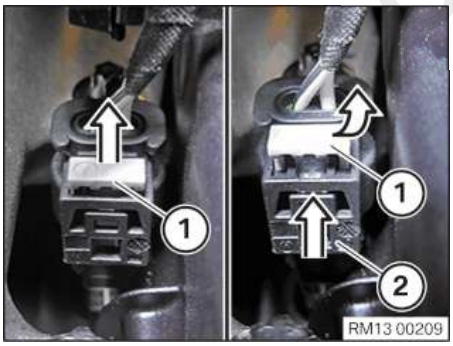
- Prepare special tool .



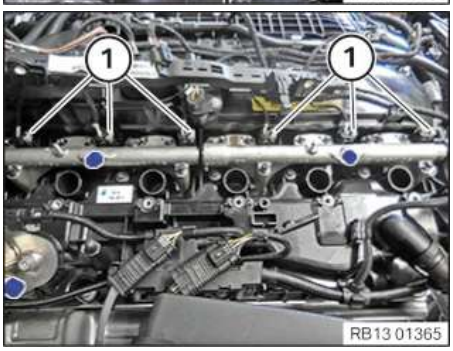
- Prepare special tool 0 496 106 (11 8 720).



- Release nuts (1) .
- Feed out ground cable (2) and set aside.
- Feed out cable channel (3) and set it aside.

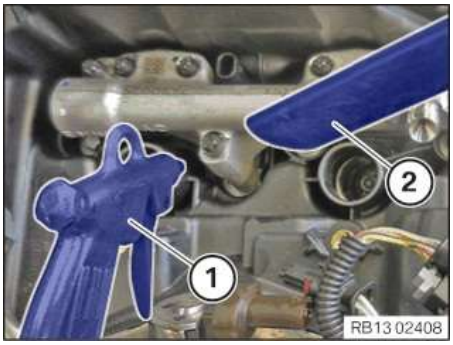


- Unlock lock (1) in direction of arrow upwards.
- Press lock (1) together and release.
- Disconnect the connector (2) from the injectors in the direction of the arrow.



- Unlock and release all connectors (1) of the injectors.

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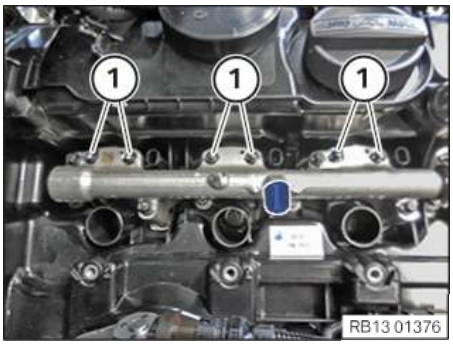


TECHNICAL INFORMATION

In case of dusty / sandy operating conditions of the vehicle, the injector shafts must be cleaned before removal.

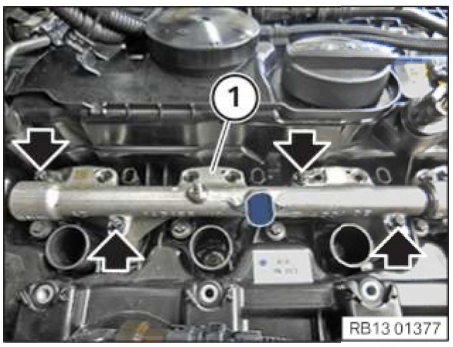
For additional information see: 13 53 ... Cleaning the cylinder head in the area of the injectors in case of sandy / dusty contamination

- Before releasing the high pressure lines: Blow out the injector shaft with an air gun (1) with less pressure.
- Simultaneously, draw the dirt particles off **using an** explosion proof (2) vacuum cleaner.



- Release screws (M5x30) (1).
- Remove screws (M5x30) (1) .

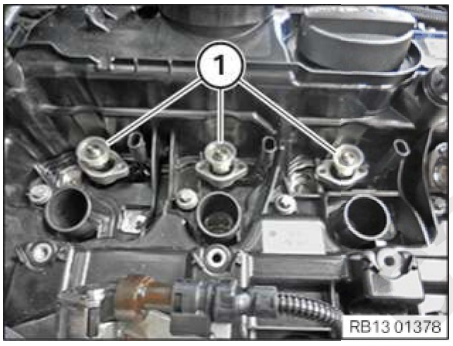
  Do **not** reuse screws (M5x30) (1).
- Catch and dispose of escaping fuel with suitable materials.



- Release screws (M6x30) (arrow).
- Remove screws (M6x30) (arrows).

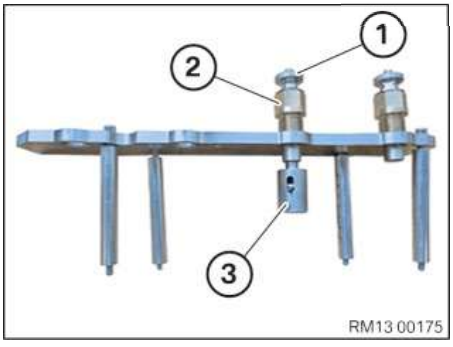
  Do **not** reuse the screws (M6x30).
- Remove rail (1) upwards.

  The injectors remain in the cylinder head.



- Remove seals (1) .

  The seals (1) are required during first assembly within the plant only and will not be installed again.



RISK OF DAMAGE

Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

- Twist the injectors with a maximum torsional movement of 13 Nm.

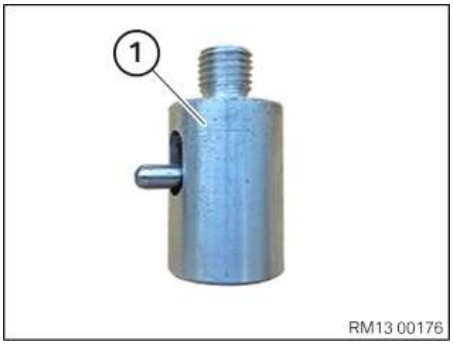
- In the event that the specified value for the tensile force is exceeded: Replace injectors.
- Use the special tool 2 358 417 to remove the injectors.

  The special tool 2 358 417 is used to ensure that the tensile force is not exceeded.

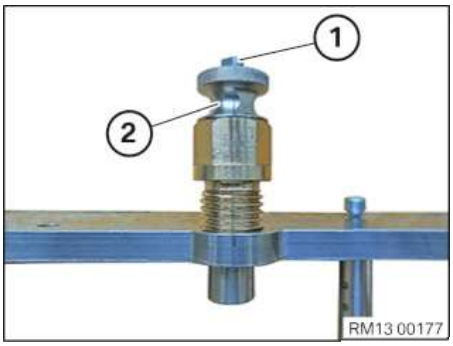
  The special tool 2 358 417 consists of:

  - (1) Threaded sleeves
  - (2) Pull-out thread (left-hand thread)
  - (3) Mounting for the injectors

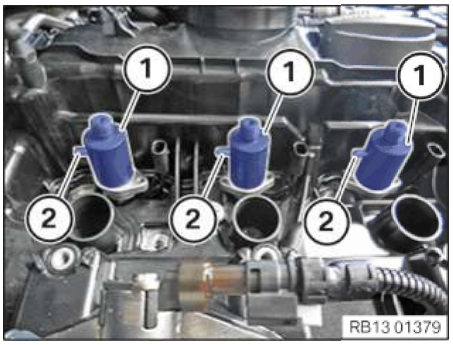
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- Unscrew the fixture for injectors (1) from special tool 2 358 417.

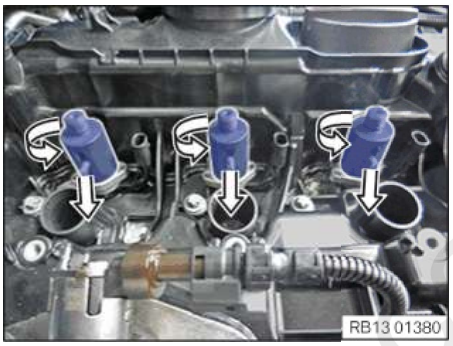


- Press lock (1) in and remove the threaded sleeve (2) from the special tool 2 358 417.



- Install all fixtures (1) for the injectors.

  The fixture (1) is not locked, if the lever is (2) on top.



- Turn fixtures (1) by 90° and lock the lever (2) downwards.



RISK OF DAMAGE

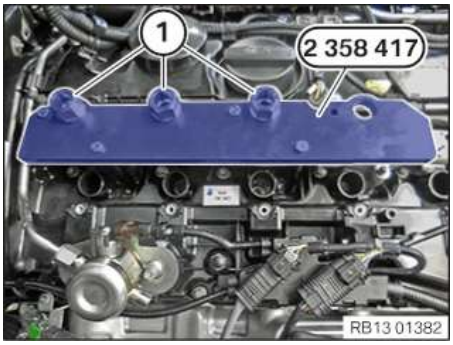
Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

- Do not use the puller plate as a support.

- Attach special tool 2 358 417 to cylinder head.
- Hand-tighten the bolts (arrows).

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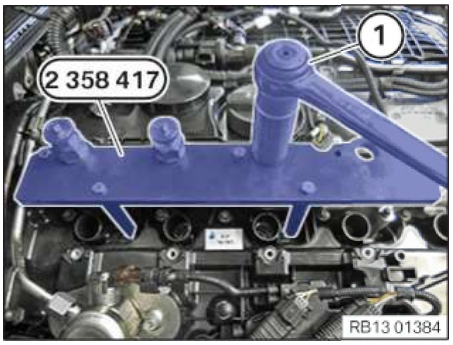
TECHNICAL INFORMATION

The extraction thread is a left-hand thread.

- Screw in pull-out thread (1) on the special tool 2 358 417 fully.



- Insert the threaded sleeves (1) again and screw threaded sleeves completely onto the fixtures for the injectors.
- Then tighten screws (arrows) on special tool 2 358 417 to 5 Nm.

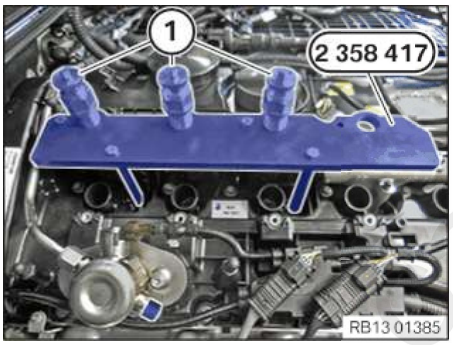


- Adjust torque wrench to 13 Nm **in clockwise** direction.
- Turn the torque wrench (1) with the special tool 0 496 106 (11 8 720) **clockwise**, until the injector is pulled out.

TECHNICAL INFORMATION

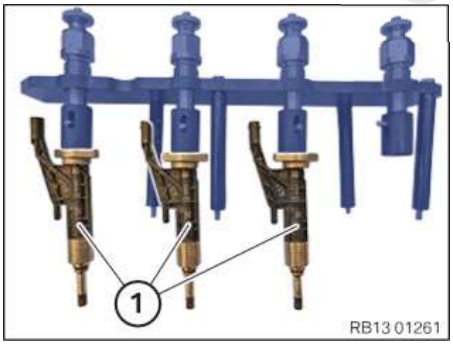
If the torque wrench makes a cracking noise when the injector is pulled out, **the injector must be renewed.**

- Disassemble all injectors individually.

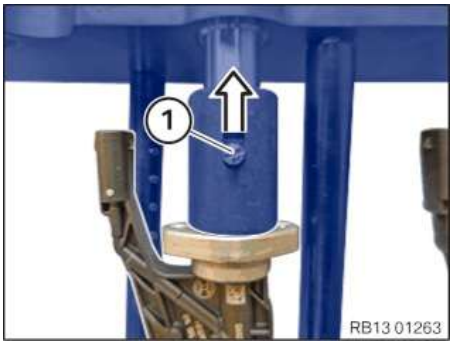


- Before removing the special tool 2 358 417 with the injectors, check if all the injectors were completely pulled out of the cylinder head.

  This can be recognised on the completely visible thread starts of the threaded sleeves (1).
- Loosen screws on special tool 2 358 417.



- Carefully remove the special tool 2 358 417 with the injectors (1) vertically straight up from the cylinder head.
- Place the combination of the special tool 2 358 417 and the injectors (1) flat onto a clean table.

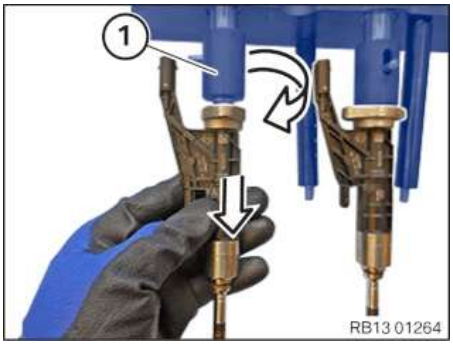


NOTICE

The description is for one component only. The procedure is identical for all further components.

- Unlock the fixture lock (1) from the top.

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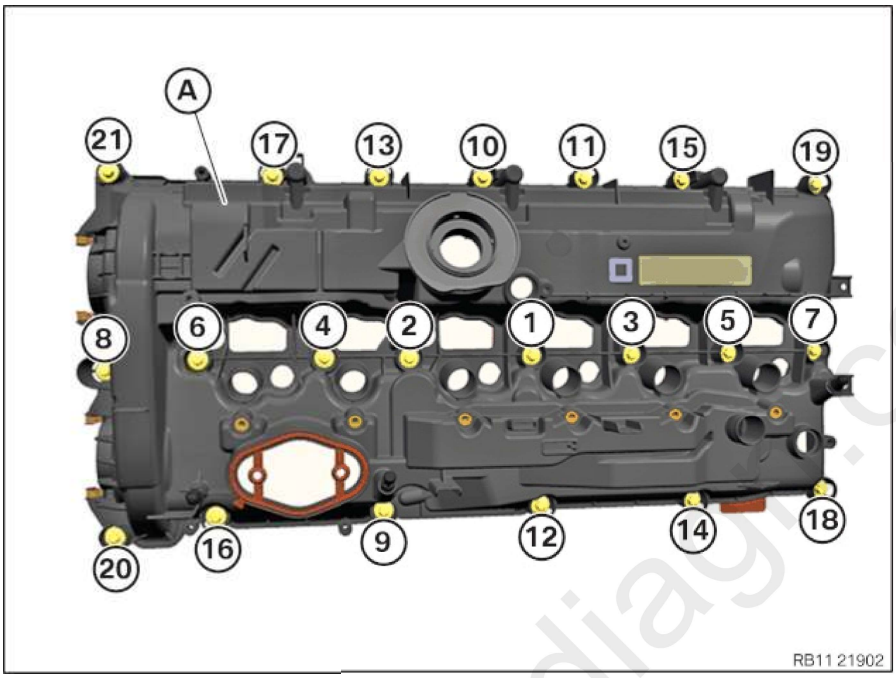


- Turn the unlocked fixture(1) by 90°.
- Release and remove the injector downwards.

MAIN WORK

25 – Removing the cylinder head cover

Overview: Bolts of the cylinder head cover



1 - 21 Bolts of the cylinder head cover

A Cylinder head cover

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

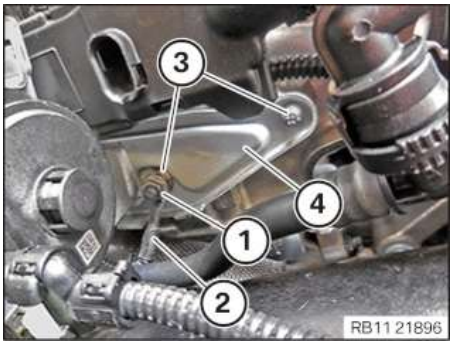
Sheared wires can cause a short circuit.

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

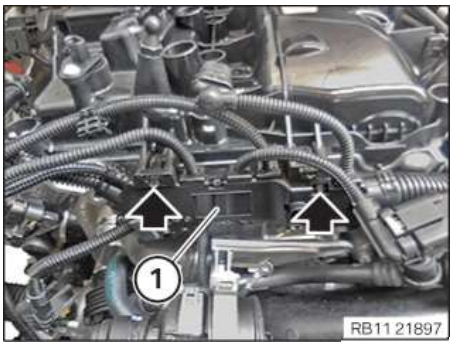


- Unlock the locks (1).
- Feed the engine ventilation line (2) out and set it aside.

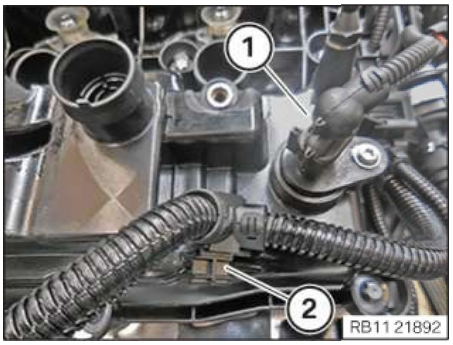
cardiagn.com



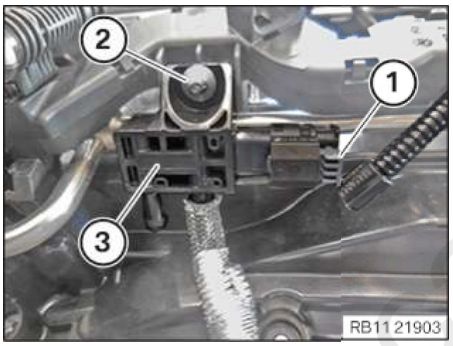
- Loosen nut (1).
- Feed out ground cable (2) and set it aside.
- Loosen screws (3).
- Thread out holder (4) and set aside.



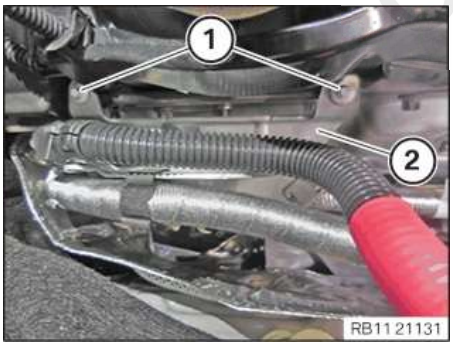
- Unlock and detach the locks (arrows).
- Guide out the wiring harness section (1) for the sensor system **2** and place to one side.



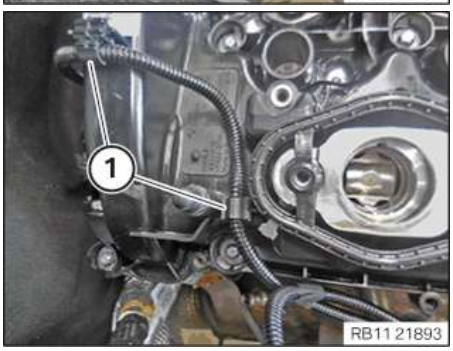
- Unlock and detach connector (1) on exhaust camshaft sensor .
- Loosen clamp (2).



- **If installed:**
- Unlock and loosen connector (1).
- Loosen screw (2).
- Remove the differential pressure sensor (3) and put it to one side.

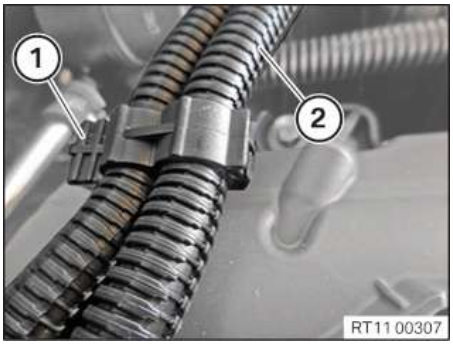


- Loosen screws (1).
- Feed out the bracket (2) of the positive battery cable and set it aside.

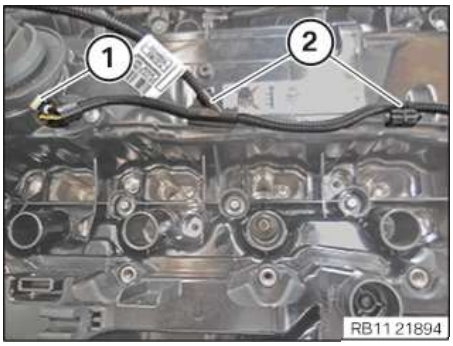


- Loosen clamps (1).

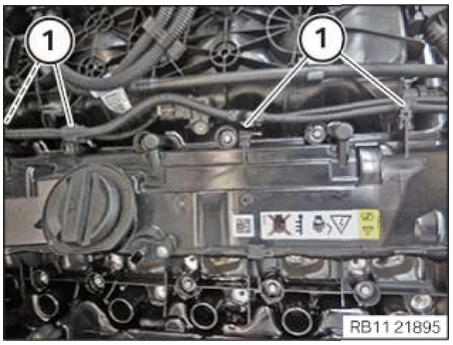
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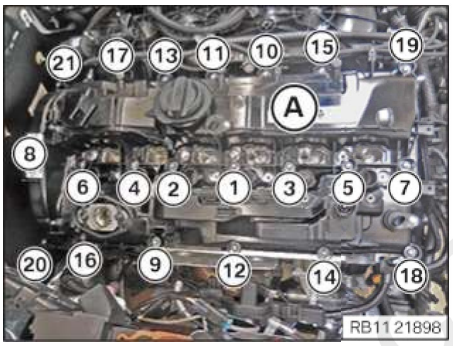
- Loosen clamp (1).
- Thread out the wiring harness section (2) for the injectors and ignition coils and set it aside.



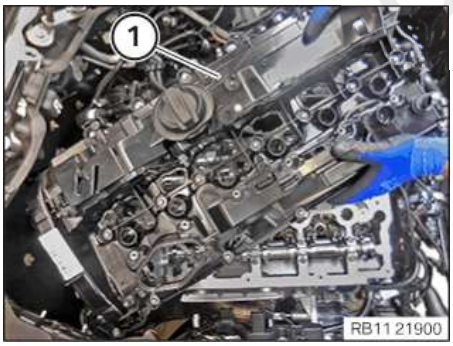
- Unlock and detach connector (1) on the intake camshaft sensor.
- Loosen clamps (2).



- Loosen clamps (1).



- Release all screws on the cylinder head cover (A) in the sequence (21) to (1).

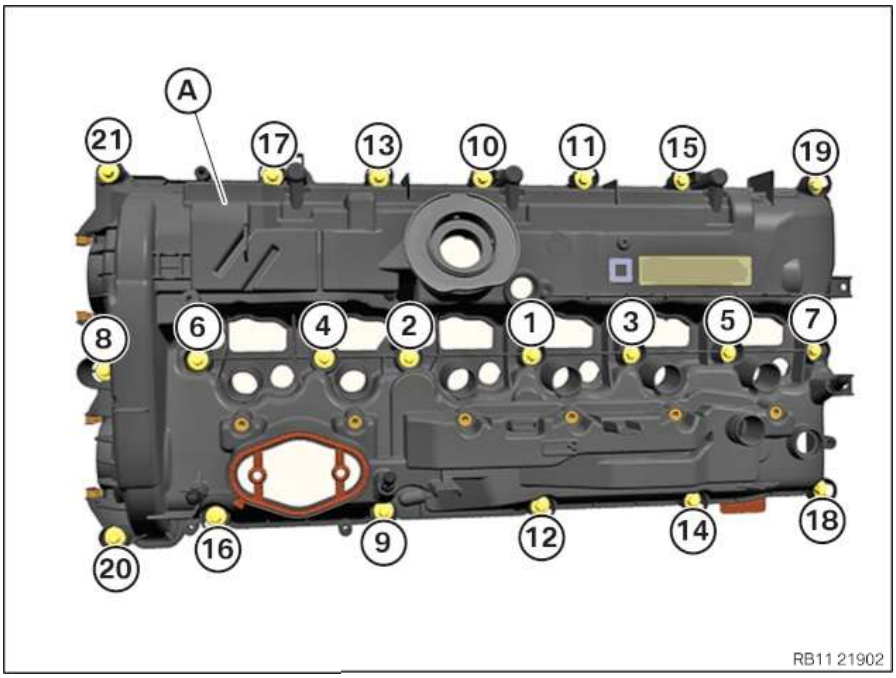


- Guide the cylinder head cover (1) out and remove it.

26 – Installing cylinder head cover

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Overview: Bolts of the cylinder head cover



1 - 21 Bolts of the cylinder head cover

A Cylinder head cover

RISK OF DAMAGE

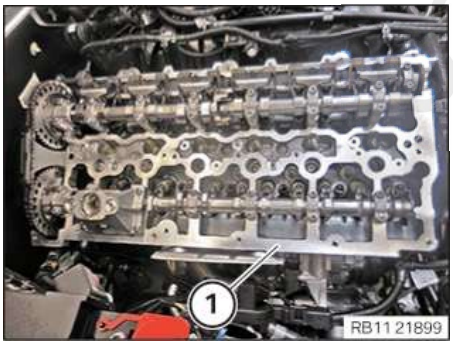
Improper routing of cables and wiring harnesses.

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

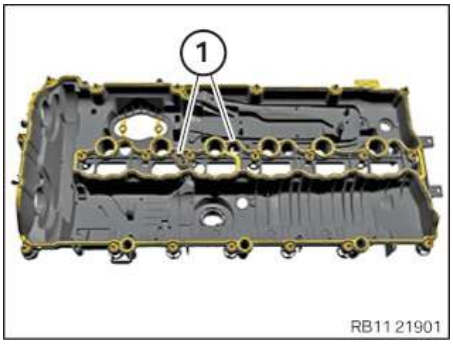
- Route all cables without abrasions, do not trap and crush.

TECHNICAL INFORMATION

Latch mechanisms, guides and mounting elements must not be damaged or missing.



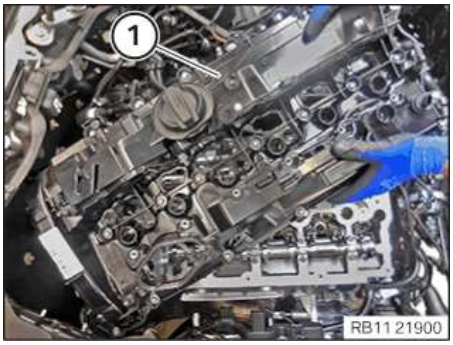
- Contact surface (1) must be free from oil and grease.



- Replace the seals (1).

  Parts: Seals

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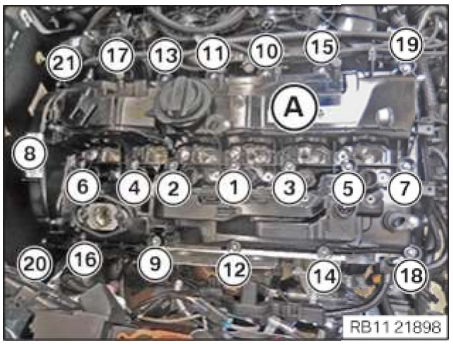


- Insert and install cylinder head cover (1).



- Ensure that the cylinder head cover (1) is installed in the **marked** area correctly on the high pressure pump bracket(2).

  The cylinder head cover (1) must not touch the high pressure pump bracket (2) in the **marked** area.



- Position the cylinder head cover (A).
- Make sure that the cylinder head cover (A) does not touch the high pressure pump bracket!
- Tighten all bolts in sequence (1) to (21).

Cylinder head cover to cylinder head

M6X30		Jointing torque	8 Nm

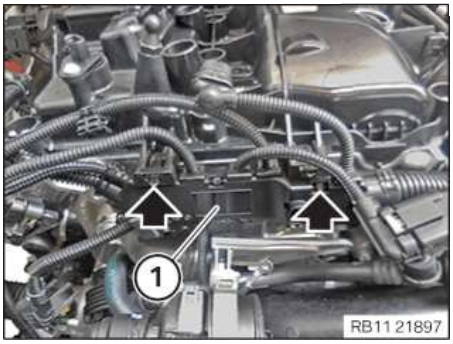
- Tighten all screws in a sequence from (1) to (21).

Cylinder head cover to cylinder head

M6X30		Tightening torque	11 Nm

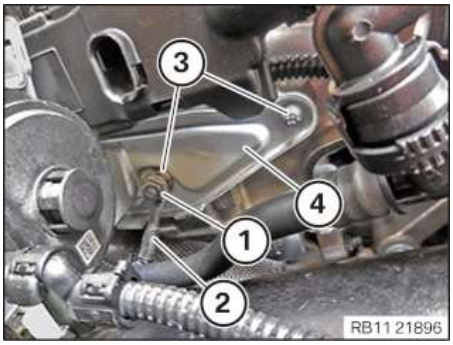


- Insert and install the engine ventilation line (2).
- Ensure that the locks (1) engage audibly.



- Feed in and install wiring harness section (1) for sensor system **2**.
- Make sure that you can hear the locks (arrows) engage.

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- Insert and position the holders (4).
- Tighten the screws (3).

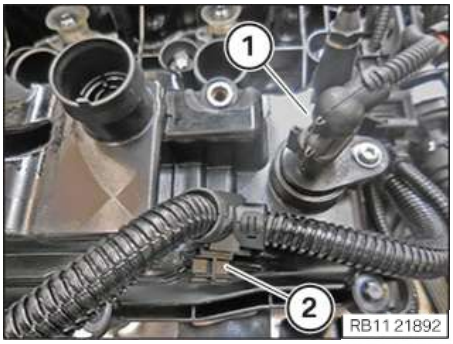
Auxiliary coolant pump holder to cylinder head

M6		Tightening torque	7 Nm

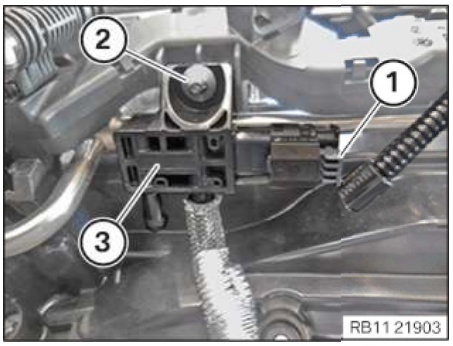
- Thread in ground cable (2) and install.
- Tighten nut (1).

Standard screw connection M6

M6			8 Nm



- Connect and lock the connector (1) on the exhaust camshaft sensor .
- Ensure that connector (1) on the exhaust camshaft sensor engages audibly.
- Secure clamps (2).

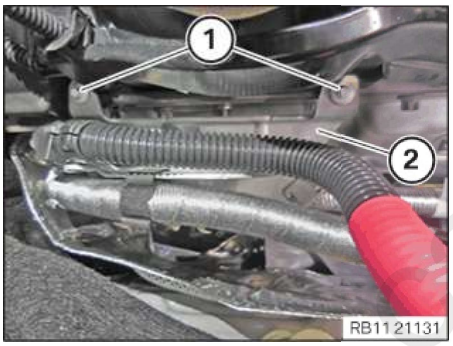


- **If installed:**
- Feed in and install the differential pressure sensor (3).
- Tighten down screw (2).

Differential pressure sensor to holder

TS6X18		Tightening torque	3,5 Nm

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



CAUTION

Improper routing of the positive battery cable.

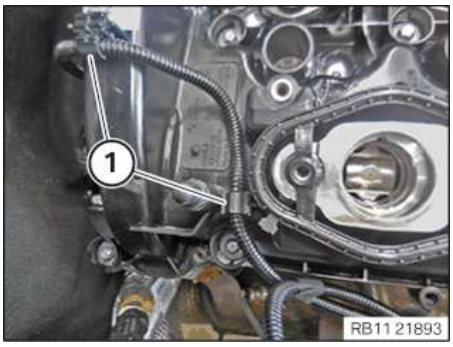
Risk of short circuits!

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

- Guide in and install holder (2) of the positive battery cable.
- Tighten the screws (1).

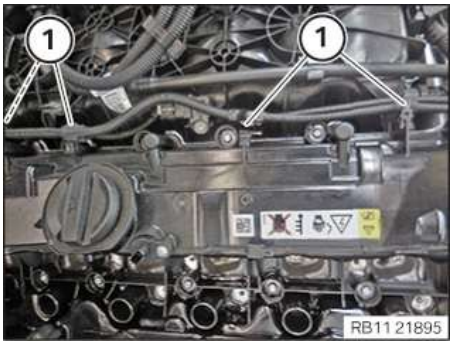
Holder, positive battery cable to cylinder head cover

6X18		Tightening torque	6 Nm

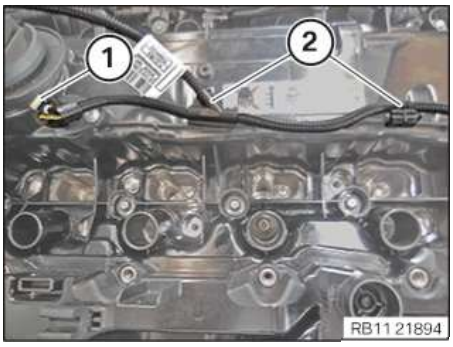


- Secure clamps (1).

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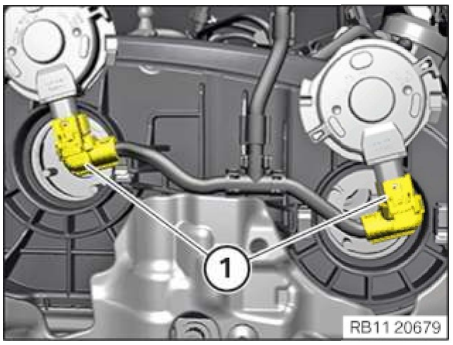
- Secure clamps (1).



- Connect connector (1) to the intake camshaft sensor and lock it.
- Make sure the connector (1) engages audibly.
- Secure clamps (2).

POSTPROCESSES

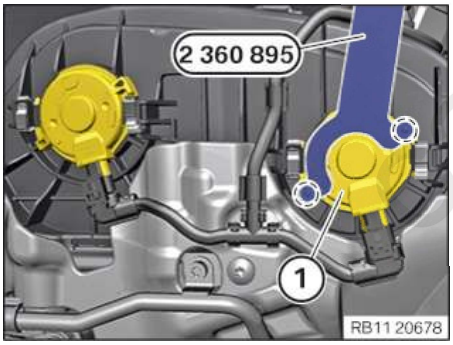
27 – Installing both actuators



NOTICE

The figure shows the rear side of the engine.

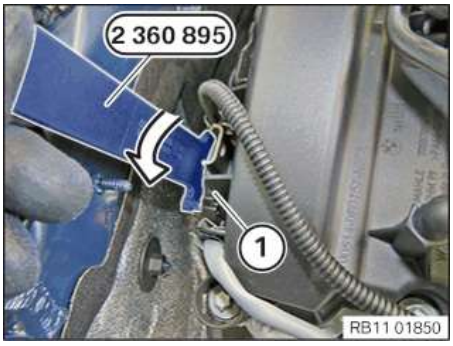
- Position both actuators.
- Connect and lock both connectors (1).
- Make sure the connectors (1) engage audibly.



NOTICE

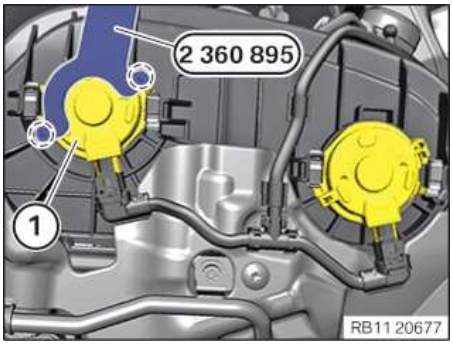
The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the exhaust side.



- Position the actuator (1) of the exhaust side and turn it in the direction of arrow with the special tool 2 360 895 until the limit stops touch the clamps.

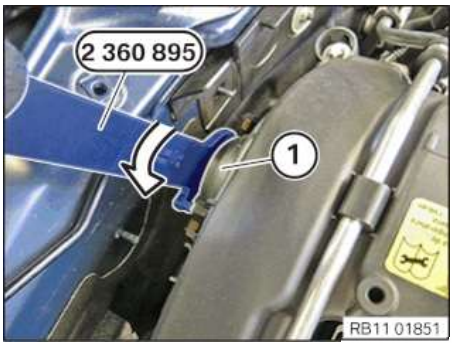
sedlagn.com



NOTICE

The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the intake side.



- Position the actuator (1) of the intake side and turn it in the direction of arrow with the special tool 2 360 895 until the limit stops touch the clamps.

28 – Install high pressure pump

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

TECHNICAL INFORMATION

Only G05 and G07

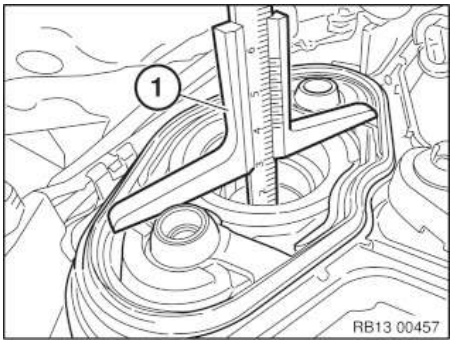
In vehicles with active anti-roll bar (ARS) the fan cowl must be removed in order to spin the engine.

For additional information see: 17 11 035 Removing and installing/replacing the fan cowl including electric fan

TECHNICAL INFORMATION

The high pressure pump can be pre-tensioned by camshaft cams. If when loosening the screws, the high pressure pump is forced out, the engine will have to be turned to bring the camshafts to a different position.

Before installing the high pressure pump, the cam of the high pressure pump drive must be turned to BDC. To do this, twist the engine if necessary in the direction of engine rotation to the central bolt of the crankshaft. Otherwise, it will not be possible to install the high-pressure pump.



- Place the depth gauge (1) flat onto the high pressure pump flange.
- Turn the engine at the central bolt in the direction of engine rotation until the BDC position of the camshaft is reached.

  The depth gauge (1) is in the deepest position.

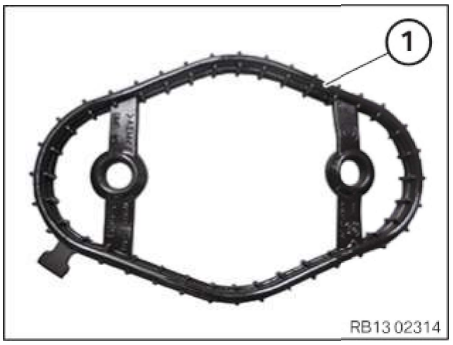
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- Rotate the engine with the special tool 0 493 380 (11 6 480) in the **direction of the arrow** until the cam of the high pressure pump drive is at the **BDC position** .



- Guide out and remove gasket (1).



- Renew the gasket (1).

  Parts: Gasket



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Check the threads (1) on the high pressure pump flange for sealing compound residue: Remove sealing compound residue as needed.
- Clean the thread (1) with a thread cutter **M6**.
- Make sure that no contamination enters the engine.
- Cover opening at the high pressure pump flange with suitable materials.



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Clean sealing surface (1).



- Insert and install the gasket (1).
- Make sure the seal (1) has been correctly positioned in the **highlighted** area.



RISK OF DAMAGE

Damage to the surface.

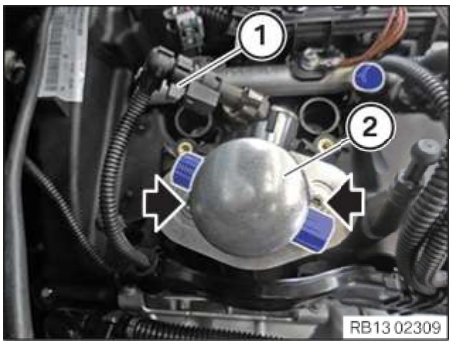
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Clean sealing surface (1).



- Feed in and install high pressure pump (2).
- Renew the bolts (arrows).

  Parts: Bolts
- Position screws (arrows) of the high pressure pump (2) and tighten **in alternating order** in **90°** increments.

  Compliance with this specification is imperative to make sure that the piston will not break due to twisting.

High pressure pump to high pressure pump flange

M6x25	*Renew screws.*	Jointing torque	12 Nm
		Tightening torque	90 °

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

29 – Prepare the injectors for installation

RISK OF DAMAGE

Damage to the injector tips and Teflon ring.

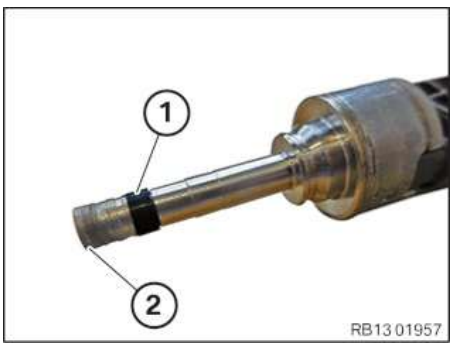
Improper handling of the injector tips and Teflon ring can lead to malfunctioning of the injector.

- Avoid mechanical contact with injector tip.
- When exchanging Teflon ring, hands and work surface must be clean and free of oil. Do not use any lubricating agents.
- Do not use fingernails to slide Teflon ring on.

TECHNICAL INFORMATION

Before re-installing the injector, the Teflon ring must be renewed. Once a Teflon ring has been installed, it may not be re-used. New injectors are supplied with a new Teflon ring.

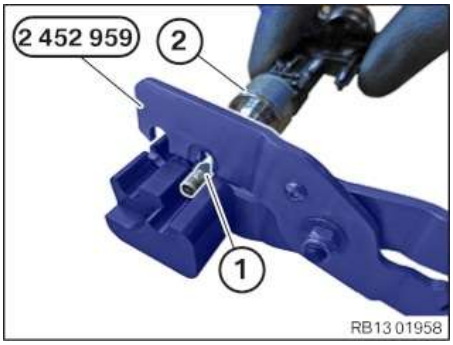
After the installation of a new Teflon ring on the injectors, the injector must be installed in the cylinder head within 10 minutes or protected with protective caps; otherwise, the Teflon ring will swell.



- Before installing the injectors: Renew the Teflon rings (1).

  Parts: Teflon rings
- Avoid mechanical contact with injector tip (2).

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- Remove Teflon ring (1) by using special tool 2 452 959 from injector (2).
- If necessary, use a lint-free cloth to clean the cylindrical part of the injector tip. Do not use ultrasonic sound or other auxiliary materials.
- Do **not** clean the injector tip.

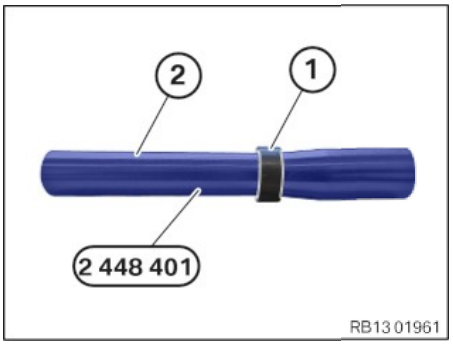


- For the installation of the new Teflon rings: Use the set of special tools 2 448 401:

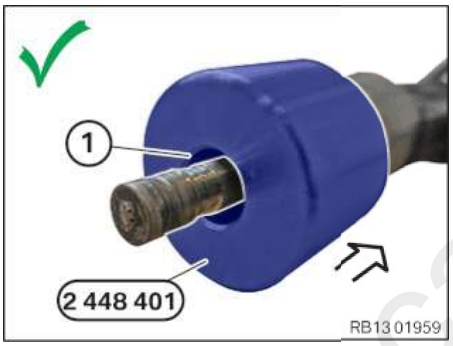
  (1) Installation cone

  (2) Sliding sleeve

  (3) Assembly sleeve

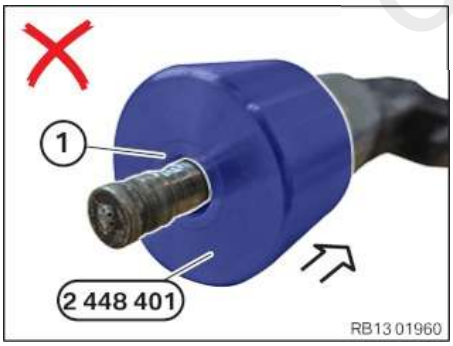


- Slide the new Teflon ring (1) onto the installation cone (2) from the set of special tools 2 448 401.



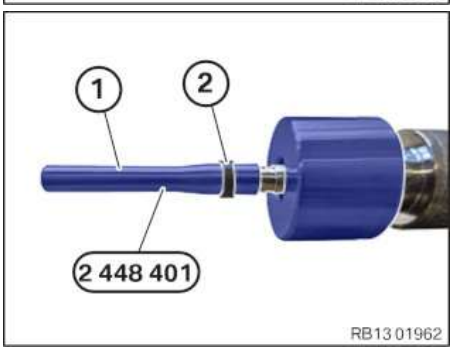
- Make sure the installation position of the assembly sleeve (1) from the set of special tools 2 448 401 is correct:

  The larger diameter of the assembly sleeve (1) must point to the injector tip.



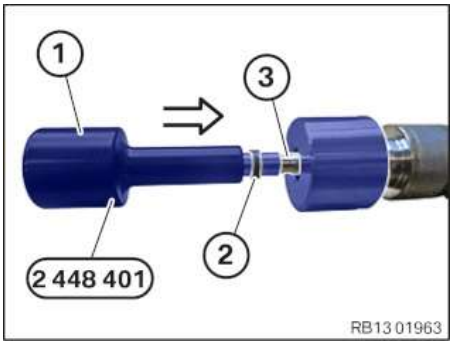
- Make sure the installation position of the assembly sleeve (1) from the set of special tools 2 448 401 is correct:

  The assembly sleeve (1) is **not** mounted correctly when the smaller diameter points to the injector tip.

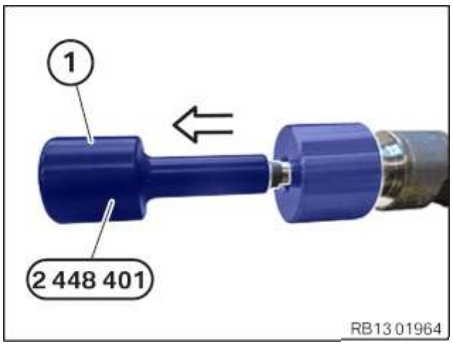


- Mount the Teflon ring (2) with the installation cone (1) from the set of special tools 2 448 401 on the injector tip .

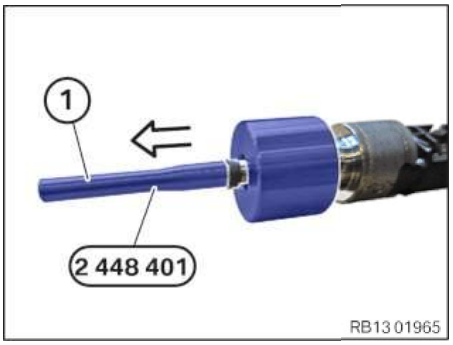
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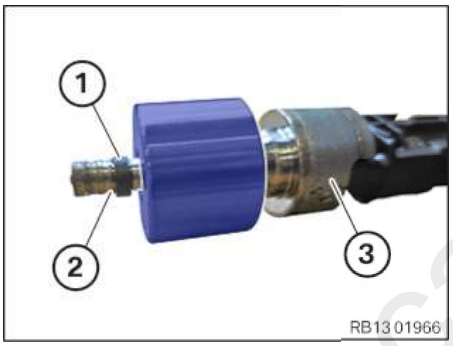
- Use the sliding sleeve (1) from the set of special tools 2 448 401 to push the Teflon ring (2) into the groove (3) on the injector in the direction of the arrow.



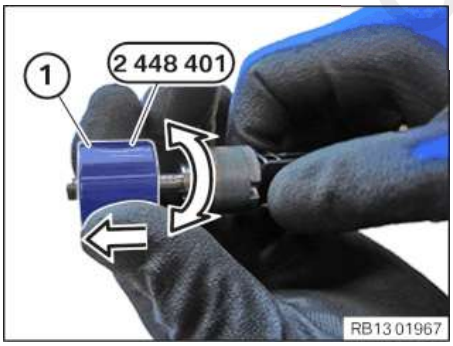
- Thread out the sliding sleeve (1) from the set of special tools 2 448 401 in the direction of the arrow and remove.



- Thread out the installation cone (1) from the set of special tools 2 448 401 in the direction of the arrow and remove.

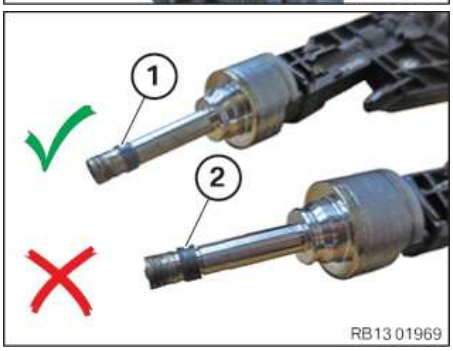


- Make sure that the expanded Teflon ring (1) is properly inserted in the groove (2) of the injector (3) and can be moved easily with your fingers.



- Calibrate the expanded Teflon ring with the assembly sleeve (1) from the set of special tools 2 448 401 to the installation dimension in the direction of the arrow.
- Perform **rotational movements** in increments of 180° synchronous to the **pull-off movement**. Perform the movements slowly and **not** jerky.

  This calibrates the Teflon ring (1) to the installation dimension.
- Thread out and remove the assembly sleeve (1).



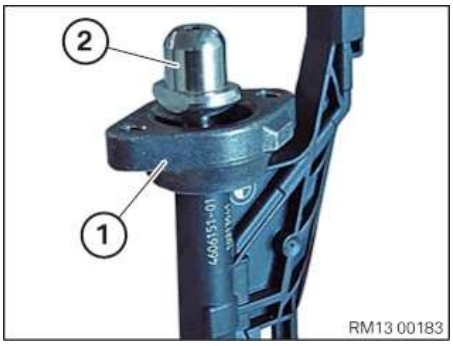
- Check the correct installation dimension of the Teflon ring (1):
  - (1) indicates a correct installation dimension of the Teflon ring.
  - (2) indicates an incorrect installation dimension of the Teflon ring.

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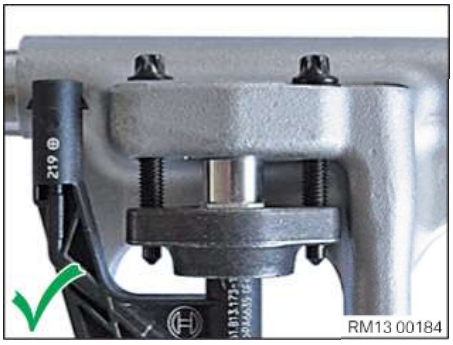
30 – Installing the high-pressure rail with injectors of the cylinders 4 to 6

TECHNICAL INFORMATION

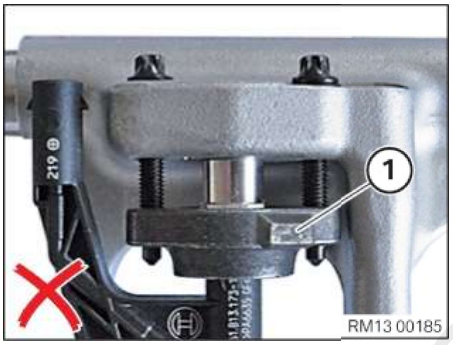
When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.



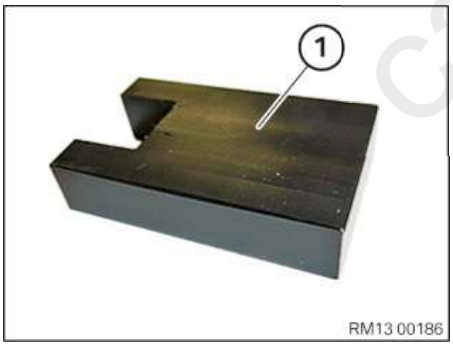
- Mount the holder (1) above the bayonet fitting (2) on the injector.
- **If the holder**(1) **has a cast lug**: Make sure that the holder is installed in the correct position.



- If applicable, note the position of the cast lug:
  The holder is mounted **correctly** when the cast lug is located at the rear.



- If applicable, note the position of the cast lug:
  The holder is mounted **incorrectly** when the cast lug (1) is in front.



RISK OF DAMAGE

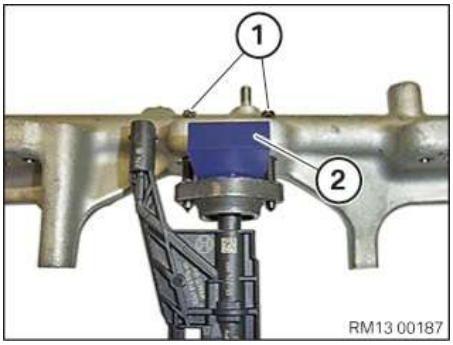
Damage to injectors.

Weld seams on the injector may tear due to incorrect distances between the rail and injector so that the injector must be renewed.

- Insertion of the distance gauge is compulsory.
- Replace distance gauge, if a thickness of 8.5 mm is no longer given in the distance gauge.

- Use the special tool (distance gauge) 2 358 022 (1).

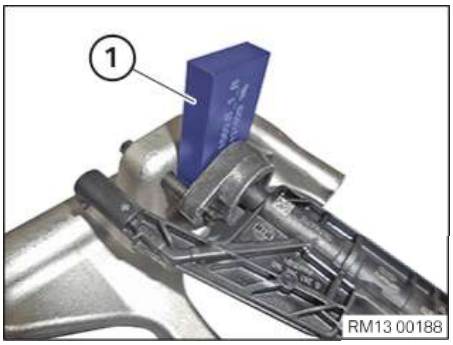
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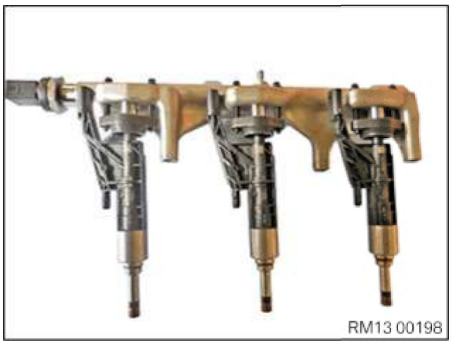
- Replace (M5x30) screws.

  Parts: Screws (M5x30)
- Mount the injectors with the holders and the bolts (M5x30) (1) on the rail.
- Keep the rail on a clean table in such a way that the openings on the rail for the injectors point upwards.

  The electrical injector connections must point to the fuel pressure sensor.
- Slide the special tool (distance gauge) 2 358 022 (2) between the holders and the rail onto the injector head.
- Make sure that the special tool (distance gauge) 2 358 022 (2) rests flat on the retaining bridge.
- Hand-tighten both screws (M5x30) (1) evenly until the special tool (distance gauge) 2 358 022 (2) rests flat against the rail and the holder.



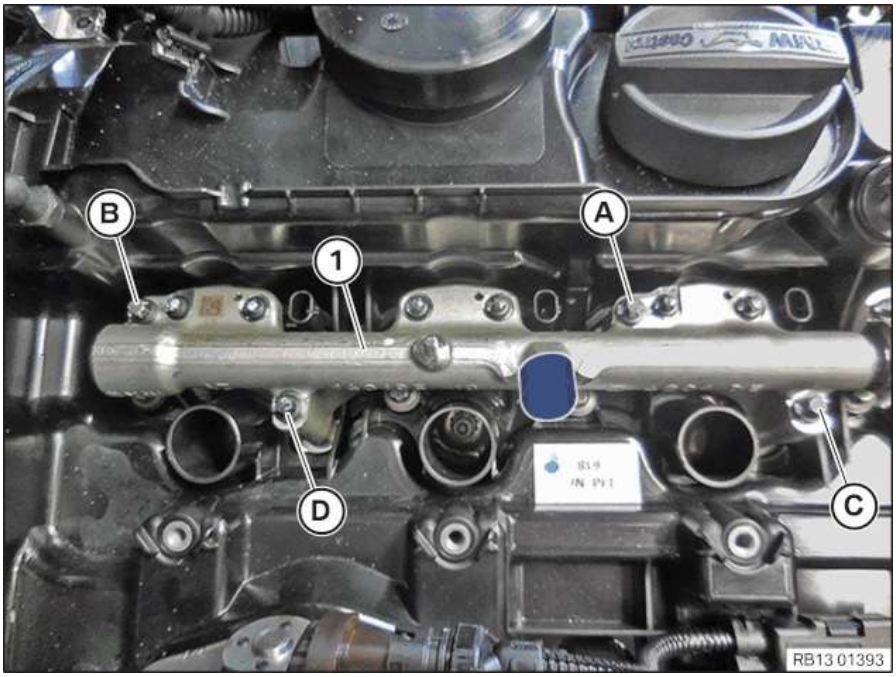
- Remove the special tool (distance gauge) 2 358 022 (1).
- Repeat this operation for all injectors.



- Check injectors for loose fit at the rail.
- Align the electrical injector connections parallel to the rail.

  The injectors must move freely.

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- Renew screws (A) to (D).

  Parts: Bolts
- Attach the rail (1) with the injectors to the cylinder head from the top.
- Make sure the injector tips catch the corresponding holes in the cylinder head.
- Make sure the guides on the injector are properly inserted into the guide bores in the cylinder head.
- Press the rail (1) down until a resistance can be felt; join and hand-tighten the bolts (M6x30) (A) and (B).
- Set the torque wrench to 2 Nm.
- Tighten the screws (A) and (B) in alternating order by **180°** each with the torque wrench until the rail is positioned flush on the cylinder head.

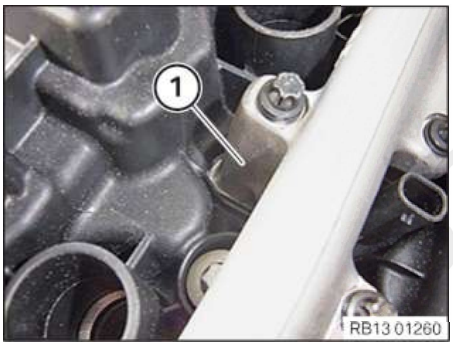
  The figure shows the rail resting flat against the cylinder head.
- Insert bolts (C) and (D).

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

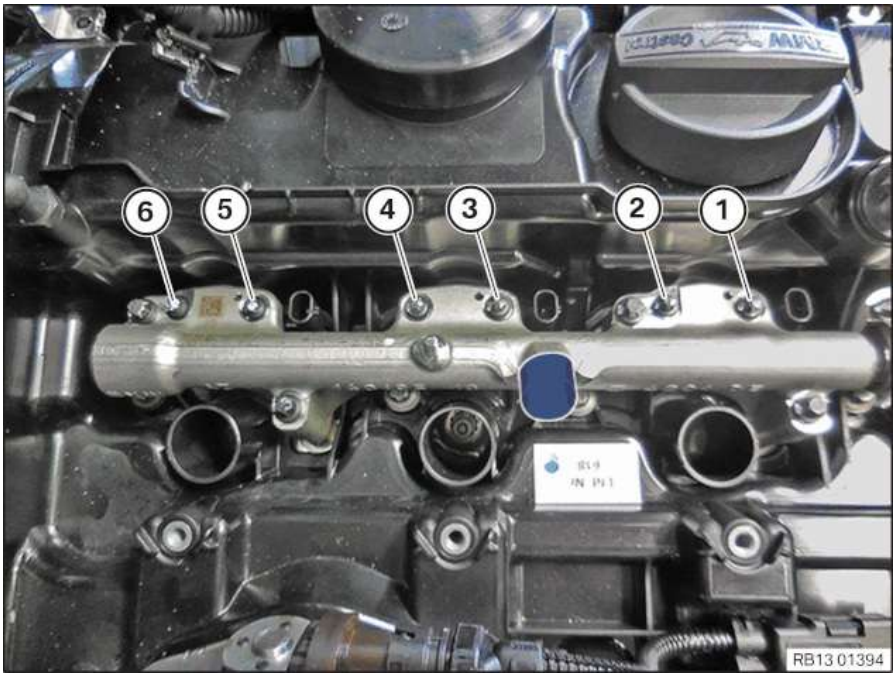
Non-observance of these requirements may result in leaks and damage.

- Tighten bolt (A) to 5 Nm.
- Tighten bolt (D) to 5 Nm.
- Tighten bolt (B) to 5 Nm.
- Tighten bolt (C) to 5 Nm.



- Make sure that the rail (1) rests flat against the cylinder head.

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- Attach a socket to an extension.

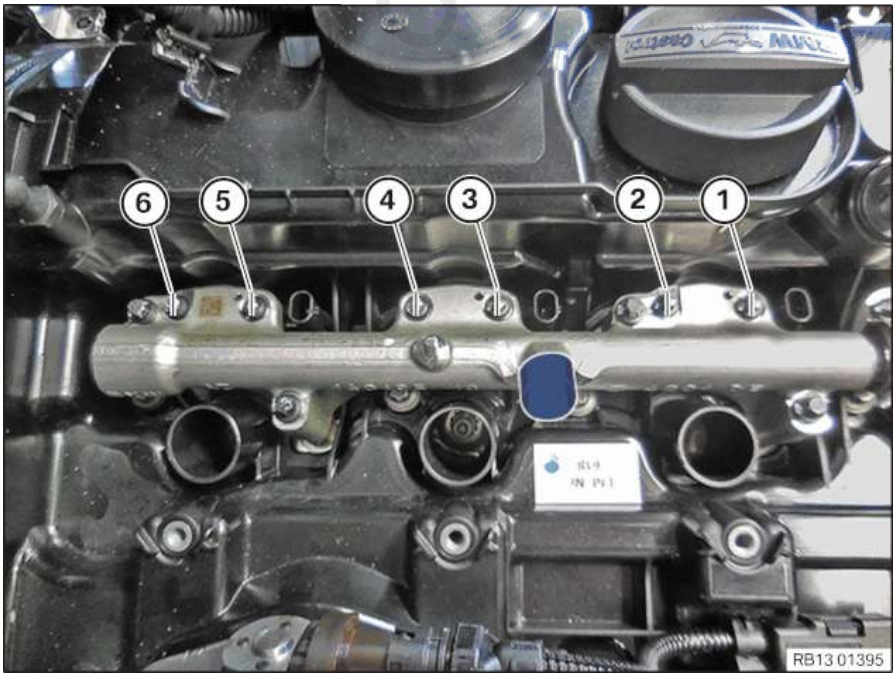
  Do not use a reversible ratchet or torque wrench.
- Tighten the bolts (M5x30) in pairs ((1) with (2), (3) with (4), (5) with (6)) in alternating order **90° hand-tight**.
- Set the torque wrench to 5 Nm.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- **Screw the (M5x30) bolts according to the following plan:**
  - **Fuel injector 4:**
  - Tighten screw (1) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (2) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (1) and (2) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 5:**
  - Tighten screw (3) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (4) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (3) and (4) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 6**:
  - Tighten screw (5) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (6) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (5) and (6) until both bolts reach a torque of 5 Nm.



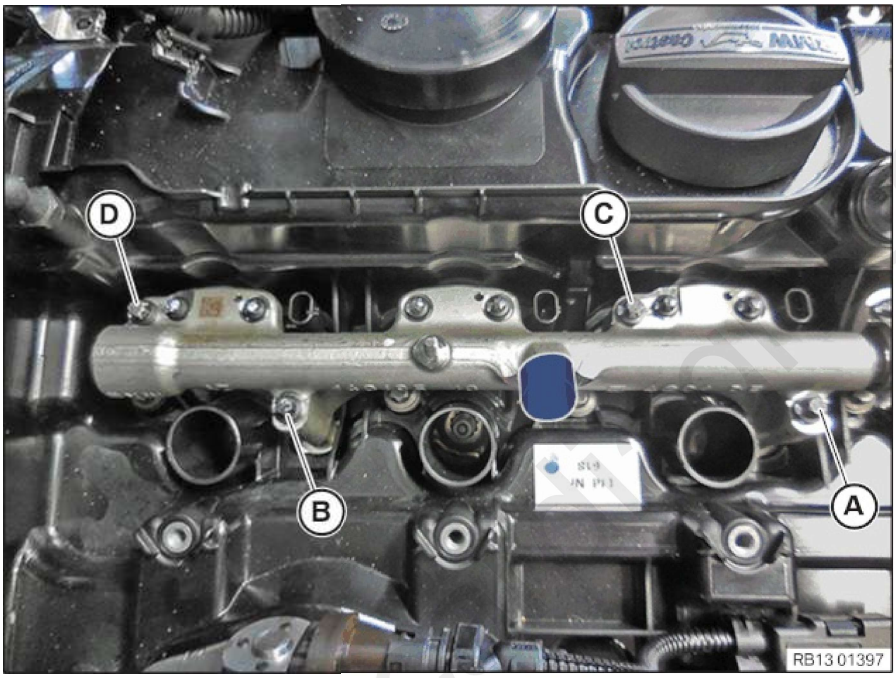
- Mark all bolts (1) to (6) with a vertical line (see figure).
- **Tighten screws using an angle of rotation.**
  - Tighten the screw (1) with an angle of rotation of 90° ±15°.
  - Tighten the screw (2) with an angle of rotation of 90° ±15°.
  - Tighten the screw (3) with an angle of rotation of 90° ±15°.
  - Tighten the screw (4) with an angle of rotation of 90° ±15°.
  - Tighten the screw (5) with an angle of rotation of 90° ±15°.
  - Tighten the screw (6) with an angle of rotation of 90° ±15°.

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- Check if all bolts (1) to (6) have been tightened with a 90° ±15° angle of rotation.

  All marks (lines) must be horizontal (see figure).



- Unscrew the bolts (M6x70) (A) to (D).

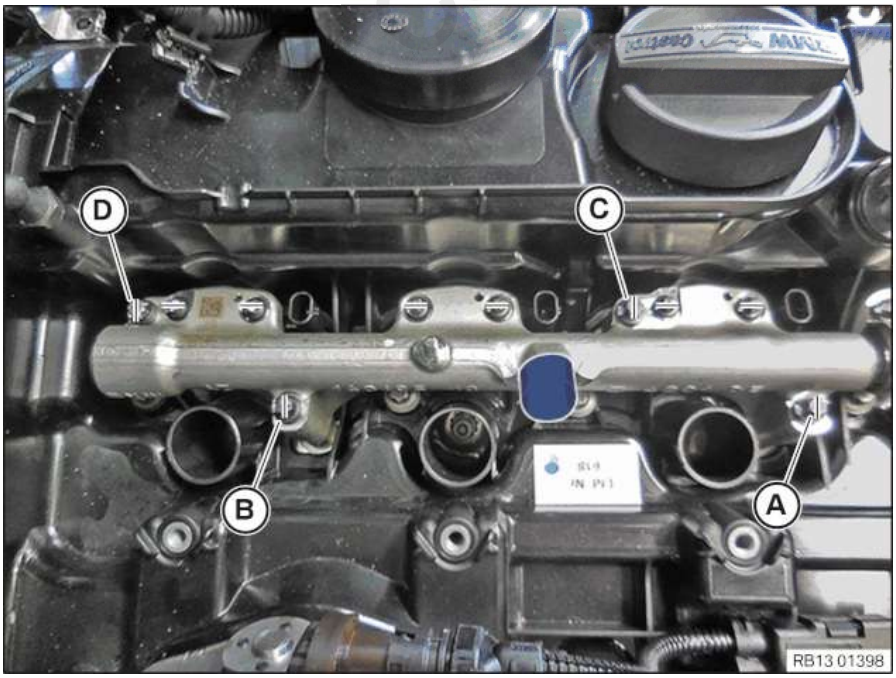
  It is imperative that the bolts are unscrewed.

TECHNICAL INFORMATION

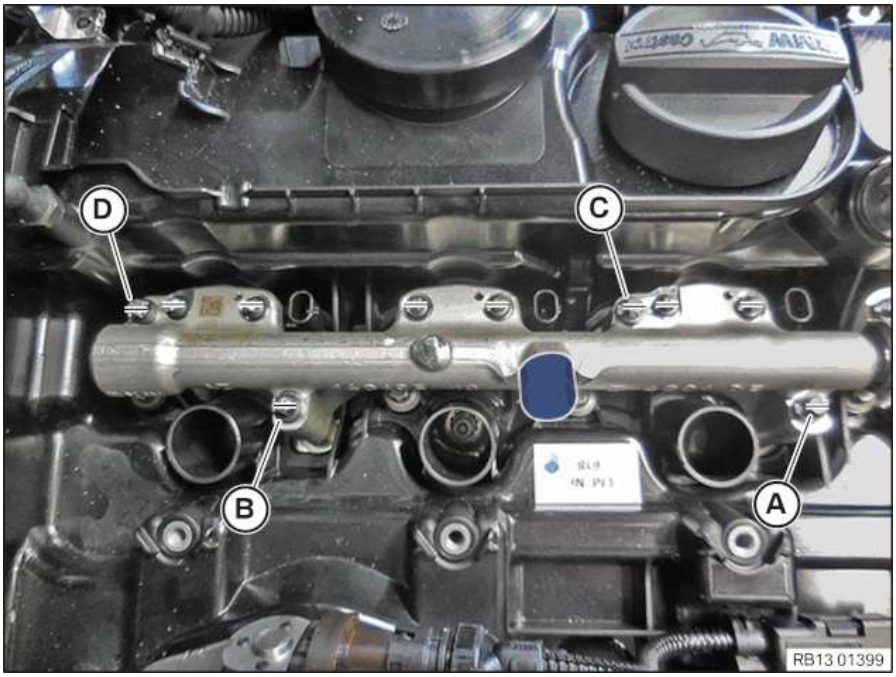
When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten bolt (A) to 5 Nm.
- Tighten bolt (D) to 5 Nm.
- Tighten bolt (B) to 5 Nm.
- Tighten bolt (C) to 5 Nm.

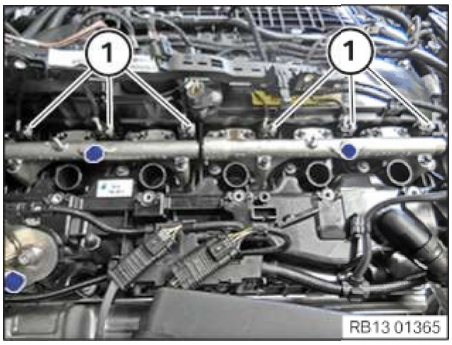


- Mark all bolts (A) to (D) with a vertical line (see figure).
- Tighten bolts (M6x70) (A) to (D) to a 90° angle of rotation.



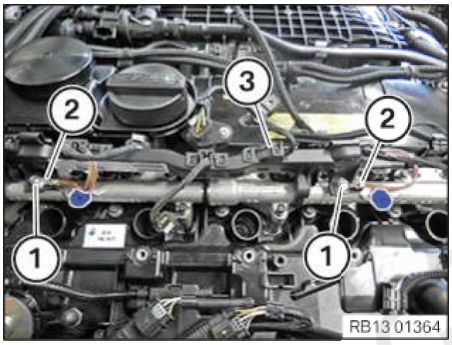
- Check if all bolts (A) to (D) have been tightened with a 90° angle of rotation.

  All marks (lines) must be horizontal (see figure).



- Connect and lock all connectors (1) to the injectors.

  All connectors (1) must engage audibly.



- Thread in cable channel (3) and install.
- Thread in ground cable (2) and install.
- Tighten nuts (1).

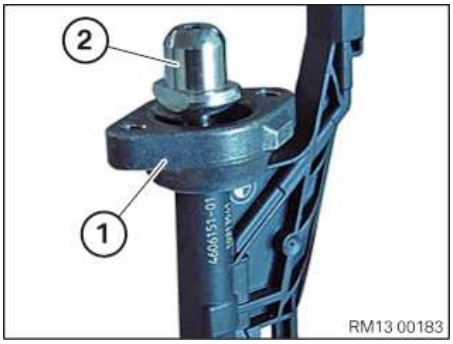
Ground cable to rail

M6			5 Nm

31 – Installing rail with injectors of cylinders 1 to 3

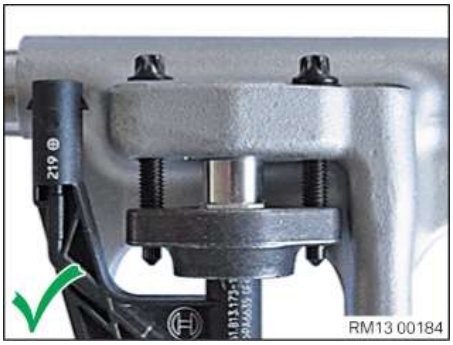
TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.



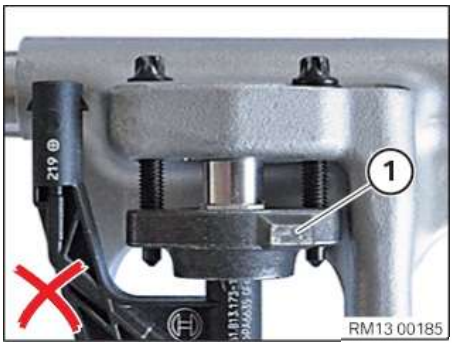
- Mount the holder (1) above the bayonet fitting (2) on the injector.
- **If there is a cast lug on the holder** (1) **:** Make sure that the holder is installed in the correct position.

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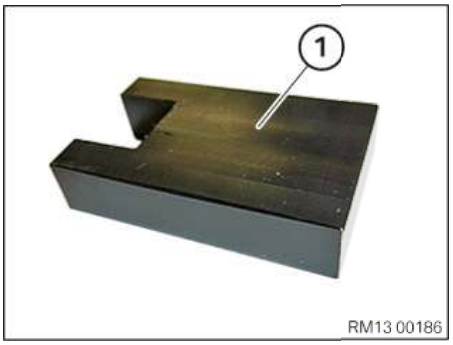
- Observe position of cast lug:

  The holder is mounted **correctly** when the cast lug is located at the rear.



- Observe position of cast lug:

  The holder is mounted **incorrectly** when the cast lug (1) is in front.



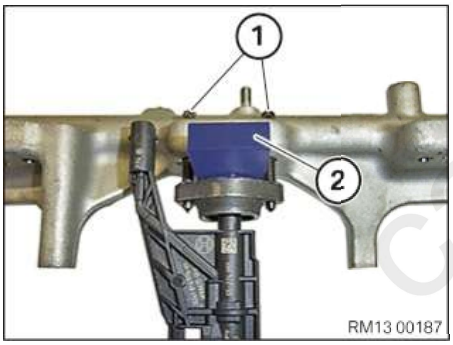
RISK OF DAMAGE

Damage to injectors.

Weld seams on the injector may tear due to incorrect distances between the rail and injector so that the injector must be renewed.

- Insertion of the distance gauge is compulsory.
- Replace distance gauge, if a thickness of 8.5 mm is no longer given in the distance gauge.

- Use special tool 2 358 022(1) .



- Replace (M5x30) screws.

  Parts: Screws (M5x30)
- Mount the injectors with the holders and the bolts (M5x30) (1) on the rail.
- Keep the rail on a clean table in such a way that the openings on the rail for the injectors point upwards.

  The electrical injector connections must point to the fuel pressure sensor.
- Slide special tool 2 358 022 (2) between the holders and the rail onto the injector head.
- Make sure the special tool 2 358 022 (2) rests flat on the retaining bridge.
- Hand-tighten both screws (M5x30) (1) *uniformly until the special* tool 2 358 022 (2) rests flat against the rail and the holder.



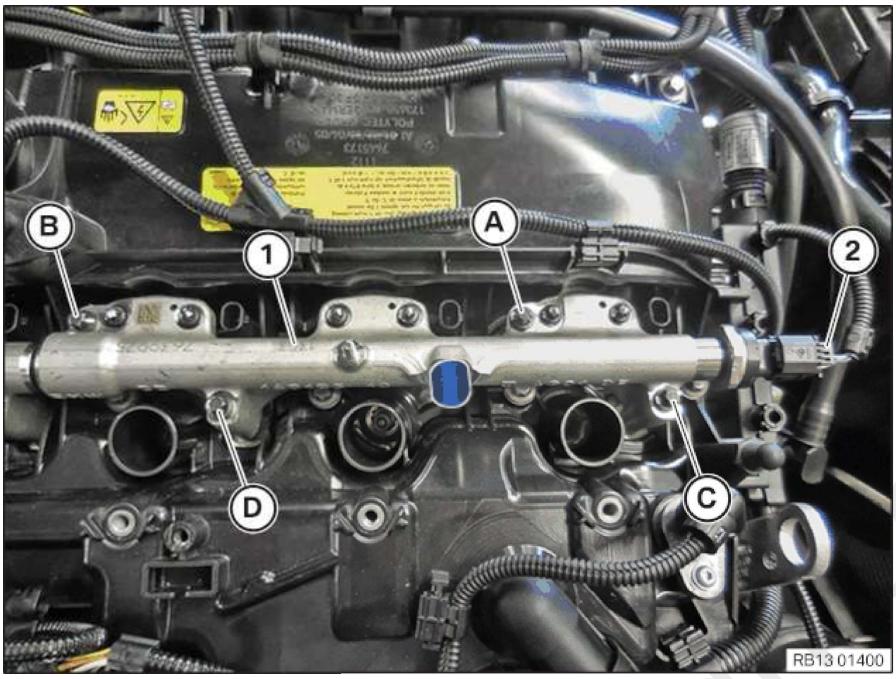
- Remove special tool 2 358 022(1) .
- Repeat this operation for all injectors.

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- Check injectors for loose fit at the rail.
- Align the electrical injector connections parallel to the rail.

  The injectors must move freely.



- Renew screws (A) to (D).

  Parts: Bolts
- Attach the rail (1) with the injectors to the cylinder head from the top.
- Make sure the injector tips catch the corresponding holes for the injectors in the cylinder head.
- Make sure the guides on the injector are properly inserted into the guide bores in the cylinder head.
- Press rail (1) down until a resistance can be felt; join and hand-tighten screws (M6x30) (A) and (B).
- Tighten screws (A) and (B) alternately by **180°** each with the torque wrench until the rail is positioned on the cylinder head.

  The figure shows the rail resting flat against the cylinder head.
- Insert screws (C) and (D).

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

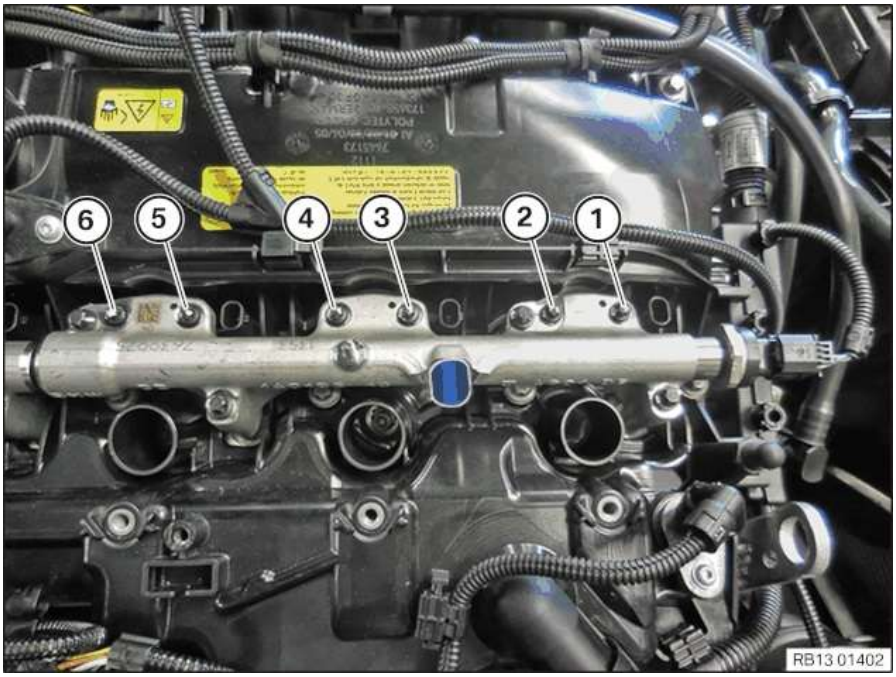
- Tighten screw (A) to 5 Nm.
- Tighten screw (D) to 5 Nm.
- Tighten screw (B) to 5 Nm.
- Tighten screw (C) to 5 Nm.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.



- Make sure that the rail (1) rests flat against the cylinder head.

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- Attach a socket to an extension.

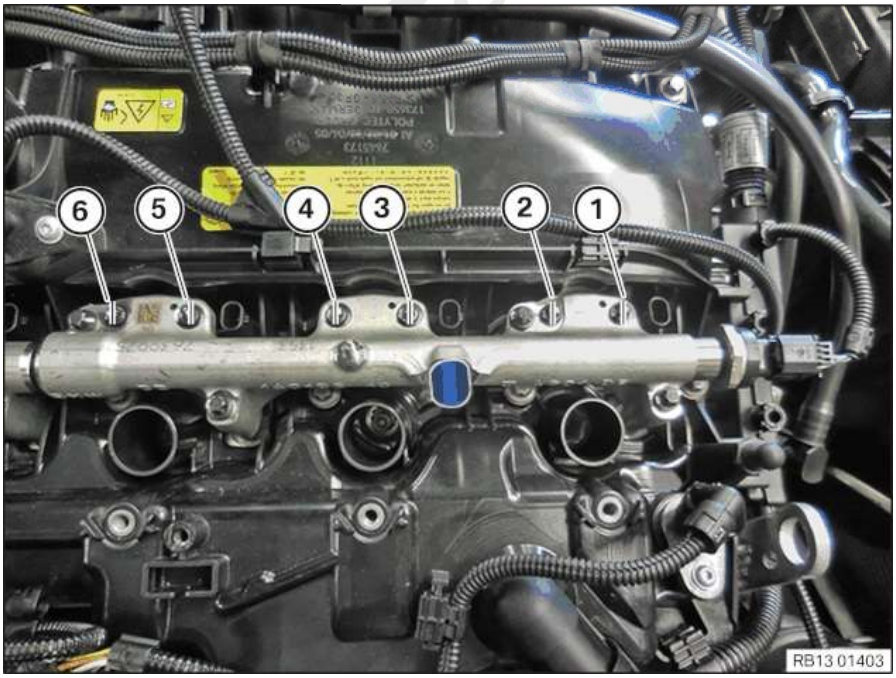
  Do not use a reversible ratchet or torque wrench.
- Hand-tighten screws (M5x30) in pairs ((1) with (2), (3) with (4), (5) with (6)) alternately by **90°**.
- Set torque wrench to 5 Nm.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

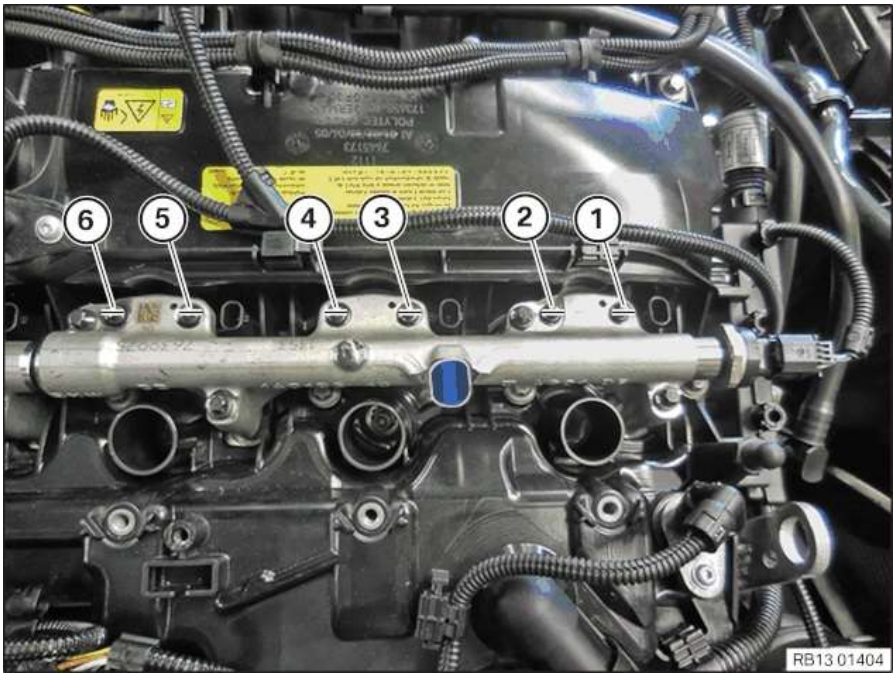
Non-observance of these requirements may result in leaks and damage.

- **Screw the (M5x30) bolts according to the following plan:**
  - **Fuel injector 1:**
  - Tighten screw (1) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (2) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (1) and (2) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 2:**
  - Tighten screw (3) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (4) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (3) and (4) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 3**:
  - Tighten screw (5) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (6) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (5) and (6) until both bolts reach a torque of 5 Nm.



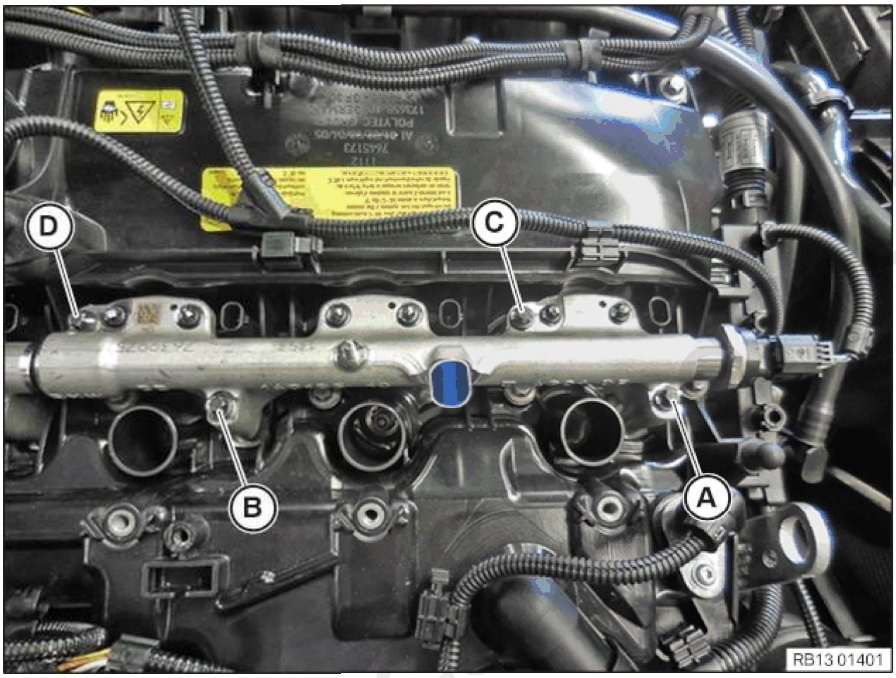
- Mark all bolts (1) to (6) with a line (see figure).
- **Tighten screws using an angle of rotation.**
  - Tighten the screw (1) with an angle of rotation of 90° ±15°.
  - Tighten the screw (2) with an angle of rotation of 90° ±15°.
  - Tighten the screw (3) with an angle of rotation of 90° ±15°.
  - Tighten the screw (4) with an angle of rotation of 90° ±15°.
  - Tighten the screw (5) with an angle of rotation of 90° ±15°.
  - Tighten the screw (6) with an angle of rotation of 90° ±15°.

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- Check if all bolts (1) to (6) have been tightened with a 90° ±15° angle of rotation.

  All markings (lines) must be horizontal (see Figure).



- Release screws (M6x70) (A) to (D) **without fail**.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten screw (A) to 5 Nm.
- Tighten screw (D) to 5 Nm.
- Tighten screw (B) to 5 Nm.
- Tighten screw (C) to 5 Nm.

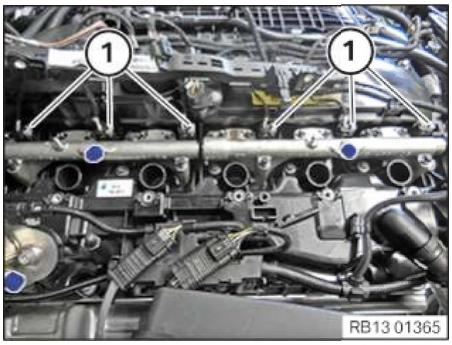


- Mark all the bolts (A) to (D) with a vertical line (see Figure).
- Tighten bolts (M6x70) (A) to (D) with an angle of rotation of 90°.



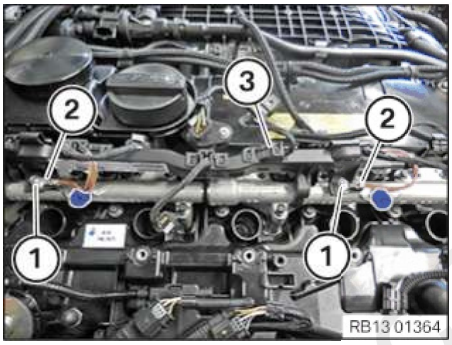
- Check whether all screws (A) to (D) have been tightened with an angle of rotation of 90°.

  All marks (lines) must be horizontal (see figure).



- Connect and lock all the connectors (1) to the injectors.

  All connectors (1) must engage audibly.

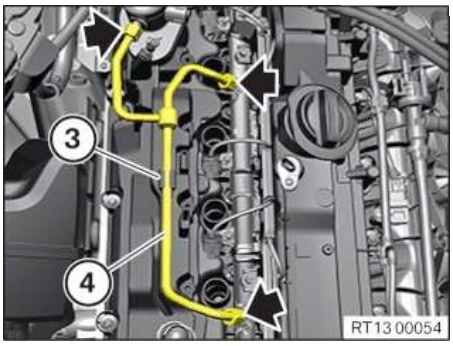


- Thread the cable channel (3) in and install.
- Thread in ground cable (2) and install.
- Tighten nuts (1).

Ground cable to rail

M6			5 Nm

32 – Installing high pressure line between rail and high pressure pump

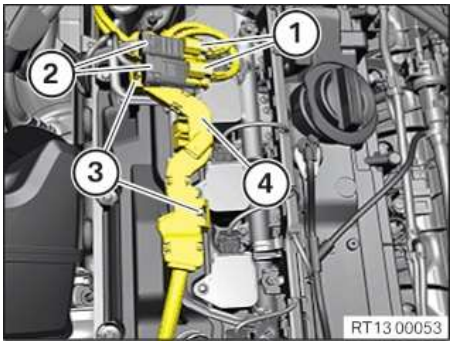


- Insert the high pressure line (4) into the holder (3) and install.
- Tighten union nuts (arrows) with the special tool .

High pressure line between rail and high pressure pump

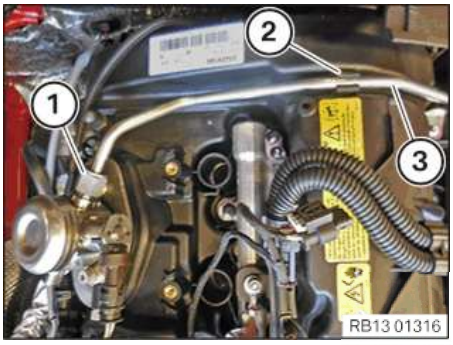
M14x1,5		Tightening torque	33 Nm

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- Insert and install the wiring harness section of the engine wiring harness (4).
  The locks (3) must engage audibly.
- Connect connectors (1) and (2) and lock.
  The connectors (1) and (2) must audibly engage.

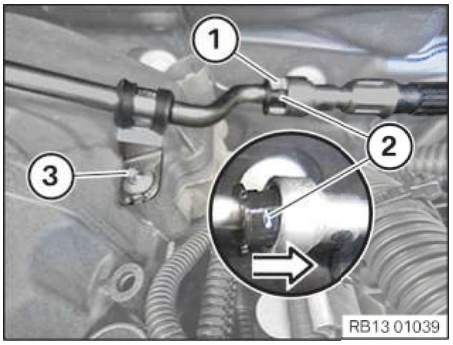
33 – Installing fuel delivery line



- Guide the fuel delivery line (3) in and install.
- Install rubber damper (2).
- Check the rubber damper (2) for the correct fit.
- Tighten the union nut (1) hand-tight.
- Tighten union nut (1).

Fuel delivery line to high pressure pump

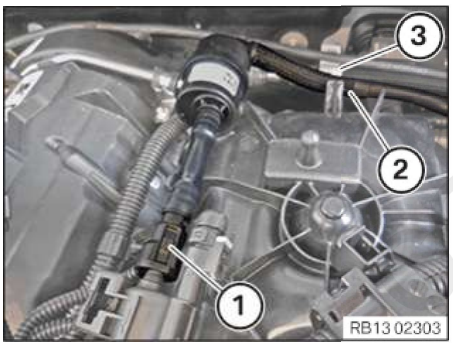
M14		Tightening torque	31 Nm



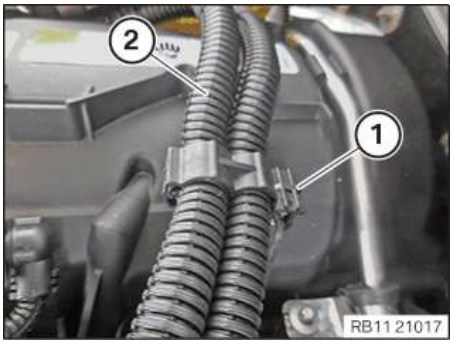
- Slide in and lock the fuel feed line in the direction of the arrow in the snap fastener (2).
  The fuel feed line must be audibly engage in the snap fastener (2).
- Secure clamps (1).
- Tighten down screw (3).

Fuel line to cylinder head cover

6x18		Tightening torque	6,5 Nm

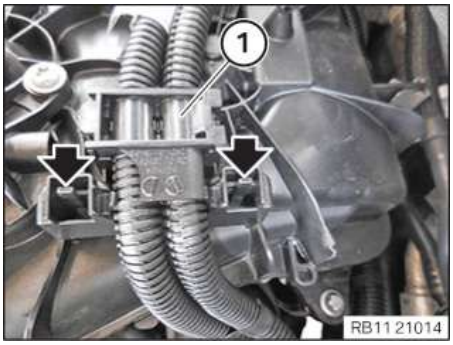


- Insert and install the tank ventilation line (2).
- Lock (1) must engage audibly.
- Secure the tank ventilation line (2) to the clamp (3).



- Insert and install wiring harness section (2) for injectors and ignition coils.
- Secure clamps (1).

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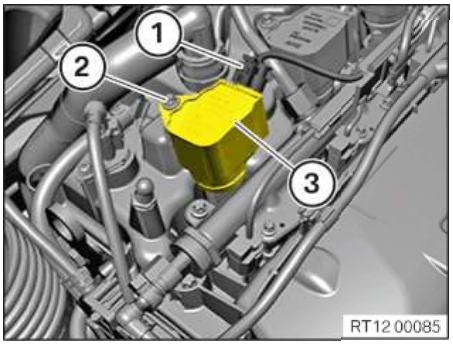
- Insert and install wiring harness section (1) for injectors and ignition coils.
- The locks (arrows) must engage audibly.

34 – Install all ignition coils

NOTICE

The description is for one component only. The procedure is identical for all further components.

▶ **Install ignition coil.**



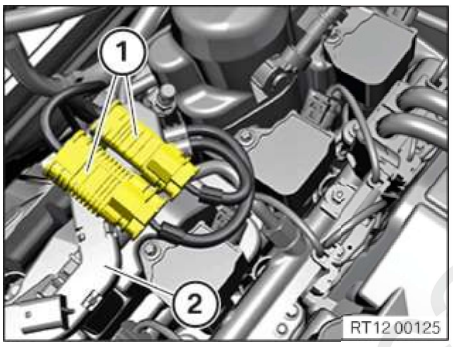
- Install ignition coil (3).
- Tighten down screw (2).

Ignition coil

Screw		Tightening torque	8 Nm

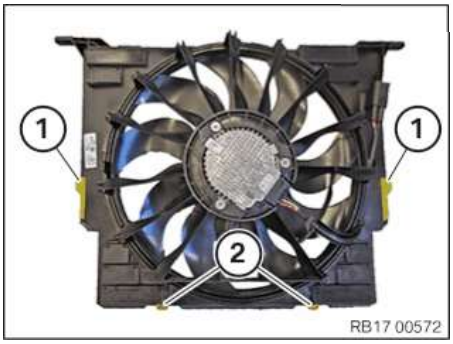
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

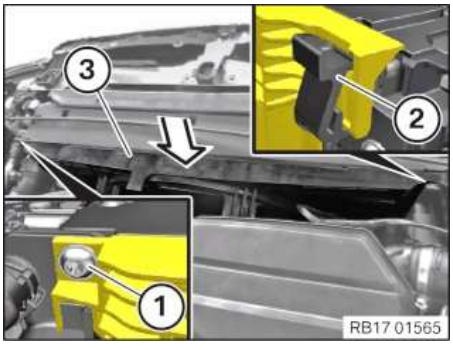


- Connect the connector (1) of the front oxygen sensor and the monitoring oxygen sensor on the cable shaft (2).

35 – Install fan cowl



- Feed guides (1) into the radiator.
- Feed guides (2) into the charge air cooler.

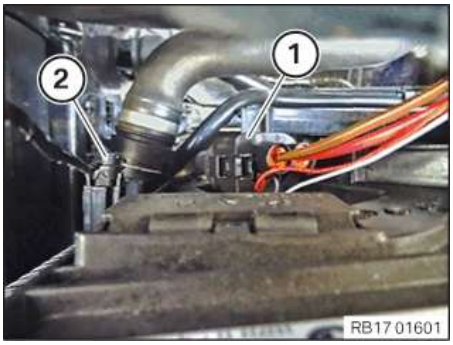


- Guide in and install fan cowl (3) **carefully** in the direction of the arrow.
- Ensure that the lock (2)engages audibly.
- Tighten down screw (1).

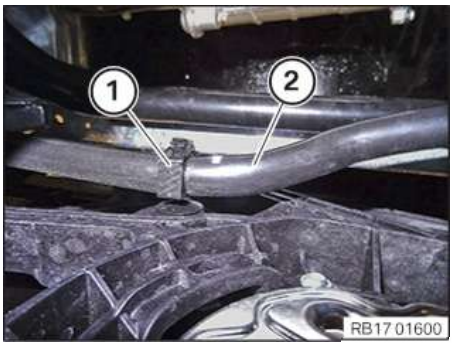
Fan cowl with electric fan on radiator

TS6x20		Tightening torque	6,5 Nm

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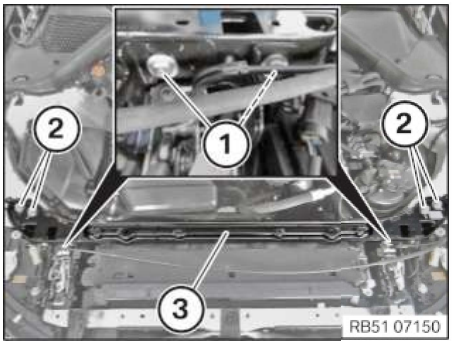


- Connect connectors (2) and lock.
  The connector (2) must engage audibly.
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.



- **If installed:** Secure the transmission oil line (2).
  Insert and install the transmission oil line (2).
  Lock holder (1).

36 – Install the rear top cross connection



- Guide in and position the top rear cross connection (3).
- Tighten the screws (1).

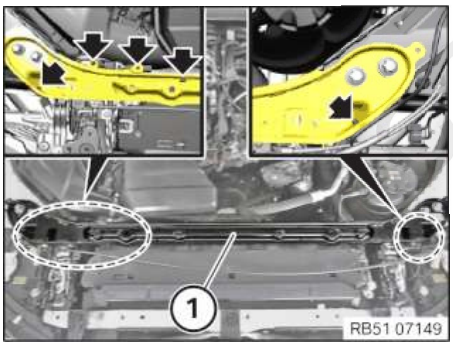
Top rear cross connection to bonnet catch support

Flat-head screw M6x20		Tightening torque	11,8 Nm

- Renew screws (2).
  Parts: Bolts
- Tighten the screws (2).

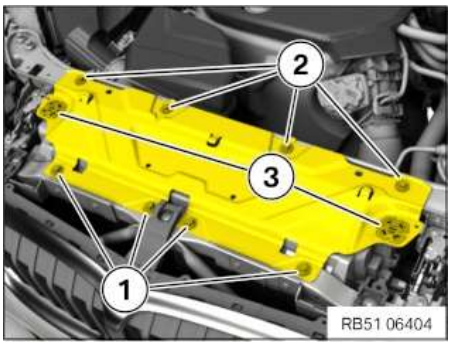
Rear top cross connection to wheel arch carrier support

M10x20 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °



- Secure the clips (arrows) in the marked areas to the top rear cross connection (1).

37 – Installing the top cross connection

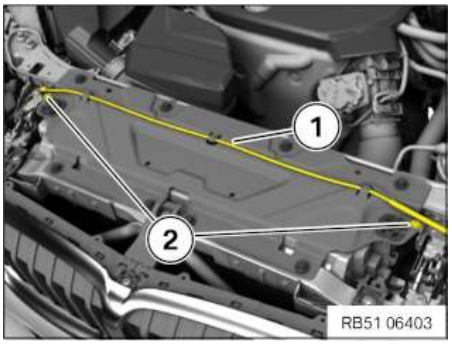


- Set and position upper cross connection with holders (3) from above.
- Tighten down screws (1) and (2).

Cross connection, top

M8x20		Tightening torque	28 Nm

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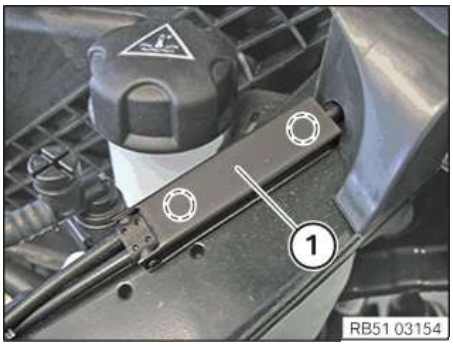


- Tighten down screws (2).

Cross connection, top

M6x20		Tightening torque	11,8 Nm

- Attach Bowden cable (1) on the upper cross connection.



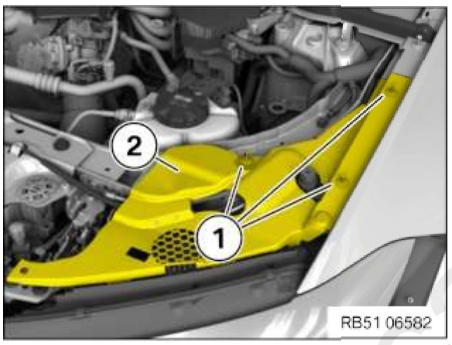
- Clip in the housing for the coupling of the Bowden cables (1).

38 – Install the cover in the engine compartment at top left and right partially

NOTICE

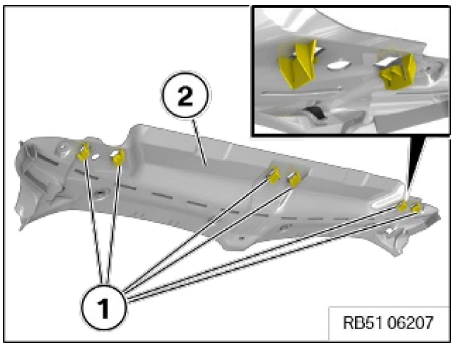
Description is for left component only. Procedure on the right side is identical.

▸ **Installing the cover in the engine compartment on top partially**



- Install the cover in the engine compartment on top (2).
- Secure expanding rivet (1).

39 – Installing cover for engine compartment centre



Check

- Check latch mechanisms (1) of cover for engine compartment centre (2) for damage.

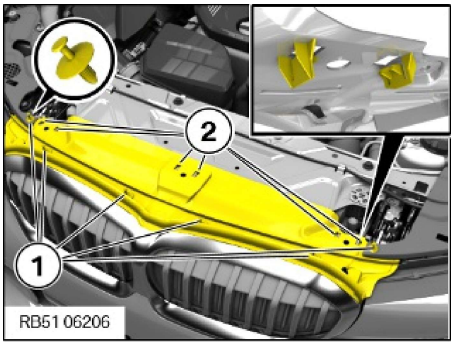
Result

» The latch mechanism (1) is damaged.

Measure

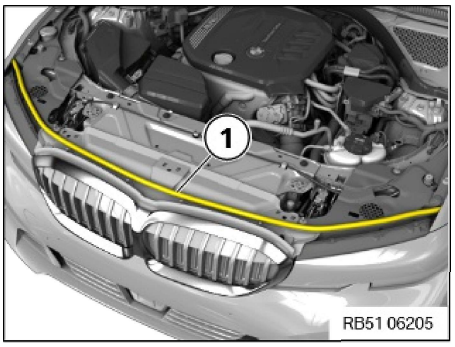
- Renew cover for engine compartment centre (2).

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- Guide in the cover for the engine compartment centre from the rear and position it.
- Clip in the cover for the engine compartment centre with latch mechanisms (2).
- Mount all expanding rivets (1).

40 – Install the seal for the front bonnet



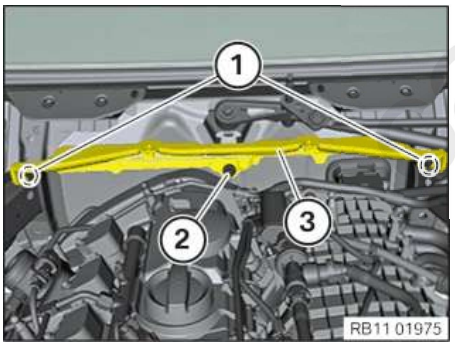
- Position the bonnet seal(1) and connect it on the mounting on the bumper and on the headlights.

41 – Disconnecting all battery earth leads



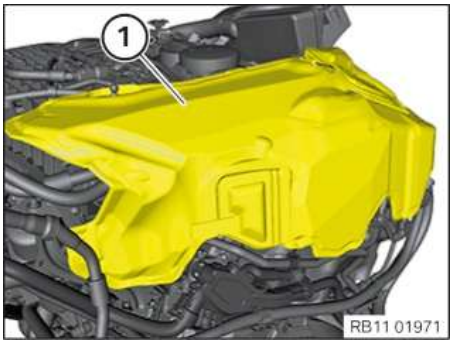
- See additional information.

42 – Installing centre bulkhead lower section



- Position the centre bulkhead lower part (3).
- Tighten nut (2) and screws (1).

43 – Installing acoustic cover at rear



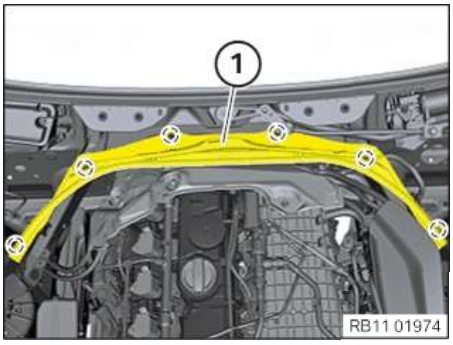
- Make sure the acoustic cover (1) is correctly positioned on the rear side of the engine.

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- Install the acoustic cover (1) from the top and clip it in into the marked areas.

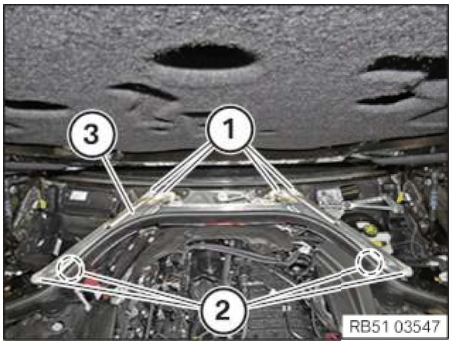
44 – Installing the centre bulkhead upper part



- Position the centre bulkhead upper part (1).
- Tighten the bolts in the marked areas.

Bulkhead upper part to bottom bulkhead

		Tightening torque	3 Nm



- **If installed:** Install tension strut on spring strut dome.
- Install the tension strut (3) on the spring strut dome.
- Tighten the screws (1).

Tension strut on bulkhead

M10x25 screw		Tightening torque	56 Nm

- Renew screws (2).
  Parts: Bolts
- Tighten the screws (2).

Tension strut to spring strut dome

Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

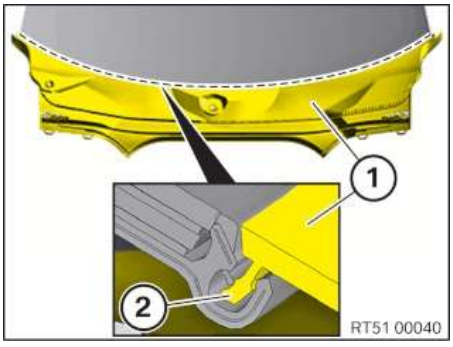
45 – Installing cowl panel cover

RISK OF DAMAGE

Damage caused by water ingress into the vehicle.

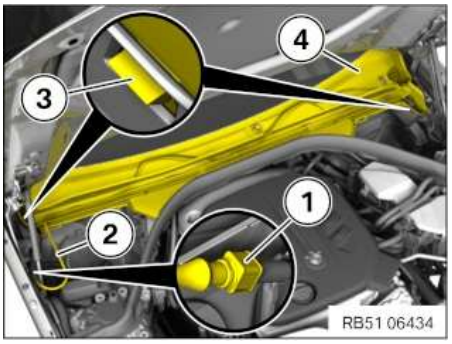
Water ingress into the vehicle may result in damage to components, malfunctions and corrosion.

- Ensure correct installation of the components.
- Only use undamaged components.



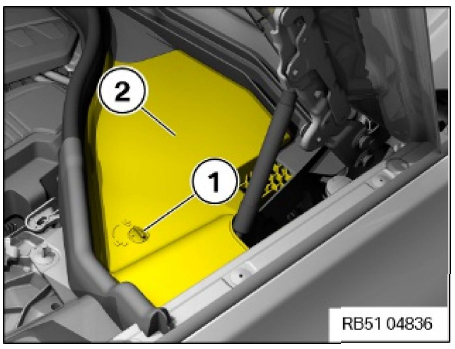
- Push the cowl panel cover (1) into the latch mechanism (2) beginning on the side.

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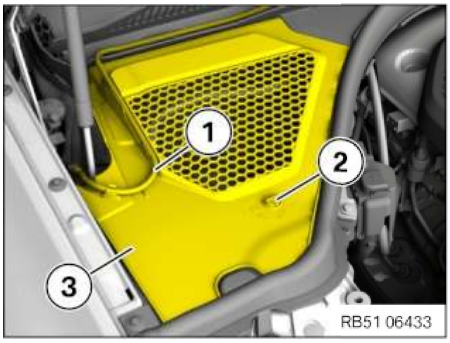
- Clip cowl panel cover (4)in by means of the latch mechanisms (3).
- Position windscreen wash hose (2) and connect windscreen wash hose (1)quick lock.

46 – Install the cover of the engine compartment on the rear left



- Position the engine compartment cover at the rear left (2) .
- Close lock (1).

47 – Install the rear right engine compartment cover



- Position the cover of the engine compartment on the rear right (3).
- Close lock (2).
- Insert washer fluid hose (1) into the guides.

48 – Installing both wiper arms

NOTICE

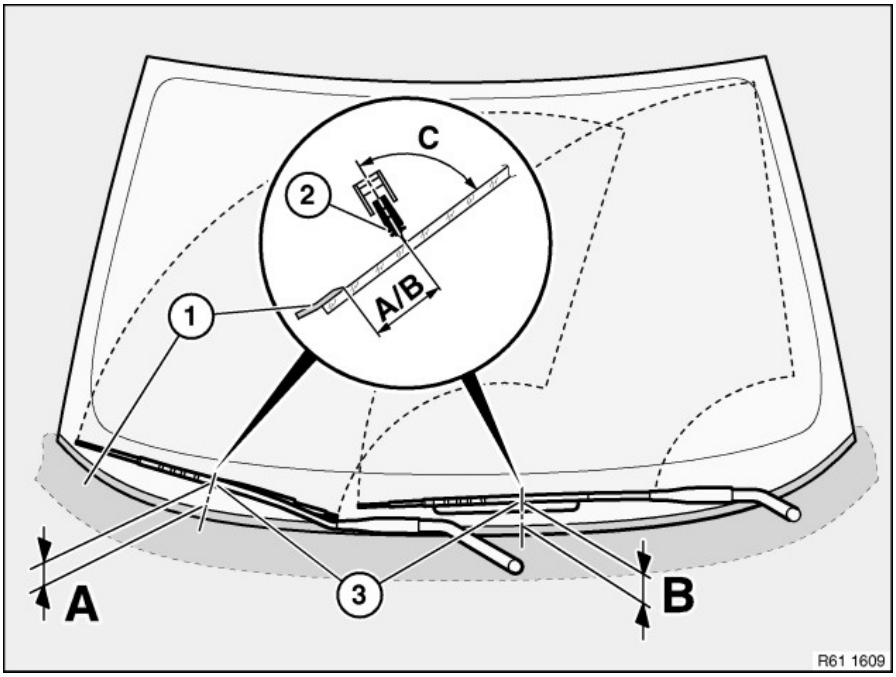
Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.

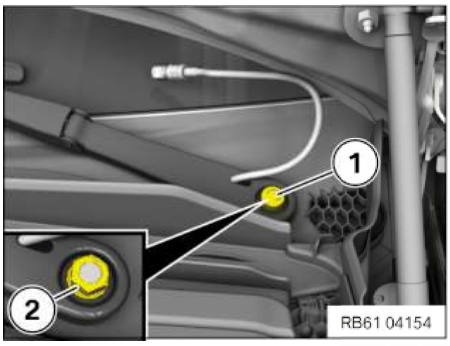
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- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).

Distance from window pane edge to wiper blade

Wiper arm right (A)	57,5 ± 5 mm
Wiper arm left (B)	63,3 ± 4 mm

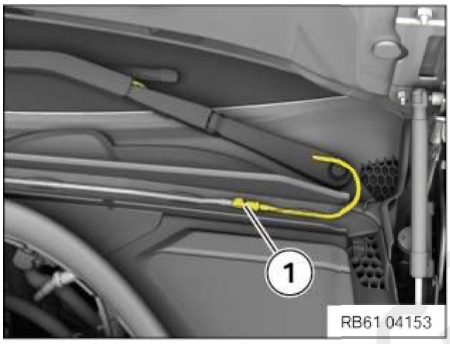


- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).



- Insert windscreen wash hose (1) into the cowl and connect at the separating point.

49 – Install acoustic cover

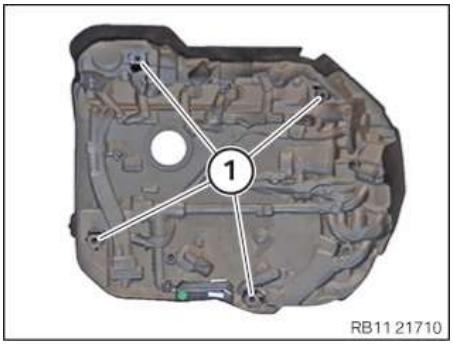
RISK OF DAMAGE

Damage to the acoustic cover.

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

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

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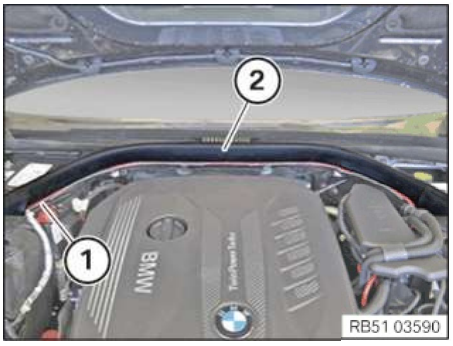


- Check the rubber mount (1) for correct fit in the acoustic cover.



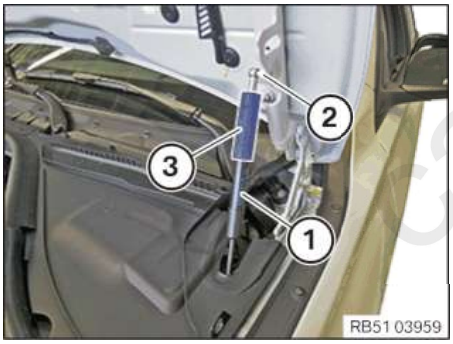
- Install acoustic cover (1) and fix in the rubber mounts (marks).

50 – Install the seal for the bonnet

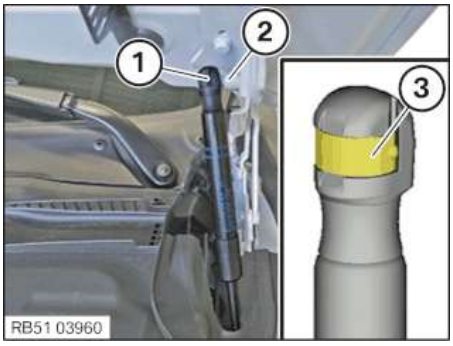


- Press the rear bonnet seal (2) into the guide.
- Feed in cable (1) into the brackets.
- Check that the rear bonnet seal (2) and the cable (1) are seated correctly.

51 – Take bonnet out of the service position



- Support the bonnet by hand.
- Remove the special tool (3) from the ball pin (2).
- Pull off the special tool (3) from the gas pressure spring (1).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.



CAUTION

Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.

- Check the clamp (3) is fitted correctly.
- Connect ball socket (1) to ball pin (2).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.

Additional Information

Overview of Tightening Torques

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Cylinder head cover to cylinder head			Used in step 26
M6X30		Jointing torque	8 Nm

Cylinder head cover to cylinder head			Used in step 26
M6X30		Tightening torque	11 Nm

Auxiliary coolant pump holder to cylinder head			Used in step 26
M6		Tightening torque	7 Nm

Standard screw connection M6			Used in step 26
M6			8 Nm

Differential pressure sensor to holder			Used in step 26
TS6X18		Tightening torque	3,5 Nm

Holder, positive battery cable to cylinder head cover			Used in step 26
6X18		Tightening torque	6 Nm

High pressure pump to high pressure pump flange			Used in step 28
M6x25	*Renew screws.*	Jointing torque	12 Nm
		Tightening torque	90 °

Ground cable to rail			Used in step 3031
M6			5 Nm

High pressure line between rail and high pressure pump			Used in step 32
M14x1,5		Tightening torque	33 Nm

Fuel delivery line to high pressure pump			Used in step 33
M14		Tightening torque	31 Nm

Fuel line to cylinder head cover			Used in step 33
6x18		Tightening torque	6,5 Nm

Ignition coil			Used in step 34
Screw		Tightening torque	8 Nm

Fan cowl with electric fan on radiator			Used in step 35
TS6x20		Tightening torque	6,5 Nm

Top rear cross connection to bonnet catch support			Used in step 36
Flat-head screw M6x20		Tightening torque	11,8 Nm

Rear top cross connection to wheel arch carrier support			Used in step 36
M10x20 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Cross connection, top			Used in step 37
M8x20		Tightening torque	28 Nm

Cross connection, top			Used in step 37
M6x20		Tightening torque	11,8 Nm

Bulkhead upper part to bottom bulkhead			Used in step 44
		Tightening torque	3 Nm

Tension strut on bulkhead			Used in step 44
M10x25 screw		Tightening torque	56 Nm

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Tension strut to spring strut dome Used in step 44

Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

Windscreen wiper arm Used in step 48

Combination hexagon nut		Tightening torque	35 Nm

Overview of Special Tools

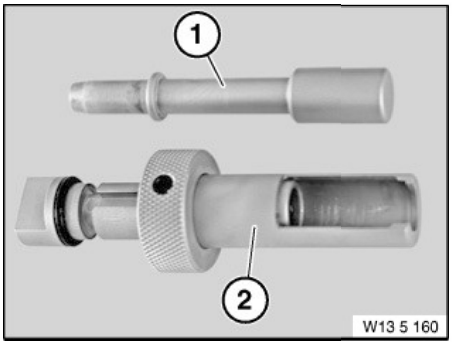
2 360 895 Pin wrench



Common Used in step 1227

Usage	For removal and installation of the magnetic actuator. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

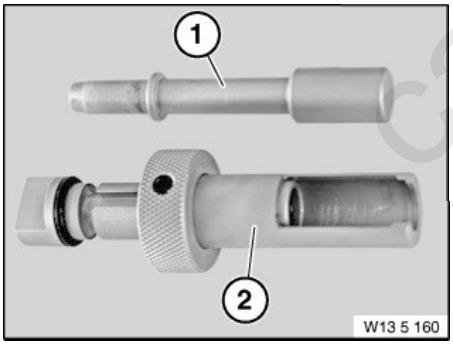
0 496 567 (13 5 161) Fastener



Common Used in step 21

Usage	(Cap (2 piece)) For sealing the quick connectors Deletion, only available via tool set
Included in the tool or work	0 496 565
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 568 (13 5 162) Fastener

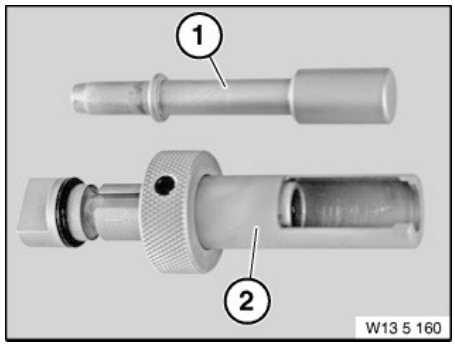


Common Used in step 21

Usage	(Cap (2 x)) To close off the fuel lines. Discontinued, can only be ordered using complete tool
Included in the tool or work	0 496 565
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 496 565 (13 5 160) Fastener



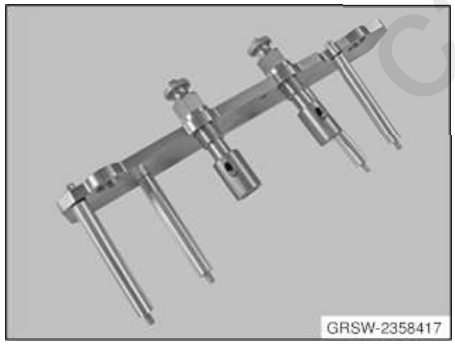
Common Used in step 21

Usage	(Caps (2x)) To close off the fuel lines when removing and installing the engine.
Included in the tool or work	
Storage location	B26
Replaced by	
In connection with	
SI-Number	01 22 08 (498)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 567 (13 5 161)		**Fastener** (Cap (2 piece)) For sealing the quick connectors Deletion, only available via tool set	
2	0 496 568 (13 5 162)		**Fastener** (Cap (2 x)) To close off the fuel lines. Discontinued, can only be ordered using complete tool	

2 358 417 Device

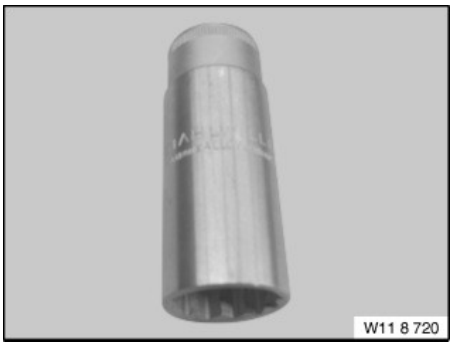


Common Used in step 2324

Usage	For removing and installing injectors. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A57
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

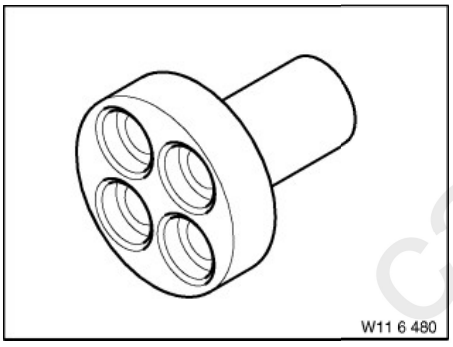
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0 496 106 (11 8 720) Socket WAF 46



Common	Used in step 2324
Usage	(Long socket SW24) For removal and installation of oil pressure sensor. (Stahlwille or HAZET)
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 04 07 (352)

0 493 380 (11 6 480) Connector



Common	Used in step 28
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 452 959 Pliers



Common	Used in step 29
Usage	For disassembly of the PTFE sealing rings on the injector HDEV5 & HDEV6. Replaces 0495757 (SWZ number 13 0 191). Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A5
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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2 448 401 Fitting aid



Common	Used in step 29
Usage	For installation of PTFE rings on injector. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C55
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 358 022 Gauge



Common	Used in step 3031
Usage	To position the injector during installation. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

Overview Technical Data

Distance from window pane edge to wiper blade	Used in step 48
Wiper arm right (A)	57,5 ± 5 mm
Wiper arm left (B)	63,3 ± 4 mm

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	141
61 20 900 Disconnecting and connecting battery earth lead	141
61 20 900 Disconnecting and connecting battery earth lead	141
61 20 900 Disconnecting and connecting battery earth lead	141
61 20 900 Disconnecting and connecting battery earth lead	141
61 20 900 Disconnecting and connecting battery earth lead	141
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	141
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	141
61 20 900 Disconnecting and connecting battery earth lead	141
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	141
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	141
61 20 900 Disconnecting and connecting battery earth lead	141
61 20 900 Disconnecting and connecting battery earth lead	141
61 20 900 Disconnecting and connecting battery earth lead	141
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61 20 900 Disconnecting and connecting battery earth lead	141
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	141
61 20 900 Disconnecting and connecting battery earth lead	141
61 20 900 Disconnecting and connecting battery earth lead	141
61 20 900 Disconnecting and connecting battery earth lead	141
61 20 900 Disconnecting and connecting battery earth lead	141
61 20 900 Disconnecting and connecting battery earth lead	141
61 20 900 Disconnecting and connecting battery earth lead	141
61 20 900 Disconnecting and connecting battery earth lead	141
61 35 ... Notes on ESD protection (Electro Static Discharge)	12
61 35 ... Notes on ESD protection (Electro Static Discharge)	1219
13 53 ... Clean the cylinder heads in the area of injectors to prevent sand/dust contamination.	2324
17 11 035 Removing and installing/replacing fan cowl with electric fan	28

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11 12 161 replace cylinder head

WARNING

Hot surfaces.

Risk of burning!

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

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

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

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Engine damage due to lack of engine oil.

Lack of engine oil after the cylinder head or the engine has been renewed may cause damage to the valve gear.

- Do not start the engine after renewing the cylinder head or the engine without following the repair notes.
- The repair notes on renewing the cylinder head or the engine must be followed.
- For additional information, see: Repair notes on renewing the cylinder head or the engine

RISK OF DAMAGE

Damage to battery terminal, the safety battery terminal or the intelligent battery sensor (IBS).

Damaged battery terminals can lead to malfunctions or vehicle electrical system faults.

- Pull off battery terminal from battery pole by carefully moving to and fro. Do not pry off using a tool.

TECHNICAL INFORMATION

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

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1 – Disconnecting all battery earth leads



- See additional information.

2 – Bring front compartment lid in the service position

Prerequisite

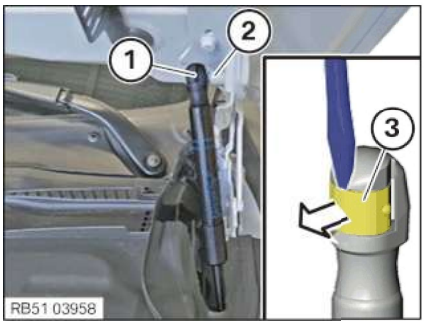
Engine compartment lid is open.

CAUTION

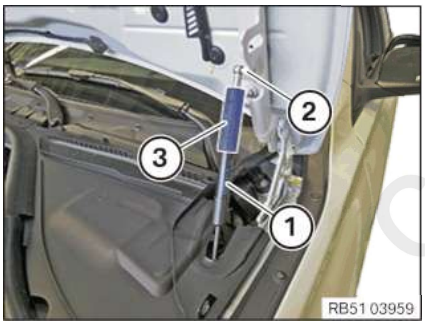
Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.



- Lift clamp (3) slightly using a screwdriver, in the direction of the arrow.
- Lift off ball socket (1) from ball pin (2).
- Repeat the operation on the other side of vehicle.



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Remove the bonnet support and open the bonnet further.
- Push special tool or (3) over gas pressure spring (1).
- Place special tool on the ball pin (2) and engage using force.
- Repeat the operation on the other side of vehicle.

3 – Remove the seal for the rear bonnet



- Feed the cable (1) out of the brackets toward the front.
- Remove the rear bonnet seal (2) from the guide toward the inside.

4 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

Damage to the acoustic cover.

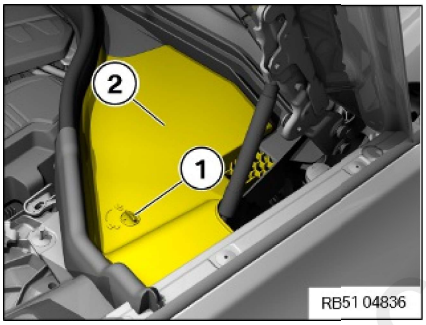
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

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



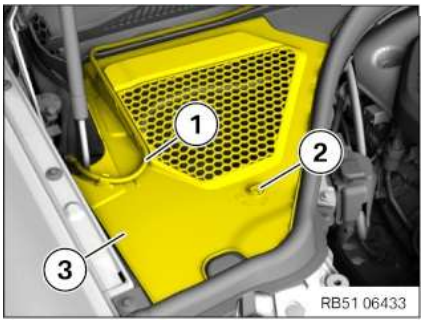
- Release the acoustic cover (1) towards the top from the rubber mounts (marks).

5 – Remove the cover of the engine compartment at the rear left



- Loosen the lock (1).
- Remove rear left cover of engine compartment (2).

6 – Remove the cover of the rear right engine compartment



- Release washer fluid hose (1) from the guides.
- Loosen the lock (2).
- Remove the cover of rear right engine compartment (3).

7 – Removing both wiper arms

NOTICE

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

▸ **Remove the wiper arm**

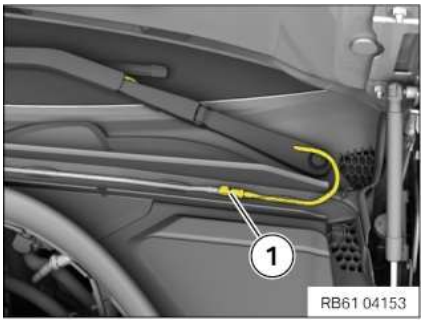
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RISK OF DAMAGE

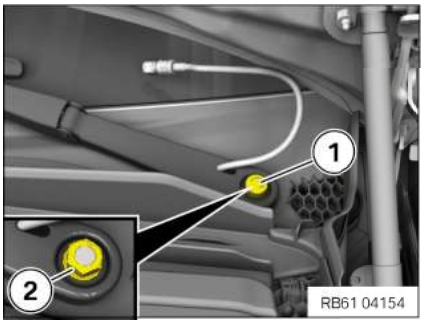
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

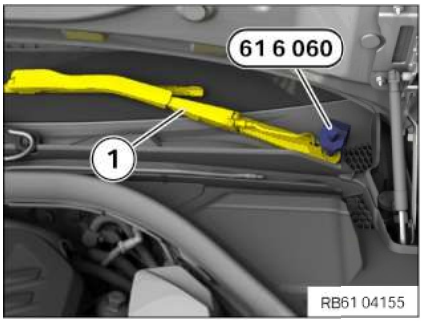
- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Disconnect the windscreen wash hose(1) at the separation point and remove from the cowl guide.

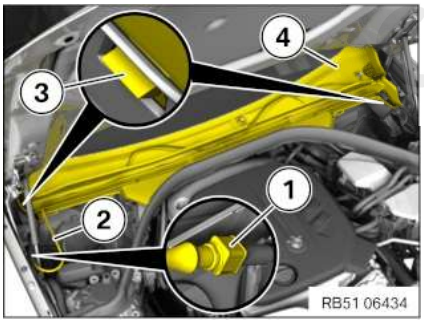


- Remove the protective cap (1).
- Loosen nut (2).

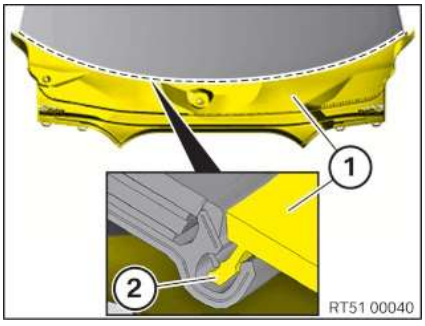


- Pull off the wiper arm (1) using special tool .

8 – Remove cowl panel cover



- Release snap fastener of the washer fluid hose (1) and put the washer fluid hose(2) to one side.
- Unclip clips (3) on the cowl panel cover (4).



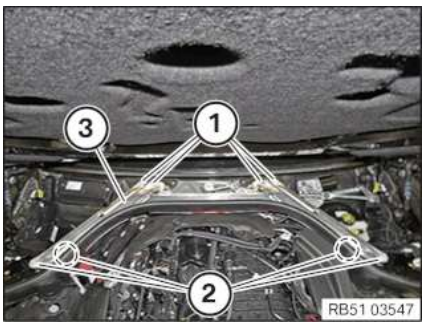
- Pull the cowl panel cover (1) upward out of the latch mechanism (2) beginning on the side.

9 – Removing the centre bulkhead upper part

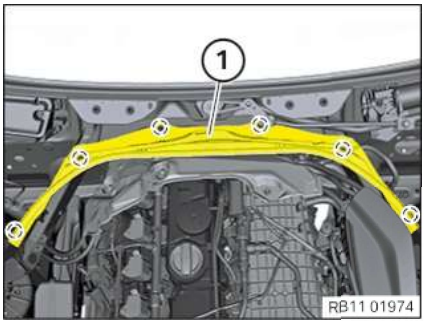
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TECHNICAL INFORMATION

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



- **If installed:** Remove tension strut on spring strut dome.
- Loosen screws (1) and (2).
- Remove tension strut (3) in the spring strut dome upwards.



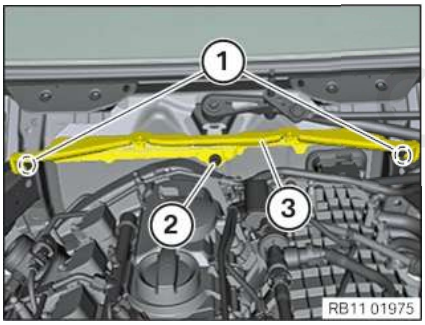
- Unscrew the bolts in the marked areas.
- Remove the centre bulkhead upper part (1).

10 – Removing acoustic cover at rear



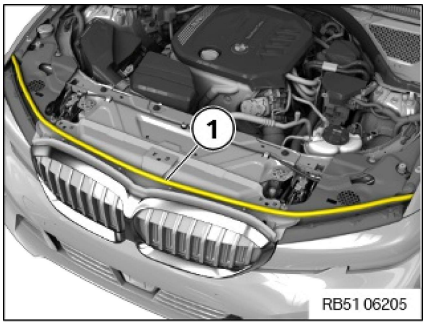
- Unclip the acoustic cover (1) in the marked areas and remove it to the top.

11 – Removing the centre bulkhead lower section



- Loosen screws (1).
- Loosen nut (2).
- Remove the centre bulkhead lower part (3).

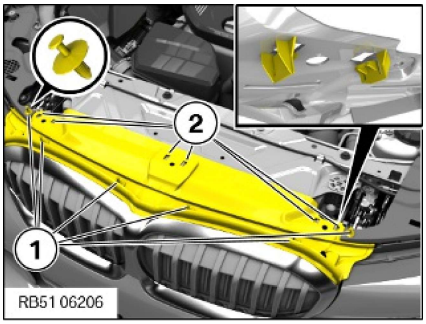
12 – Remove the seal for the bonnet in front



- Pull off front bonnet seal (1) upwards.

13 – Removing the centre engine compartment cover

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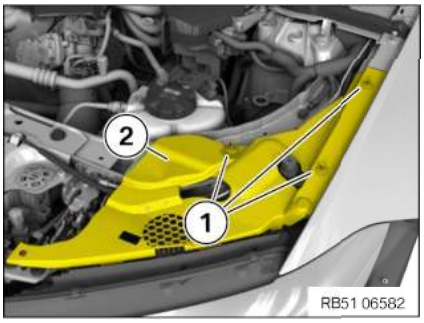
- Detach all expanding rivets (1).
- Release the cover of the centre engine compartment with the latch mechanisms (2) .
- Feed the cover for the centre engine compartment out to the rear.

14 – Partially remove the top left and right cover in the engine compartment

NOTICE

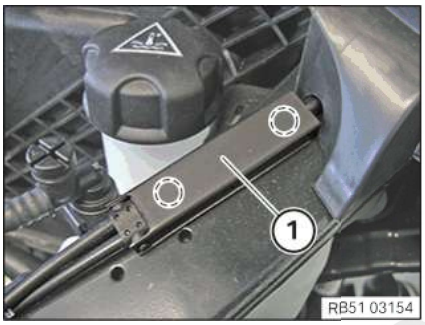
Description is for left component only. Procedure on the right side is identical.

▶ **Removing the cover in the engine compartment on top partially**

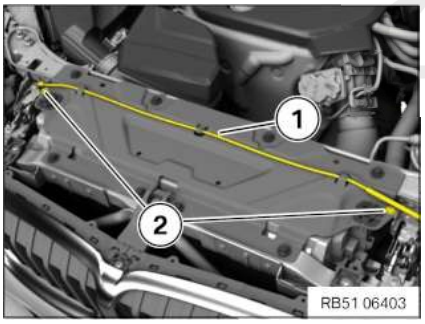


- Loosen the expanding rivet (1).
- Remove the cover in the engine compartment on top (2) partially.

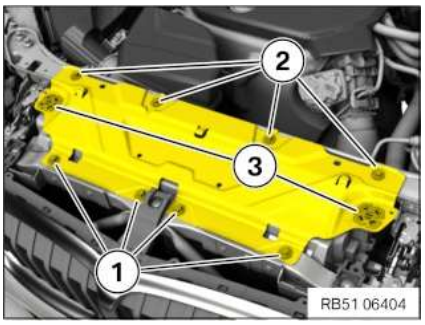
15 – Removing the top cross connection



- Release the housing for the coupling of the Bowden cables (1) from the body.



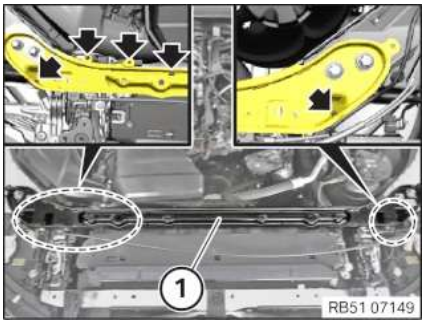
- Detach Bowden cable (1) at the top cross connection.
- Loosen screws (2).



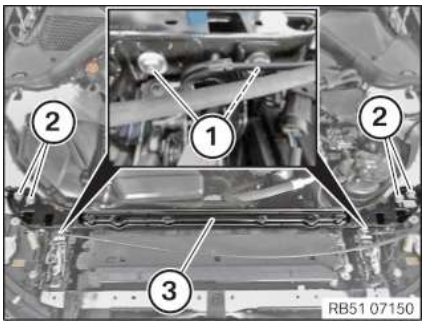
- Loosen screws (1) and (2).
- Remove the top cross connection with the holders(3) towards the top.

16 – Remove the rear top cross connection

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- Release the clips (arrows) in the marked areas from the top rear cross connection (1).

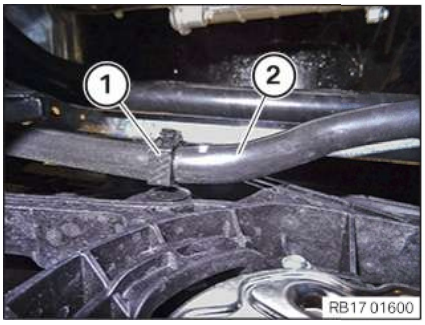


- Loosen screws (1).
- Loosen screws (2).
- Guide out and remove top rear cross connection (3).

17 – Remove fan cowl.

TECHNICAL INFORMATION

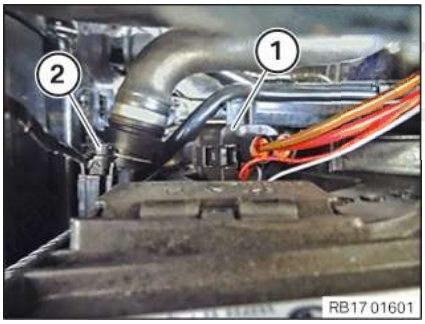
- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!



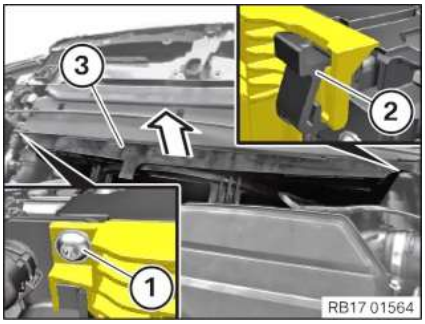
- **If installed:** Release transmission oil line (2).

  Unlock the holder (1).

  Thread out transmission oil line (2) and set aside.



- Unlock plug connection (1) and disconnect.
- Unlock plug connection (2) and disconnect.



- Loosen screw (1).
- Unlock lock (2).
- Guide out and remove fan cowl (3) **carefully** in the direction of the arrow.

18 – Removing intake silencer housing

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RISK OF DAMAGE

Damage to the clean air line. Damage to the air filter.

For changing the air filter insert, if the upper section of intake filter housing is only raised and not completely removed, the clean air line and the air filter insert may be damaged.

- Do not lift upper section of intake filter housing by force.
- Unfasten clamp.
- Remove upper section of intake filter housing completely.



- Unlock plug connection (1) and disconnect.
- Unfasten clamp (2).
- Pull out and remove the intake silencer housing (3) from the rubber mounts towards the top.

19 – Removing engine ventilation line

WARNING

Hot surfaces.

Risk of burning!

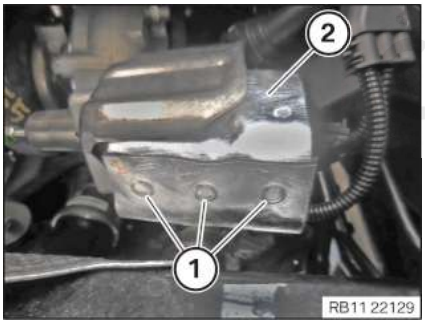
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

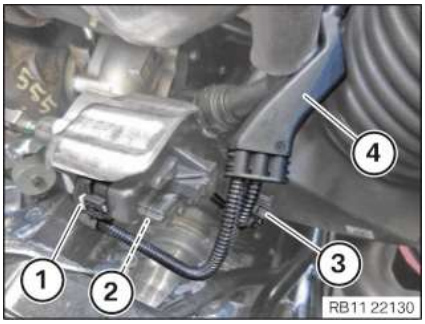
Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

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

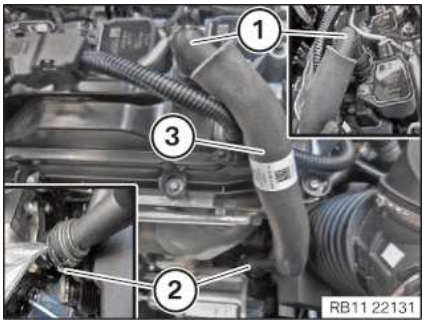


- Unlock the locks (1).
- Feed out and remove heat protection (2).

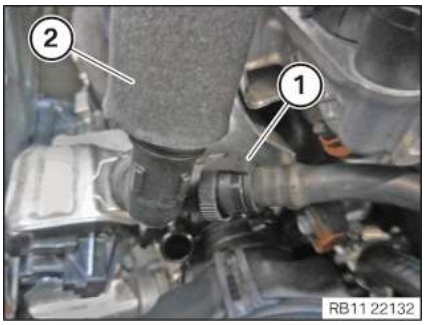


- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Loosen clamp (3).
- Feed out wiring harness section for sensor system **2** (4) and set it aside.

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- Unlock and loosen the locks (1).
- Unlock and loosen lock (2).
- Feed the engine ventilation line (3) out and set it aside.



- Unlock and release tank ventilation line (1).
- Feed out the engine ventilation line (2) and remove.

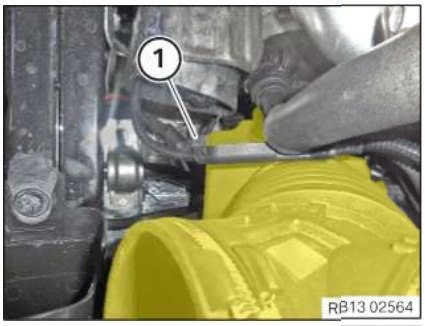
20 – Removing clean air pipe

WARNING

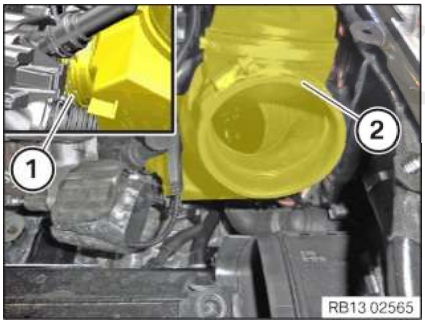
Hot surfaces.

Risk of burning!

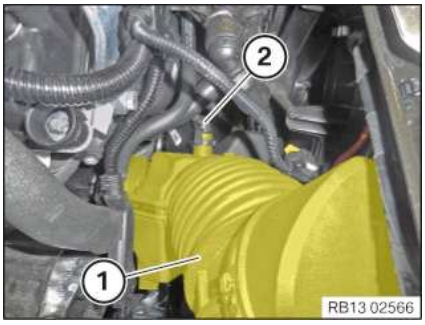
- Perform all work only on components that have cooled down.



- Loosen clamp (1).



- Unlock the clamp (1).
- Thread out clean air pipe (2) and set it aside.



- Position clean air pipe (1).
- Unlock and loosen engine ventilation line (2).
- Feed out clean air pipe and remove (1).

21 – Remove charge air line

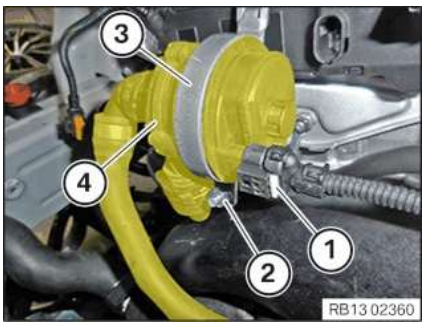
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WARNING

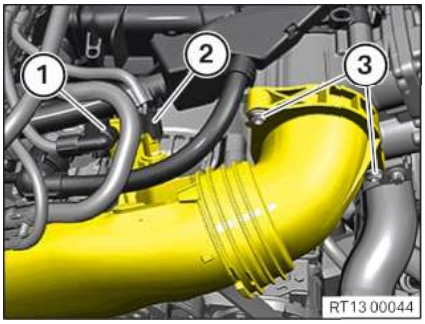
Hot surfaces.

Risk of burning!

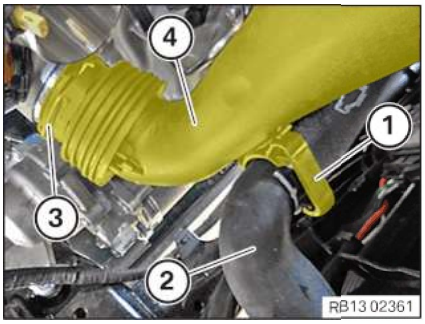
- Perform all work only on components that have cooled down.



- Unlock plug connection (1) and disconnect.
- Loosen nut (2).
- Guide the retaining bracket (3)out and remove.
- Guide out auxiliary coolant pump (4) and place it aside.



- Unlock plug connection (1) and disconnect.
- Unlock plug connection (2) and disconnect.
- Loosen screws (3).



- Unlock the clamp (1).
- Feed out the coolant hose (2) and set it aside.
- Unlock the clamp (3).
- Feed the charge air line (4) out upwards and remove it.

22 – Remove the adapter for engine ventilation line with heating element on exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

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

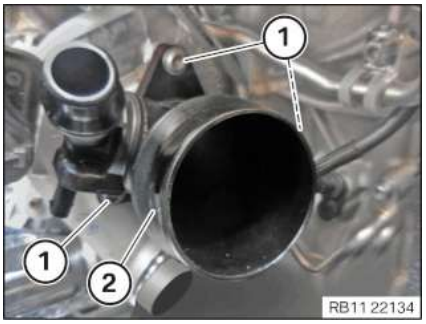
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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



- Loosen screws (1).
- Feed out the connecting branch (2) with heating element on the exhaust turbocharger and remove.

23 – Remove the front oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

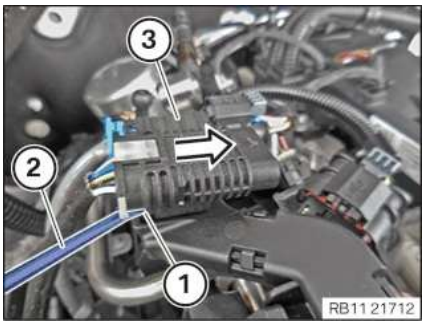
Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

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

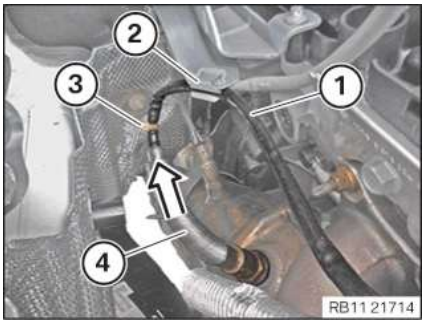


- Unlock and loosen connector (1).



- Unlock the locks (1) with a conventional screwdriver (2) and release.
- Feed out the connector (3) in **the direction of arrow** and set aside.

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- Detach the line of the front oxygen sensor (1) from the holder (2).
- Unfasten cable strap (3).
- Feed out the heat shield (4) **in direction of arrow** and set it aside.



- Release and remove the control sensor (1) with the special tool .

24 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

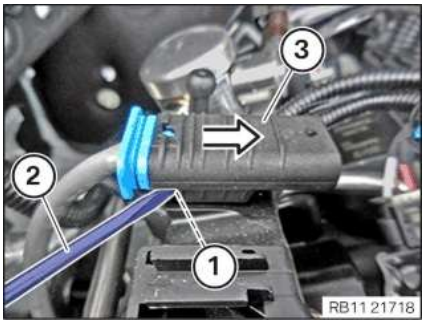
Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

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

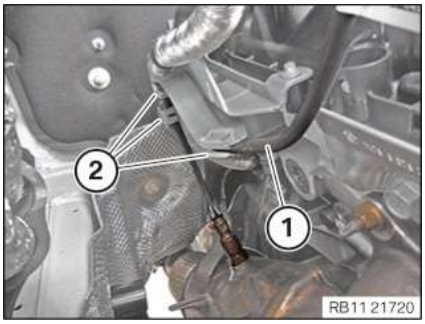


- Unlock and loosen connector (1).

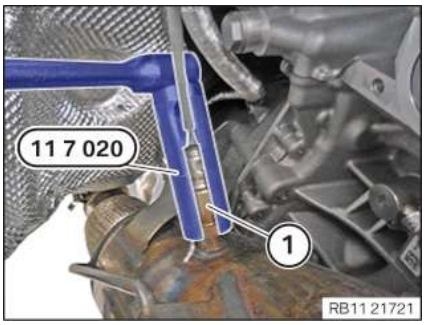


- Unlock the lock (1) with a suitable screwdriver (2).
- Feed out the connector (3) in the direction of the **arrow** and set it aside.

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- Detach the line of the monitoring oxygen sensor (1) from the holder (2).



- Release the monitoring oxygen sensor (1) using special tool .
- Remove the monitoring sensor (1).

25 – Remove all ignition coils.

NOTICE

The description is for one component only. The procedure is identical for all further components.

▸ **Removing the ignition coil**

WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

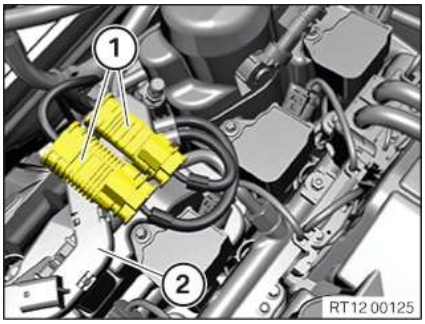
RISK OF DAMAGE

Electrostatic discharge.

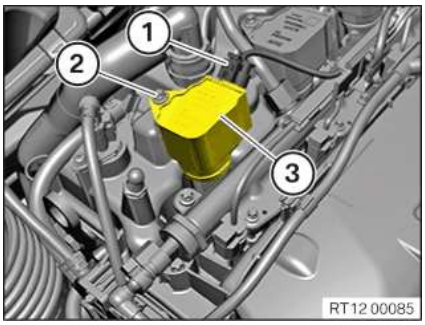
Damage to or destruction of electrical components.

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

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- Disconnect the connector (1) of the front oxygen sensor and the monitoring oxygen sensor from the cable channel (2) and set aside.



- Unlock plug connection (1) and disconnect.
- Loosen screw (2).
- Remove ignition coil (3).

26 – Removing all spark plugs

WARNING

Hot surfaces.

Risk of burning!

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

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

TECHNICAL INFORMATION

Clean spark plug slot with compressed air.

The spark plug shaft must be cleaned using compressed air after having removed the ignition coils and before removing the spark plugs. After having removed the spark plugs, once again check the sealing surface for contamination and (if necessary) clean using a moist cloth or clean using compressed air.

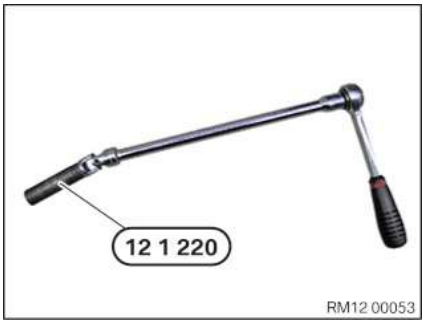
Deposits that are not removed according to instructions may enter the combustion chamber and lead to uncontrolled combustion. Remaining deposits on the spark plug sealing surfaces may lead to leaks and the spark plugs may come loose during engine operation.

Spark plug threads must not be greased or oiled. Insufficiently tightened spark plugs may cause leaks and the sparks plugs may come loose during engine operation.

NOTICE

The description is for one component only. The procedure is identical for all further components.

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TECHNICAL INFORMATION

Exclusively swivelling extensions may be used for the reversible ratchet. Rigid mounting tool and variable plug connections with rigid option may not be used; there is a risk that the insulator breaks.

- Mount the special tool 0 495 560 (12 1 220) on a pivoting extension.



- Unscrew spark plugs with the special tool 0 495 560 (12 1 220) and a pivoting extension.

27 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

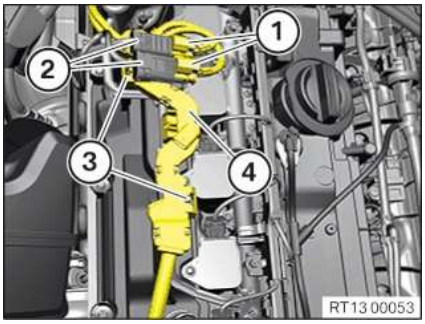
On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

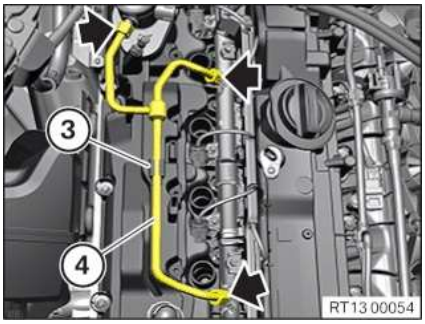
TECHNICAL INFORMATION

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



- Unlock and disconnect the plug connections (1) and (2).
- Unlock the locks (3).
- Guide out the wiring harness section of the engine wiring harness (4) and set it aside.

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- Position a lint-free rag under the union nuts.
- Unscrew union nuts (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Thread out the high pressure line (4) from the bracket (3) and remove it.
- Feed out and dispose of the lint-free cleaning clothes .

28 – Remove fuel delivery line

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

Contaminant or foreign body.

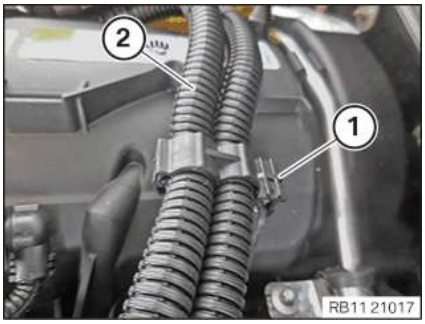
Contamination can result in malfunctions, operating failure or leaks.

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

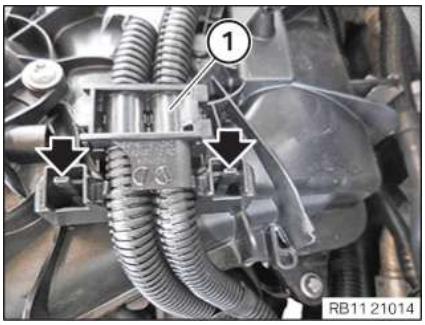
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

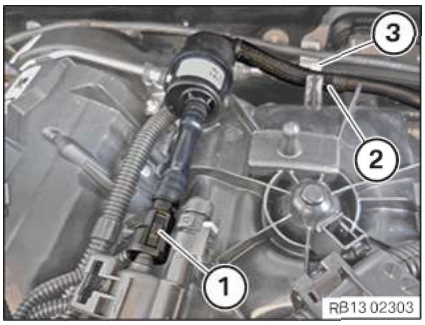
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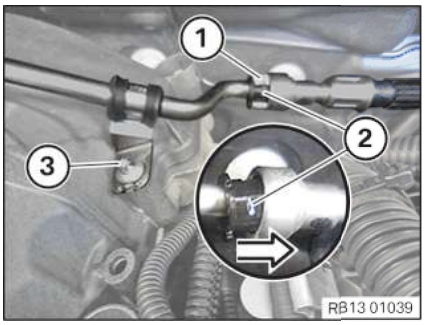
- Loosen clamp (1).
- Guide out wiring harness section (2) for the injectors and ignition coils and place it aside.



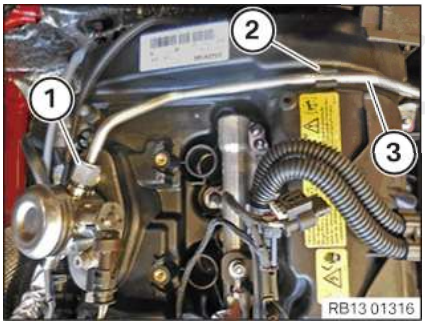
- Unlock the locks (arrows).
- Guide out wiring harness section (1) for the injectors and ignition coils and place it aside.



- Unlock and loosen lock (1).
- Guide tank ventilation line (2) out of clamp (3) and place it aside.



- Unlock and loosen clamp (1).
- Unlock and remove the snap fastener (2) in the direction of the arrow.
- Catch and dispose of escaping fuel.
- Seal the fuel lines with special tools 0 496 567 (13 5 161) and 0 496 568 (13 5 162) from the set of special tools 0 496 565 (13 5 160).
- Loosen screw (3).



- Slacken the union nut (1) on the high pressure pump.
- Catch and dispose of escaping fuel.
- Seal all openings with the special tool .
- Guide the fuel feed line (3) out and remove.
- Make sure that the rubber damper (2) is not lost.

29 – Remove high pressure pump

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

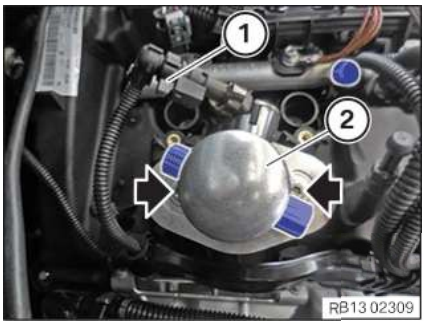
TECHNICAL INFORMATION

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

TECHNICAL INFORMATION

The high pressure pump can be pre-tensioned by camshaft cams. If when loosening the screws, the high pressure pump is forced out, the engine will have to be turned to bring the camshafts to a different position.

Before installing the high pressure pump, the cam of the high pressure pump drive must be turned to BDC. To do this, twist the engine if necessary in the direction of engine rotation to the central bolt of the crankshaft. Otherwise, it will not be possible to install the high-pressure pump.



- Unlock plug connection (1) and disconnect.
- Unscrew the bolts (arrows) **in alternating order**.
- Have a rag ready and catch any engine oil that may emerge.
- Feed out high pressure pump (2) and remove.

30 – Removing rail with injectors of cylinders 1 to 3

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

Damage to the injector tips and Teflon ring.

Improper handling of the injector tips and Teflon ring can lead to malfunctioning of the injector.

- Avoid mechanical contact with injector tip.
- When exchanging Teflon ring, hands and work surface must be clean and free of oil. Do not use any lubricating agents.
- Do not use fingernails to slide Teflon ring on.

RISK OF DAMAGE

Damage to injectors.

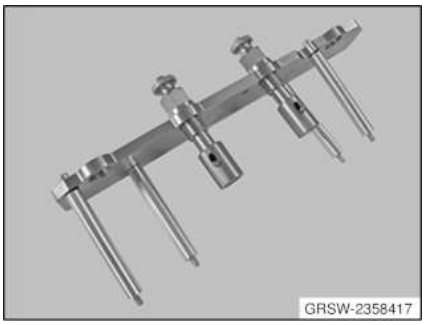
Excessive force may damage the injector and this means having to renew the injector.

- Twist the injectors with a maximum torsional movement of 13 Nm.

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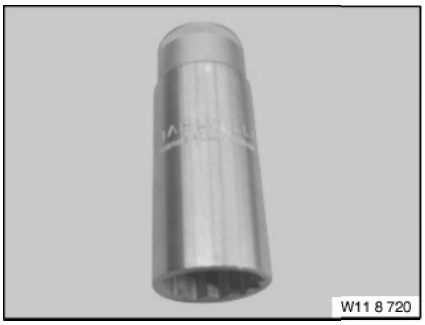
- Prepare special tool .



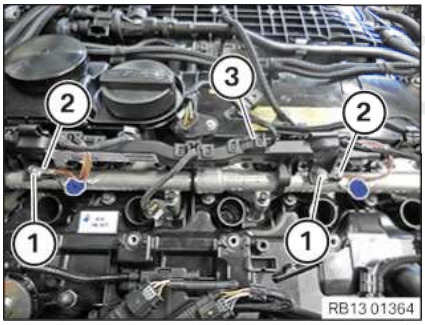
- Prepare special tool 2 358 417.



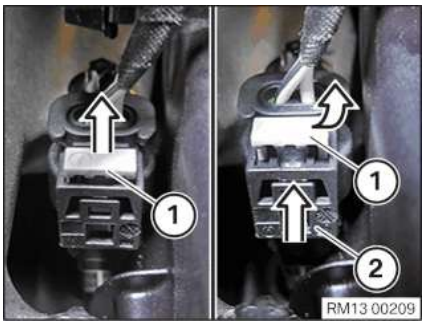
- Prepare special tool .



- Prepare special tool 0 496 106 (11 8 720).

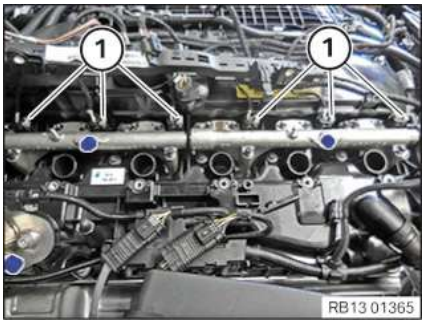


- Loosen nut (1).
- Feed out ground cable (2) and set it aside.
- Feed out cable channel (3) and set it aside.

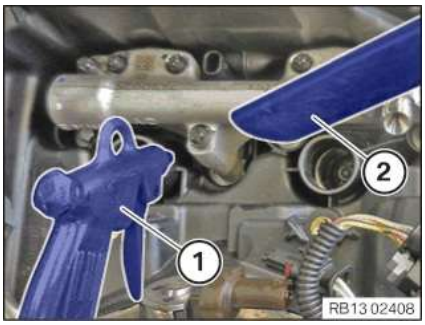


- Unlock lock (1) in direction of arrow from the top.
- Press lock (1) together and release.
- Pull out the connector (2) from the injectors.

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- Unlock and release all connectors (1) of the injectors.

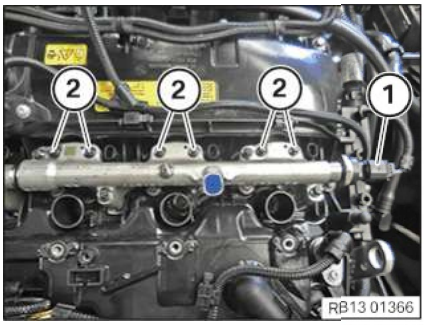


TECHNICAL INFORMATION

In case of dusty / sandy operating conditions of the vehicle, the injector shafts must be cleaned before removal.

For additional information see: 13 53 ... Cleaning the cylinder head in the area of the injectors in case of sandy / dusty contamination

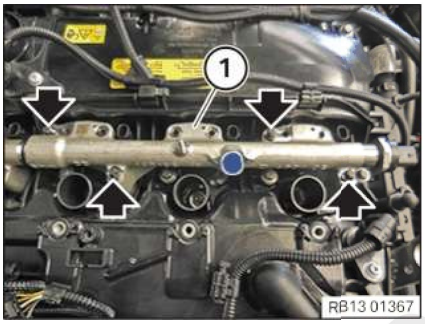
- Before releasing the high pressure lines: Blow out the injector shafts with an air gun(1) with less pressure.
- Simultaneously, draw off the dirt particles with an **explosion proof** vacuum cleaner (2).



- Unlock and loosen connector (1).
- Release screws (M5x30) (2).
- Remove screws (2).

  Do not reuse the bolts (2).

  Parts: Screws (M5x30)
- Catch and dispose of escaping fuel with suitable materials.

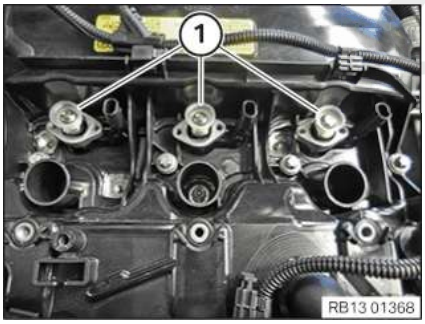


- Unscrew the screws (M6x30) (arrows).

  The screws may not be reused!
- Renew screws.

  Parts: Screws (M6x30)
- Remove rail (1) in upward direction.

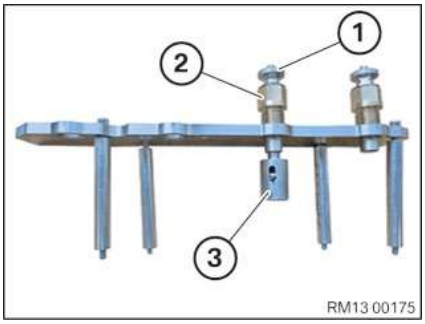
  The injectors remain in the cylinder head.



- Remove the gaskets (1).

  The seals (1) are only required during the initial assembly at the plant and will not be installed again.

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RISK OF DAMAGE

Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

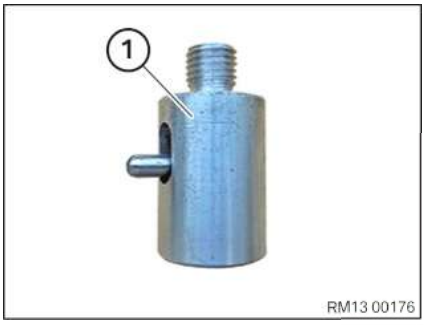
- Twist the injectors with a maximum torsional movement of 13 Nm.

- In the event that the specified value for the tensile force is exceeded: Replace injectors.
- Use the special tool 2 358 417to remove the injectors.

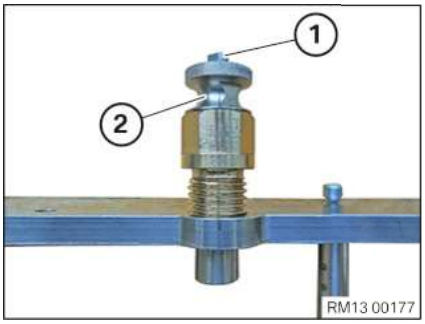
  The special tool 2 358 417 is used to ensure that the tensile force is not exceeded.

  Special tool 2 358 417 consists of:

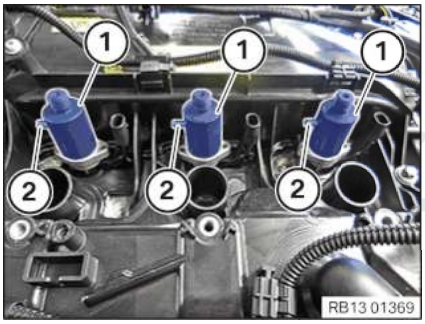
  - **(1)** Threaded sleeves
  - **(2)** Pull-out thread (left-hand thread)
  - **(3)** Mounting for the injectors



- Unscrew the fixture for the injectors (1) from the special tool 2 358 417.

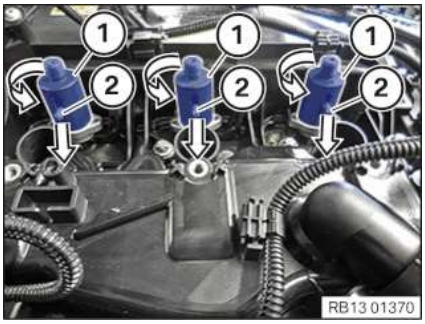


- Press the lock (1) in and remove threaded sleeve (2) from the special tool 2 358 417.



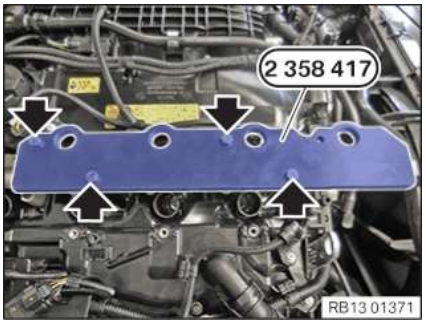
- Install all fixtures (1) for the injectors.

  The fixture (1) is not locked if the lever (2) is on the top.



- Turn fixtures (1) by 90° and lock the lever (2) downwards.

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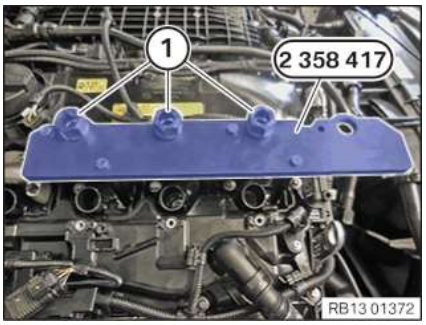
RISK OF DAMAGE

Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

- Do not use the puller plate as a support.

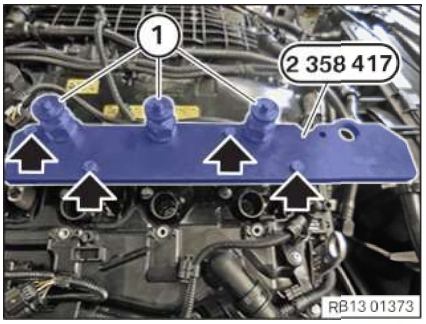
- Attach special tool 2 358 417 to cylinder head.
- Hand-tighten the bolts (arrows).



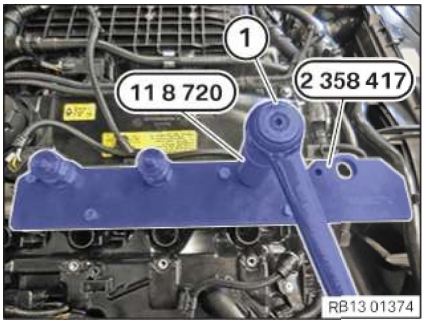
TECHNICAL INFORMATION

The extraction thread is a left-hand thread.

- Screw in pull-out thread (1) on the special tool 2 358 417fully.



- Insert threaded sleeves (1) again and screw threaded sleeves completely onto the fixtures for injectors.
- Then tighten screws (arrows) on special tool 2 358 417 to 5 Nm.

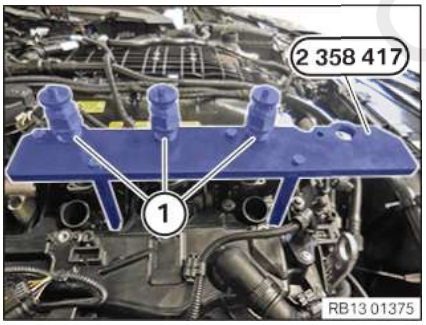


- Adjust torque wrench to 13 Nm **clockwise** .
- Turn torque wrench (1) in **clockwise** direction with special tool 0 496 106 (11 8 720)until the injector is pulled out.

TECHNICAL INFORMATION

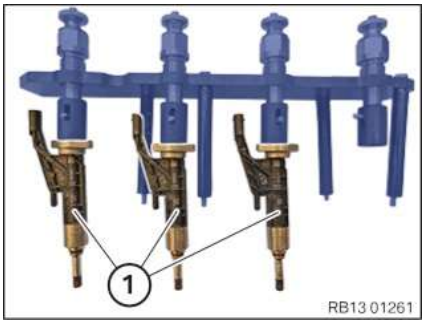
If the torque wrench makes a cracking noise when the injector is pulled out, **the injector must be renewed.**

- Disassemble all injectors individually.



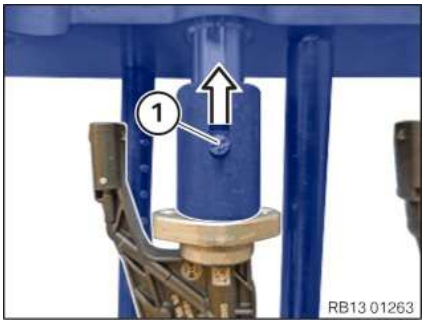
- Before removing the special tool 2 358 417 with the injectors, check if all the injectors were completely pulled out of the cylinder head.

  This can be recognised on the completely visible threads of the sleeves (1).
- Loosen screws on special tool 2 358 417.



- Carefully remove the special tool 2 358 417with injectors (1) from the cylinder head vertically upwards.
- Place the combination of the special tool 2 358 417 and the injectors (1) flat on a clean table.

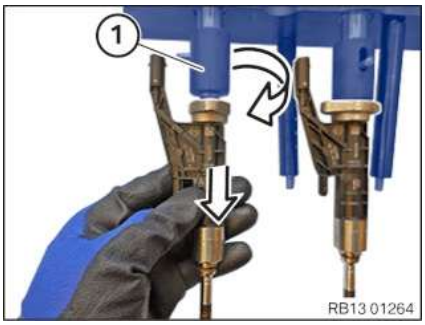
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NOTICE

The description is for one component only. The procedure is identical for all further components.

- Unlock the fixture lock (1) from the top.



- Turn the unlocked fixture (1) by 90°.
- Release and remove the injector downwards.

31 – Removing rail with injectors of cylinders 4 to 6

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

Damage to the injector tips and Teflon ring.

Improper handling of the injector tips and Teflon ring can lead to malfunctioning of the injector.

- Avoid mechanical contact with injector tip.
- When exchanging Teflon ring, hands and work surface must be clean and free of oil. Do not use any lubricating agents.
- Do not use fingernails to slide Teflon ring on.

RISK OF DAMAGE

Damage to injectors.

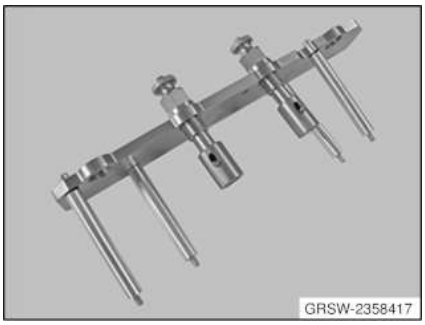
Excessive force may damage the injector and this means having to renew the injector.

- Twist the injectors with a maximum torsional movement of 13 Nm.

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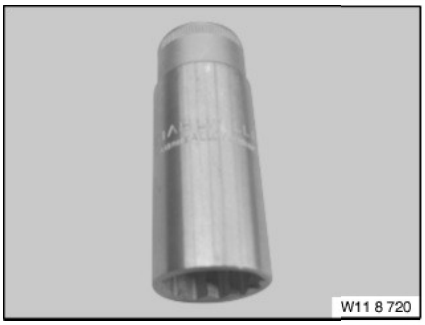
- Prepare special tool .



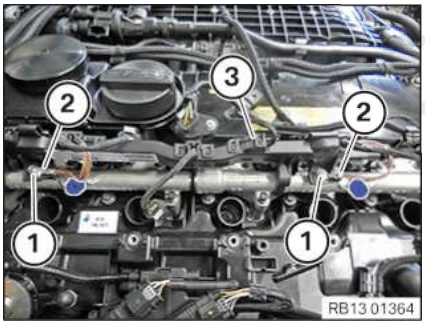
- Prepare special tool 2 358 417.



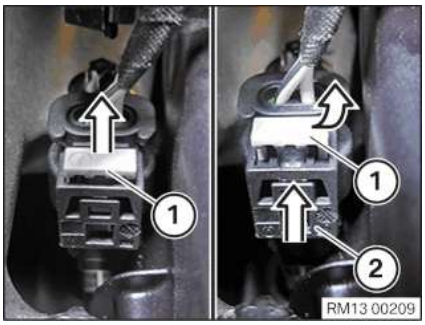
- Prepare special tool .



- Prepare special tool 0 496 106 (11 8 720).

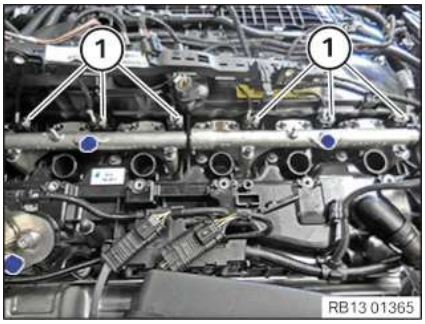


- Release nuts (1) .
- Feed out ground cable (2) and set aside.
- Feed out cable channel (3) and set it aside.

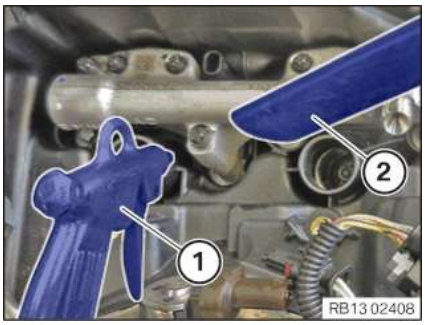


- Unlock lock (1) in direction of arrow upwards.
- Press lock (1) together and release.
- Disconnect the connector (2) from the injectors in the direction of the arrow.

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- Unlock and release all connectors (1) of the injectors.

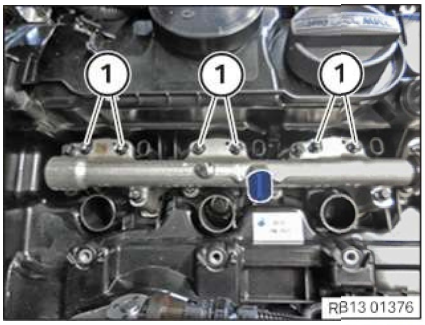


TECHNICAL INFORMATION

In case of dusty / sandy operating conditions of the vehicle, the injector shafts must be cleaned before removal.

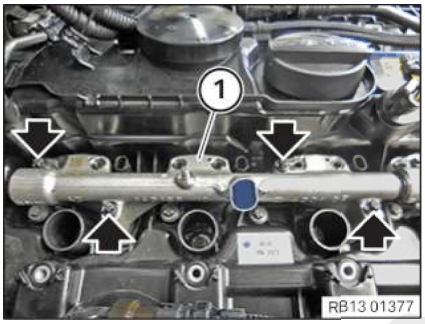
For additional information see: 13 53 ... Cleaning the cylinder head in the area of the injectors in case of sandy / dusty contamination

- Before releasing the high pressure lines: Blow out the injector shaft with an air gun (1) with less pressure.
- Simultaneously, draw the dirt particles off **using an** explosion proof (2) vacuum cleaner.



- Release screws (M5x30) (1).
- Remove screws (M5x30) (1) .

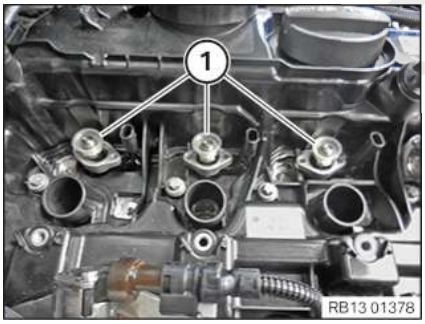
  Do **not** reuse screws (M5x30) (1).
- Catch and dispose of escaping fuel with suitable materials.



- Release screws (M6x30) (arrow).
- Remove screws (M6x30) (arrows).

  Do **not** reuse the screws (M6x30).
- Remove rail (1) upwards.

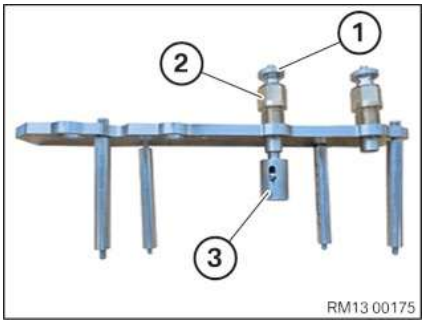
  The injectors remain in the cylinder head.



- Remove seals (1) .

  The seals (1) are required during first assembly within the plant only and will not be installed again.

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RISK OF DAMAGE

Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

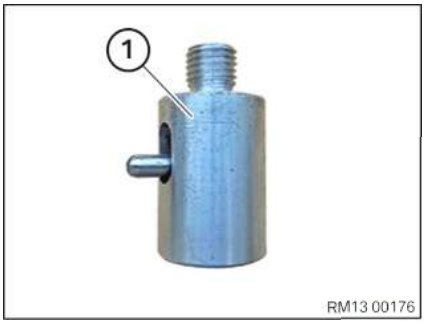
- Twist the injectors with a maximum torsional movement of 13 Nm.

- In the event that the specified value for the tensile force is exceeded: Replace injectors.
- Use the special tool 2 358 417 to remove the injectors.

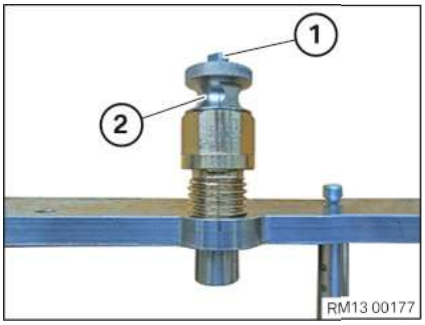
  The special tool 2 358 417 is used to ensure that the tensile force is not exceeded.

  The special tool 2 358 417 consists of:

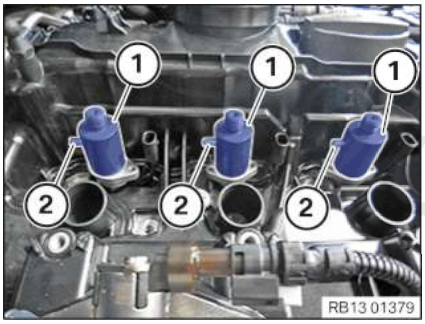
  - (1) Threaded sleeves
  - (2) Pull-out thread (left-hand thread)
  - (3) Mounting for the injectors



- Unscrew the fixture for injectors (1) from special tool 2 358 417.

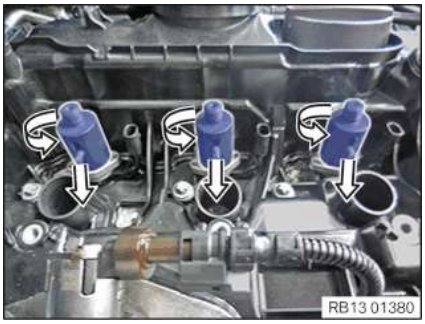


- Press lock (1) in and remove the threaded sleeve (2) from the special tool 2 358 417.



- Install all fixtures (1) for the injectors.

  The fixture (1) is not locked, if the lever is (2) on top.



- Turn fixtures (1) by 90° and lock the lever (2) downwards.

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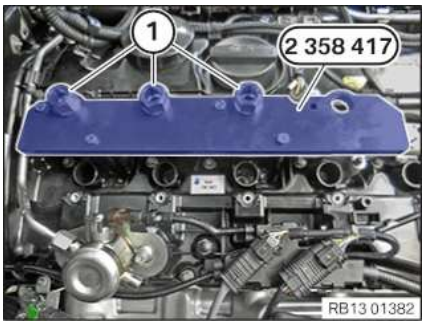
RISK OF DAMAGE

Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

- Do not use the puller plate as a support.

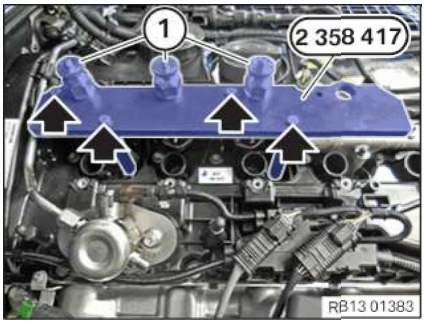
- Attach special tool 2 358 417 to cylinder head.
- Hand-tighten the bolts (arrows).



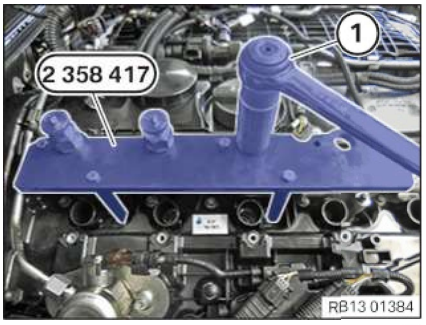
TECHNICAL INFORMATION

The extraction thread is a left-hand thread.

- Screw in pull-out thread (1) on the special tool 2 358 417 fully.



- Insert the threaded sleeves (1) again and screw threaded sleeves completely onto the fixtures for the injectors.
- Then tighten screws (arrows) on special tool 2 358 417 to 5 Nm.

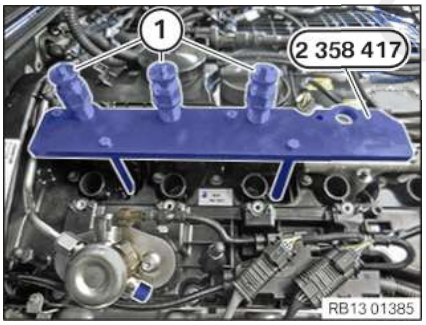


- Adjust torque wrench to 13 Nm **in clockwise** direction.
- Turn the torque wrench (1) with the special tool 0 496 106 (11 8 720) **clockwise**, until the injector is pulled out.

TECHNICAL INFORMATION

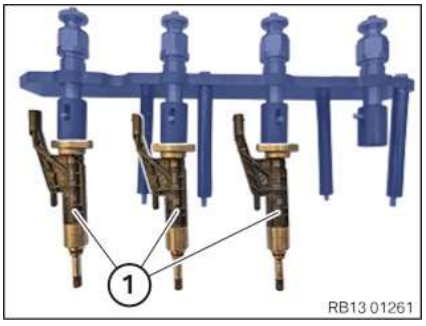
If the torque wrench makes a cracking noise when the injector is pulled out, **the injector must be renewed.**

- Disassemble all injectors individually.



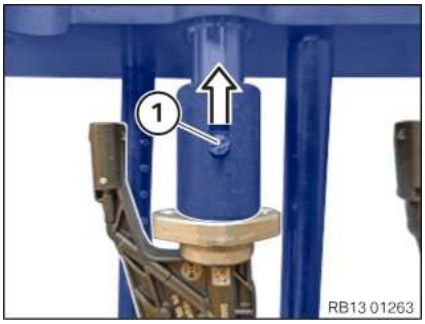
- Before removing the special tool 2 358 417 with the injectors, check if all the injectors were completely pulled out of the cylinder head.

  This can be recognised on the completely visible thread starts of the threaded sleeves (1).
- Loosen screws on special tool 2 358 417.



- Carefully remove the special tool 2 358 417 with the injectors (1) vertically straight up from the cylinder head.
- Place the combination of the special tool 2 358 417 and the injectors (1) flat onto a clean table.

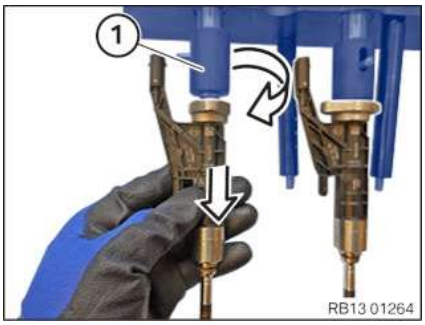
cardiagn.com



NOTICE

The description is for one component only. The procedure is identical for all further components.

- Unlock the fixture lock (1) from the top.



- Turn the unlocked fixture(1) by 90°.
- Release and remove the injector downwards.

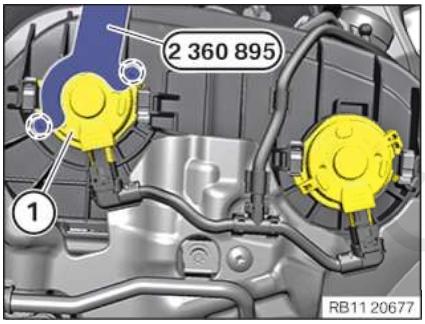
32 – Removing both actuators

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

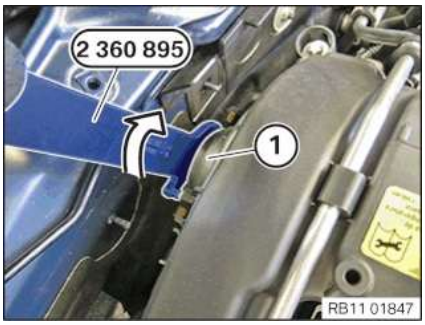
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the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



NOTICE

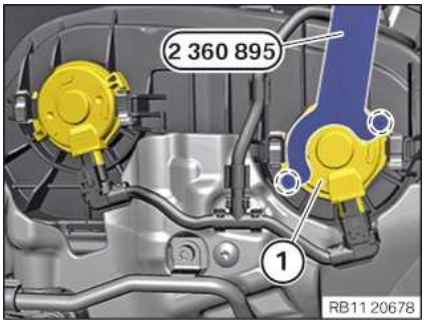
The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the intake side.



- Turn the actuator (1) on the intake side with the special tool 2 360 895 by about 50° in the direction of arrow and release it.

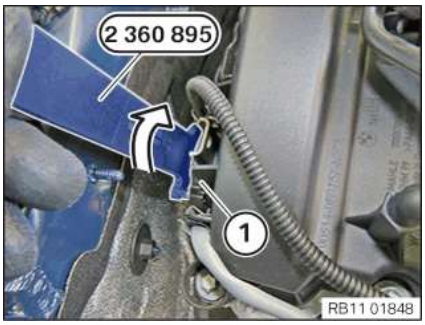
carsdiagn.com



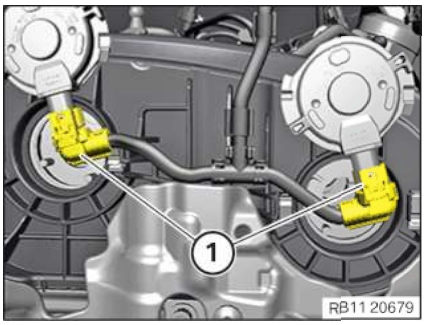
NOTICE

The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the exhaust side.



- Turn the actuator (1) on the exhaust side with the special tool 2 360 895 by about 50° in the direction of arrow and release it.



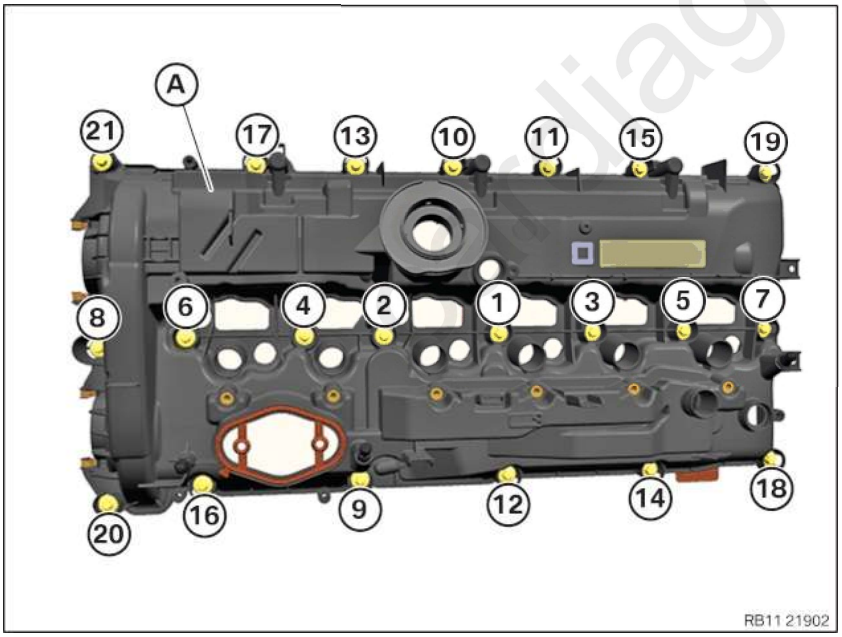
NOTICE

The figure shows the rear side of the engine.

- Unlock and disconnect both connectors (1).
- Feed out and remove both actuators.

33 – Removing the cylinder head cover

Overview: Bolts of the cylinder head cover



1 - 21 Bolts of the cylinder head cover

A Cylinder head cover

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

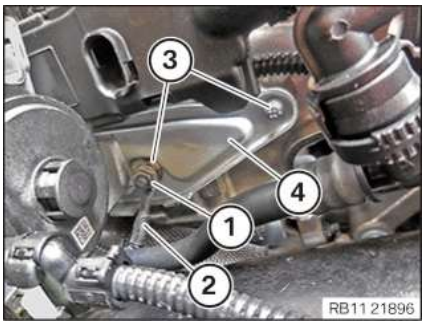
Sheared wires can cause a short circuit.

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

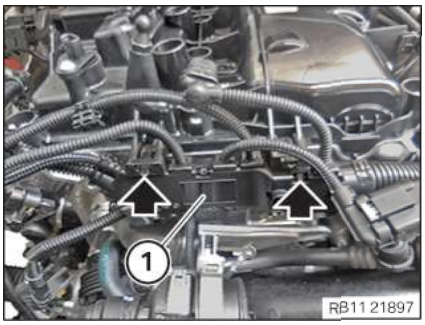
.com



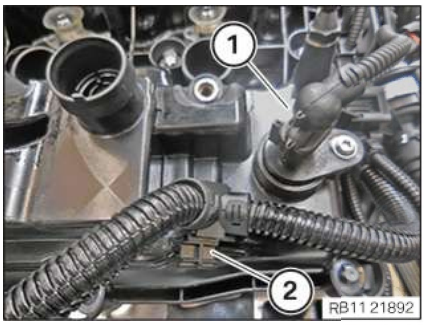
- Unlock the locks (1).
- Feed the engine ventilation line (2) out and set it aside.



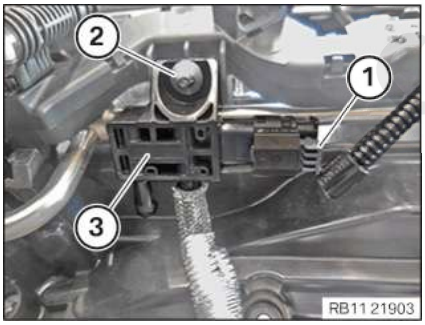
- Loosen nut (1).
- Feed out ground cable (2) and set it aside.
- Loosen screws (3).
- Thread out holder (4) and set aside.



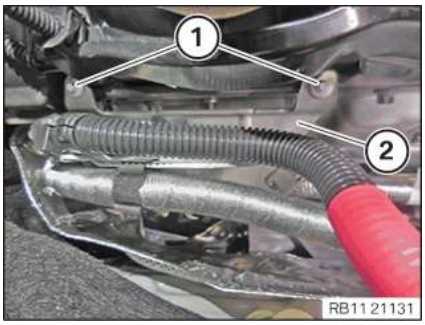
- Unlock and detach the locks (arrows).
- Guide out the wiring harness section (1) for the sensor system **2** and place to one side.



- Unlock and detach connector (1) on exhaust camshaft sensor .
- Loosen clamp (2).

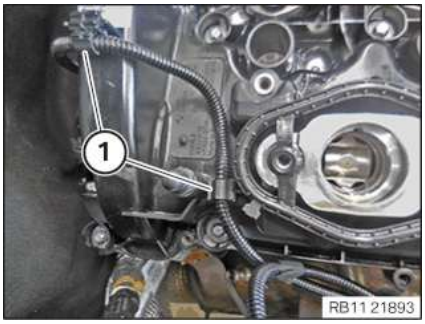


- **If installed:**
- Unlock and loosen connector (1).
- Loosen screw (2).
- Remove the differential pressure sensor (3) and put it to one side.

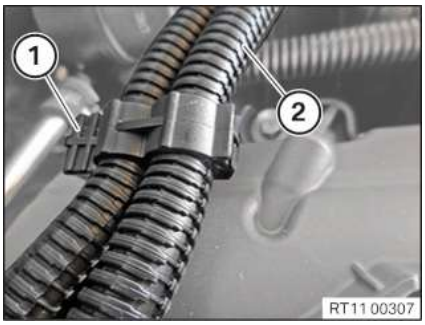


- Loosen screws (1).
- Feed out the bracket (2) of the positive battery cable and set it aside.

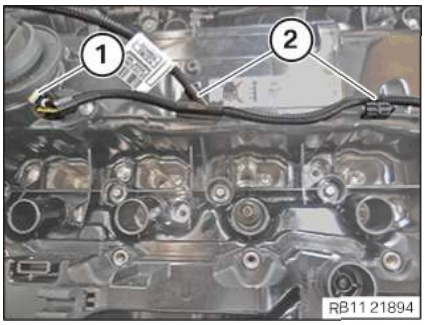
cardiagn.com



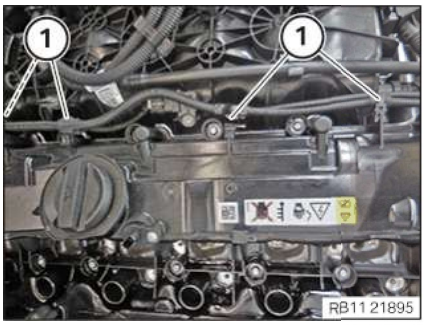
- Loosen clamps (1).



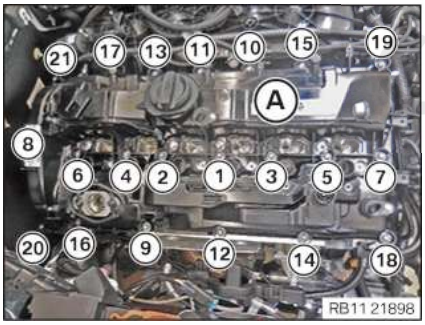
- Loosen clamp (1).
- Thread out the wiring harness section (2) for the injectors and ignition coils and set it aside.



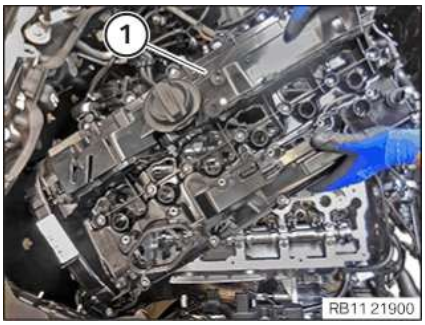
- Unlock and detach connector (1) on the intake camshaft sensor.
- Loosen clamps (2).



- Loosen clamps (1).



- Release all screws on the cylinder head cover (A) in the sequence (21) to (1).



- Guide the cylinder head cover (1) out and remove it.

34 – Removing integrated supply module (PDM)

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WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

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

RISK OF DAMAGE

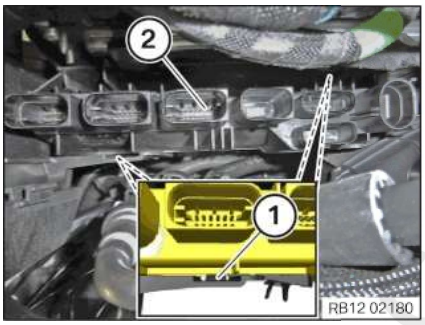
Electrostatic discharge.

Damage to or destruction of electrical components.

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



- Unlock and disconnect plug connections (1).



- Unlock the latch mechanisms (1).
- Guide out and remove integrated supply module (PDM) (2) upwards.

35 – Removing the DME control unit

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

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

TECHNICAL INFORMATION

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

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TECHNICAL INFORMATION

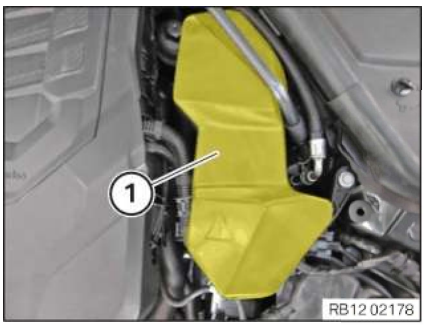
In a warranty case, you must always provide a fault memory printout with the defective part, even if the fault memory does not contain an entry.

TECHNICAL INFORMATION

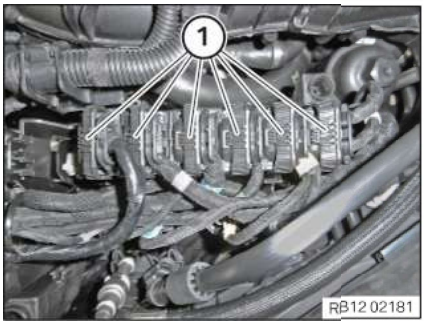
Control unit must be programmed after it is replaced.
For additional information see: 61 00 ... Programming/encoding control unit(s)

TECHNICAL INFORMATION

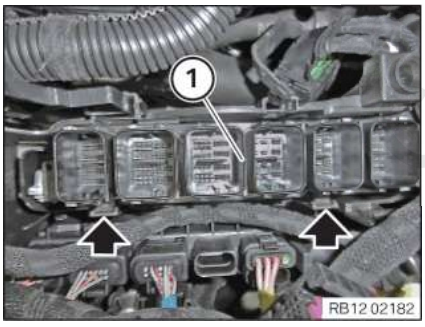
Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Pull the cover (1) towards the top and feed out.

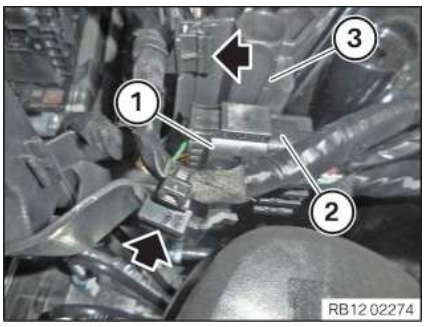


- Unlock and disconnect the plug connection (1).



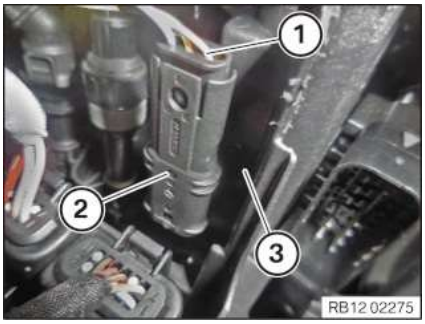
- Unlock the locks (arrows).
- Guide out and remove DME control unit (1).

36 – Removing the control unit holder

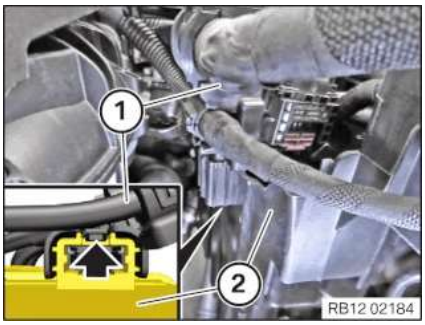


- Unlock plug connection (1) and disconnect.
- Unlock the connector (2) and disconnect from the control unit holder (3).
- Release the clamps (arrows).

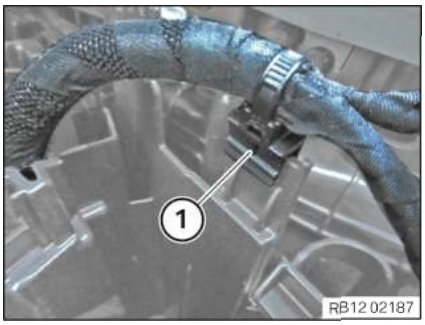
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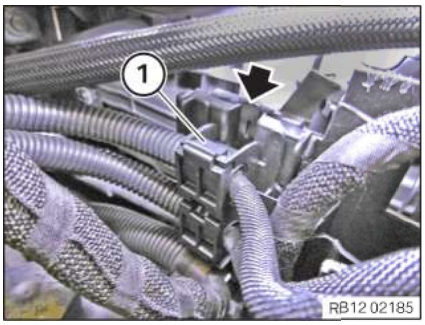
- Unlock plug connection (1) and disconnect.
- Unlock the connector and disconnect from the control unit holder (3).



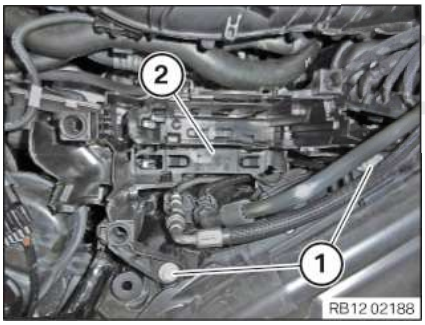
- Unlock the lock (arrow).
- Disconnect the cable holder (1) upwards from the control unit holder (2).



- Loosen clamp (1).

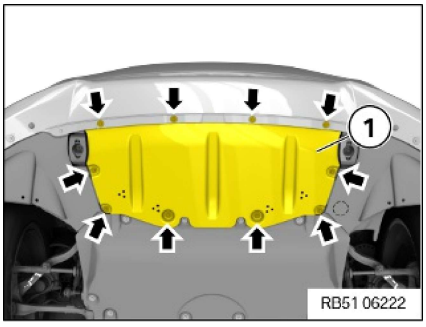


- Unlock the lock (arrow).
- Feed out the cable clip (1) upwards and set it aside.



- Loosen screws (1).
- Guide out and remove the control unit holder (2).

37 – Removing the front underbody protection

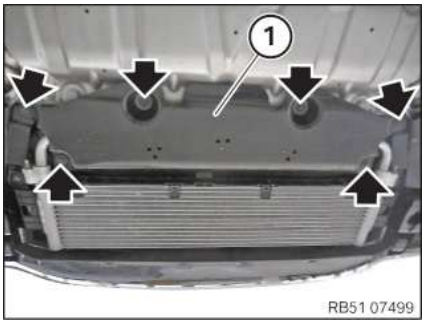


- **Version 1:**

  Remove screws (arrows).

  Feed front underbody protection (1) backwards out of the bumper panel.

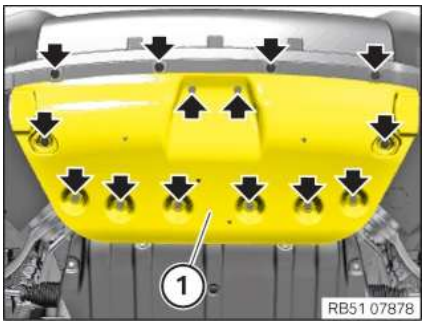
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- **Version 2:**

  Remove screws (arrows).

  Guide out front underbody protection (1) and remove it.



- **Version 3:**

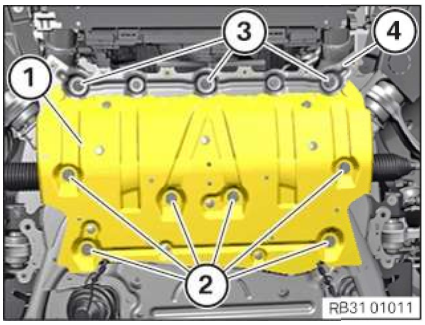
  Remove screws (arrows).

  Guide out front underbody protection (1) and remove it.

38 – Removing the stiffening plate

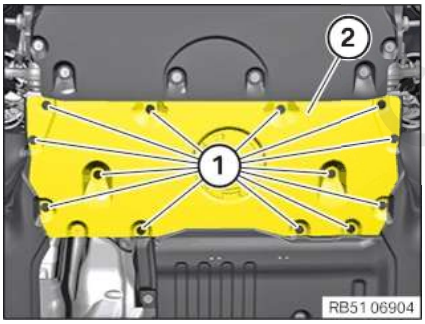
TECHNICAL INFORMATION

Driving without stiffening plate is not permissible.



- Loosen screws (3).
- Remove the holder of the underride protection (4).
- Loosen screws (2).
- Remove stiffening plate (1).

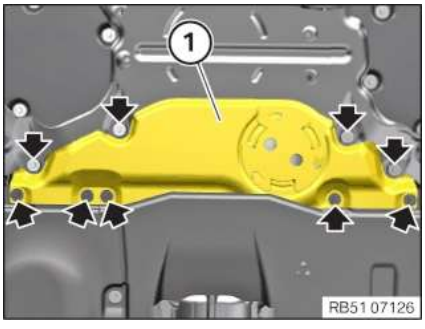
39 – Removing the centre underbody protection



- **Version with rear-wheel drive:**

  Loosen screws (1).

  Remove centre underbody protection (2) .



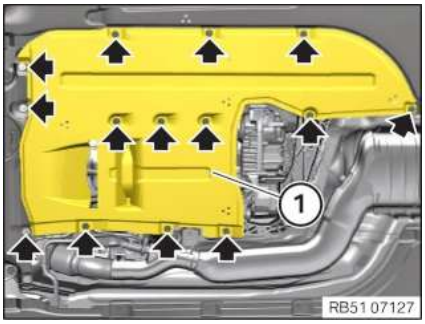
- **Version with all-wheel drive:**

  Remove screws (arrows).

  Feed out and remove the centre underbody protection (1).

40 – Remove rear underbody protection

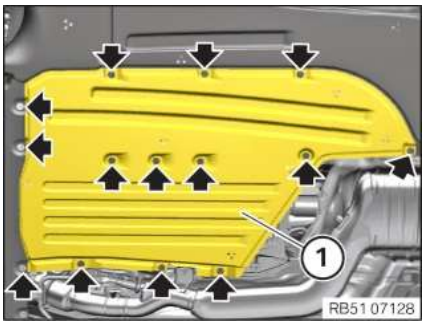
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- **Version 1:**

  Remove screws (arrows).

  Feed out the rear underbody protection (1).

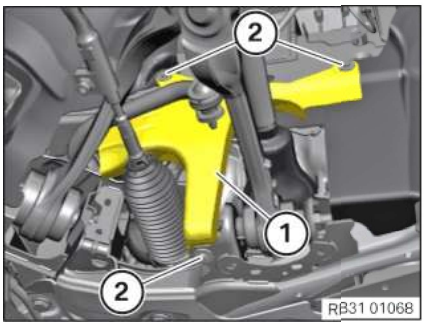


- **Version 2:**

  Remove screws (arrows).

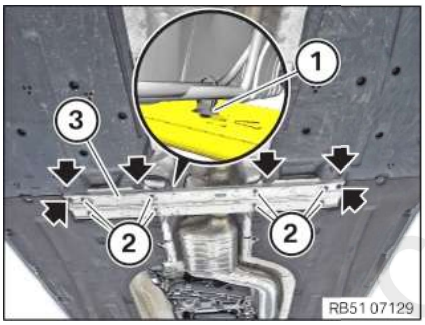
  Guide out rear underbody protection (1) and remove it.

41 – Remove the cover of the steering assembly



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

42 – Remove the connecting support from the tunnel



- Remove screws (arrows).
- **If installed:** Loosen clamp (1).
- Loosen screws (2).
- Guide out and remove connecting support (3) on the tunnel.

43 – Remove complete exhaust system

WARNING

Hot surfaces.

Risk of burning!

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

CAUTION

Component with heavy weight.

Danger of injury!

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

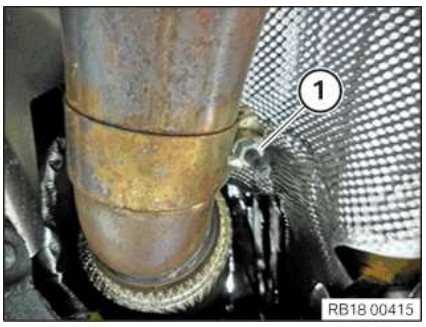
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CAUTION

Heavy component.

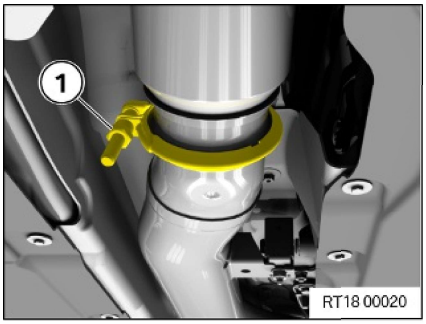
Heavy components can lead to injury or damage.

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



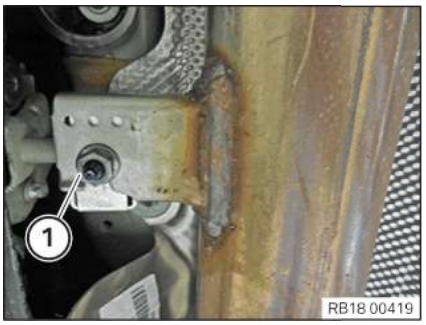
- **Equipment specification 1 (ribbon clamp)**

  Detach the ribbon clamp (1).

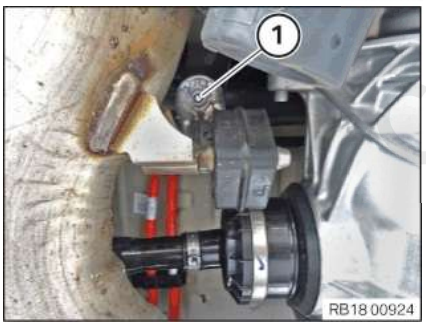


- **Equipment specification 2 (V-clips)**

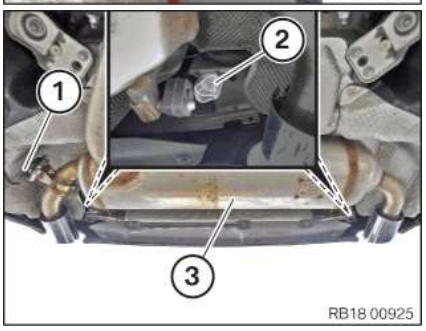
  Unfasten clamp (1).



- Loosen nut (1).



- Release nut (1) on the rear axle support.



- Unlock plug connection (1) and disconnect.
- Loosen nuts (2).
- Lower and remove the exhaust system (3) with the assistance of a second person.

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WARNING

Hot surfaces.

Risk of burning!

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

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

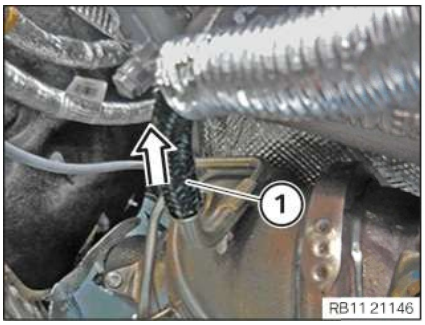
- Remove and install heavy components with the aid of another person/other persons.

CAUTION

Component with heavy weight.

Danger of injury!

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

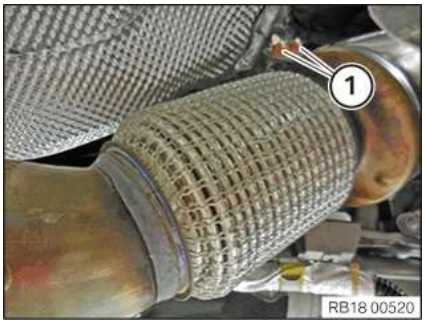


- **If installed: Disconnect pressure hose.**

  Pull off pressure hose (1) in direction of arrow and set it aside.



- Loosen V-band clamp (1).



- Loosen nuts (1).

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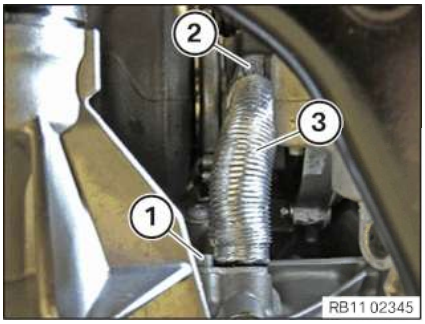


- Unlock and loosen clamp (1).
- Feed out catalytic converter and remove.

45 – Removing the oil return line for the exhaust turbocharger

TECHNICAL INFORMATION

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



- Have cleaning rags ready for any escaping engine oil.
- Loosen screws (1) and (2).
- Guide out and remove the oil return line (3).

46 – If installed: Partially release the engine oil cooler

WARNING

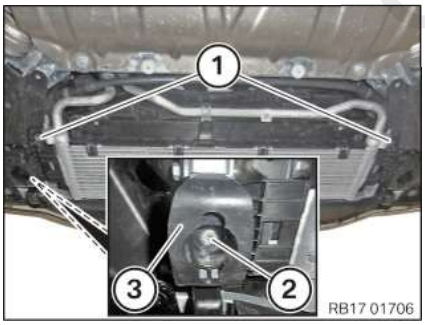
Hot surfaces.

Risk of burning!

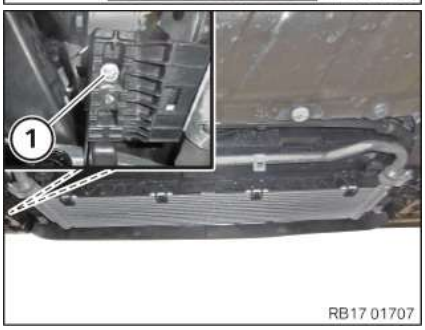
- Perform all work only on components that have cooled down.

TECHNICAL INFORMATION

The work must be performed with care to prevent component damage.

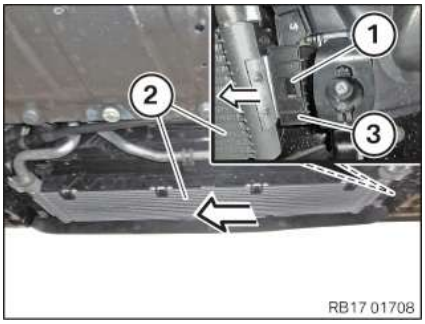


- Loosen screws (1).
- Drill out rivet on the left (2).
- Remove the left-hand damper (3).

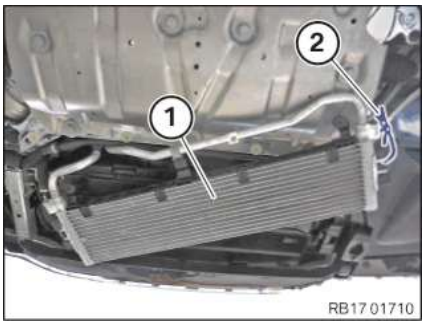


- Loosen screw (1).

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- Unlock lock (1).
- Feed out engine oil cooler (2) from the holder in the direction of arrow (3) and place to one side.



- Affix the engine oil cooler (1) with a cable strap (2) as shown.

47 – Draining the coolant from the low-temperature cooling system

WARNING

Hot surfaces.

Risk of burning!

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

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

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

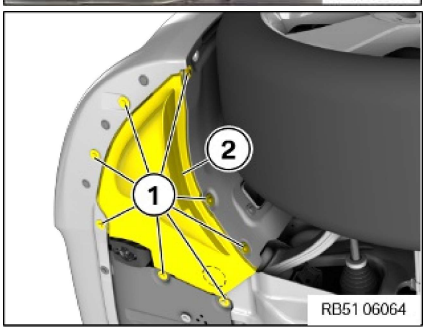
In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

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

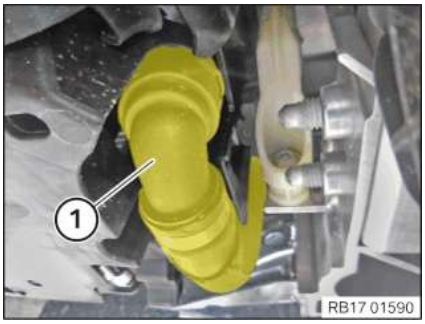


- Loosen sealing cap (1).



- Loosen screws (1).
- Guide out and remove bottom left cover (2) to the front.

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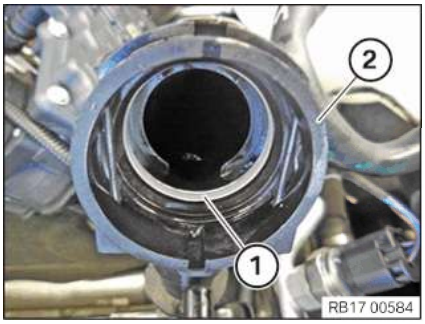


- Unlock and disconnect the coolant line (1).
- Catch and dispose of escaping coolant.

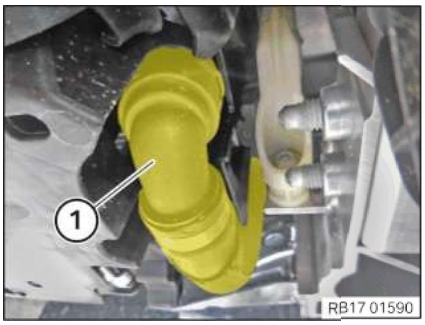
48 – Connecting the coolant lines for the low-temperature coolant circuit

TECHNICAL INFORMATION

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

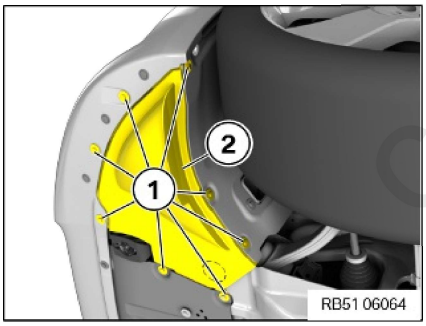


- Check the sealing rings (1) of the coolant lines (2) for damage and renew if necessary.



- Connect and lock the coolant line (1).

  The coolant line (1) must audibly engage.



- Feed in and install cover (2) at the bottom front left.
- Tighten the screws (1).

Cover, front bottom on side

Hexagon screw for thermoplastic		Tightening torque	3 Nm

49 – Draining the coolant from the high-temperature cooling system

WARNING

Hot fluids.

Risk of scalding!

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

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CAUTION

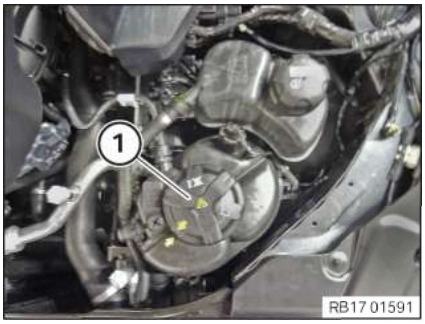
Materials harmful to health.

Contact with fluids harmful to health!

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

TECHNICAL INFORMATION

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



- Loosen sealing cap (1).

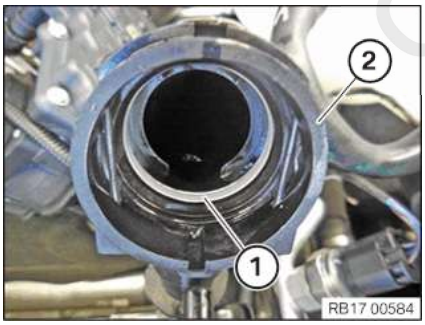


- Unlock lower right coolant hose (1) on the high-temperature coolant radiator and pull it off.
- Catch and dispose of escaping coolant.

50 – Connecting coolant hose to high-temperature coolant radiator

TECHNICAL INFORMATION

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



- Check the sealing rings (1) of the coolant lines (2) for damage and renew if necessary.



- Connect coolant hose (1), bottom right to the high-temperature coolant radiator and lock it audibly.

51 – Remove the coolant line between the cylinder head and the coolant pump

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WARNING

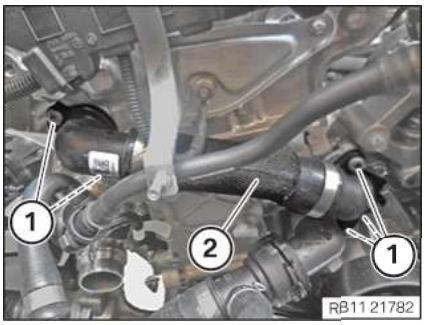
Hot surfaces.

Risk of burning!

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

TECHNICAL INFORMATION

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



- Loosen screws (1).
- Remove the coolant line (2).
- Catch and dispose of escaping coolant.

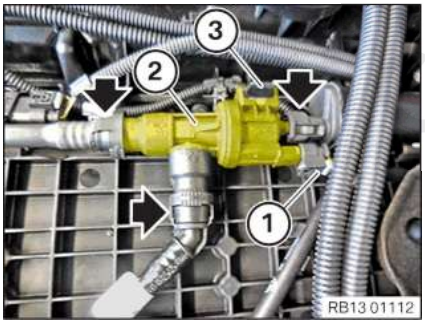
52 – Remove tank vent valve

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

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



- Unlock and disconnect connector (1).
- Unlock and disconnect the tank ventilation lines (arrows).
- Detach and remove the tank vent valve (2) from the holder (3).

53 – Removing the intake plenum

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

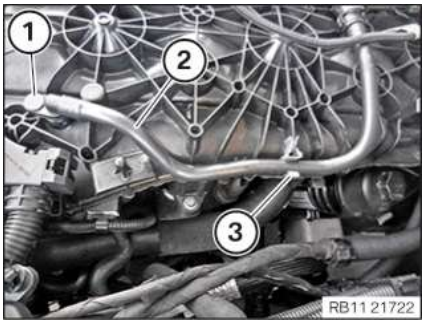
- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

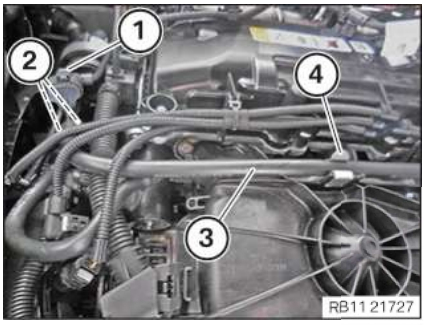
Additional coolant can escape. Make sure that no coolant enters the intake port of the cylinder head.

TECHNICAL INFORMATION

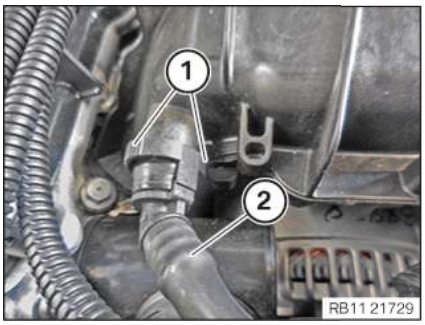
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



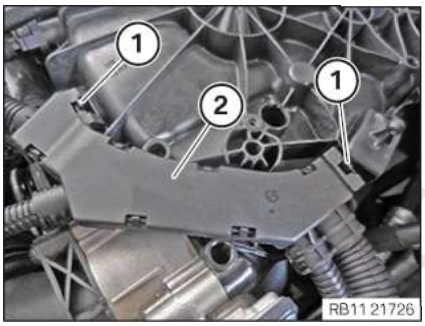
- Loosen screw (1).
- Guide tank ventilation line (2) out of clamp (3) and remove it.



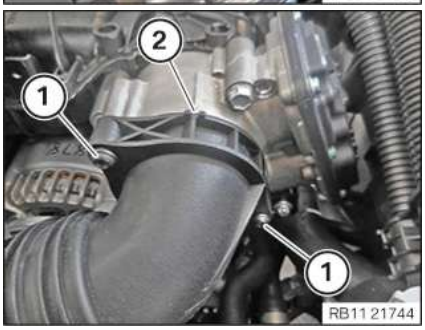
- Unlock and loosen connector (1).
- Unlock the locks (2).
- Guide tank ventilation line (3) out of clamp (4) and remove it.



- Unlock the locks (1).
- Feed the tank ventilation line (2) out and set it aside.

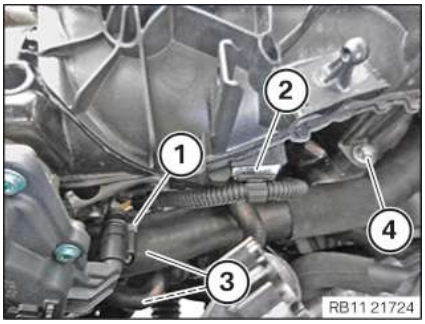


- Unlock the locks (1).
- Guide out the wiring harness section (2) for the sensor system **2** and place to one side.

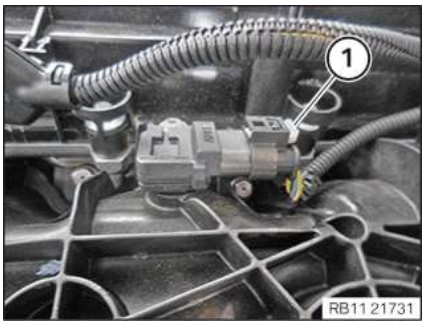


- Loosen screws (1).
- Feed out charge air line (2) and place to one side.

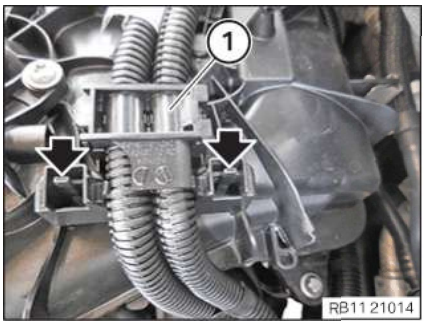
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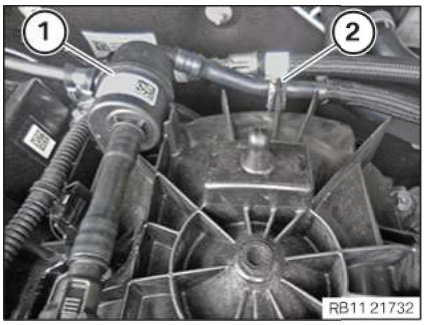
- Unlock and loosen connector (1).
- Loosen clamp (2).
- Thread off coolant line (3) and place to the side.
- Loosen screw (4).



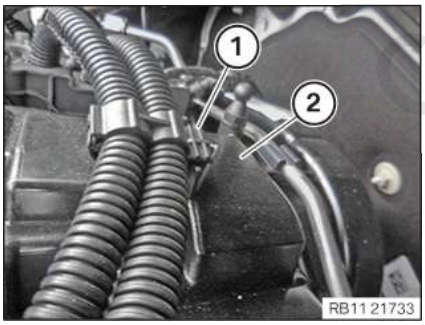
- Unlock and loosen connector (1).



- Unlock the locks (arrows).
- Thread out the wiring harness section (1) for the injectors and ignition coils and set it aside.



- Guide tank ventilation line (1) out of clamp (2) and place it aside.

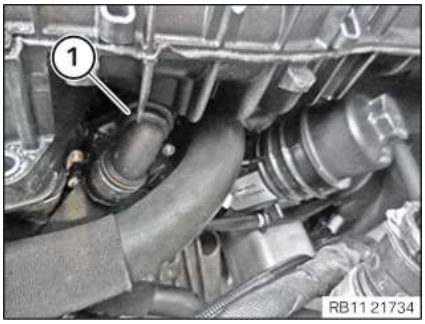


- Guide out the wiring harness section (1) for the injectors and ignition coils of the cylinder head cover (2) and set it aside.

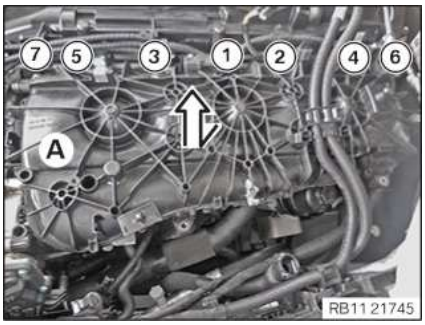


- Loosen screw (1).

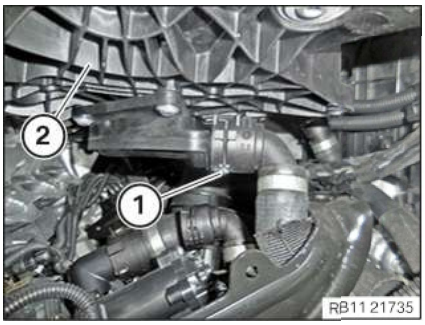
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- Unlock and loosen coolant line (1).
- Catch and dispose of escaping coolant.



- Loosen screws in the order (7) to (1).
- Slightly raise intake plenum (A) in direction of arrow.



TECHNICAL INFORMATION

Additional coolant can escape. Make sure that no coolant enters the intake port of the cylinder head.

- Unlock and release coolant line (1) below the intake plenum (2).
- Catch and dispose of escaping coolant.
- Thread out intake plenum (2) and remove.

54 – Block the engine with the special tool in TDC firing position



- Thread the sealing cap (1) out and remove.



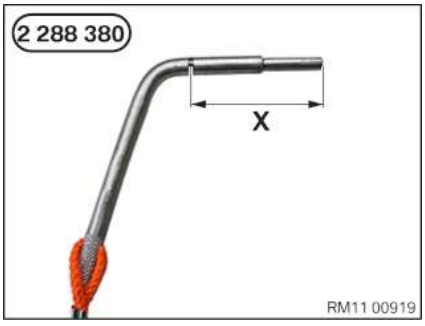
RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Turn the engine in **direction of arrow** with the special tool 0 493 380 (11 6 480) to the TDC firing position of **cylinder 1**.

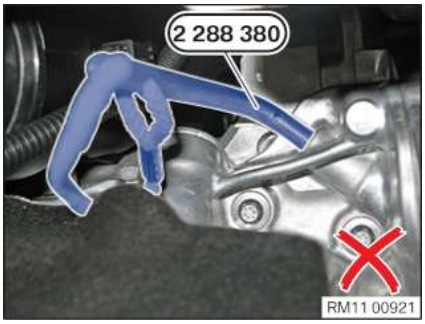


- **Vehicles with automatic transmission:**

  Dimension (X) = 66 mm

  The special tool 2 288 380 must be inserted in the dowel hole to dimension (X).

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- **Vehicles with automatic transmission:**

  Special tool 2 288 380 **incorrectly** positioned.

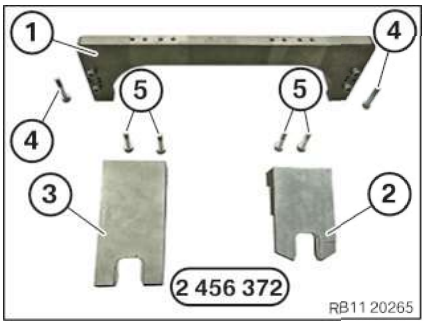
  The TDC firing position of cylinder 1 was **not** reached.



- **Vehicles with automatic transmission:**

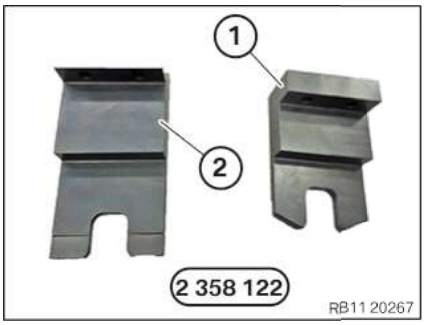
  Special tool 2 288 380 **correctly** positioned.

  The engine is in the TDC firing position of cylinder 1.



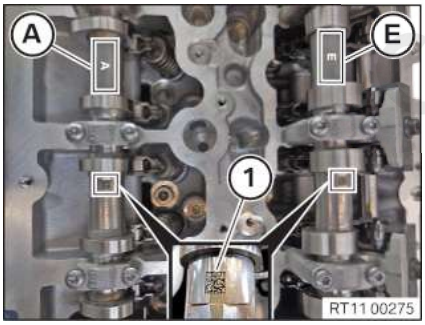
- Overview of the set of special tools 2 456 372:

Number	Description
1	Basic carrier
2	Setting gauge to adjust the intake camshaft
3	Setting gauge to adjust the exhaust camshaft
4	Basic carrier screws on cylinder head
5	Screw gauge on basic carrier

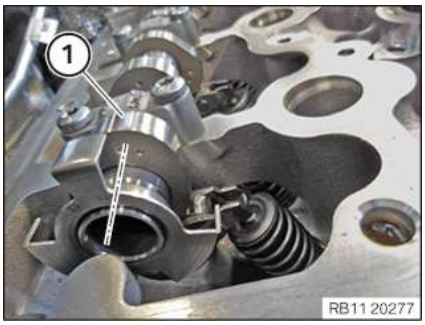


- Overview of the test gauges from the set of special tools 2 358 122:

Number	Description
1	Test gauge to fix the intake camshaft
2	Test gauge to fix the exhaust camshaft



- Turn intake camshaft (E) and exhaust camshaft (A) until marks (1) can be read from the top.

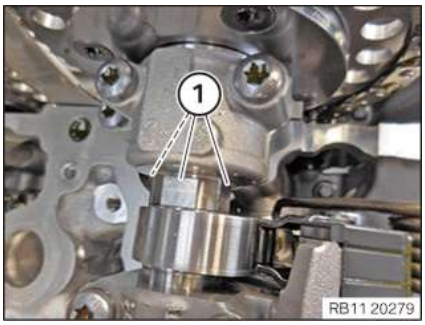


- Ensure that the cam (1) on the exhaust camshaft on **cylinder 1** points to the inside right at a slight angle.

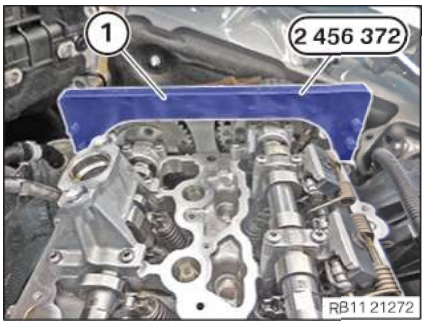
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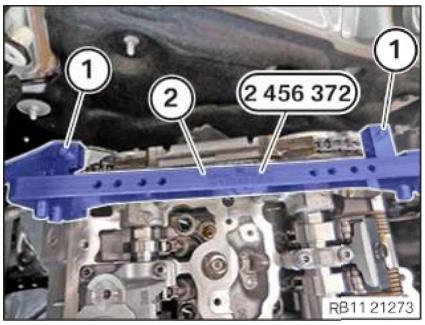
- Ensure that the cam (1) on the intake camshaft on **cylinder 1** points to the inside left at an angle.



- Ensure that the flattened areas (1) on the intake camshaft and the exhaust camshaft point upwards.



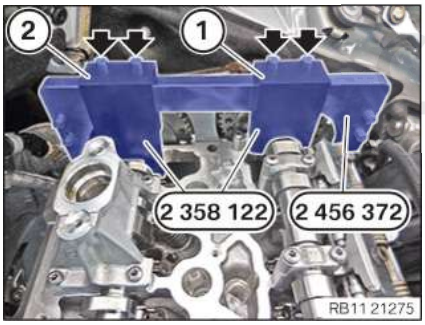
- Position basic carrier (1) from the set of special tools 2 456 372 on the cylinder head.



- Tighten the screws (1) from the set of special tools 2 456 372 on the basic carrier (2).

Basic carrier to cylinder head

M6		Tightening torque	8 Nm



- Position the test gauge (1) from the set of special tools 2 358 122 between the intake camshaft and the basic carrier from the set of special tools 2 456 372.
- Position the test gauge (2) from the set of special tools 2 358 122 between the exhaust camshaft and the basic carrier from the set of special tools 2 456 372.
- Tighten screws (arrows).

Test gauge to basic carrier

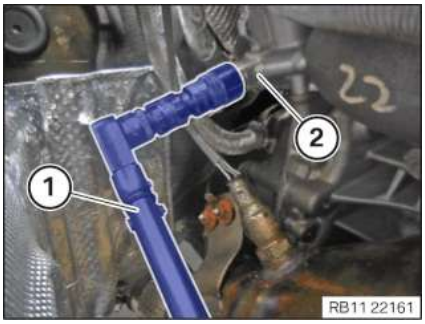
M6		Tightening torque	8 Nm

55 – Removing chain tensioner

TECHNICAL INFORMATION

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

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- A small amount on engine oil emerges when removing the chain tensioner (2), have a cleaning cloth ready.
- Release the chain tensioner (2) with conventional tools (1).



- Feed out and remove the chain tensioner (1).

56 – Releasing the VANOS central valve of the intake adjuster



- To release the VANOS central valve (1), use the reversible ratchet (2) from the special tool 0 496 855 with the special tool 2 450 487.



NOTICE

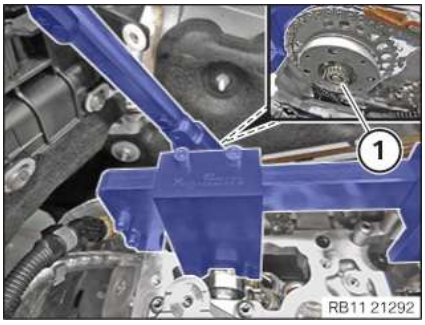
The figure shows the rear side of the engine.

- Release the VANOS central valve (1) of the intake adjuster.

57 – Releasing VANOS central valve of the exhaust camshaft adjuster



- To release the VANOS central valve (1), use the reversible ratchet (2) from the special tool 0 496 855 with the special tool 2 450 487.



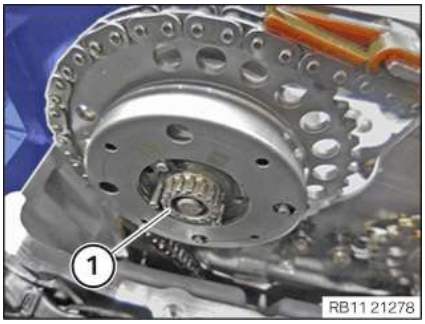
NOTICE

The figure shows the rear side of the engine.

- Release the VANOS central valve (1) of the exhaust camshaft adjuster.

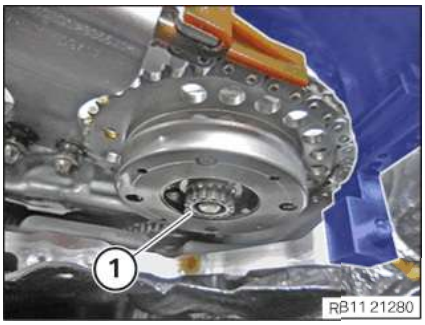
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58 – Removing the VANOS central valve of the intake adjuster



- Guide out and remove the VANOS central valve (1) of the intake adjuster.

59 – Remove the VANOS central valve of the exhaust camshaft adjuster

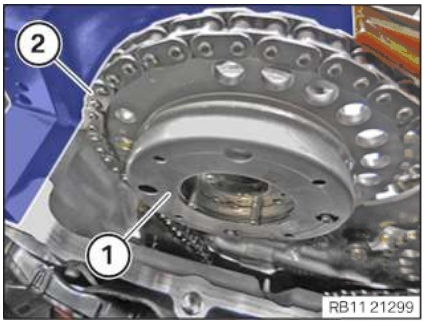


- Guide out and remove the VANOS central valve (1) of the exhaust camshaft adjuster.

60 – Removing intake adjuster

NOTICE

The figure shows the rear side of the engine.

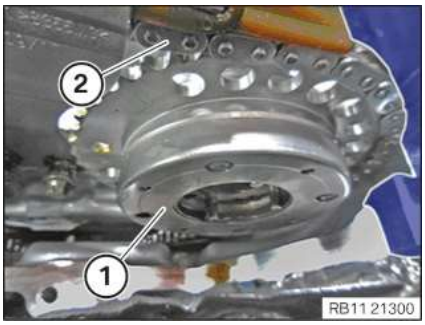


- Guide out the intake adjuster (1) from the timing chain (2) and remove.

61 – Remove exhaust camshaft adjuster

NOTICE

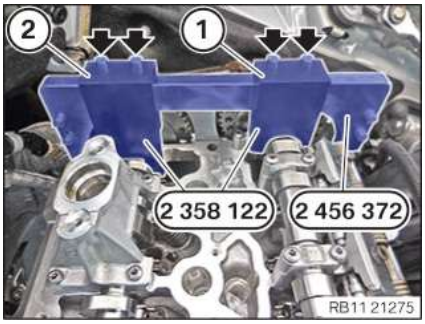
The figure shows the rear side of the engine.



- Guide out the exhaust camshaft adjuster (1) from the timing chain (2) and remove.

62 – Remove the test gauges to fix the camshafts

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- Remove screws (arrows).
- Guide out and remove test gauge (1) from the set of special tools 2 358 122 between the intake camshaft and the basic carrier of the set of special tools 2 456 372.
- Guide out and remove test gauge (2) from the set of special tools 2 358 122 between the exhaust camshaft and the basic carrier of the set of special tools 2 456 372.

MAIN WORK

63 – Remove cylinder head.

CAUTION

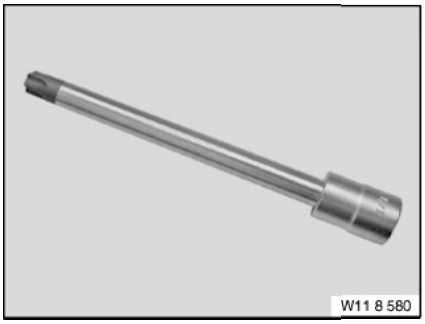
Heavy component.

Heavy components can lead to injury or damage.

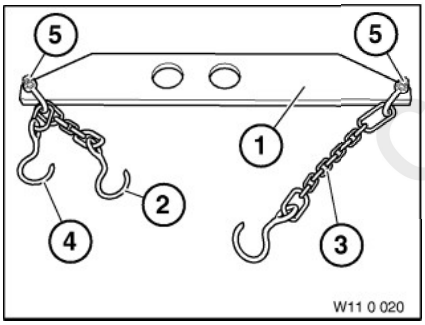
- Remove and install heavy components with the aid of another person/other persons.

TECHNICAL INFORMATION

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



- Prepare special tool 0 495 747 (11 8 580).



- Prepare special tool 0 490 567 (11 0 020).

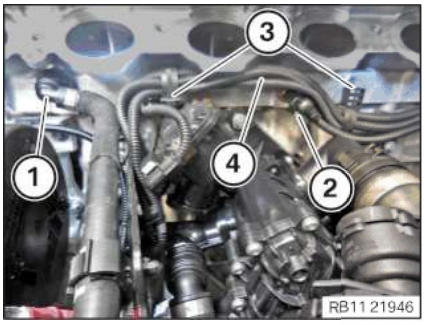
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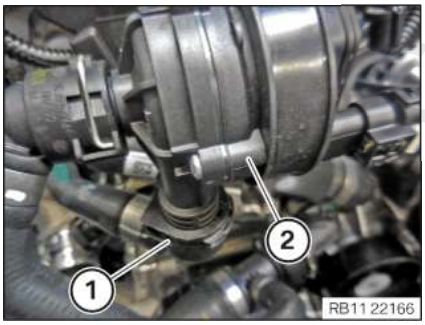
- Prepare the workshop crane 2 220 718.



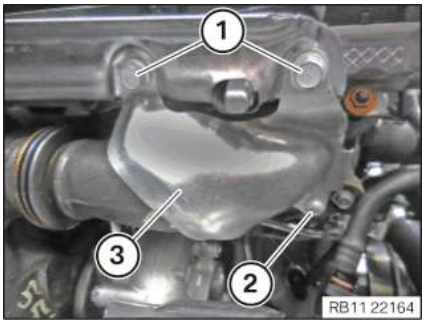
- Unlock plug connection (1) and disconnect.



- Unlock and loosen coolant line (1).
- Catch and dispose of escaping coolant.
- Unlock plug connection (2) and disconnect.
- Loosen clamps (3).
- Feed out wiring harness section (4) for sensor system **1** and set it aside.



- Unlock and release coolant return line (1) on coolant pump (2) for the exhaust turbocharger.
- Catch and dispose of escaping coolant.

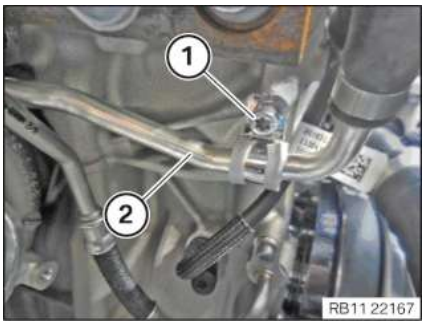


- Loosen screws (1).
- Loosen screw (2).
- Feed out and remove the heat shield (3).

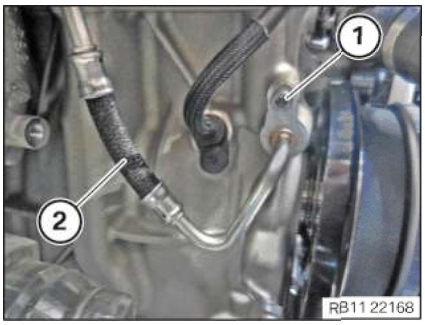
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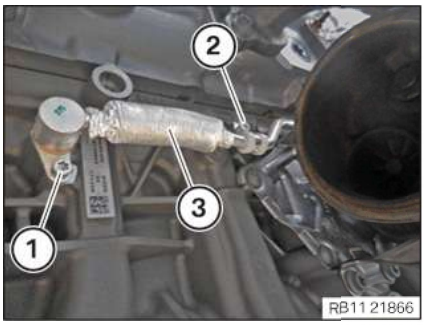
- Loosen screws (1).
- Feed out and remove the heat shield (2).



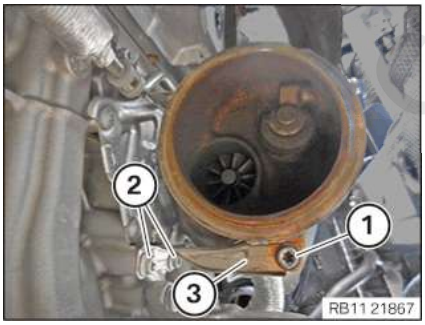
- Release screw (1) on coolant return line (2).



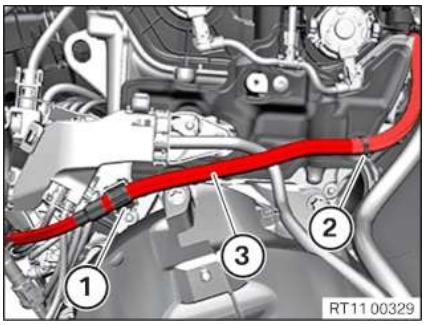
- Loosen screw (1).
- Guide out oil feed line (2) for the exhaust turbocharger and place it aside.
- Catch and dispose of emerging engine oil.



- Loosen screws (1) and (2).
- Guide the coolant feed line for exhaust turbocharger (3) from the crankcase and place it aside.
- Catch and dispose of escaping coolant.

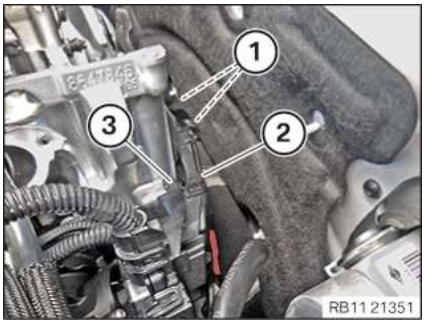


- Loosen screws (1) and (2).
- Feed the support (3) out and remove.

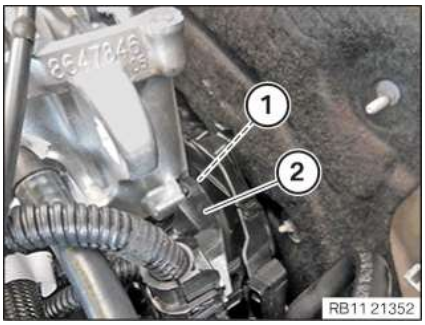


- Unlock and release clamps (1) and (2).
- Feed out positive battery cable (3) and put to one side.

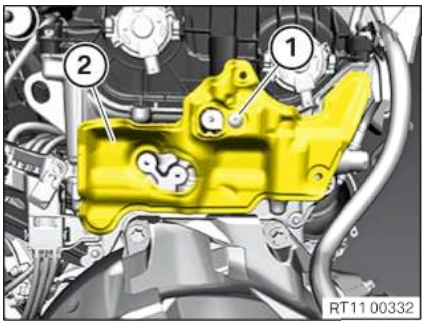
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- Loosen screws (1).
- Guide out transmission wiring harness (2) on wiring harness section (3) for sensor system 1 and set it aside.



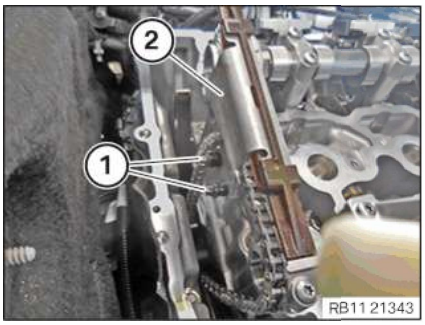
- Loosen screw (1).
- Guide out the wiring harness section (2) for sensor system 1 and place to one side.



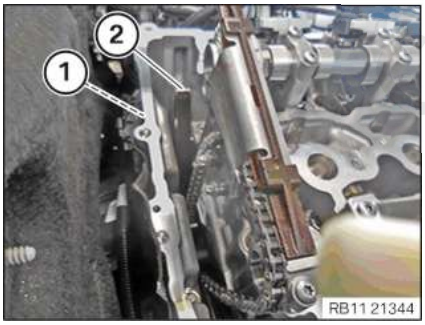
NOTICE

The figure shows the rear side of the engine.

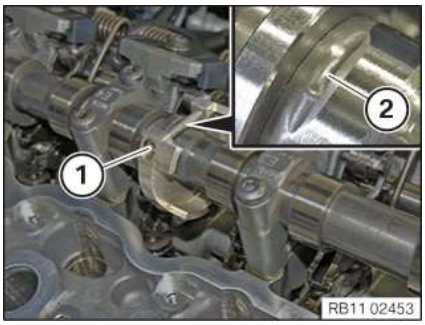
- Loosen screw (1).
- Guide out and remove the cover (2).



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



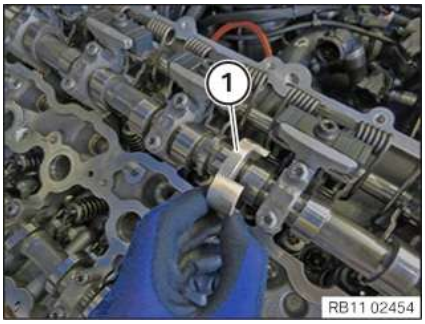
- Release the bearing journal (1) from the guide rail (2).



- Rotate intake camshaft, if necessary in the position shown.

  The recess (2) must point upwards.
- Loosen screw (1).

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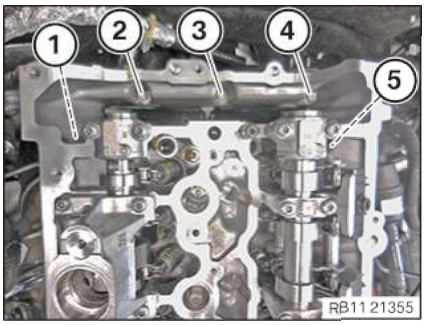
- Slide camshaft sensor wheel (1) in the direction of cylinder 1 and guide it out from the intake camshaft.



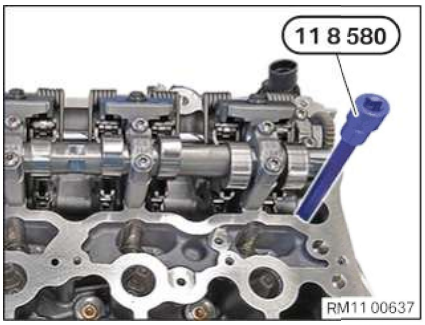
- Guide in and position special tool on the cylinder head.
- Tighten the screws (1) of special tool .

Special tool to cylinder head

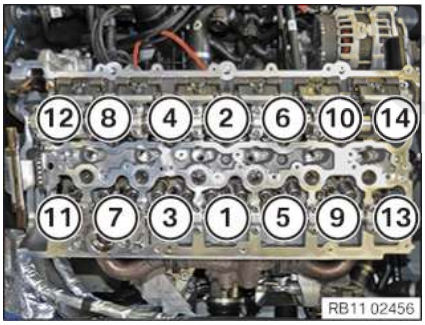
M8		Tightening torque	21,5 Nm



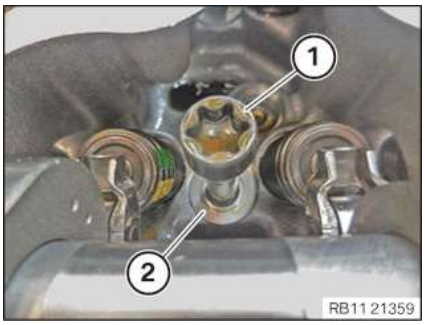
- Loosen the cylinder head bolts in the sequence from (5) to (1).



- Release cylinder head bolts with the special tool 0 495 747 (11 8 580).

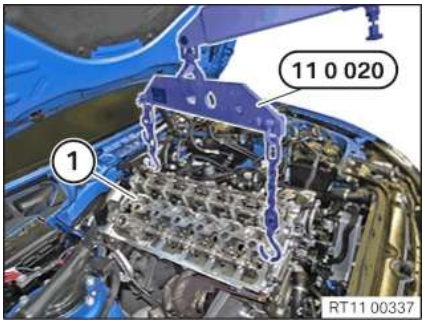


- Undo the screws using the special tool 0 495 747 (11 8 580) in the order (14) to (1) .



- Feed out and remove all the cylinder head bolts (1).
- Feed out and remove all the washers (2).

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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

RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Attach special tool 0 490 567 (11 0 020) to workshop crane.
- Lift out cylinder head (1) and the exhaust turbocharger with an auxiliary person, the workshop crane and special tool 0 490 567 (11 0 020).

64 – Removing the exhaust turbocharger (cylinder head removed)

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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

RISK OF DAMAGE

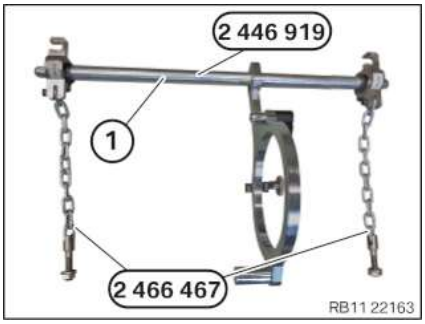
Damage to the electrical wastegate valve controller.

The electrical wastegate valve controller may be damaged as a result of the excessive forces required when removing and installing a jammed exhaust turbocharger.

- Do not pull on the electrical wastegate valve controller.
- Apply force to the turbine housing and exhaust manifold only.
  - Do not pull on the compressor housing.

TECHNICAL INFORMATION

Do not damage the thermal compensating elements. The disassembly and installation including intermediate storage of the exhaust turbocharger is only permitted with mounted special tool 2 466 919 .



- Have the special tool 2 446 919 and the special tool 2 466 467 ready.

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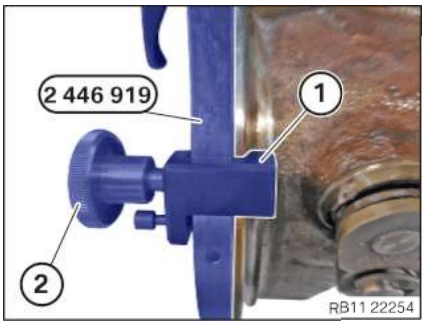
- Install the special tool 2 446 919 on the exhaust turbocharger and secure it with the bolt (1).



- Fix the special tool 2 446 919 by turning the clamping lever (1) in the **direction** of the arrow.

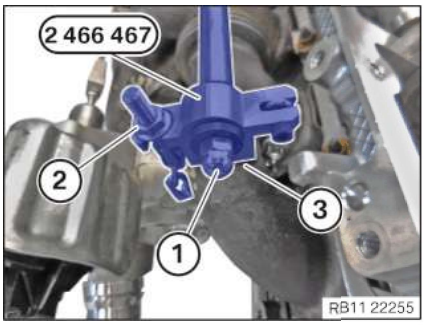
Note: The clamping lever that is shown in the graphic is already in its end position.

- Make sure that the special tool 2 446 919 is flush with the exhaust turbocharger in the **marked area**.

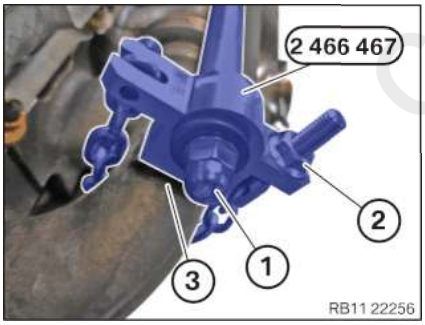


- Position the holder (1) and fasten it with the bolt (2).

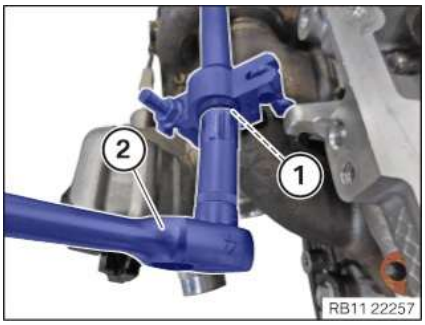
Note: The holder is used for the final mounting of the special tool **2 446 919**.



- Tighten the nut (1) hand-tight.
- Tighten the nut (2) hand-tight.
- Ensure that the special tool 2 466 467 rests correctly on the exhaust turbocharger (3).



- Tighten the nut (1) hand-tight.
- Tighten the nut (2) hand-tight.
- Ensure that the special tool 2 466 467 rests correctly on the exhaust turbocharger (3).

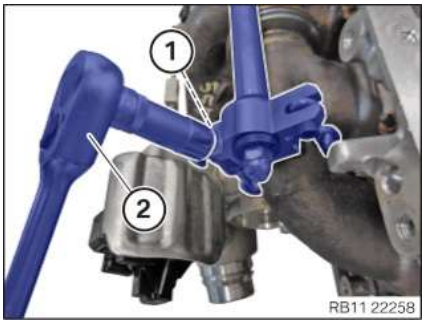


- Tighten the nut (1) using commercially available tools (2).

Special tool 2 466 467 to special tool 2 446 919

M8		Tightening torque	5 Nm

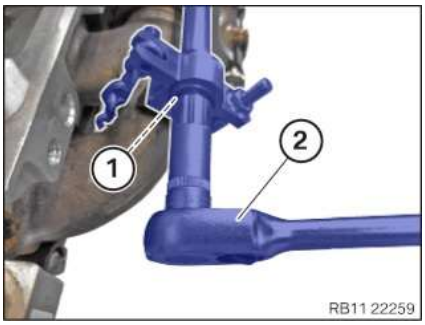
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- Tighten the nut (1) using commercially available tools (2).

Special tool 2 466 467 to special tool 2 446 919

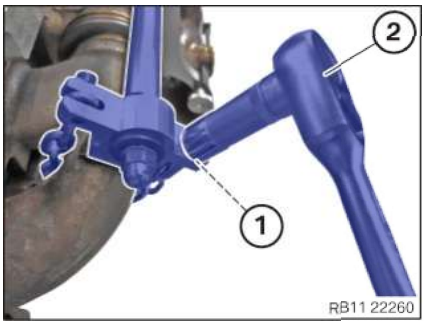
M8		Tightening torque	5 Nm



- Tighten the nut (1) using commercially available tools (2).

Special tool 2 466 467 to special tool 2 446 919

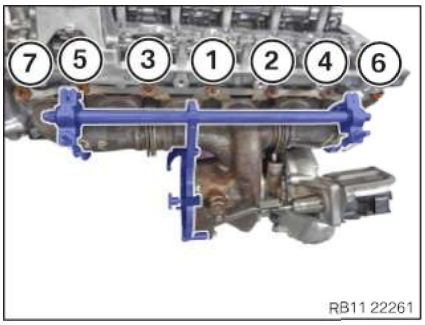
M8		Tightening torque	5 Nm



- Tighten the nut (1) using commercially available tools (2).

Special tool 2 466 467 to special tool 2 446 919

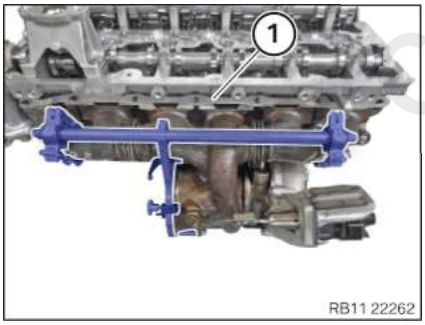
M8		Tightening torque	5 Nm



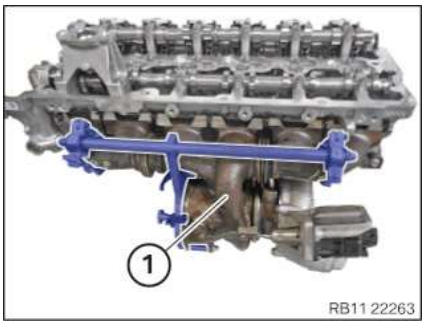
TECHNICAL INFORMATION

Exhaust manifold/exhaust turbocharger is not bolted to the underside, but clamped instead. When removing/replacing the exhaust manifold/exhaust turbocharger, the clamping strip remains screwed on.

- Unscrew the nuts in sequence (7) to (1).
- Secure exhaust turbocharger against falling down.



- Slide the slide rail (1) out and remove.



CAUTION

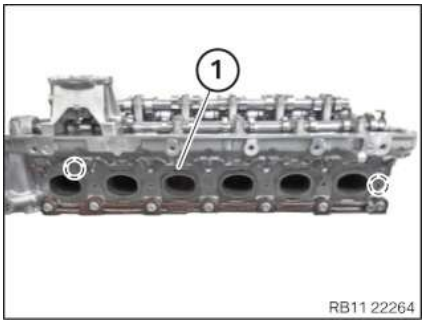
Heavy component.

Heavy components can lead to injury or damage.

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

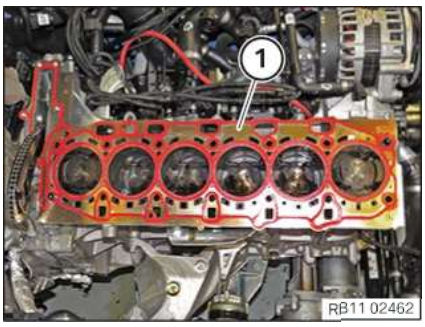
- Carefully guide out and remove the exhaust turbocharger (1).
- Thermal compensating elements of the exhaust turbocharger (1) or exhaust manifold should **not** be bent or deformed.

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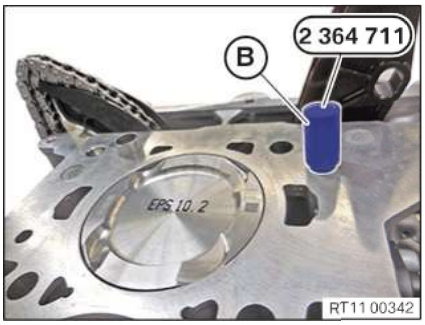
- Feed out and remove seal (1) in the **marked area.**

65 – Removing the cylinder head gasket



- Thread out and remove cylinder head gasket (1).

66 – Sealing the oil duct



- Seal the oil duct using special tool (B) from the set of special tools 2 364 711.

67 – Clean sealing surfaces

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

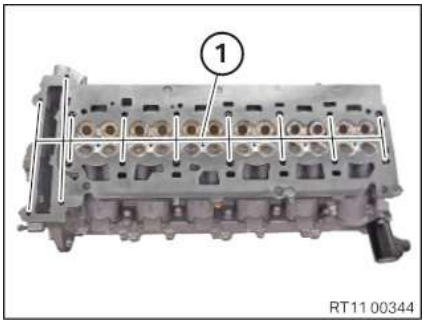


- Remove coarse backlogs from the sealing surfaces of the cylinder head using special tool 0 495 103 (11 4 471).



- Remove fine residues from the sealing surfaces of the cylinder head using special tool 0 495 104 (11 4 472).

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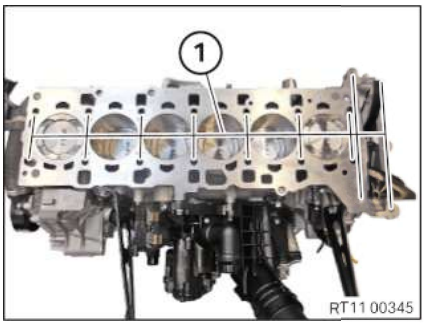
- Clean all blind holes (1) of the cylinder head.



- Remove coarse backlogs from the sealing surfaces of the crankcase using special tool 0 495 103 (11 4 471).



- Remove fine backlogs from the sealing surfaces of the crankcase using special tool 0 495 104 (11 4 472).
- Clean all blind holes of the crankcase.



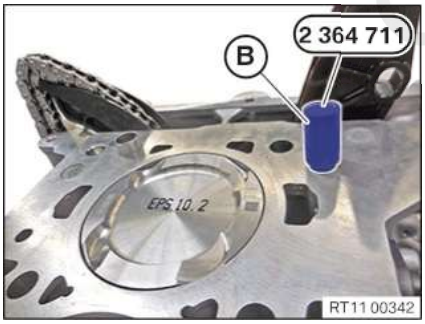
CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

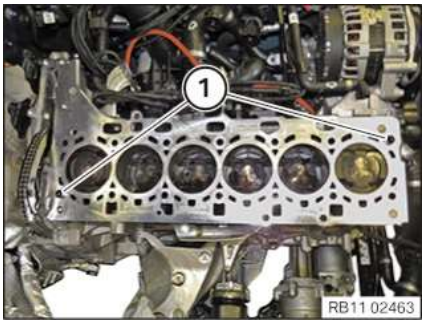
- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.
- Clean all threaded holes (1) of the crankcase with compressed air.



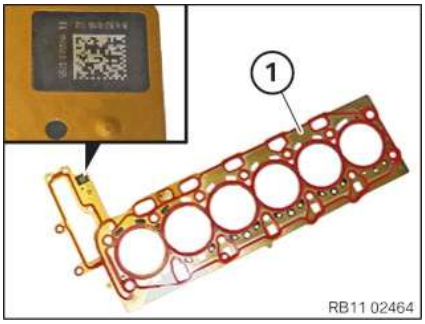
- Remove special tool (B) contained in the set of special tools 2 364 711.

68 – Installing the cylinder head gasket



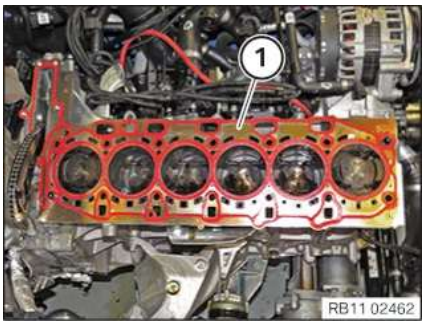
- Check the fitting sleeves (1) for damage and renew if necessary.

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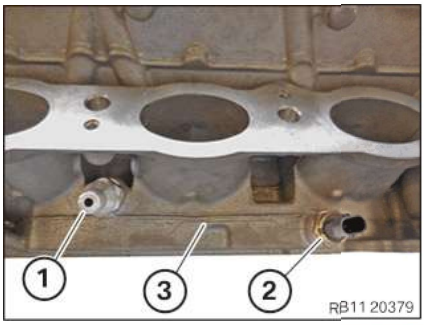
- Renew cylinder head gasket (1).

  Parts: Cylinder head gasket
- Install a thicker cylinder head gasket (1) with +0.3 mm in rebuilt cylinder heads.
- Check cylinder head gasket (1) using the part number.

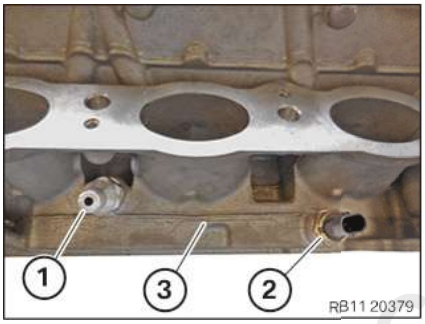


- Install cylinder head gasket (1) and place it correctly on the fitting sleeves.

69 – Renewing the cylinder head (remounting components)



- Detach ventilation connection (1) on cylinder head (3).
- Detach coolant temperature sensor (2) on cylinder head (3).



- Tighten ventilation connection (1) on new cylinder head (3).

Ventilation connection/special tool to cylinder head

M10	18 Nm

- Tighten coolant temperature sensor (2) on new cylinder head (3).

Coolant temperature sensor at cylinder head

Sensor		Tightening torque	13,5 Nm

70 – Installing the exhaust turbocharger (cylinder head removed)

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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

RISK OF DAMAGE

Damage to the electrical wastegate valve controller.

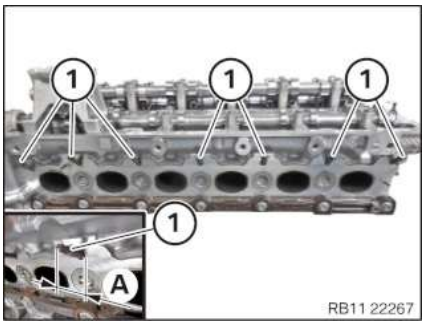
The electrical wastegate valve controller may be damaged as a result of the excessive forces required when removing and installing a jammed exhaust turbocharger.

- Do not pull on the electrical wastegate valve controller.
- Apply force to the turbine housing and exhaust manifold only.
  - Do not pull on the compressor housing.

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TECHNICAL INFORMATION

Do not damage the thermal compensating elements. The disassembly and installation including intermediate storage of the exhaust turbocharger is only permitted with mounted special tool 2 466 919 .



- Check stud bolt (1) for damage, renew if necessary.

  Parts: Stud bolt
- Check screw-in depth (A) of the upper stud bolt (1).

Screw-in depth of upper stud bolt on cylinder head

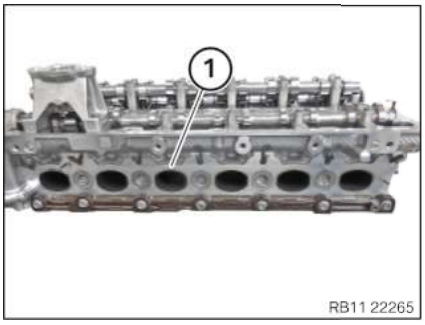
Dimension A	30 mm

- If necessary, screw the stud bolts in further or unscrew.



- Check stud bolts in the **marked area** for damage and replace if necessary.

  Parts: Stud bolt

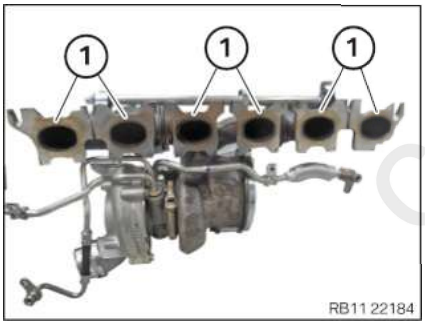


RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.
- Clean the sealing surfaces (1) on the cylinder head using special tool 0 495 102 (11 4 470).

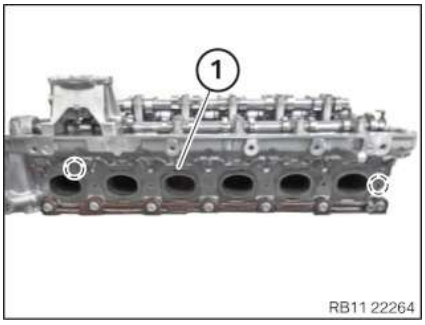


RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

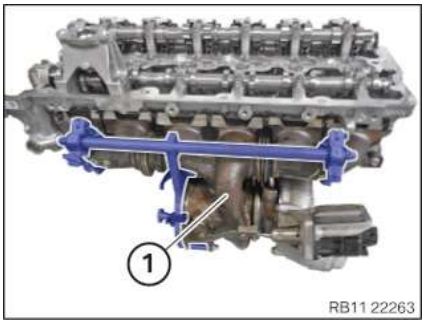
- Do not use any metal-cutting tools.
- Clean the sealing surfaces (1) on the exhaust turbocharger using the special tool 0 495 102 (11 4 470).



- Renew the gasket (1).

  Parts: Gasket
- Guide seal (1) into the **marked area** and install it.

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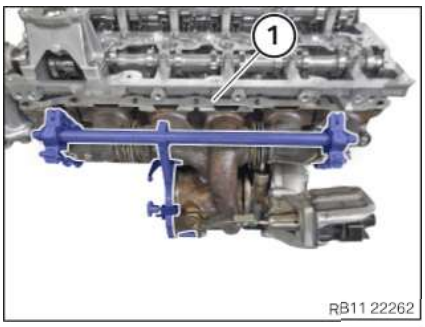
CAUTION

Heavy component.

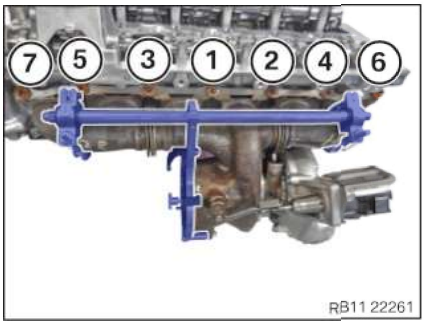
Heavy components can lead to injury or damage.

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

- Insert and install the exhaust turbocharger (1).
- Thermal compensating elements of the exhaust turbocharger (1) or exhaust manifold should **not** be bent or deformed.



- Feed in and install the sliding rail (1).
- Install sliding rail (1) so that the part number is **seen**.

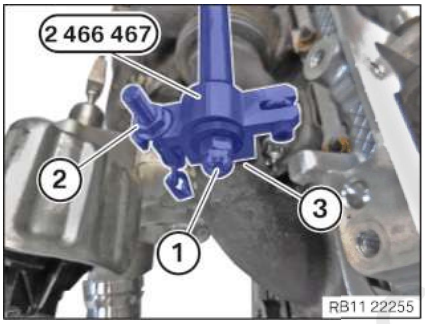


- Tighten nuts in sequence (1) to (7).

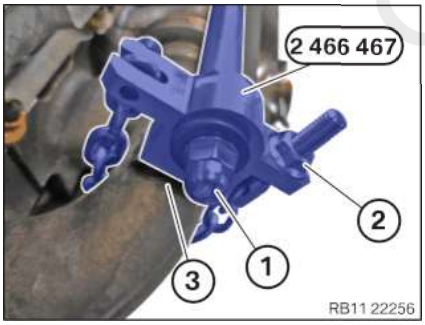
Exhaust manifold to cylinder head

Flange nutM7	*Replace flange nuts*	1. Jointing torque	10 Nm
		2. Jointing torque	10 Nm
		3. Jointing torque	16 Nm
		4. Jointing torque	16 Nm
		5. Jointing torque	16 Nm

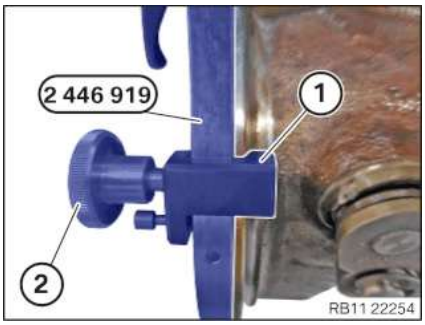
- Make sure the thermal compensating elements (A) have **not** been damaged.



- Loosen nuts (1) and (2).
- Pull out special tool 2 466 467 at the exhaust turbocharger (3) and remove.



- Release the nut (1) and (2).
- Pull out special tool 2 466 467 at the exhaust turbocharger (3) and remove.



- Loosen screw (2).
- Feed out the bracket (1) of the special tool 2 446 919 and set it aside.

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- Release clamping lever (1) of the special tool 2 446 919 in the **direction of arrow**.



- Loosen screw (1).
- Pull out special tool 2 446 919 at the exhaust turbocharger and remove.

71 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

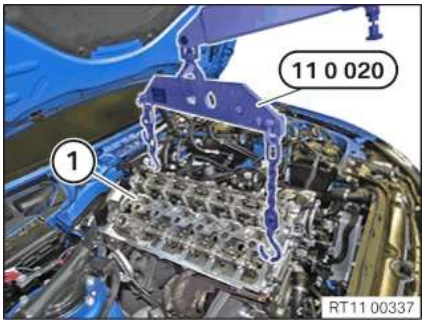
- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.

TECHNICAL INFORMATION

When replacing the cylinder head: The complete valve control and the Valvetronic servomotor are already pre-assembled for new cylinder heads.



RISK OF DAMAGE

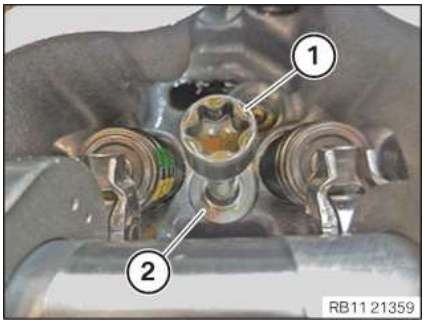
Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in, position and install cylinder head (1) and exhaust turbocharger with the help of an auxiliary person, the workshop crane and the special tool 0 490 567 (11 0 020).
- Ensure that the **guide rails** of the timing chain are **not** damaged.

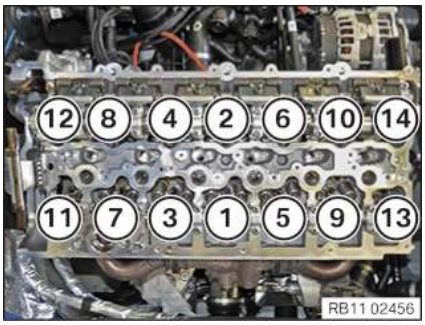
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- Insert and install washer (2).
- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do not wash off the coating (1) **of the cylinder head bolts** .
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of crankcase.
- Guide in and install cylinder head bolts (1).



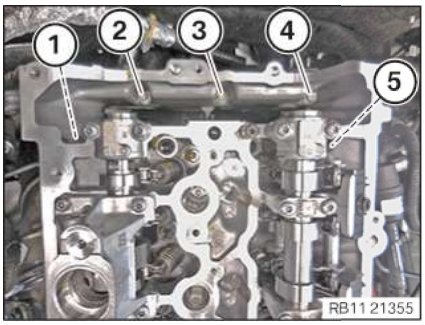
TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Screw in the cylinder head bolts in the sequence (1) to (14).
- Tighten the cylinder head bolts using the special tool 0 495 747 (11 8 580) and 0 490 504 (00 9 120) in the sequence (1) to (14).

Cylinder head to crankcase

M11	Observe tightening sequence. Fit new cylinder head bolts.	1. Jointing torque	30 Nm
		2. Angle of rotation	90 °
		3. Angle of rotation	180 °

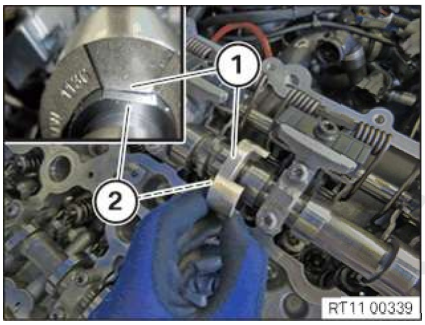


- Renew cylinder head bolts (1) to (5).

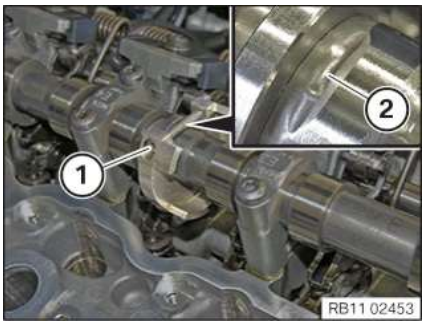
  Parts: Cylinder head bolts
- Make sure that there is **no** coolant, water or engine oil in the threaded holes of the timing case cover.
- Screw in cylinder head bolts (1) to (5).
- Tighten the cylinder head bolts in the order (1) to (5).

Cylinder head bolt to timing case cover

M8x40	Renew screws.	Tightening torque	19 Nm



- Feed in and position camshaft sensor wheel (1) on the intake camshaft (2).



- Rotate intake camshaft, if necessary in the position shown.

  The recess (2) must point upwards.
- Tighten down screw (1).

Camshaft sensor wheel to intake camshaft

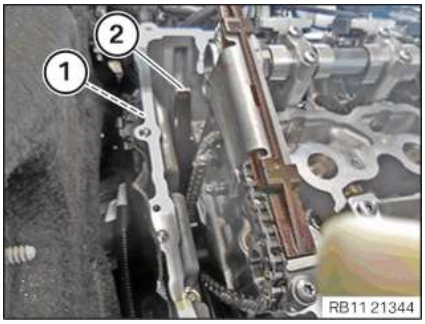
M4 x35		4,5 Nm



- Renew bearing journal (1).

  Parts: Bearing journal

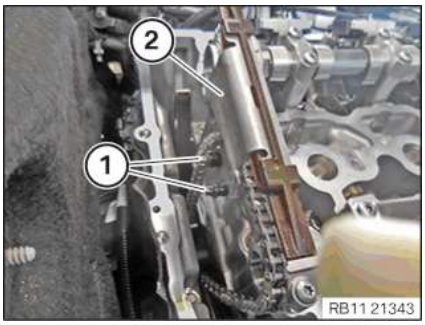
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- Feed in and install bearing journal (1) on the guide rail (2).
- Tighten the bearing journals (1).

Bearing journal to cylinder head

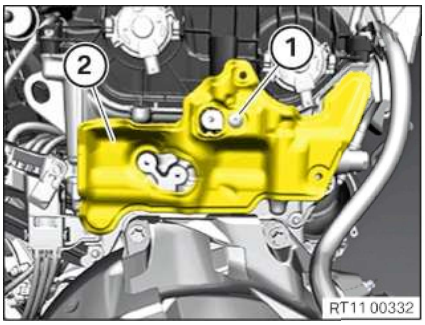
Bearing journal	Renew the bearing journal!	Tightening torque	20 Nm



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

Sliding rail to cylinder head

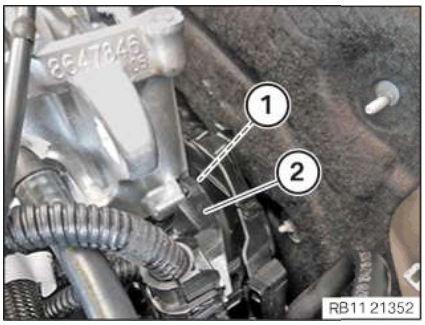
M6x16			8 Nm



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

Cover on rear cylinder head

M6		Tightening torque	8 Nm



RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

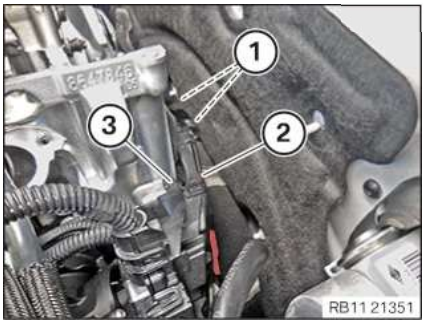
Trapped, crushed or damaged cables may cause short circuits and malfunctions.

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

- Guide in and install wiring harness section (2) for sensor system 1.
- Tighten down screw (1).

Cable routing to cylinder head, rear

M6 x 20		Tightening torque	8 Nm



RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

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

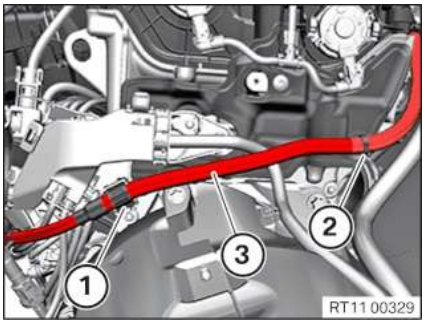
- Route all cables without abrasions, do not trap and crush.

- Guide in and install transmission wiring harness (2) on wiring harness section (3) for sensor system 1.
- Tighten the screws (1).

Cable routing to cylinder head, rear

M6 x 20		Tightening torque	8 Nm

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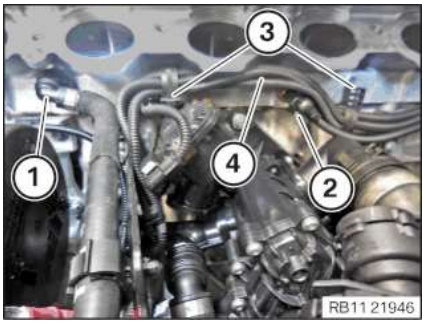
CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

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

- Insert and install the positive battery cable (3).
- Secure clamps (1) and (2).



RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

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

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

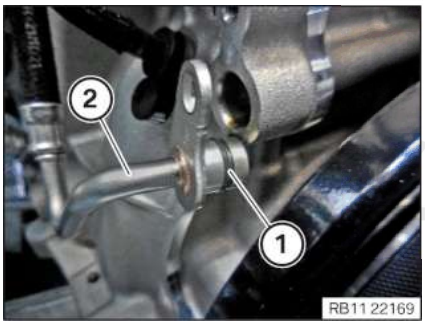
- Connect connectors (2) and lock.

  The connector must engage audibly.
- Guide in and position the wiring harness section (4) of sensor system **1**.
- Secure clamps (3).
- Connect and lock coolant line (1).
- Make sure that the cooling line (1) engages audibly.



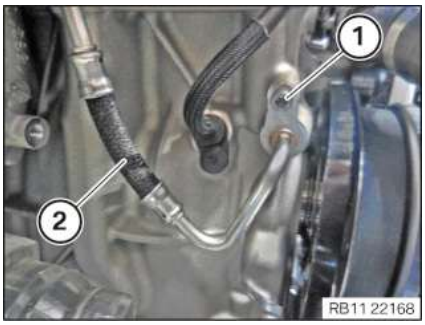
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.



- Renew sealing ring (1) on the oil feed line (2) of the exhaust turbocharger with special tool 0 496 714 (00 9 030).

  Parts: Sealing ring

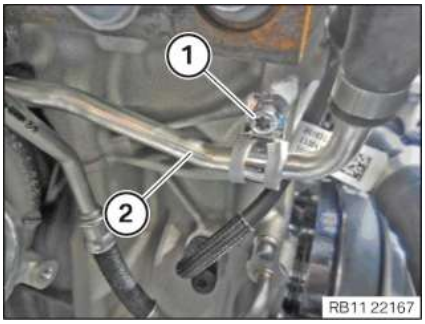


- Feed in and install the oil feed line (2) for the exhaust turbocharger.
- Tighten down screw (1).

Oil feed line for exhaust turbocharger to crankcase

M6 x 12	Replace sealing ring.	Tightening torque	8 Nm

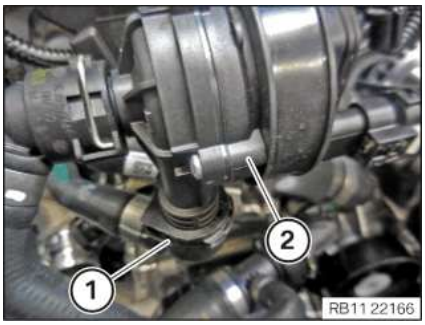
caldiagn.com



- Tighten screw (1) on the coolant return line (2).

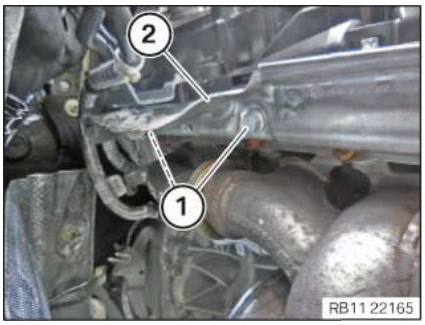
Coolant return line holder bracket to crankcase

M6X12		Tightening torque	8 Nm



- Connect coolant return line (1) to the coolant pump (2) for the exhaust turbocharger and lock.
  The coolant return line (1) must engage audibly.

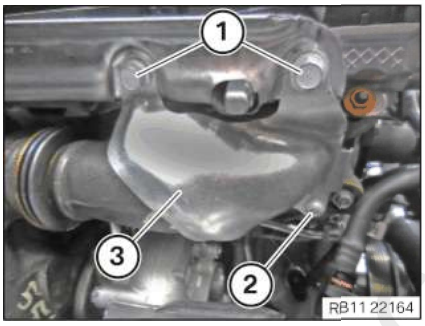
- Connect coolant return line (1) for the exhaust turbocharger and lock.
- Ensure the coolant return line (1) audibly engages.



- Feed in and install the heat shield (2).
- Renew screws (1).
  Parts: Bolts
  Tighten the screws (1).

Heat shield to cylinder head

M8X12	Renew screws.	Tightening torque	19 Nm



- Feed in and install the heat shield (3).
- Renew screws (1).
  Parts: Bolts
  Tighten the screws (1).

Heat shield to cylinder head

M8X12	Renew screws.	Tightening torque	19 Nm

- Renew the screw (2).
  Parts: Screw
  Tighten down screw (2).

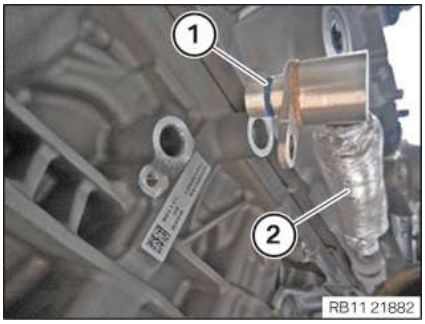
Heat shield to clamping strip

M6X16	Renew screw.	Tightening torque	8 Nm



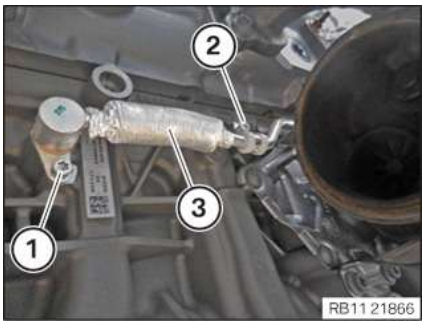
- Unscrew the bolts (1) of the special tool .
- Feed out the special tool at the cylinder head and remove.

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- Renew sealing ring (1) on the coolant feed line (2) of the exhaust turbocharger with special tool 0 496 714 (00 9 030).

  Parts: Sealing ring



- Feed in and install coolant feed line for the exhaust turbocharger (3).
- Tighten down screw (1).

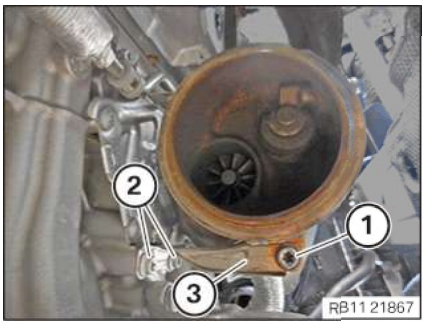
Coolant feed line to crankcase

M6X12		Tightening torque	8 Nm

- Tighten down screw (2).

Coolant feed line to crankcase

M6X12		Tightening torque	8 Nm



- Renew screws (1) and (2).

  Parts: Bolts
- Feed in and install support (3).
- Tighten the screws (2).

Exhaust turbocharger support to crankcase

M8 x 20	Renew screws.	19 Nm

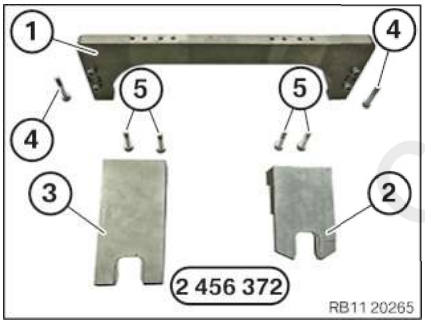
- Tighten the screws (1).

Exhaust turbocharger to support

M8 x 25	Renew screw.	19 Nm

POSTPROCESSES

72 – Adjust the camshafts with the special tool



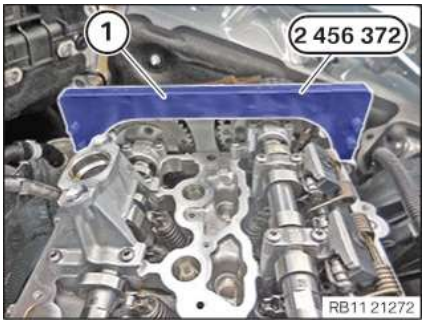
- Overview of the set of special tools 2 456 372:

Number	Description
1	Basic carrier
2	Setting gauge to adjust the intake camshaft
3	Setting gauge to adjust the exhaust camshaft
4	Basic carrier screws on cylinder head
5	Screw gauge on basic carrier

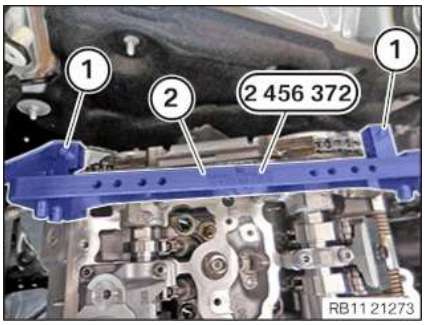


- Use the setting gauge 0.7 ° (1) from the set of special tools 2 456 372 to adjust the intake camshaft.
- Use the setting gauge 0.5 ° (2) from the set of special tools 2 456 372 to adjust the exhaust camshaft.

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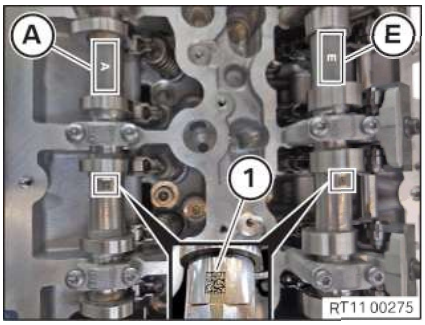
- Position the basic carrier (1) from the set of special tools 2 456 372 on the cylinder head.



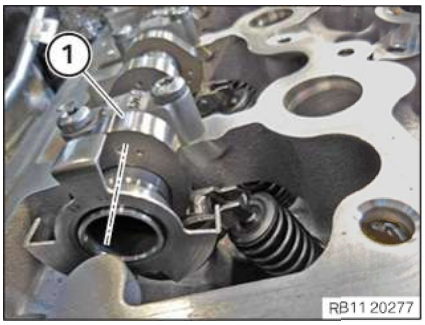
- Tighten the screws (1) from the set of special tools 2 456 372 on the basic carrier (2).

Basic carrier to cylinder head

M6		Tightening torque	8 Nm



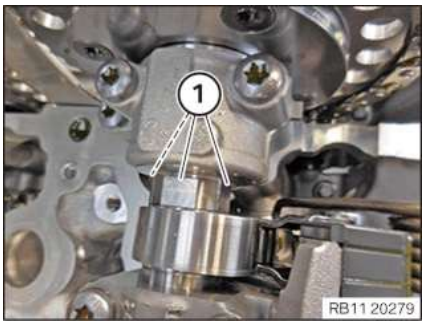
- Turn the intake camshaft (E) and the exhaust camshaft (A) such that the marks (1) can be read from the top.



- Ensure that the cam (1) on the exhaust camshaft on **cylinder 1** points to the inside right at a slight angle.

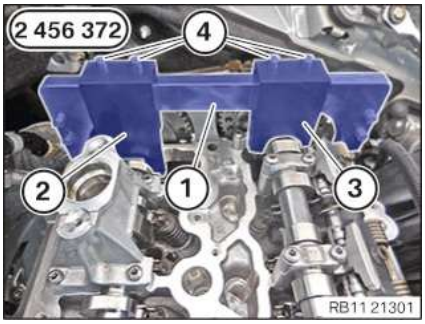


- Ensure that the cam (1) on the intake camshaft on **cylinder 1** points to the inside left at an angle.



- Ensure that the flattened areas (1) on the intake camshaft and the exhaust camshaft point upwards.

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- Position the setting gauge 0.5° (2) from the set of special tools 2 456 372 between the exhaust camshaft and the basic carrier (1) from the set of special tools 2 456 372.
- Position the setting gauge 0.7° (3) from the set of special tools 2 456 372 between the intake camshaft and the basic carrier (1) from the set of special tools 2 456 372.
- Tighten the screws (4).

Test gauge to basic carrier

M6		Tightening torque	8 Nm

73 – Installing the intake adjuster

NOTICE

The figure shows the rear side of the engine.

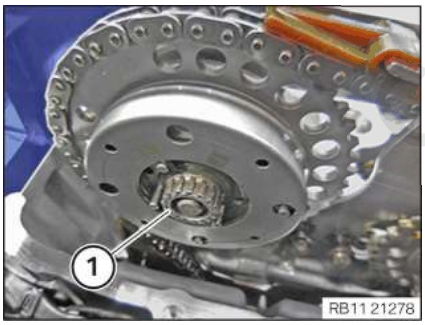


- Keep intake adjuster (1) marked IN ready.

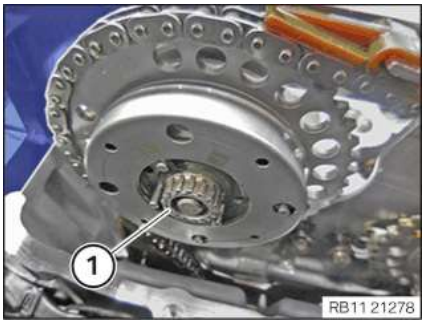


- Feed in intake adjuster (1) in the timing chain (2) and position on the intake camshaft .

74 – Install the VANOS central valve of the intake adjuster

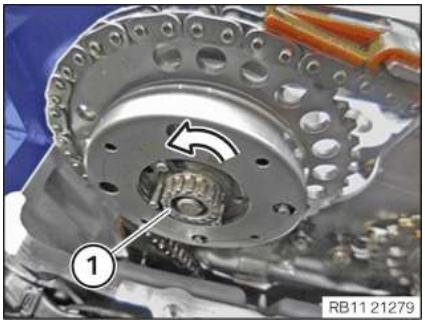


- Guide in the VANOS central valve (1) of the intake adjuster and install.



- Hand-tighten the VANOS central valve (1) of the intake adjuster.

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- Release the VANOS central valve (1) of the intake adjuster in the **direction of the arrow** by 60 °.

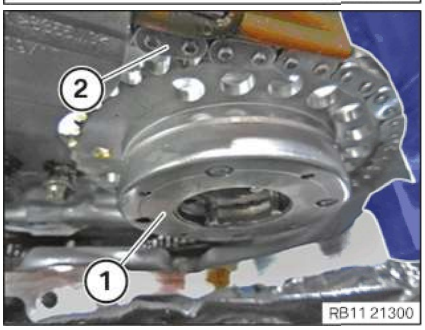
75 – Install exhaust camshaft adjuster

NOTICE

The figure shows the rear side of the engine.

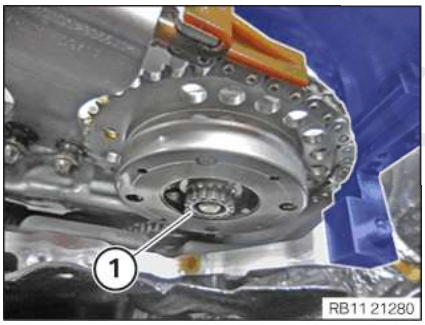


- Keep exhaust camshaft adjuster (1) marked EX ready.

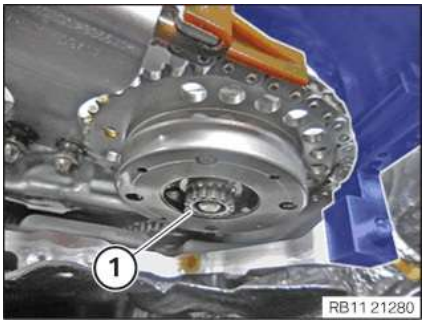


- Feed in exhaust camshaft adjuster (1) in the timing chain (2) and position on the exhaust camshaft .

76 – Installing the VANOS central valve of the exhaust camshaft adjuster

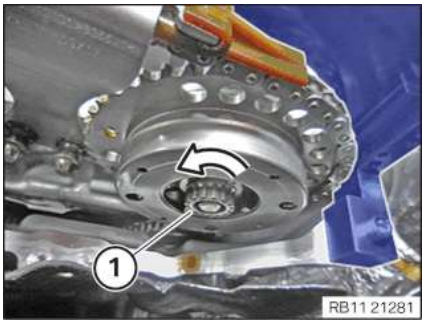


- Guide in the VANOS central valve (1) of the exhaust camshaft adjuster and install.



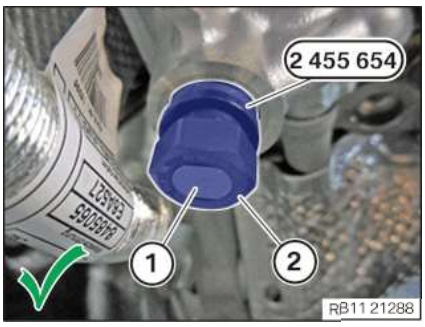
- Hand-tighten the VANOS central valve (1) of the exhaust camshaft adjuster.

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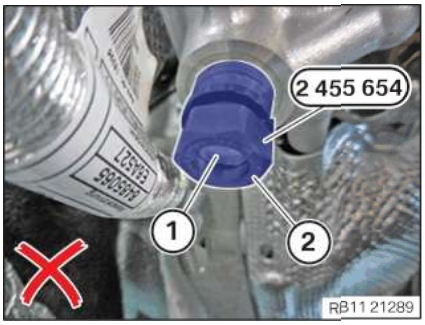
- Release the VANOS central valve (1) of the exhaust camshaft adjuster in the **direction of the arrow** by 60 °.

77 – Pretension the timing chain with the special tool



- Make sure that the timing chain is **correctly** pre-tensioned with the special tool 2 455 654.

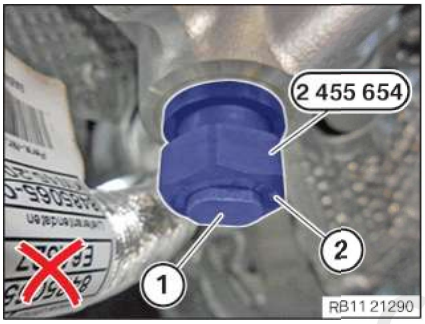
  The pin (1) must align **precisely** with housing (2).



- Make sure that the preload of the timing chain is no **insufficient**.

  The preload is insufficient when the pin (1) of the special tool 2 455 654 is not aligned flush with the housing (2).

  The timing chain is **not correctly** pre-tensioned.



- Make sure that the preload of the timing chain is not **too high**.

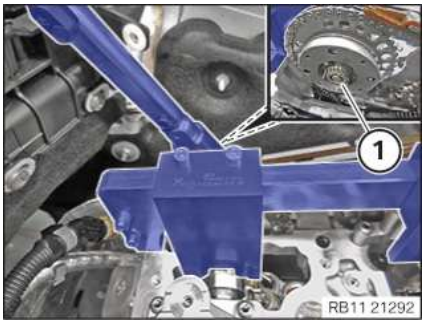
  The preload is too high when the pin (1) of the special tool 2 455 654 is not aligned flush with the housing (2).

  The timing chain is **not correctly** pre-tensioned.

78 – Tightening the VANOS central valve of the exhaust camshaft adjuster



- To tighten the VANOS central valve (1), use the reversible ratchet (2) from the special tool 0 496 855 with special tool 2 450 487.



- Tighten the VANOS central valve (1) of the exhaust camshaft adjuster.

VANOS central valve to camshaft

M20 x 1.5		1. Jointing torque	10 Nm
		2. Jointing torque	30 Nm
		3. Jointing torque	50 Nm
		4. Angle of rotation	35 °

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79 – Tightening the VANOS central valve of the intake adjuster



- To tighten the VANOS central valve (1), use the reversible ratchet (2) from the special tool 0 496 855 with special tool 2 450 487.

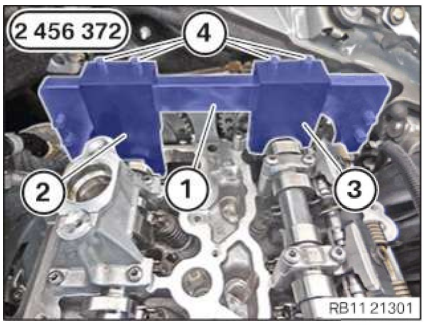


- Tighten the VANOS central valve (1) of the intake adjuster.

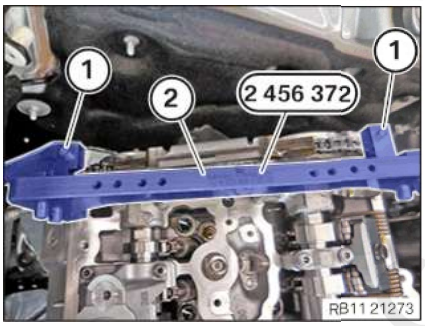
VANOS central valve to camshaft

M20 x 1.5		1. Jointing torque	10 Nm
		2. Jointing torque	30 Nm
		3. Jointing torque	50 Nm
		4. Angle of rotation	35 °

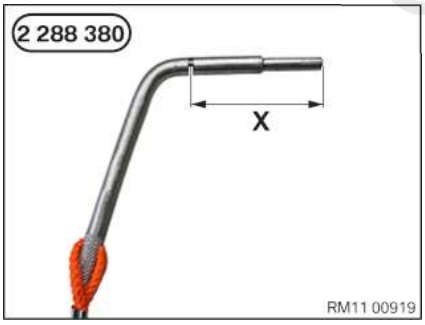
80 – Disassembling all special tools



- Unscrew the bolts (4) from the set of special tools 2 456 372.
- Feed out the setting gauge 0.5 ° (2) from the set of special tools 2 456 372 between the exhaust camshaft and the basic carrier (1) and remove.
- Feed out the setting gauge 0.7 ° (3) from the set of special tools 2 456 372 between the intake camshaft and the basic carrier (1) and remove.



- Unscrew the bolts (1) from the set of special tools 2 456 372.
- Thread the basic carrier (2) out of the special tool 2 456 372 and remove.

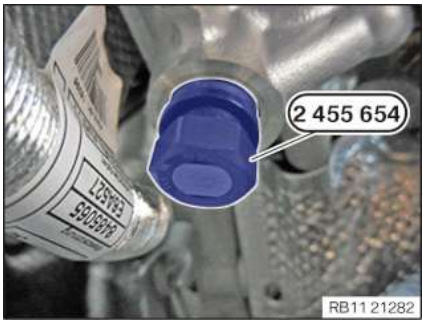


- Guide the special tool 2 288 380 out and remove.



- Guide the special tool 0 493 380 (11 6 480) out and remove.

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- Guide the special tool (1)2 455 654 out and remove.

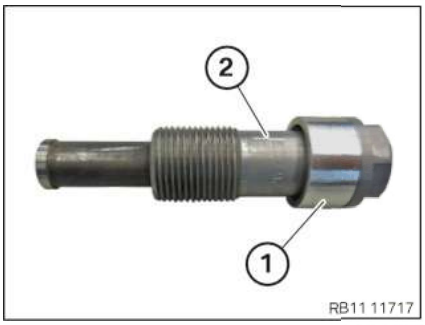
81 – Install chain tensioner

TECHNICAL INFORMATION

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



- Drain the oil chamber in the chain tensioner when reusing the chain tensioner.
- Place the chain tensioner on a level support and slowly compress and release it again in the direction of the arrow.
- Catch and dispose of emerging engine oil.
- Repeat process twice.

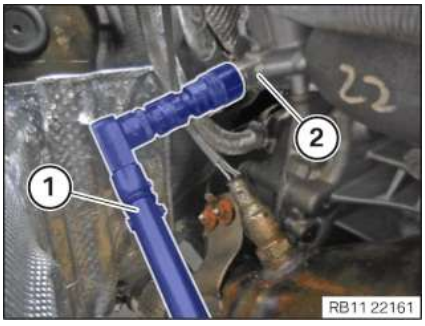


- Renew the sealing sleeve (1).

  Parts: Sealing sleeve
- Guide the sealing sleeve (1) onto the chain tensioner (2) and install.



- Insert and install the chain tensioner (1).



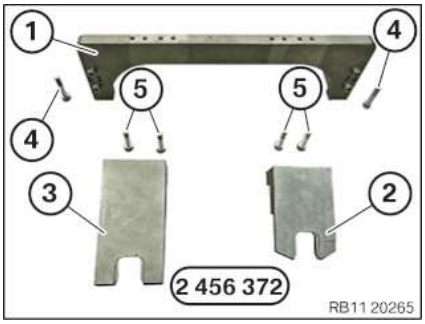
- Tighten the chain tensioner (2) using commercially available tools (1).

Chain tensioner to cylinder head

Chain tensioner		Tightening torque	20 Nm
		Angle of rotation	40 °

82 – Checking camshaft timing

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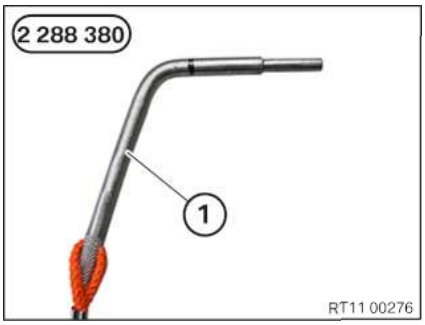
- Have the set of special tools 2 456 372 ready.

Number	Description
1	Basic carrier
2	0.7° setting gauge to adjust the intake camshaft
3	0.5° setting gauge to adjust the exhaust camshaft
4	Basic carrier screws on cylinder head
5	Screw gauge on basic carrier



- Keep the test gauge from the set of special tools 2 358 122 ready.

Number	Description
1	Test gauge to fix the intake camshaft
2	Test gauge to fix the exhaust camshaft



- Have the special tool 2 288 380 ready.

Number	Description
1	Locating stud



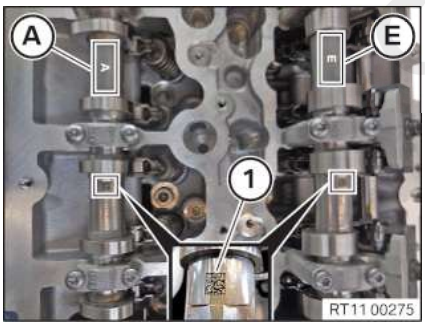
RISK OF DAMAGE

Damage to the engine.

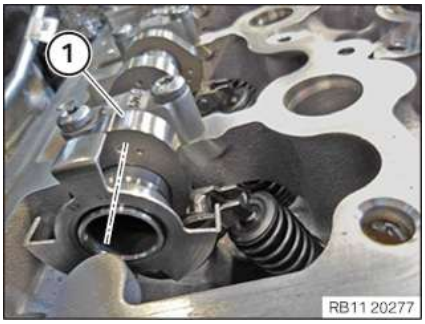
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Turn the engine with the special tool 0 493 380 (11 6 480) to the TDC firing position of **cylinder 1**.



- Make sure that the marks (1) on the intake camshaft (E) and the exhaust camshaft (A) are legible from above.

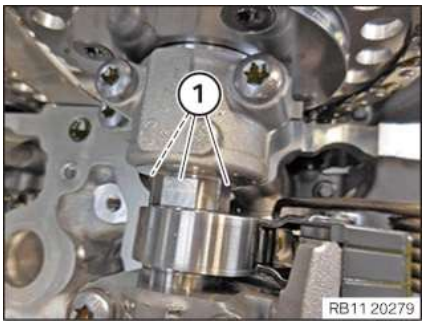


- Ensure that the cam (1) on the exhaust camshaft on **cylinder 1** points to the inside right at a slight angle.

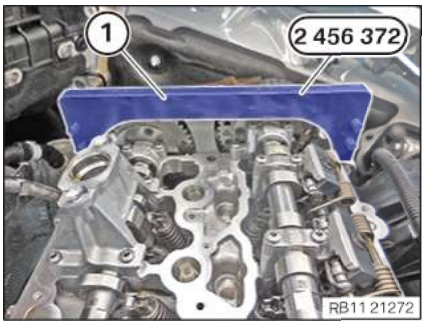
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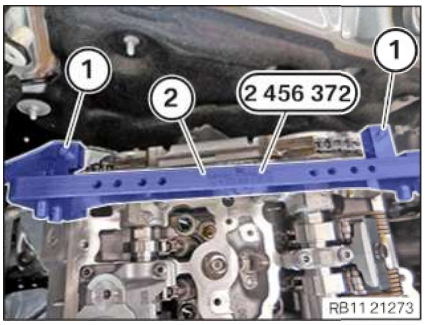
- Ensure that the cam (1) on the intake camshaft on **cylinder 1** points to the inside left at an angle.



- Ensure that the flattened areas (1) on the intake camshaft and the exhaust camshaft point upwards.



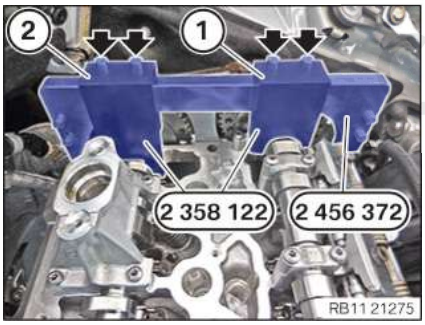
- Position the basic carrier (1) from the set of special tools 2 456 372 on the cylinder head.



- Tighten the screws (1) from the set of special tools 2 456 372 on the basic carrier (2).

Basic carrier to cylinder head

M6		Tightening torque	8 Nm



- Position the test gauge (1) from the set of special tools 2 358 122 between the intake camshaft and the basic carrier from the set of special tools 2 456 372.
- Position the test gauge (2) from the set of special tools 2 358 122 between the exhaust camshaft and the basic carrier from the set of special tools 2 456 372.
- Tighten screws (arrows).

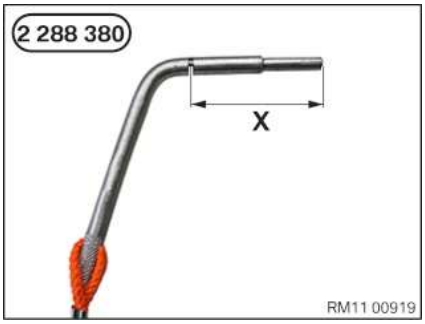
Test gauge to basic carrier

M6		Tightening torque	8 Nm



- Thread the sealing cap (1) out and remove.

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- **Vehicles with automatic transmission:**

  Dimensions (X) = 66 mm

  The special tool 2 288 380 must be inserted in the dowel hole to dimension (X).



- **Vehicles with automatic transmission:**

  Special tool 2 288 380 **incorrectly** positioned.

  The TDC firing position of cylinder 1 was **not** reached.



- **Vehicles with automatic transmission:**

  Special tool 2 288 380 has been **correctly** positioned.

  The engine **is in the** TDC firing position of cylinder 1.

83 – Installing the intake plenum

RISK OF DAMAGE

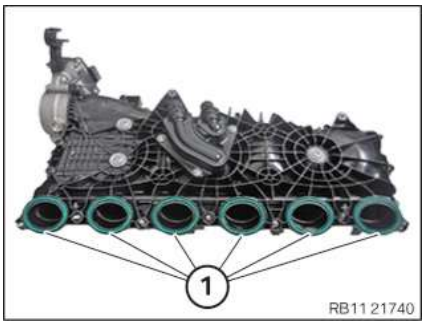
Improper routing of cables and wiring harnesses.

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

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

TECHNICAL INFORMATION

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



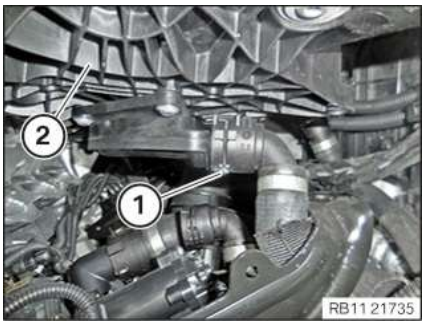
- Renew gaskets (1).

  Parts: Seals

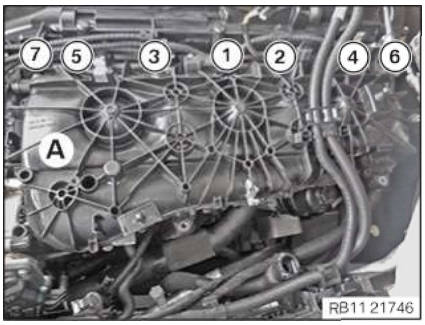
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- Clean contact surface (1).



- Feed in and position intake plenum (2).
- Connect and lock coolant line (1).
- Make sure that the cooling line (1) engages audibly.



TECHNICAL INFORMATION

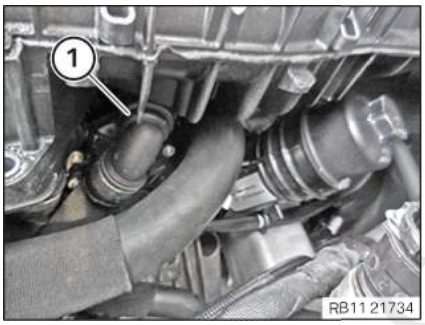
Additional coolant can escape. Make sure that no coolant enters the intake port of the cylinder head.

- Position the intake plenum (A).
- Tighten screws in the order (1) to (7).

Note: Tighten the bolts in 360 degree steps.

Intake plenum to cylinder head

M6		Tightening torque	10 Nm



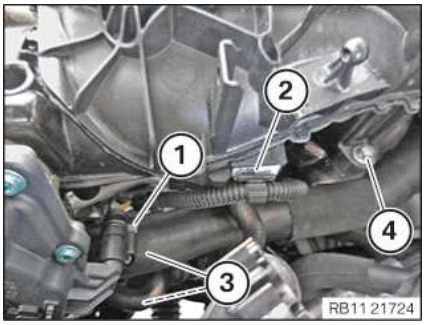
- Connect and lock coolant line (1).
- Make sure that the cooling line (1) engages audibly.



- Tighten down screw 1.

Intake plenum to support

M6X25		Tightening torque	8 Nm



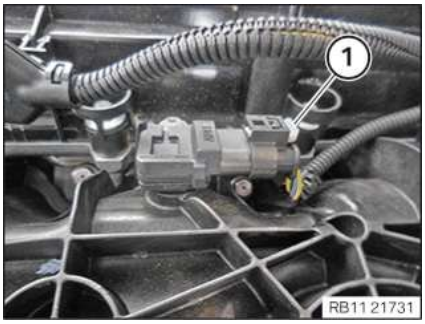
- Tighten down screw (4).

Intake plenum to support

M6X25		Tightening torque	8 Nm

- Thread in and install coolant line (3).
- Secure clamps (2).
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

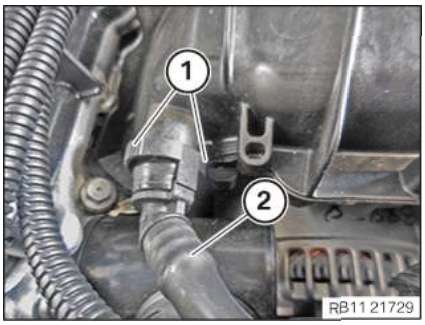
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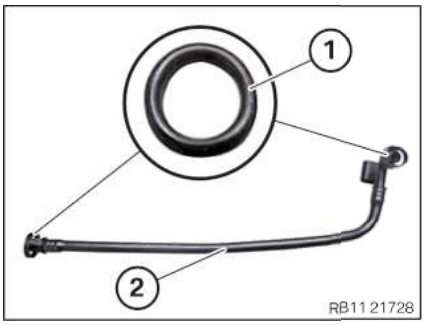
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.



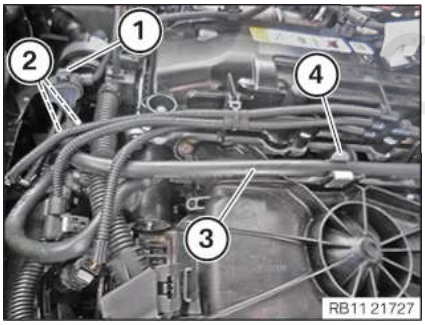
- Check sealing ring (1) for damage and renew tank ventilation line if necessary.



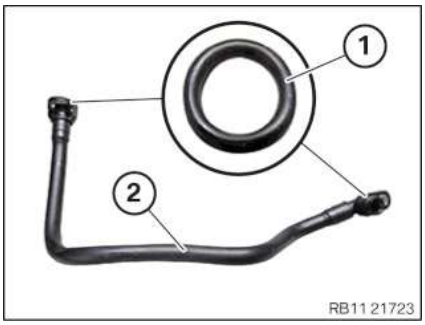
- Insert and install the tank ventilation line (2).
- Ensure that the locks (1) engage audibly.



- Check sealing ring (1) for damage and renew tank ventilation line (2) if necessary.

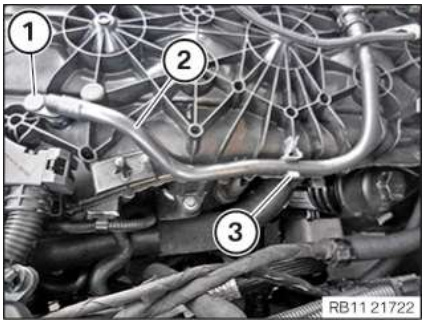


- Insert and install the tank ventilation line (3).
- Ensure that the locks (2) engage audibly.
- Secure the tank ventilation line (3) to the clamp (4).
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.



- Check sealing ring (1) for damage and renew tank ventilation line (2) if necessary.

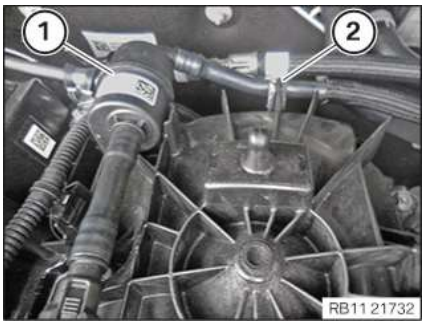
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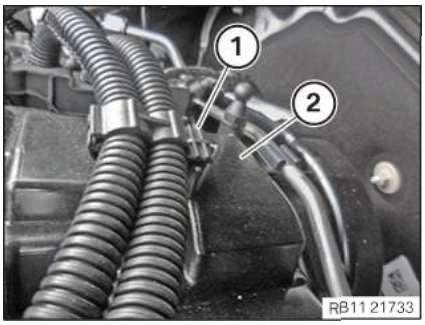
- Insert and install the tank ventilation line (2).
- Secure the tank ventilation line (2) to the clamp (3).
- Tighten down screw (1).

Tank ventilation line to intake plenum

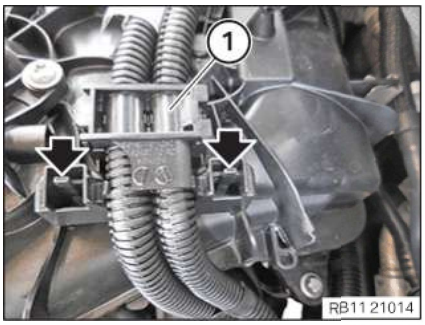
Oval-head screw		Tightening torque	3 Nm



- Insert and install the tank ventilation line (1).
- Secure the tank ventilation line (1) to the clamp (2).

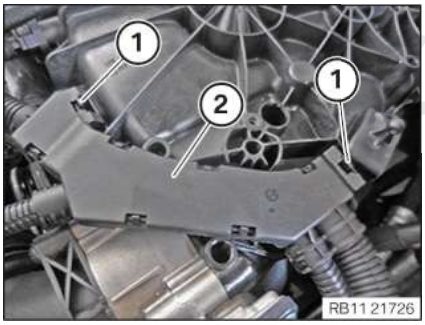


- Secure the wiring harness section(1) for the injectors and ignition coils on the cylinder head cover (2).



- Insert and install the wiring harness section (1) for the injectors and ignition coils.

  The locks (arrows) must engage audibly.

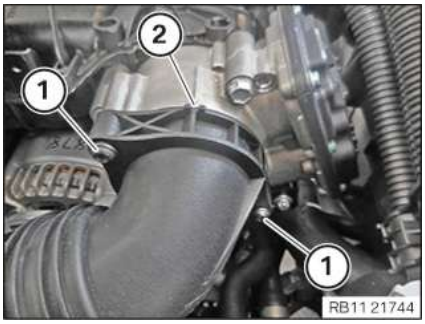


- Feed in and install wiring harness section (2) for sensor system **2**.
- Ensure that the locks (1) engage audibly.



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

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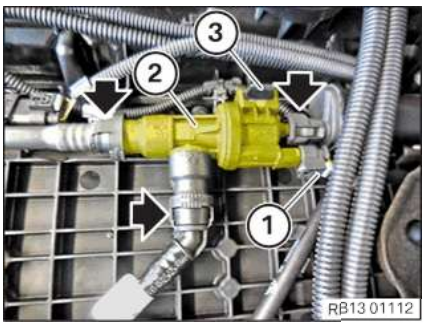


- Insert and install charge air line (2).
- Tighten the screws (1).

Charge air line to throttle valve

M6x30		Tightening torque	8 Nm

84 – Installing the tank vent valve

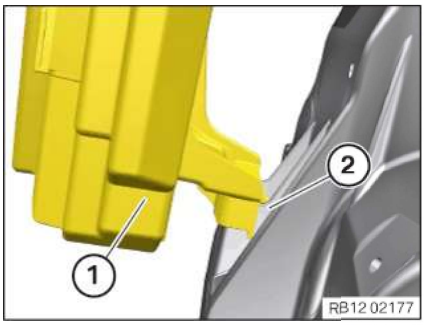


- Secure the tank vent valve (2) to the holder (3).
- Connect and lock the tank ventilation lines (arrows).

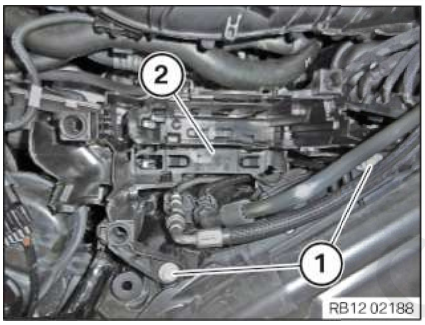
  The tank ventilation lines (arrows) must audibly engage.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

85 – Installing the control unit holder



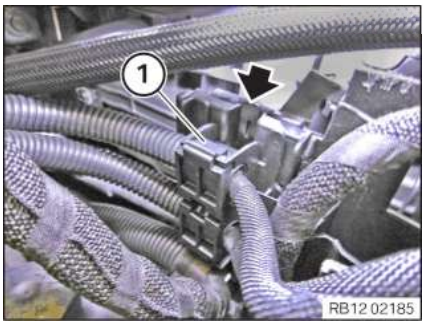
- Make sure the bottom control unit holder (1) is inserted correctly into the fixture (2).



- Guide in and install control unit holder (2).
- Tighten the screws (1).

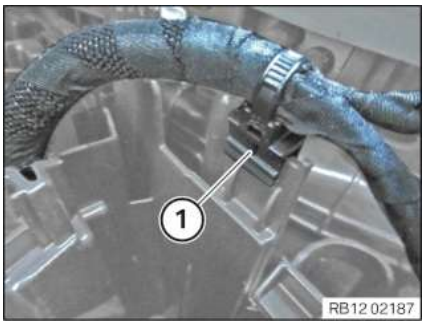
Control unit holder on spring strut dome

Hexagon screw		Tightening torque	8 Nm



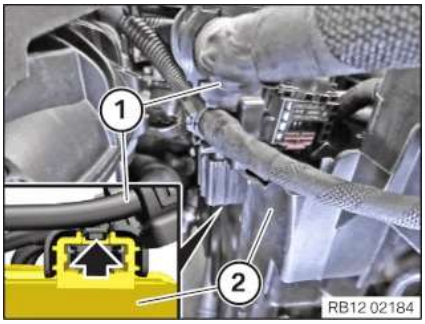
- Feed in and install the cable clip (1).

  Lock (arrow) must audibly engage.

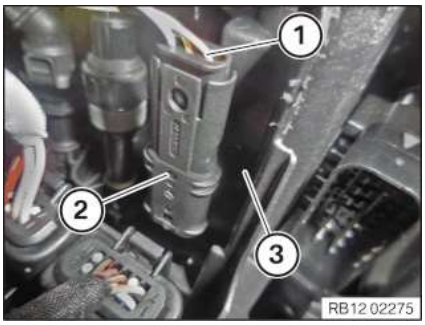


- Secure clamps (1).

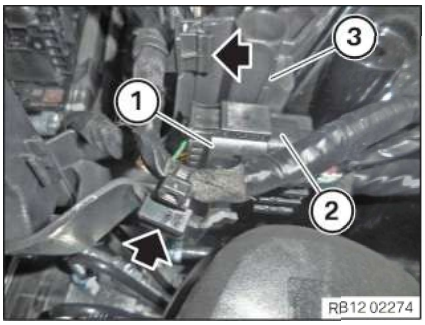
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- Connect the cable clip (1) with the control unit holder (2) and lock it.
  Lock (arrow) must audibly engage.

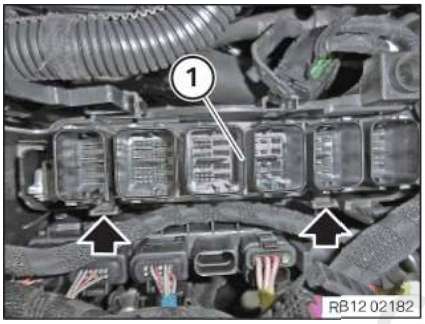


- Connect connector (2) to the control unit holder (3) and lock it.
  The connector (2) must engage audibly.
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.

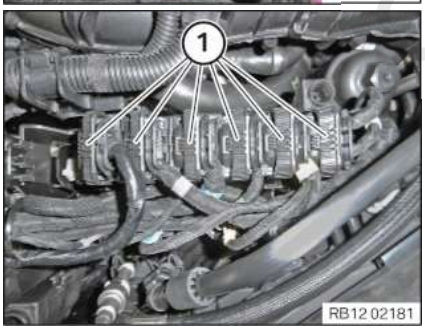


- Connect and lock the connector (2) with the control unit holder (3).
  The connector (2) must engage audibly.
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.
- Secure the clamps (arrows).

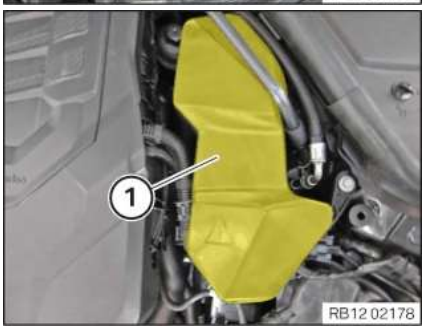
86 – Installing the DME control unit



- Feed in and install DME control unit (1).
  The locks (arrows) must engage audibly.



- Connect connectors (1) and lock.
  All connectors (1) must engage audibly.



- Insert and install cover (1) into guides.

87 – Installing the integrated supply module (PDM)

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WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

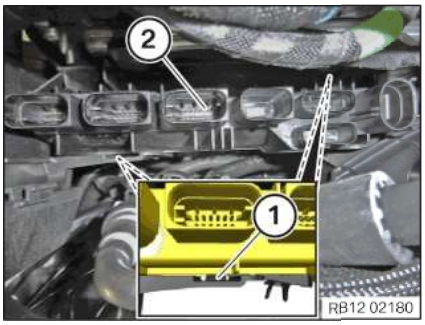
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

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



- Insert and install the integrated supply module (PDM) (2).

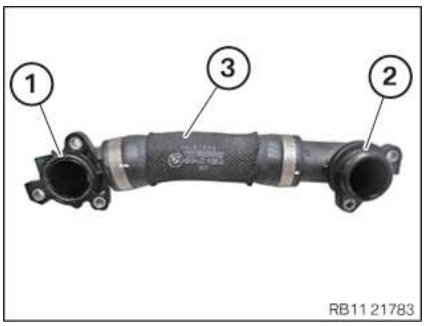
  The latch mechanisms (1) must engage audibly.
- Unlock the latch mechanisms (1).



- Connect connectors (1) and lock.

  The connectors (1) must engage audibly.

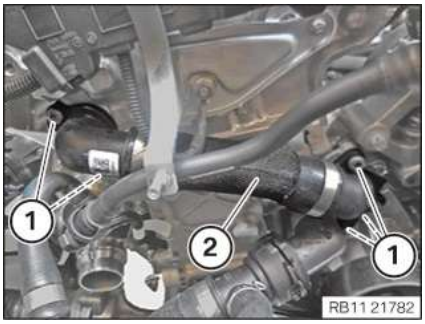
88 – Install the coolant line between the cylinder head and the coolant pump



- Check sealing rings (1) and (2) for damage; renew coolant line (3) if necessary.

  Parts: Sealing ring

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TECHNICAL INFORMATION

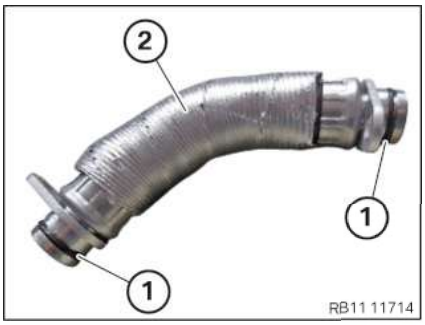
When assembling, it is essential to observe screwing sequences and tightening torques. Non-observance of these requirements may result in leaks and damage.

- Feed in and install coolant line (2).
- Hand-tighten the bolts (1).
- Tighten the screws (1).

Coolant line to coolant pump/cylinder head

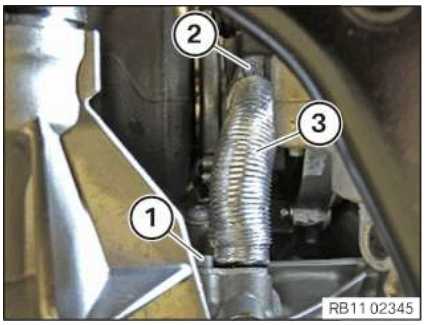
M6x20		Tightening torque	8 Nm

89 – Installing the oil return line for the exhaust turbocharger



- Renew the sealing rings (1) on the oil return line (2).

  Parts: Sealing ring



- Feed in and install the oil return line (3).
- Tighten down screw (2).

Oil return line to turbocharger

M6 x 12		8 Nm

- Tighten down screw (1).

Oil return line to crankcase

M6 x 12		8 Nm

90 – Install catalytic converter



- Renew the V-clip (1).

  Parts: V-band clamp



- Renew the gasket (1).

  Parts: Gasket

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- Feed in and install catalytic converter.
- Lock clamp (1).

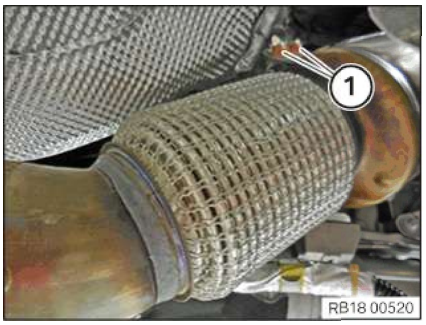
  The clamp (1) must engage audibly.



- Tighten V-band clamp (1).

Catalytic converter to turbocharger

V-band clamp	Replace V-band clamp.	Tightening torque	19 Nm

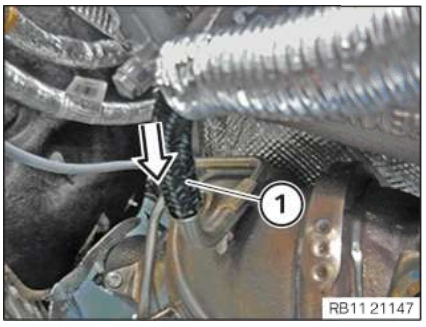


- Renew nuts (1).

  Parts: Nuts
- Tighten nuts (1).

Catalytic converter to holder

M8 nut	Renew nut.	Tightening torque	28 Nm



- **If installed: Connect pressure hose.**

  Renew pressure hose (1).

  Parts: Pressure hose
- Connect the pressure hose (1) in direction of arrow to the limit position.

91 – Installing the complete exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

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

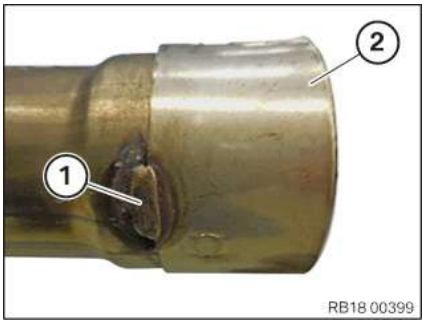
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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

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CAUTION

Swarf resulting from sawing or grinding components.

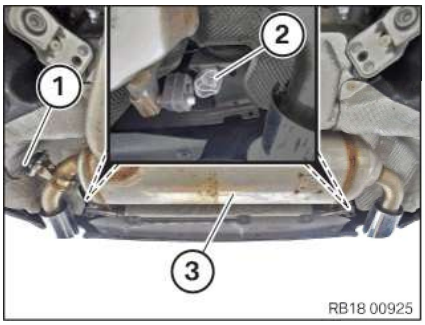
Danger of injury!

- Conduct all work in appropriate personal protective equipment only.
- Wear safety goggles and protective gloves.

- **Equipment specification 1 (ribbon clamp)**

  Open the weld seam (1) with a conventional tool.
- Remove ribbon clamp (2).
- Renew the (2) ribbon clamp.

  Parts: Ribbon cable clamp



- Feed in and install the exhaust system (3) with a second person.
- Renew nuts (2).

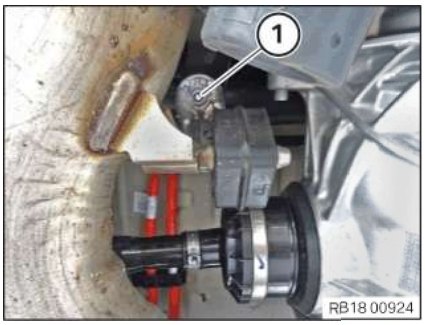
  Parts: Nuts
- Tighten nuts (2).

Rear silencer to body / bumper support

M8	Replace nuts.	Tightening torque	19 Nm

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.



- Renew nut (1).

  Parts: Nut
- Tighten the bolt (1) on the rear axle support.

Exhaust system to rear axle carrier

Nut M8	Renew nut.	Tightening torque	19 Nm

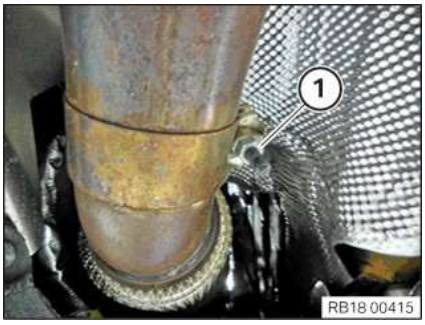


- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Front pipe / petrol particulate filter on transmission holder

M8	Renew nut.	Tightening torque	19 Nm

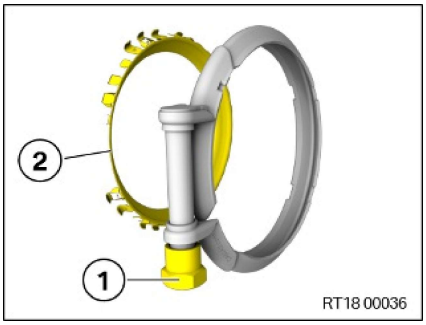


- Tighten the ribbon clamp (1).

Exhaust system to catalytic converter

Ribbon cable clamp	Renew flat band clip.	Tightening torque	26 Nm

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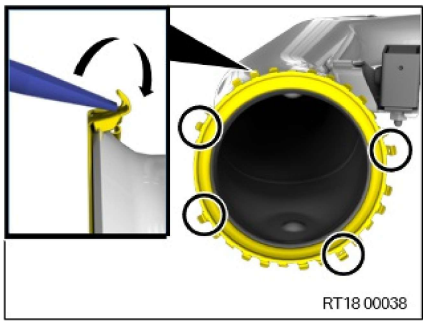


- **Equipment specification 2 (V-clips)**

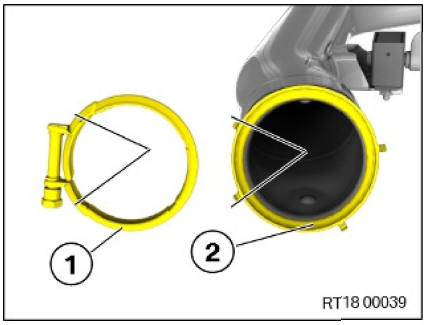
  Renew V-band clamp.

  Parts: V-band clamp

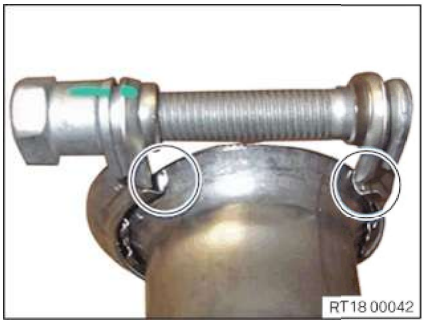
  Unscrew the nut (1) and remove the sealing ring (2).



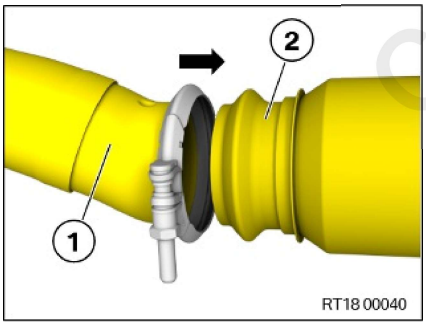
- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.



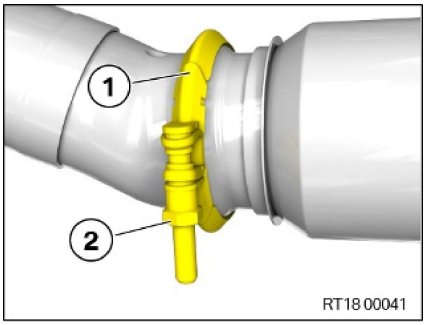
- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).



- Ensure that the V-clip rests against the sheet metal tabs in the marked areas after mounting.



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



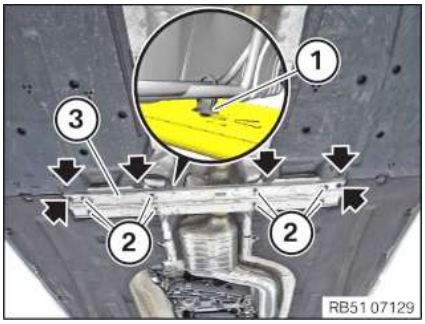
- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

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

92 – Install the connecting supports on the tunnel

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- Guide in and install connecting support (3) on the tunnel.
- Tighten the screws (2).

Connecting support to tunnel

M8x25 screw		Tightening torque	20 Nm
Screw		Tightening torque	3 Nm

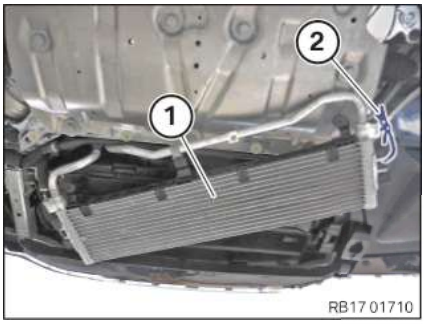
- Tighten screws (arrows).

Connecting support to tunnel

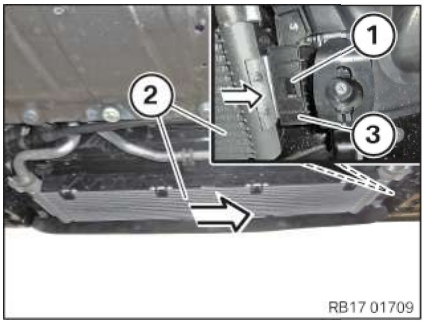
M8x25 screw		Tightening torque	20 Nm
Screw		Tightening torque	3 Nm

- **If installed:** Secure clamps (1).

93 – If installed: Secure engine oil cooler



- Remove the cable straps (2).
- Position engine oil cooler (1).



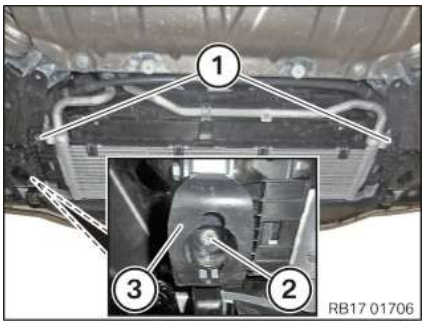
- Feed in and install the engine oil cooler (2) on the holder (3) in the direction of the arrow.
- Ensure that the lock (1)engages audibly.



- Tighten down screw (1).

Engine oil cooler to bumper support

M6X25		Tightening torque	8 Nm



- Renew rivet (2).

  Parts: Rivet
- Install and rivet damper (3).
- Tighten the screws (1).

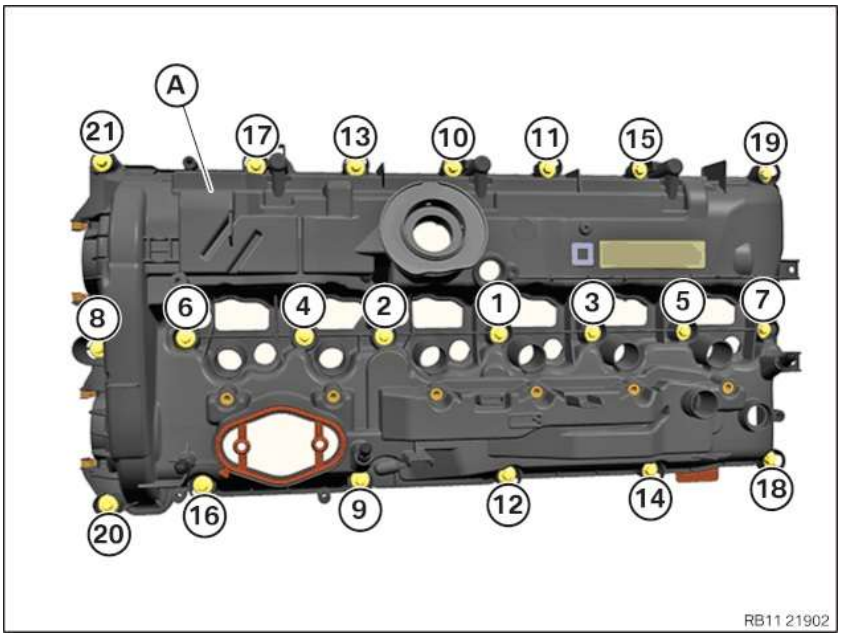
Cover, front bottom on side

Hexagon screw for thermoplastic		Tightening torque	3 Nm

94 – Installing cylinder head cover

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Overview: Bolts of the cylinder head cover



1 - 21 Bolts of the cylinder head cover

A Cylinder head cover

RISK OF DAMAGE

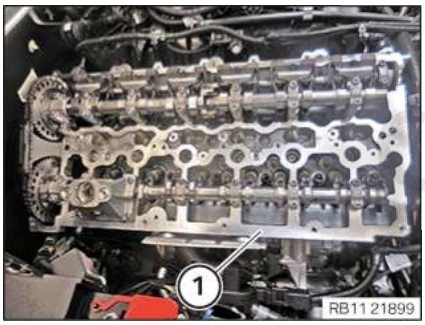
Improper routing of cables and wiring harnesses.

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

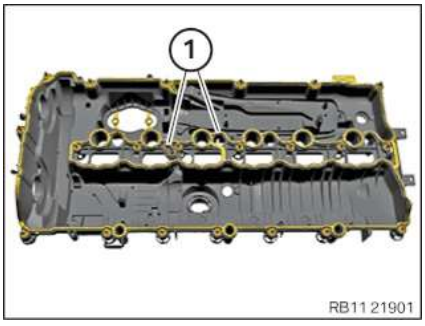
- Route all cables without abrasions, do not trap and crush.

TECHNICAL INFORMATION

Latch mechanisms, guides and mounting elements must not be damaged or missing.



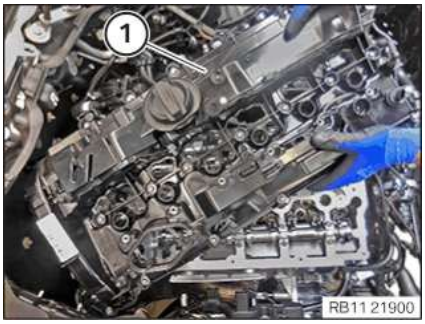
- Contact surface (1) must be free from oil and grease.



- Replace the seals (1).

  Parts: Seals

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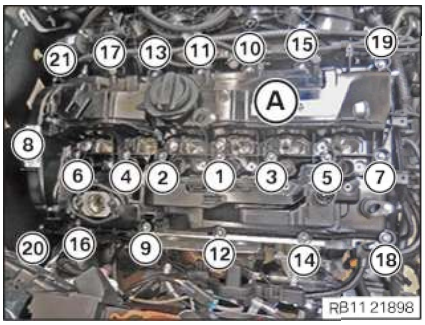


- Insert and install cylinder head cover (1).



- Ensure that the cylinder head cover (1) is installed in the **marked** area correctly on the high pressure pump bracket(2).

  The cylinder head cover (1) must not touch the high pressure pump bracket (2) in the **marked** area.



- Position the cylinder head cover (A).
- Make sure that the cylinder head cover (A) does not touch the high pressure pump bracket!
- Tighten all bolts in sequence (1) to (21).

Cylinder head cover to cylinder head

M6X30		Jointing torque	8 Nm

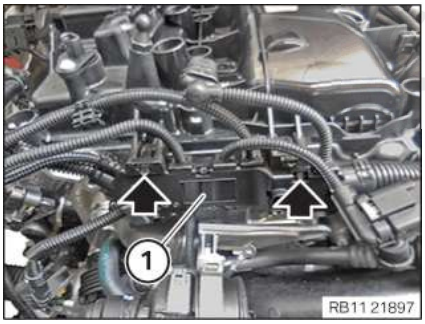
- Tighten all screws in a sequence from (1) to (21).

Cylinder head cover to cylinder head

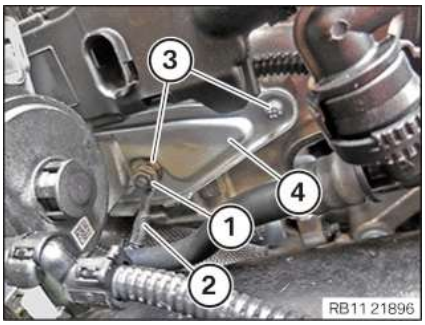
M6X30		Tightening torque	11 Nm



- Insert and install the engine ventilation line (2).
- Ensure that the locks (1) engage audibly.



- Feed in and install wiring harness section (1) for sensor system **2**.
- Make sure that you can hear the locks (arrows) engage.



- Insert and position the holders (4).
- Tighten the screws (3).

Auxiliary coolant pump holder to cylinder head

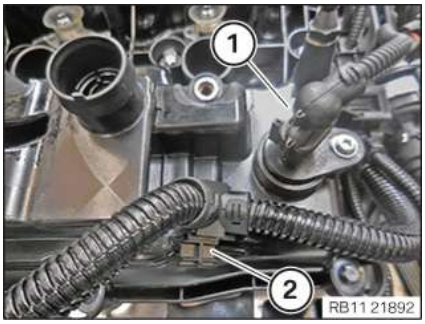
M6		Tightening torque	7 Nm

- Thread in ground cable (2) and install.
- Tighten nut (1).

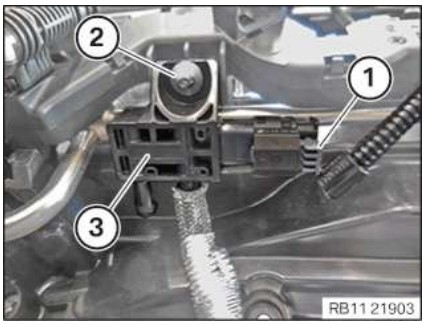
Standard screw connection M6

M6			8 Nm

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- Connect and lock the connector (1) on the exhaust camshaft sensor .
- Ensure that connector (1) on the exhaust camshaft sensor engages audibly.
- Secure clamps (2).

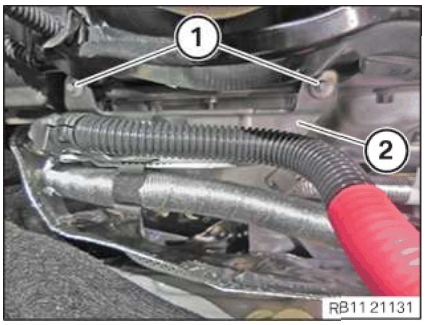


- **If installed:**
- Feed in and install the differential pressure sensor (3).
- Tighten down screw (2).

Differential pressure sensor to holder

TS6X18		Tightening torque	3,5 Nm

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



CAUTION

Improper routing of the positive battery cable.

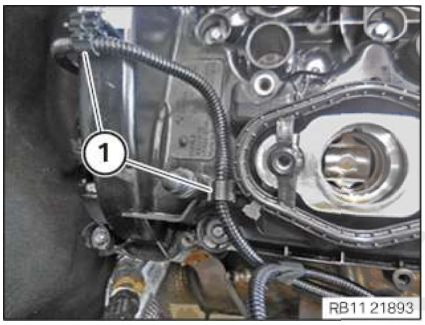
Risk of short circuits!

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

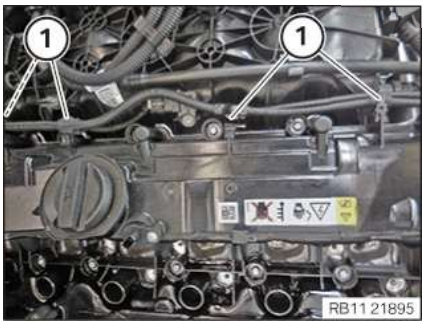
- Guide in and install holder (2) of the positive battery cable.
- Tighten the screws (1).

Holder, positive battery cable to cylinder head cover

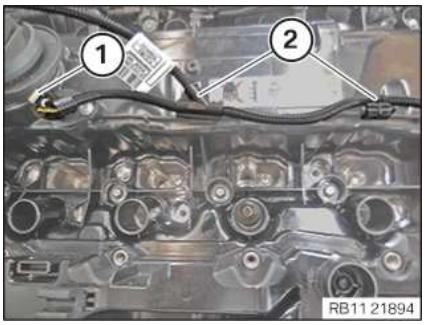
6X18		Tightening torque	6 Nm



- Secure clamps (1).



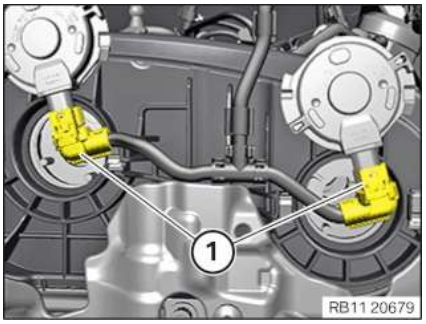
- Secure clamps (1).



- Connect connector (1) to the intake camshaft sensor and lock it.
- Make sure the connector (1) engages audibly.
- Secure clamps (2).

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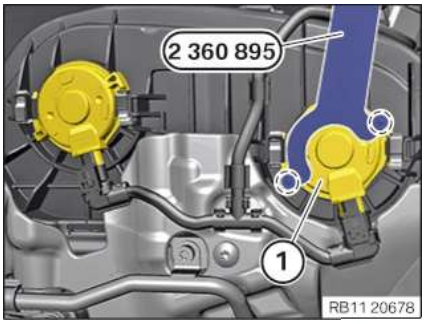
95 – Installing both actuators



NOTICE

The figure shows the rear side of the engine.

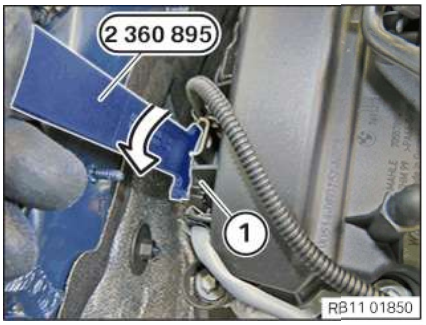
- Position both actuators.
- Connect and lock both connectors (1).
- Make sure the connectors (1) engage audibly.



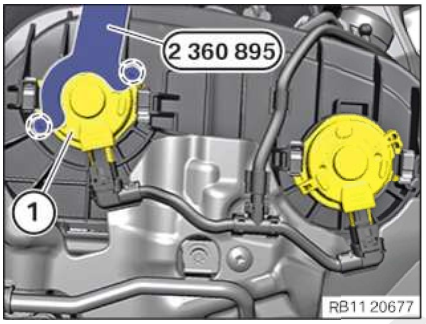
NOTICE

The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the exhaust side.



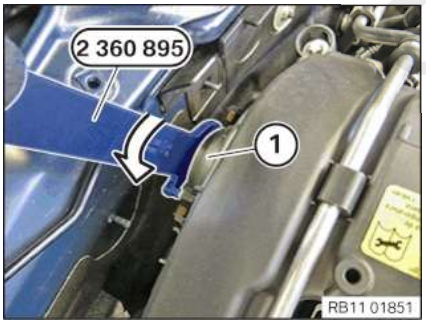
- Position the actuator (1) of the exhaust side and turn it in the direction of arrow with the special tool 2 360 895 until the limit stops touch the clamps.



NOTICE

The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the intake side.



- Position the actuator (1) of the intake side and turn it in the direction of arrow with the special tool 2 360 895 until the limit stops touch the clamps.

96 – Install high pressure pump

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

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TECHNICAL INFORMATION

Only G05 and G07

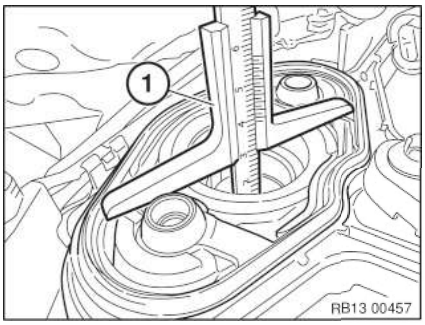
In vehicles with active anti-roll bar (ARS) the fan cowl must be removed in order to spin the engine.

For additional information see: 17 11 035 Removing and installing/replacing the fan cowl including electric fan

TECHNICAL INFORMATION

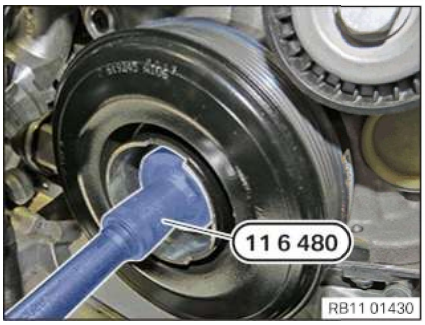
The high pressure pump can be pre-tensioned by camshaft cams. If when loosening the screws, the high pressure pump is forced out, the engine will have to be turned to bring the camshafts to a different position.

Before installing the high pressure pump, the cam of the high pressure pump drive must be turned to BDC. To do this, twist the engine if necessary in the direction of engine rotation to the central bolt of the crankshaft. Otherwise, it will not be possible to install the high-pressure pump.



- Place the depth gauge (1) flat onto the high pressure pump flange.
- Turn the engine at the central bolt in the direction of engine rotation until the BDC position of the camshaft is reached.

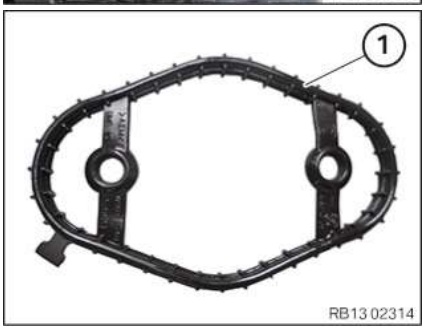
  The depth gauge (1) is in the deepest position.



- Rotate the engine with the special tool 0 493 380 (11 6 480) in the **direction of the arrow** until the cam of the high pressure pump drive is at the **BDC position** .



- Guide out and remove gasket (1).



- Renew the gasket (1).

  Parts: Gasket

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TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Check the threads (1) on the high pressure pump flange for sealing compound residue: Remove sealing compound residue as needed.
- Clean the thread (1) with a thread cutter **M6**.
- Make sure that no contamination enters the engine.
- Cover opening at the high pressure pump flange with suitable materials.



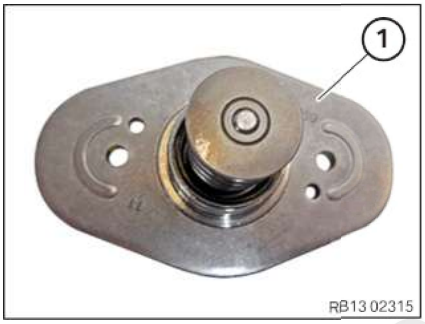
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Clean sealing surface (1).



- Insert and install the gasket (1).
- Make sure the seal (1) has been correctly positioned in the **highlighted** area.



RISK OF DAMAGE

Damage to the surface.

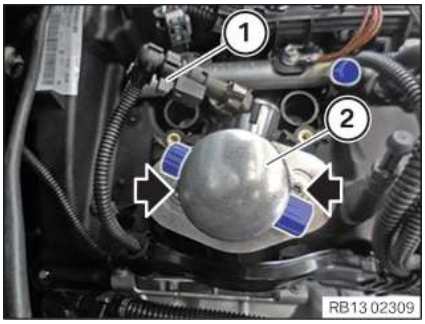
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Clean sealing surface (1).



- Feed in and install high pressure pump (2).
- Renew the bolts (arrows).

  Parts: Bolts
- Position screws (arrows) of the high pressure pump (2) and tighten **in alternating order** in **90°** increments.

  Compliance with this specification is imperative to make sure that the piston will not break due to twisting.

High pressure pump to high pressure pump flange

M6x25	*Renew screws.*	Jointing torque	12 Nm
		Tightening torque	90 °

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

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RISK OF DAMAGE

Damage to the injector tips and Teflon ring.

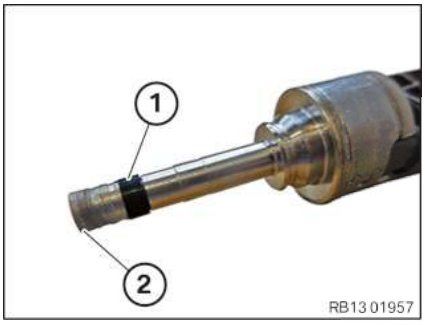
Improper handling of the injector tips and Teflon ring can lead to malfunctioning of the injector.

- Avoid mechanical contact with injector tip.
- When exchanging Teflon ring, hands and work surface must be clean and free of oil. Do not use any lubricating agents.
- Do not use fingernails to slide Teflon ring on.

TECHNICAL INFORMATION

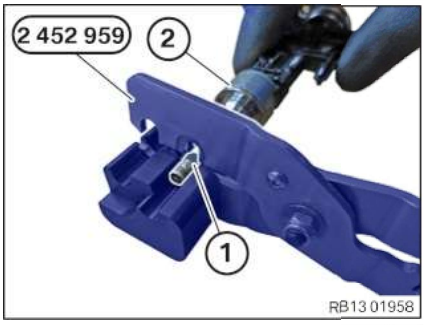
Before re-installing the injector, the Teflon ring must be renewed. Once a Teflon ring has been installed, it may not be re-used. New injectors are supplied with a new Teflon ring.

After the installation of a new Teflon ring on the injectors, the injector must be installed in the cylinder head within 10 minutes or protected with protective caps; otherwise, the Teflon ring will swell.



- Before installing the injectors: Renew the Teflon rings (1).

  Parts: Teflon rings
- Avoid mechanical contact with injector tip (2).



- Remove Teflon ring (1) by using special tool 2 452 959 from injector (2).
- If necessary, use a lint-free cloth to clean the cylindrical part of the injector tip. Do not use ultrasonic sound or other auxiliary materials.
- Do **not** clean the injector tip.

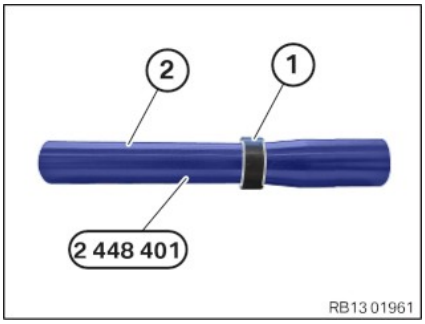


- For the installation of the new Teflon rings: Use the set of special tools 2 448 401:

  (1) Installation cone

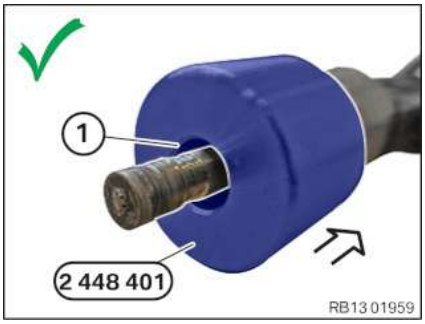
  (2) Sliding sleeve

  (3) Assembly sleeve



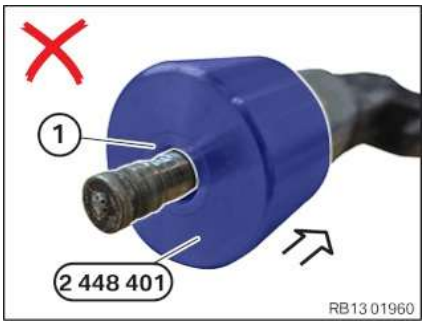
- Slide the new Teflon ring (1) onto the installation cone (2) from the set of special tools 2 448 401.

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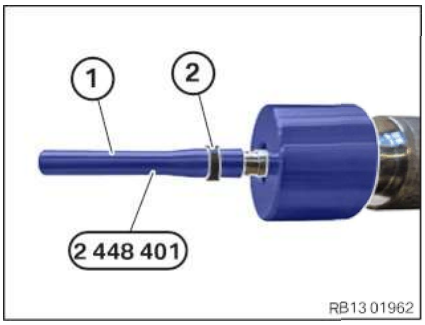
- Make sure the installation position of the assembly sleeve (1) from the set of special tools 2 448 401 is correct:

  The larger diameter of the assembly sleeve (1) must point to the injector tip.

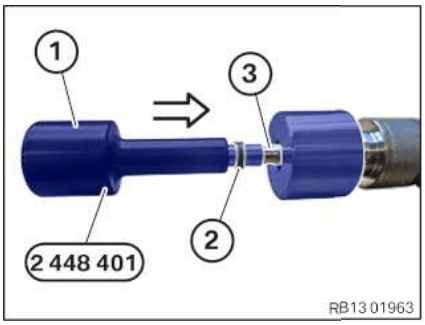


- Make sure the installation position of the assembly sleeve (1) from the set of special tools 2 448 401 is correct:

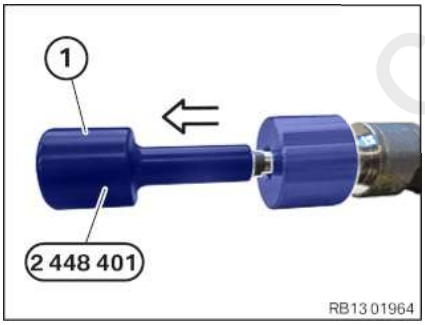
  The assembly sleeve (1) is **not** mounted correctly when the smaller diameter points to the injector tip.



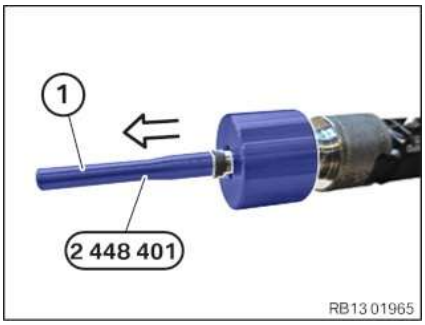
- Mount the Teflon ring (2) with the installation cone (1) from the set of special tools 2 448 401 on the injector tip .



- Use the sliding sleeve (1) from the set of special tools 2 448 401 to push the Teflon ring (2) into the groove (3) on the injector in the direction of the arrow.

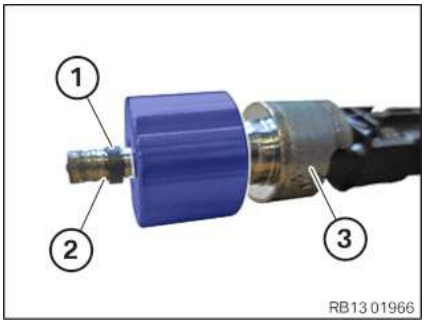


- Thread out the sliding sleeve (1) from the set of special tools 2 448 401 in the direction of the arrow and remove.

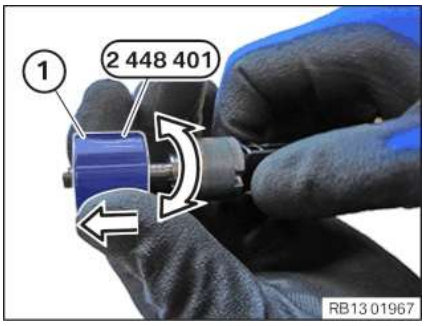


- Thread out the installation cone (1) from the set of special tools 2 448 401 in the direction of the arrow and remove.

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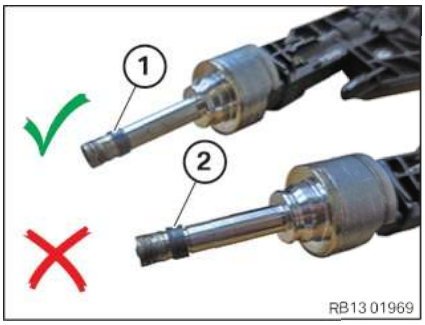


- Make sure that the expanded Teflon ring (1) is properly inserted in the groove (2) of the injector (3) and can be moved easily with your fingers.



- Calibrate the expanded Teflon ring with the assembly sleeve (1) from the set of special tools 2 448 401 to the installation dimension in the direction of the arrow.
- Perform **rotational movements** in increments of 180° synchronous to the **pull-off movement**. Perform the movements slowly and **not** jerky.

  This calibrates the Teflon ring (1) to the installation dimension.
- Thread out and remove the assembly sleeve (1).

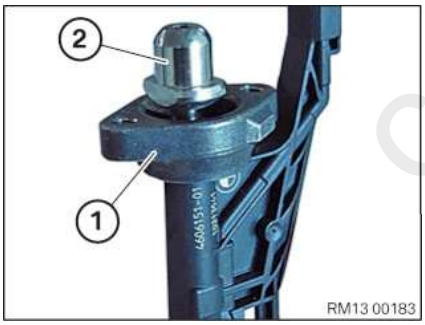


- Check the correct installation dimension of the Teflon ring (1):
  - (1) indicates a correct installation dimension of the Teflon ring.
  - (2) indicates an incorrect installation dimension of the Teflon ring.

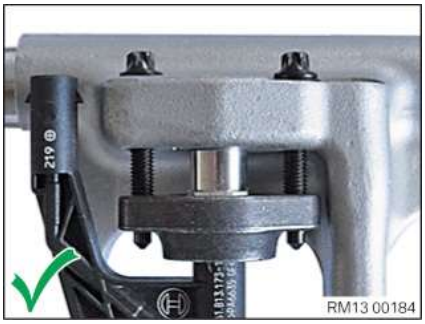
98 – Installing the high-pressure rail with injectors of the cylinders 4 to 6

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.



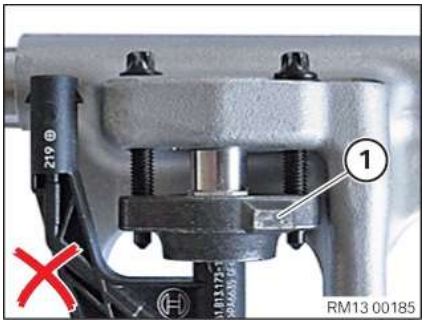
- Mount the holder (1) above the bayonet fitting (2) on the injector.
- **If the holder**(1) **has a cast lug**: Make sure that the holder is installed in the correct position.



- If applicable, note the position of the cast lug:

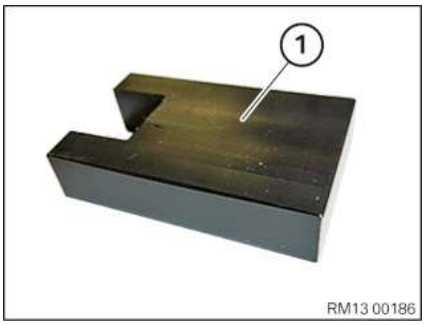
  The holder is mounted **correctly** when the cast lug is located at the rear.

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- If applicable, note the position of the cast lug:

  The holder is mounted **incorrectly** when the cast lug (1) is in front.



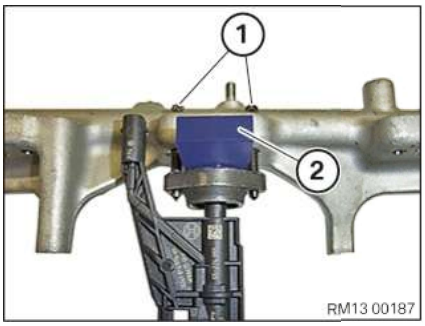
RISK OF DAMAGE

Damage to injectors.

Weld seams on the injector may tear due to incorrect distances between the rail and injector so that the injector must be renewed.

- Insertion of the distance gauge is compulsory.
- Replace distance gauge, if a thickness of 8.5 mm is no longer given in the distance gauge.

- Use the special tool (distance gauge) 2 358 022 (1).



- Replace (M5x30) screws.

  Parts: Screws (M5x30)
- Mount the injectors with the holders and the bolts (M5x30) (1) on the rail.
- Keep the rail on a clean table in such a way that the openings on the rail for the injectors point upwards.

  The electrical injector connections must point to the fuel pressure sensor.
- Slide the special tool (distance gauge) 2 358 022 (2) between the holders and the rail onto the injector head.
- Make sure that the special tool (distance gauge) 2 358 022 (2) rests flat on the retaining bridge.
- Hand-tighten both screws (M5x30) (1) evenly until the special tool (distance gauge) 2 358 022 (2) rests flat against the rail and the holder.



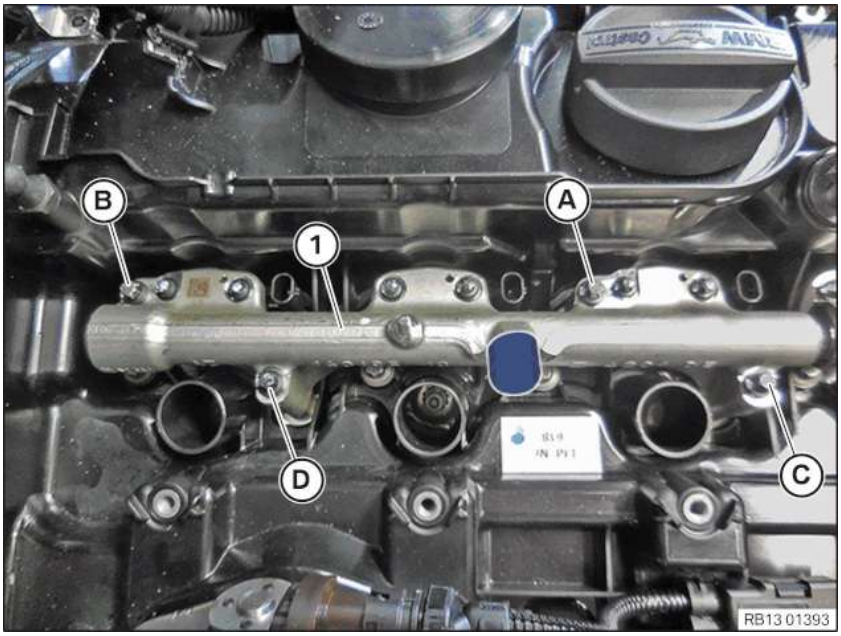
- Remove the special tool (distance gauge) 2 358 022 (1).
- Repeat this operation for all injectors.



- Check injectors for loose fit at the rail.
- Align the electrical injector connections parallel to the rail.

  The injectors must move freely.

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- Renew screws (A) to (D).

  Parts: Bolts
- Attach the rail (1) with the injectors to the cylinder head from the top.
- Make sure the injector tips catch the corresponding holes in the cylinder head.
- Make sure the guides on the injector are properly inserted into the guide bores in the cylinder head.
- Press the rail (1) down until a resistance can be felt; join and hand-tighten the bolts (M6x30) (A) and (B).
- Set the torque wrench to 2 Nm.
- Tighten the screws (A) and (B) in alternating order by **180°** each with the torque wrench until the rail is positioned flush on the cylinder head.

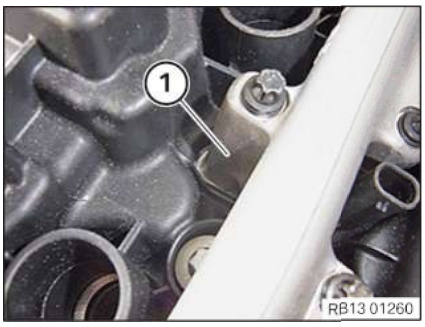
  The figure shows the rail resting flat against the cylinder head.
- Insert bolts (C) and (D).

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

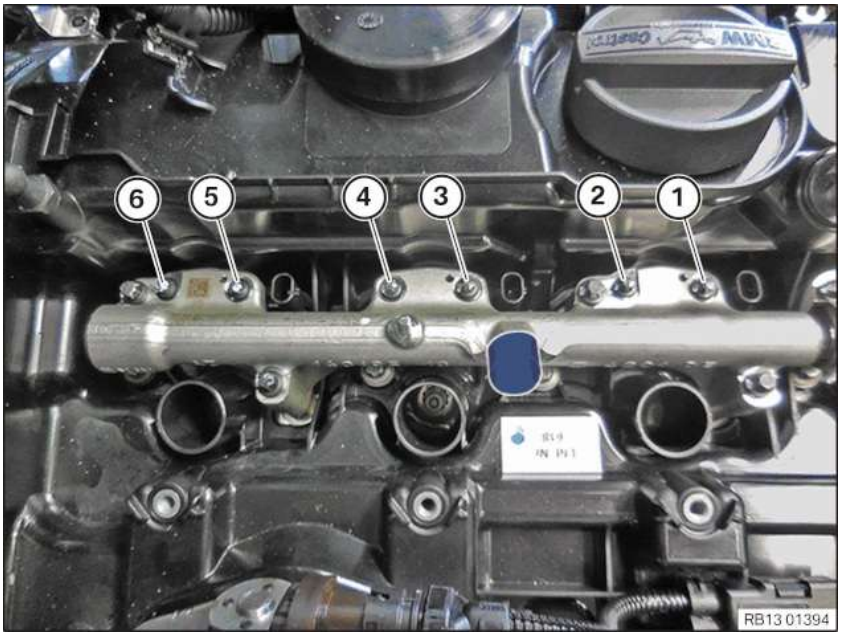
Non-observance of these requirements may result in leaks and damage.

- Tighten bolt (A) to 5 Nm.
- Tighten bolt (D) to 5 Nm.
- Tighten bolt (B) to 5 Nm.
- Tighten bolt (C) to 5 Nm.



- Make sure that the rail (1) rests flat against the cylinder head.

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- Attach a socket to an extension.

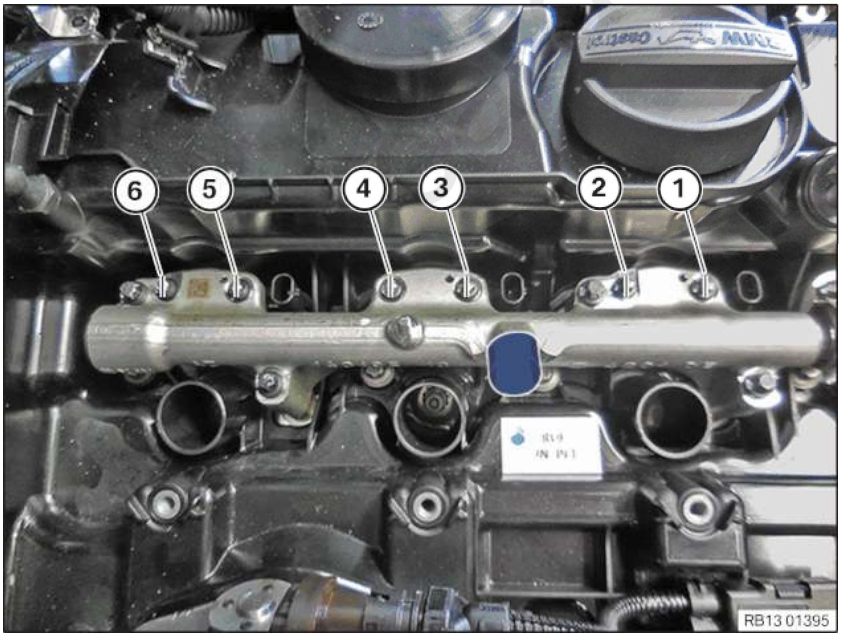
  Do not use a reversible ratchet or torque wrench.
- Tighten the bolts (M5x30) in pairs ((1) with (2), (3) with (4), (5) with (6)) in alternating order **90° hand-tight**.
- Set the torque wrench to 5 Nm.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- **Screw the (M5x30) bolts according to the following plan:**
  - **Fuel injector 4:**
  - Tighten screw (1) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (2) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (1) and (2) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 5:**
  - Tighten screw (3) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (4) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (3) and (4) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 6**:
  - Tighten screw (5) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (6) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (5) and (6) until both bolts reach a torque of 5 Nm.



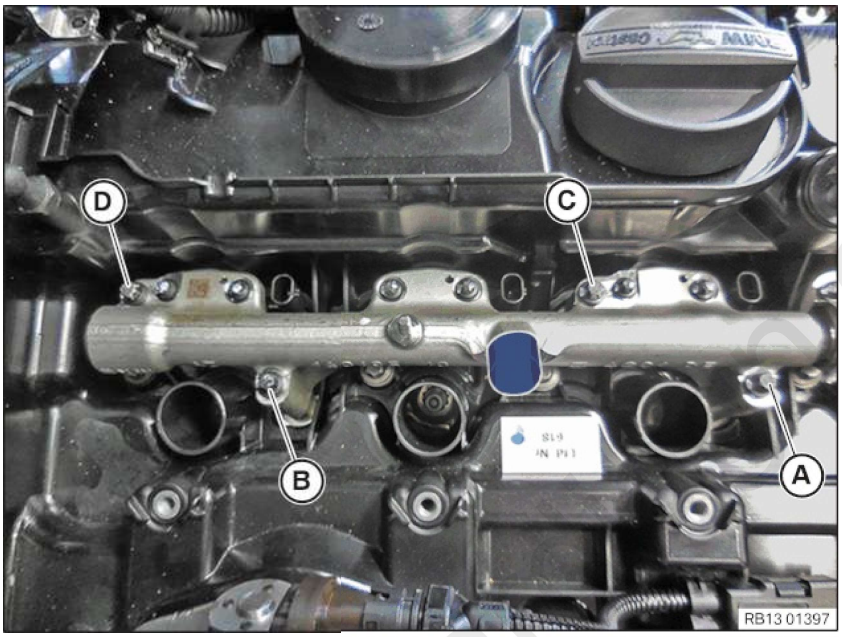
- Mark all bolts (1) to (6) with a vertical line (see figure).
- **Tighten screws using an angle of rotation.**
  - Tighten the screw (1) with an angle of rotation of 90° ±15°.
  - Tighten the screw (2) with an angle of rotation of 90° ±15°.
  - Tighten the screw (3) with an angle of rotation of 90° ±15°.
  - Tighten the screw (4) with an angle of rotation of 90° ±15°.
  - Tighten the screw (5) with an angle of rotation of 90° ±15°.
  - Tighten the screw (6) with an angle of rotation of 90° ±15°.

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- Check if all bolts (1) to (6) have been tightened with a 90° ±15° angle of rotation.

  All marks (lines) must be horizontal (see figure).



- Unscrew the bolts (M6x70) (A) to (D).

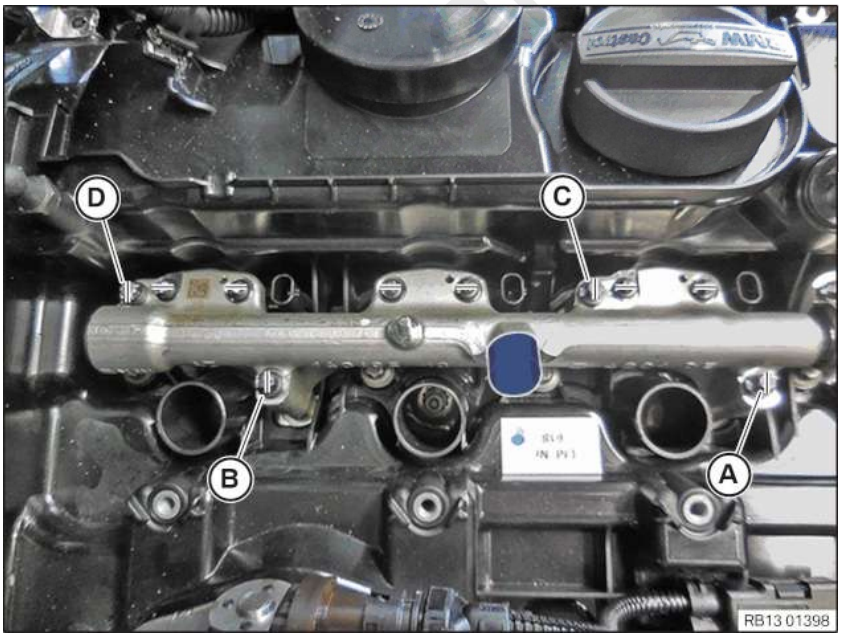
  It is imperative that the bolts are unscrewed.

TECHNICAL INFORMATION

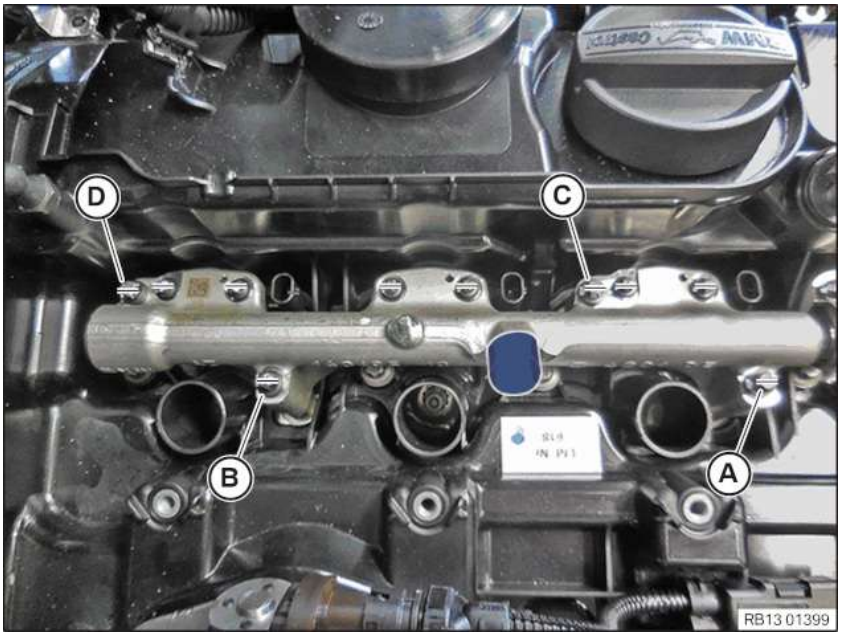
When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten bolt (A) to 5 Nm.
- Tighten bolt (D) to 5 Nm.
- Tighten bolt (B) to 5 Nm.
- Tighten bolt (C) to 5 Nm.

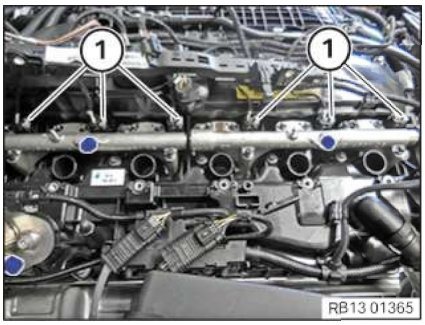


- Mark all bolts (A) to (D) with a vertical line (see figure).
- Tighten bolts (M6x70) (A) to (D) to a 90° angle of rotation.



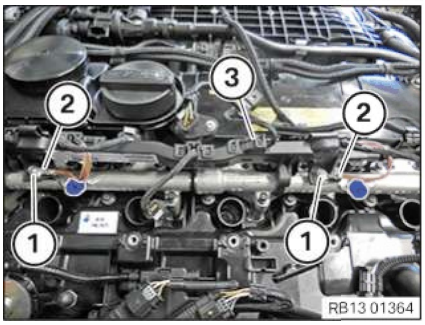
- Check if all bolts (A) to (D) have been tightened with a 90° angle of rotation.

  All marks (lines) must be horizontal (see figure).



- Connect and lock all connectors (1) to the injectors.

  All connectors (1) must engage audibly.



- Thread in cable channel (3) and install.
- Thread in ground cable (2) and install.
- Tighten nuts (1).

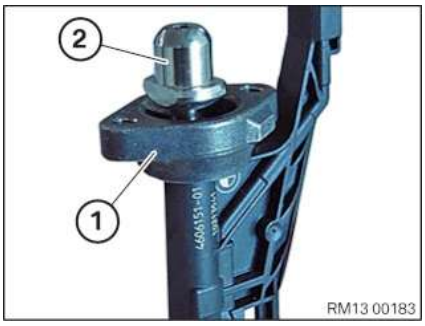
Ground cable to rail

M6		5 Nm

99 – Installing rail with injectors of cylinders 1 to 3

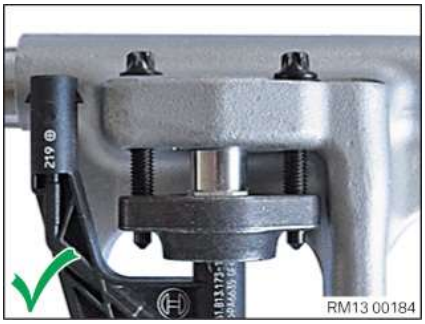
TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.



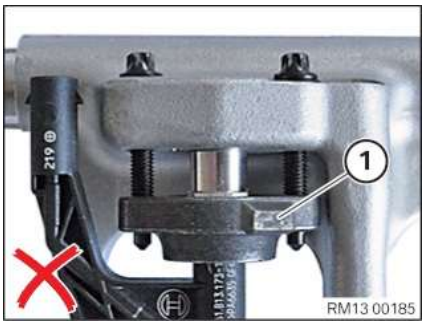
- Mount the holder (1) above the bayonet fitting (2) on the injector.
- **If there is a cast lug on the holder** (1) **:** Make sure that the holder is installed in the correct position.

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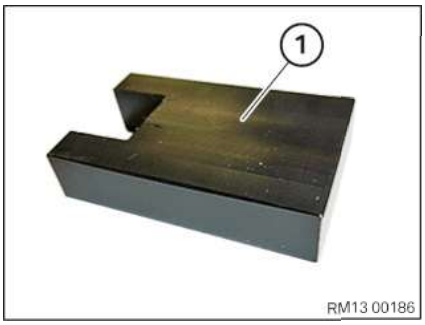
- Observe position of cast lug:

  The holder is mounted **correctly** when the cast lug is located at the rear.



- Observe position of cast lug:

  The holder is mounted **incorrectly** when the cast lug (1) is in front.



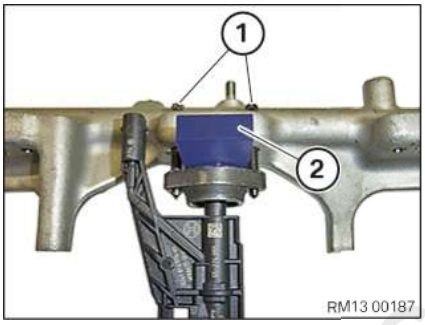
RISK OF DAMAGE

Damage to injectors.

Weld seams on the injector may tear due to incorrect distances between the rail and injector so that the injector must be renewed.

- Insertion of the distance gauge is compulsory.
- Replace distance gauge, if a thickness of 8.5 mm is no longer given in the distance gauge.

- Use special tool 2 358 022(1) .



- Replace (M5x30) screws.

  Parts: Screws (M5x30)
- Mount the injectors with the holders and the bolts (M5x30) (1) on the rail.
- Keep the rail on a clean table in such a way that the openings on the rail for the injectors point upwards.

  The electrical injector connections must point to the fuel pressure sensor.
- Slide special tool 2 358 022 (2) between the holders and the rail onto the injector head.
- Make sure the special tool 2 358 022 (2) rests flat on the retaining bridge.
- Hand-tighten both screws (M5x30) (1) uniformly until the special tool 2 358 022 (2) rests flat against the rail and the holder.



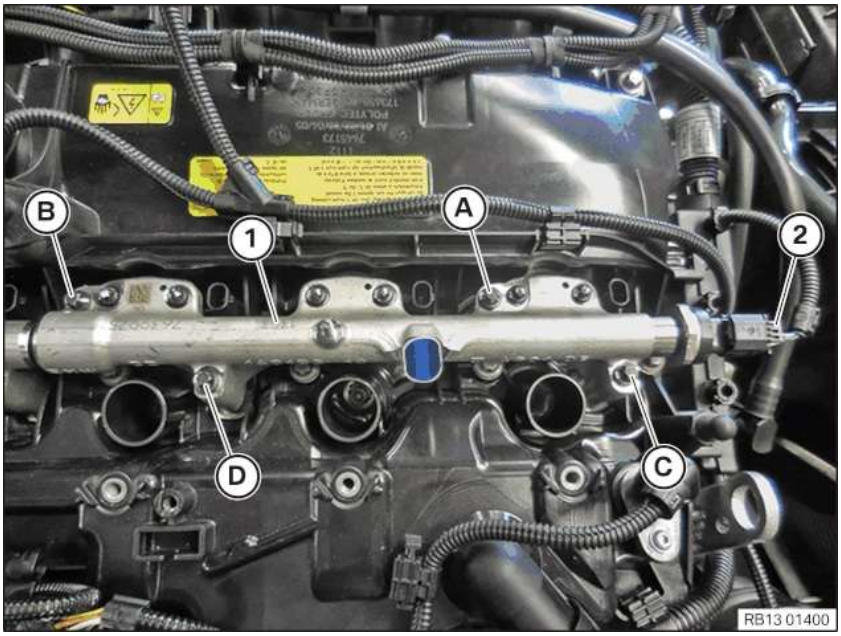
- Remove special tool 2 358 022(1) .
- Repeat this operation for all injectors.



- Check injectors for loose fit at the rail.
- Align the electrical injector connections parallel to the rail.

  The injectors must move freely.

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- Renew screws (A) to (D).

  Parts: Bolts
- Attach the rail (1) with the injectors to the cylinder head from the top.
- Make sure the injector tips catch the corresponding holes for the injectors in the cylinder head.
- Make sure the guides on the injector are properly inserted into the guide bores in the cylinder head.
- Press rail (1) down until a resistance can be felt; join and hand-tighten screws (M6x30) (A) and (B).
- Tighten screws (A) and (B) alternately by **180°** each with the torque wrench until the rail is positioned on the cylinder head.

  The figure shows the rail resting flat against the cylinder head.
- Insert screws (C) and (D).

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

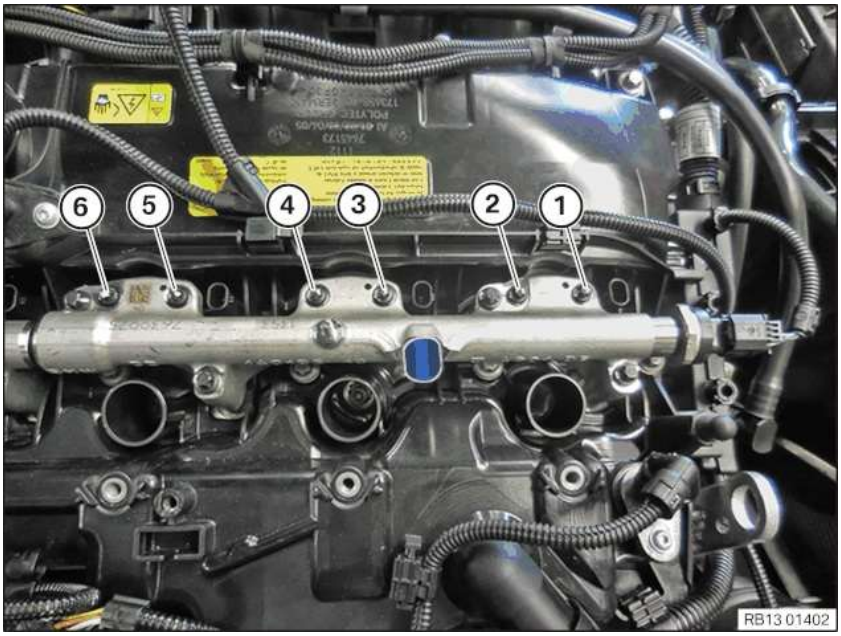
- Tighten screw (A) to 5 Nm.
- Tighten screw (D) to 5 Nm.
- Tighten screw (B) to 5 Nm.
- Tighten screw (C) to 5 Nm.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.



- Make sure that the rail (1) rests flat against the cylinder head.

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- Attach a socket to an extension.

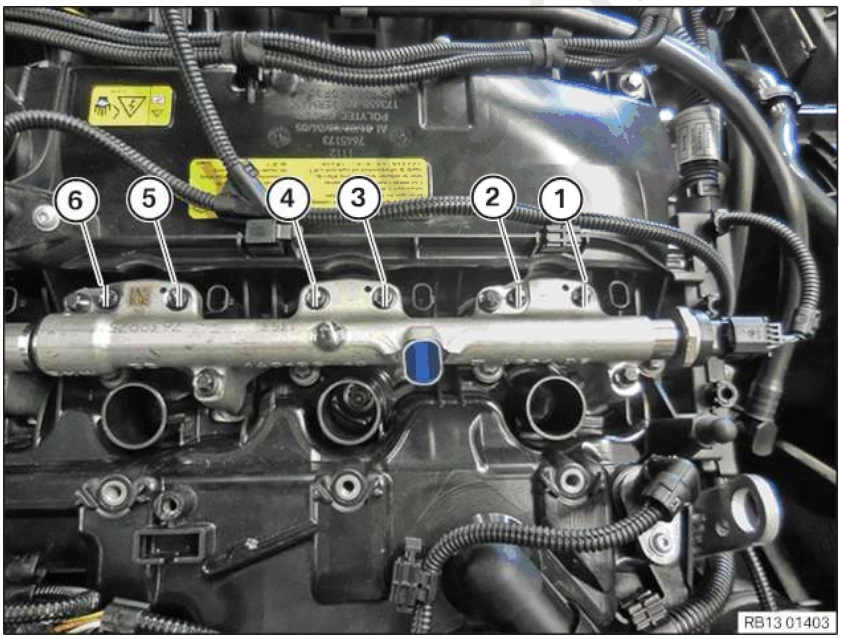
  Do not use a reversible ratchet or torque wrench.
- Hand-tighten screws (M5x30) in pairs ((1) with (2), (3) with (4), (5) with (6)) alternately by **90°**.
- Set torque wrench to 5 Nm.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

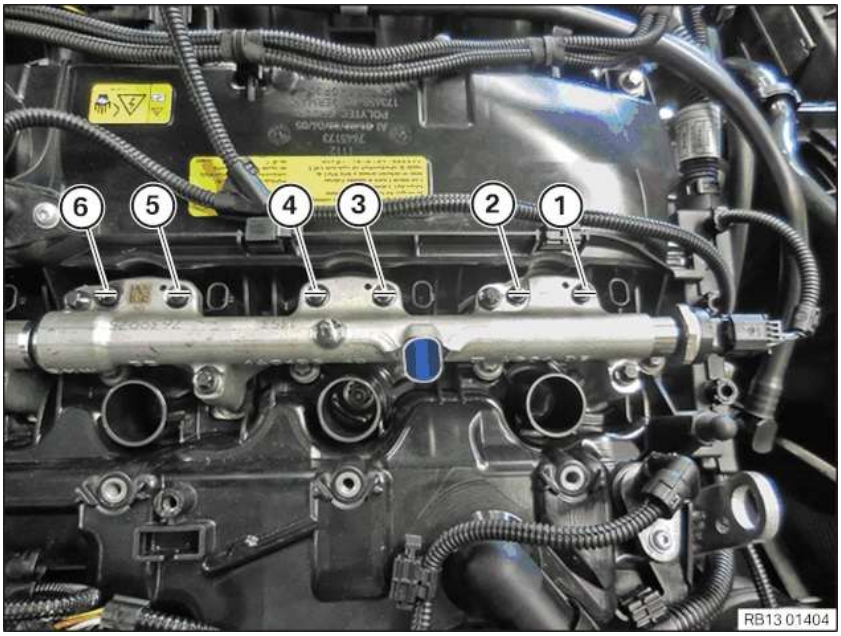
Non-observance of these requirements may result in leaks and damage.

- **Screw the (M5x30) bolts according to the following plan:**
  - **Fuel injector 1:**
  - Tighten screw (1) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (2) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (1) and (2) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 2:**
  - Tighten screw (3) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (4) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (3) and (4) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 3**:
  - Tighten screw (5) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (6) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (5) and (6) until both bolts reach a torque of 5 Nm.



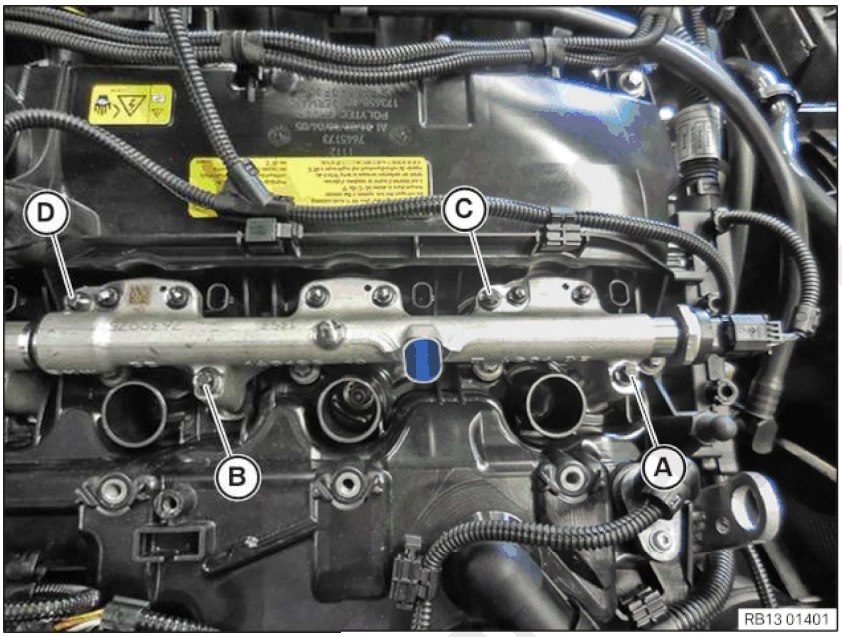
- Mark all bolts (1) to (6) with a line (see figure).
- **Tighten screws using an angle of rotation.**
  - Tighten the screw (1) with an angle of rotation of 90° ±15°.
  - Tighten the screw (2) with an angle of rotation of 90° ±15°.
  - Tighten the screw (3) with an angle of rotation of 90° ±15°.
  - Tighten the screw (4) with an angle of rotation of 90° ±15°.
  - Tighten the screw (5) with an angle of rotation of 90° ±15°.
  - Tighten the screw (6) with an angle of rotation of 90° ±15°.

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- Check if all bolts (1) to (6) have been tightened with a 90° ±15° angle of rotation.

  All markings (lines) must be horizontal (see Figure).



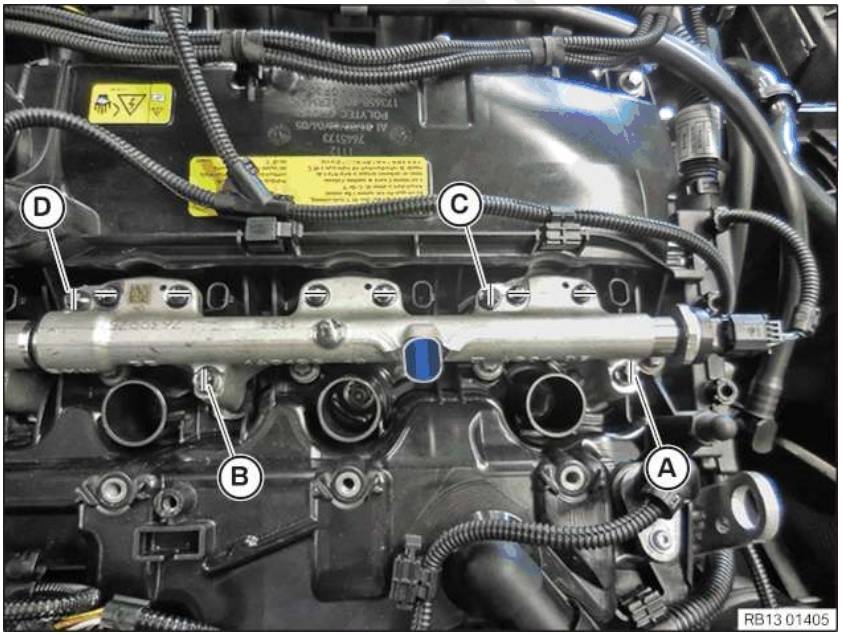
- Release screws (M6x70) (A) to (D) **without fail**.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten screw (A) to 5 Nm.
- Tighten screw (D) to 5 Nm.
- Tighten screw (B) to 5 Nm.
- Tighten screw (C) to 5 Nm.

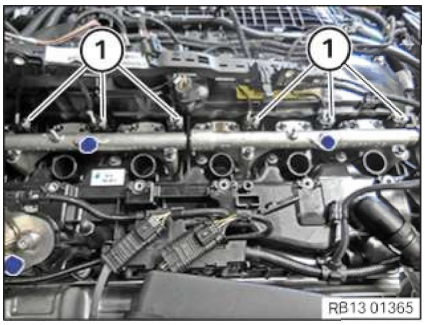


- Mark all the bolts (A) to (D) with a vertical line (see Figure).
- Tighten bolts (M6x70) (A) to (D) with an angle of rotation of 90°.



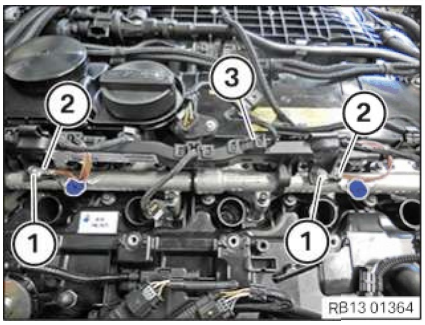
- Check whether all screws (A) to (D) have been tightened with an angle of rotation of 90°.

  All marks (lines) must be horizontal (see figure).



- Connect and lock all the connectors (1) to the injectors.

  All connectors (1) must engage audibly.

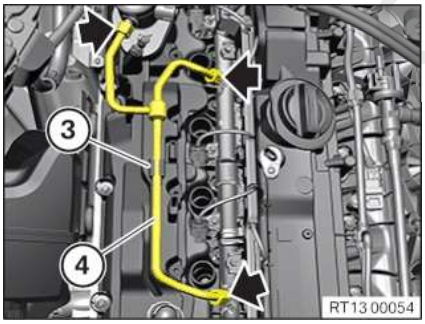


- Thread the cable channel (3) in and install.
- Thread in ground cable (2) and install.
- Tighten nuts (1).

Ground cable to rail

M6		5 Nm

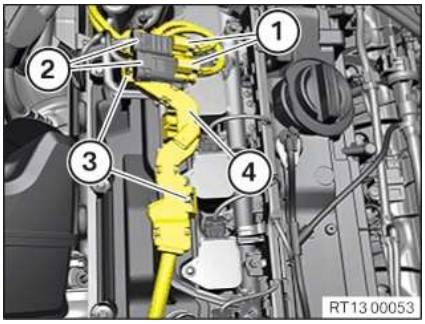
100 – Installing high pressure line between rail and high pressure pump



- Insert the high pressure line (4) into the holder (3) and install.
- Tighten union nuts (arrows) with the special tool .

High pressure line between rail and high pressure pump

M14x1,5		Tightening torque	33 Nm



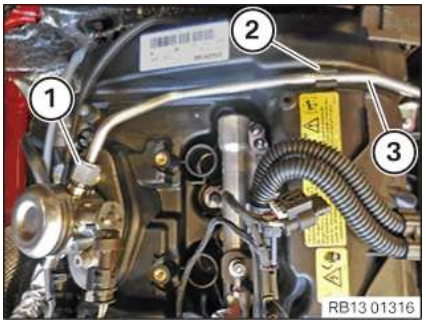
- Insert and install the wiring harness section of the engine wiring harness (4).

  The locks (3) must engage audibly.
- Connect connectors (1) and (2) and lock.

  The connectors (1) and (2) must audibly engage.

101 – Installing fuel delivery line

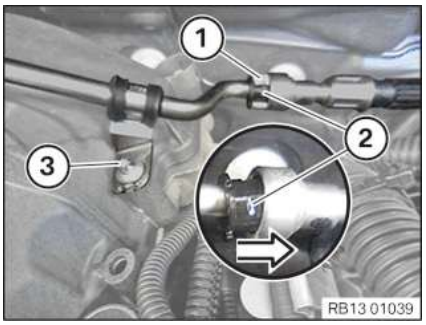
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- Guide the fuel delivery line (3) in and install.
- Install rubber damper (2).
- Check the rubber damper (2) for the correct fit.
- Tighten the union nut (1) hand-tight.
- Tighten union nut (1).

Fuel delivery line to high pressure pump

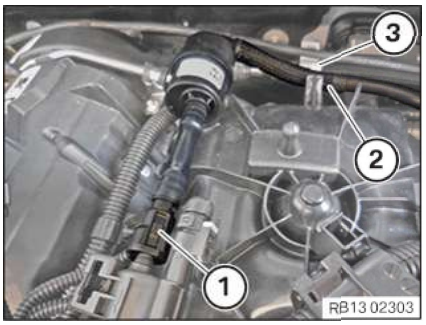
M14		Tightening torque	31 Nm



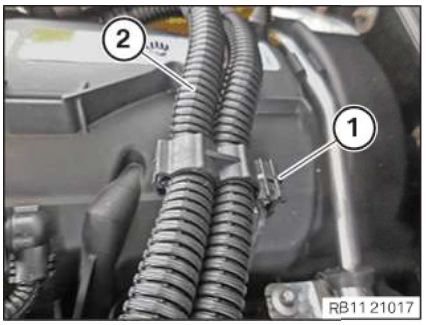
- Slide in and lock the fuel feed line in the direction of the arrow in the snap fastener (2).
  The fuel feed line must be audibly engage in the snap fastener (2).
- Secure clamps (1).
- Tighten down screw (3).

Fuel line to cylinder head cover

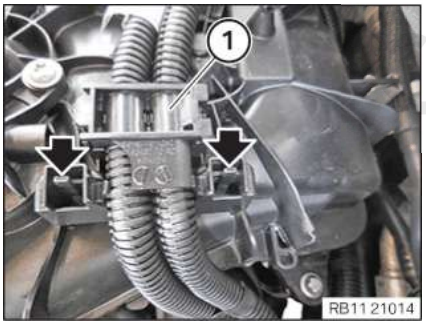
6x18		Tightening torque	6,5 Nm



- Insert and install the tank ventilation line (2).
- Lock (1) must engage audibly.
- Secure the tank ventilation line (2) to the clamp (3).



- Insert and install wiring harness section (2) for injectors and ignition coils.
- Secure clamps (1).



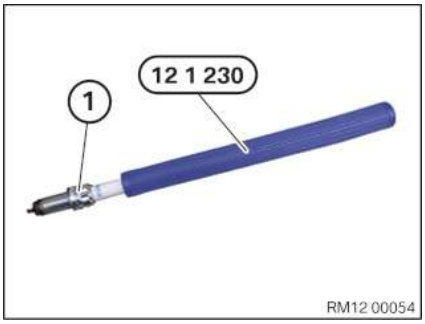
- Insert and install wiring harness section (1) for injectors and ignition coils.
- The locks (arrows) must engage audibly.

102 – Installing all spark plugs

NOTICE

The description is for one component only. The procedure is identical for all further components.

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- Insert spark plug (1) into special tool 0 496 065 (12 1 230).



TECHNICAL INFORMATION

Do not drop spark plug into spark plug shaft! This can lead to a reduction of the electrode gap and can thus impair smooth running of the engine, especially in idle position.

- Screw in the spark plugs in the engine with the special tool 0 496 065 (12 1 230) until hand-tight.



TECHNICAL INFORMATION

Exclusively swivelling extensions may be used for the reversible ratchet. Rigid mounting tool and variable plug connections with rigid option may not be used; there is a risk that the insulator breaks.

- Tighten the spark plugs with the torque wrench, the special tool 0 495 560 (12 1 220) and a swivelling extension.

Spark plugs

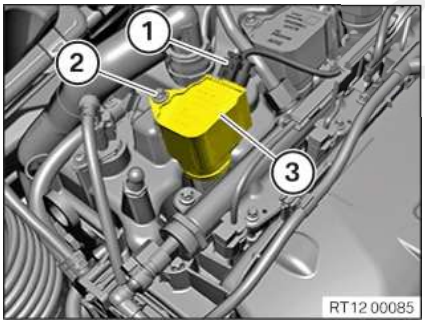
M12x1.25		Tightening torque	23 Nm

103 – Install all ignition coils

NOTICE

The description is for one component only. The procedure is identical for all further components.

▸ **Install ignition coil.**



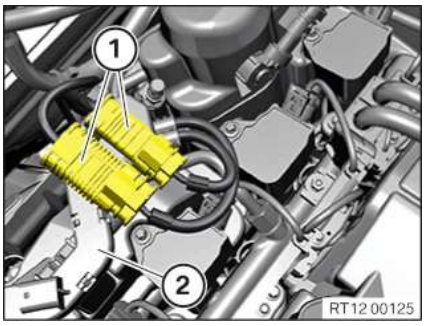
- Install ignition coil (3).
- Tighten down screw (2).

Ignition coil

Screw		Tightening torque	8 Nm

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.



- Connect the connector (1) of the front oxygen sensor and the monitoring oxygen sensor on the cable shaft (2).

104 – Install engine ventilation line adapter with heating element on the exhaust turbocharger

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

RISK OF DAMAGE

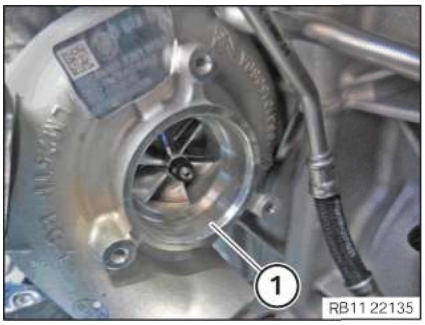
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

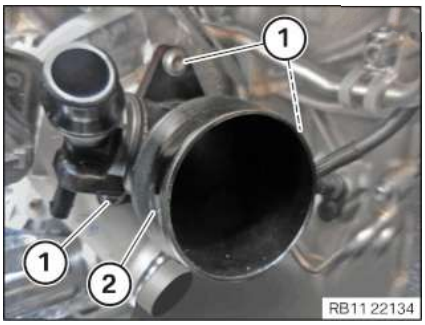


- Clean sealing surface (1).



- Renew the seal (1) using the special tool 0 496 714 (00 9 030).

  Parts: Gasket



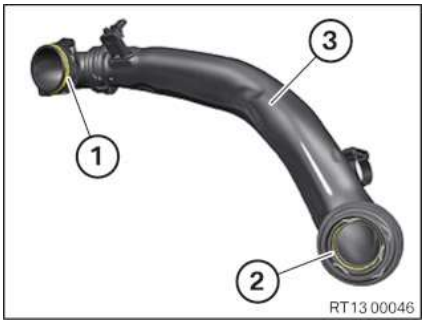
- Feed in and install connecting branch with heating element (2) on exhaust turbocharger.
- Tighten the screws (1).

Engine ventilation line adapter with heating element to exhaust turbocharger

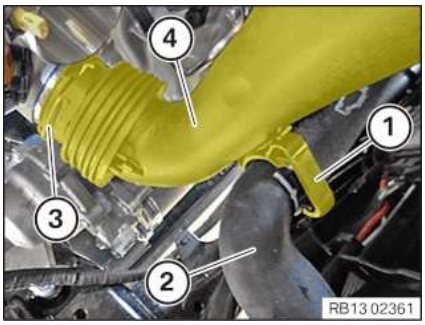
M6x26 screw		Tightening torque	8 Nm

105 – Install charge air line

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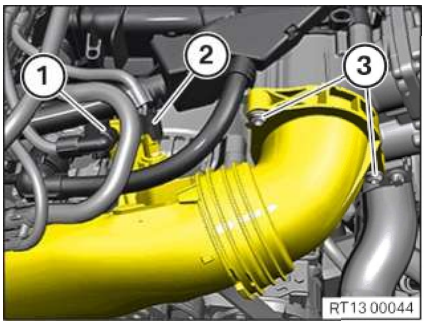


- Check the sealing ring (1) on the charge air line (3) for damage and renew it with the special tool 0 496 714 (00 9 030), if necessary.
- Check the sealing ring (2) on the charge air line (3) for damage and renew it with the special tool 0 496 714 (00 9 030), if necessary.



- Insert and install charge air line (4).
- Lock clamp (3).

  The clamp (3) must engage audibly.
- Insert and install the coolant hose (2).
- Lock clamp (1).



- Tighten the screws (3).

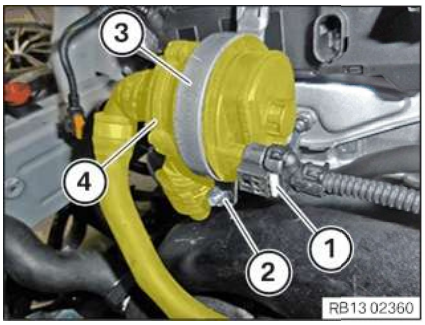
Charge air line to throttle valve

M6x30		Tightening torque	8 Nm

- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.



- Insert and position the additional coolant pump (4).
- Insert and position the retaining bracket (3).
- Tighten nut (2).

Electric coolant pump to holder

M6		Tightening torque	8 Nm

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

106 – Installing clean air pipe



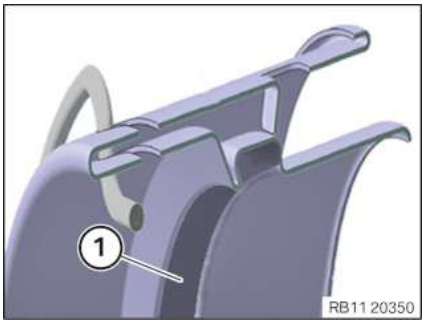
- Check the seal (1) for damage and renew if necessary.

▸ **Replace damaged gasket**

TECHNICAL INFORMATION

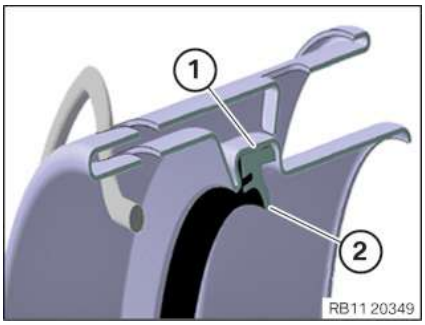
Do not use pointed or sharp-edged tools for the installation and/or removal.

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

  The gasket groove (1) must be clean.



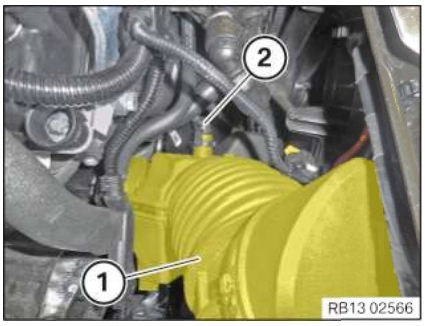
- Renew gasket.

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

TECHNICAL INFORMATION

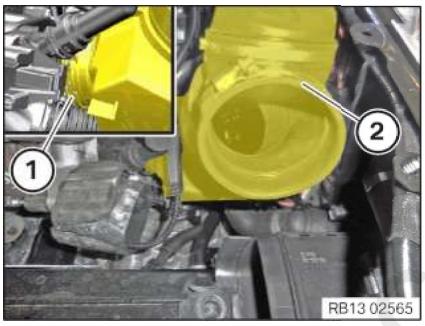
Incorrect assembly is possible. Ensure correct installation position.

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



- Guide in and position clean air pipe (1).
- Connect engine ventilation line (2) and lock.

  The engine ventilation line (2) must engage audibly.



- Install the clean air pipe (2).
- Lock clamp (1).

  The clamp (1) must engage audibly.



- Secure clamps (1).

107 – Install engine ventilation line

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

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

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

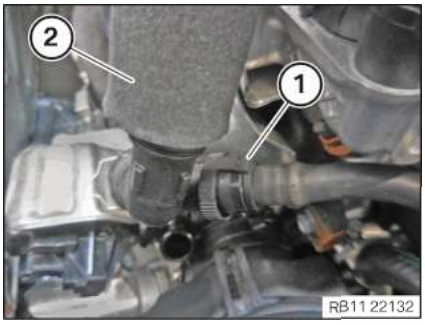
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TECHNICAL INFORMATION

Check the retaining lug on the connector for damage and perform a tension check as needed.

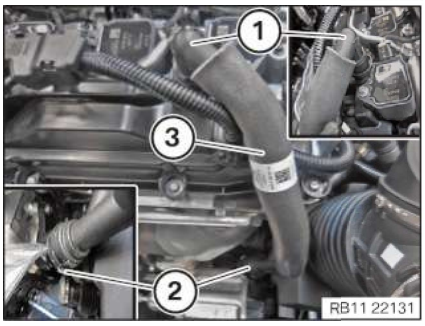


- Check sealing ring (1) for damage and renew tank ventilation line if necessary.

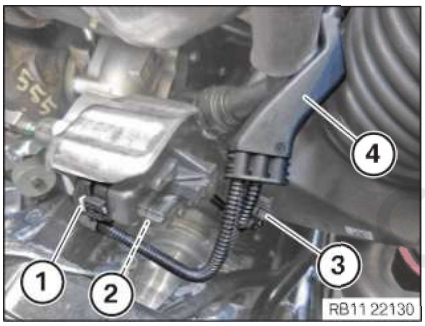


- Insert and position the engine ventilation line (2).
- Insert and install the tank ventilation line (1).

  Tank ventilation line (1) must engage audibly into place.

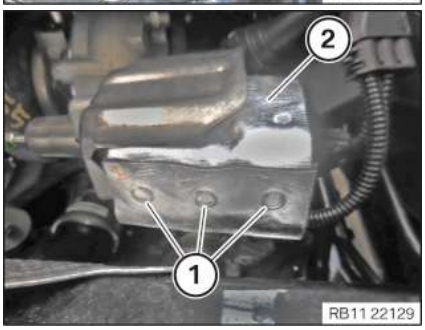


- Insert and install the engine ventilation line (3).
- Make sure you can hear the locks (1) and (2) engage.



- Feed in and position the wiring harness section of sensor system **2** (4).
- Connect connectors (2) and lock.
- Connect connectors (1) and lock.

  The connectors (1) and (2) must audibly engage.
- Secure clamps (3).

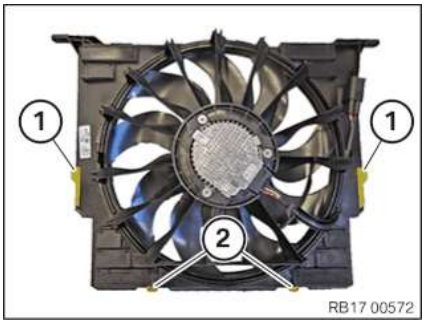


- Feed in and install heat shield (2).
- Lock the locks (1).

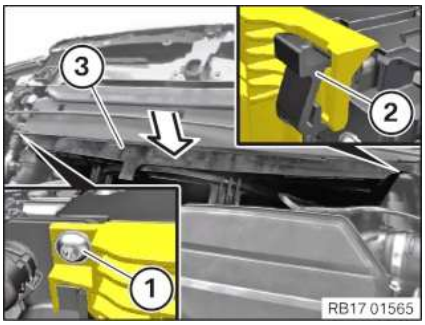
  Locks (1) must engage audibly.

108 – Install fan cowl

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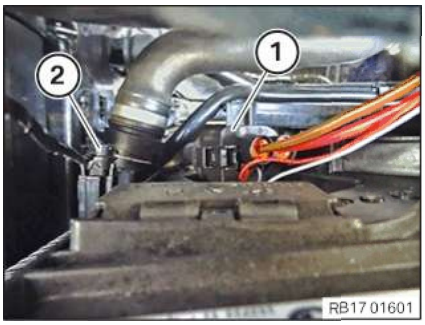
- Feed guides (1) into the radiator.
- Feed guides (2) into the charge air cooler.



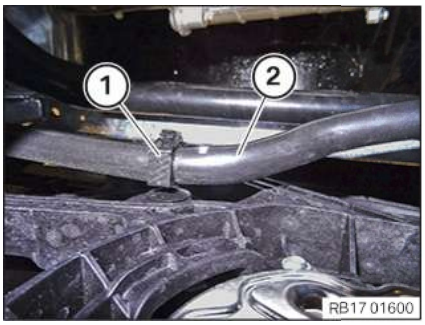
- Guide in and install fan cowl (3) **carefully** in the direction of the arrow.
- Ensure that the lock (2)engages audibly.
- Tighten down screw (1).

Fan cowl with electric fan on radiator

TS6x20		Tightening torque	6,5 Nm

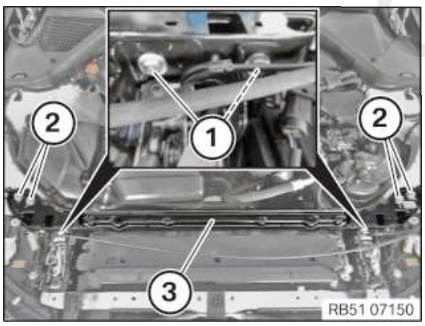


- Connect connectors (2) and lock.
  The connector (2) must engage audibly.
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.



- **If installed:** Secure the transmission oil line (2).
  Insert and install the transmission oil line (2).
  Lock holder (1).

109 – Install the rear top cross connection



- Guide in and position the top rear cross connection (3).
- Tighten the screws (1).

Top rear cross connection to bonnet catch support

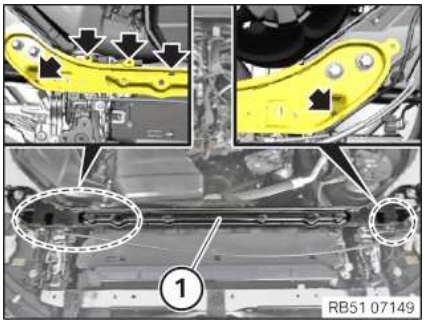
Flat-head screw M6x20		Tightening torque	11,8 Nm

- Renew screws (2).
  Parts: Bolts
- Tighten the screws (2).

Rear top cross connection to wheel arch carrier support

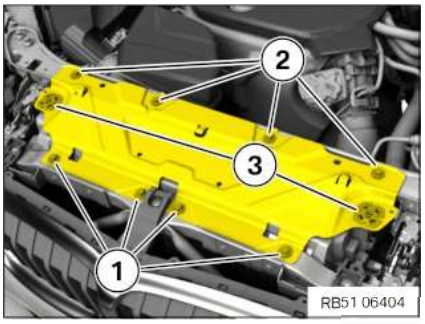
M10x20 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

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- Secure the clips (arrows) in the marked areas to the top rear cross connection (1).

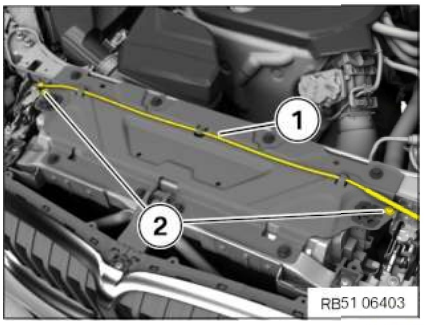
110 – Installing the top cross connection



- Set and position upper cross connection with holders (3) from above.
- Tighten down screws (1) and (2).

Cross connection, top

M8x20		Tightening torque	28 Nm

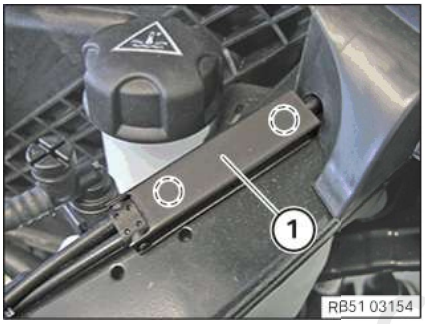


- Tighten down screws (2).

Cross connection, top

M6x20		Tightening torque	11,8 Nm

- Attach Bowden cable (1) on the upper cross connection.



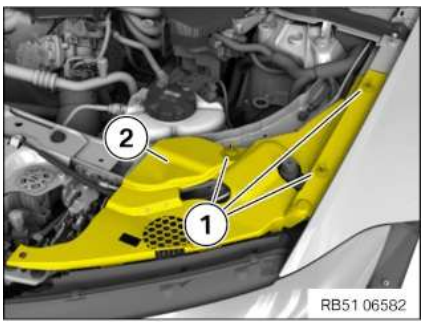
- Clip in the housing for the coupling of the Bowden cables (1).

111 – Install the cover in the engine compartment at top left and right partially

NOTICE

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

▸ **Installing the cover in the engine compartment on top partially**

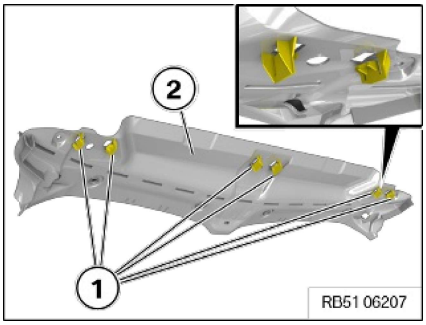


- Install the cover in the engine compartment on top (2).
- Secure expanding rivet (1).

112 – Installing cover for engine compartment centre

Check

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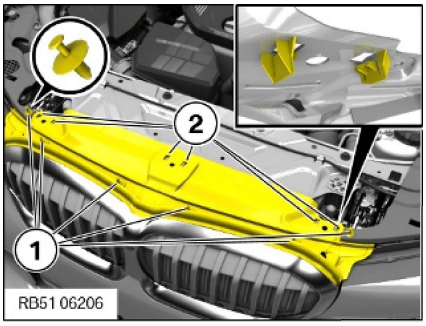
- Check latch mechanisms (1) of cover for engine compartment centre (2) for damage.

Result

» The latch mechanism (1) is damaged.

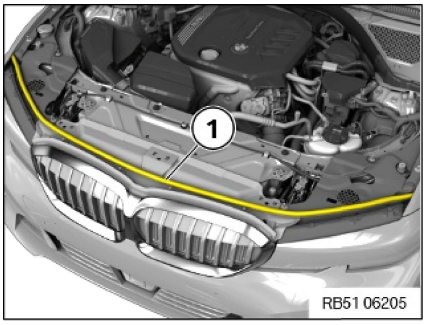
Measure

- Renew cover for engine compartment centre (2).



- Guide in the cover for the engine compartment centre from the rear and position it.
- Clip in the cover for the engine compartment centre with latch mechanisms (2).
- Mount all expanding rivets (1).

113 – Install the seal for the front bonnet



- Position the bonnet seal(1) and connect it on the mounting on the bumper and on the headlights.

114 – Install the monitoring oxygen sensor

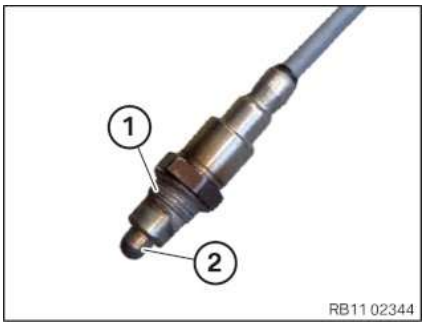
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue



- Prepare the oxygen sensor.

  Do not damage the sensor ceramics.

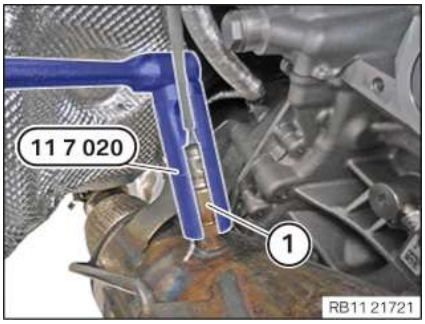
  (1) = Thread

  (2) = Sensor ceramics
- Grease the thread (1) of the Lambda monitoring oxygen sensor thinly and evenly.

Expendable materials

Brake block paste * TU = Trade Unit. TU numbers cannot be ordered! For invoicing purposes only.	3 g, Bag	83192158851
	100 g, Tube	83192158852
	5 g, TU*	83230140233

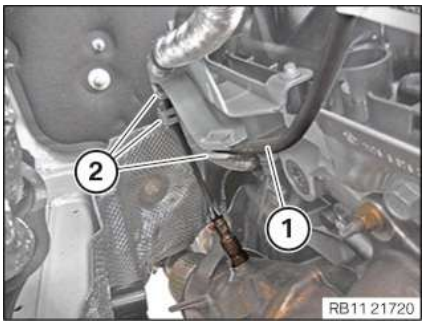
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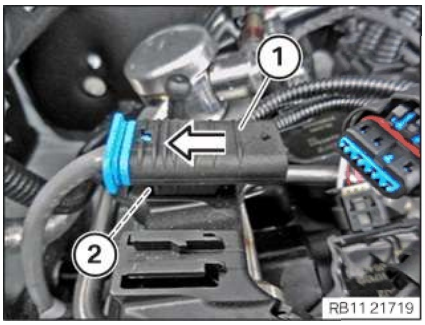
- Feed in the monitoring oxygen sensor (1) and install.
- Tighten monitoring oxygen sensor (1) using special tools 0 493 751 (11 9 150) and 0 491 075 (11 7 030) .

Monitoring oxygen sensor to catalytic converter

M18X1.5		Tightening torque	50 Nm



- Guide monitoring oxygen sensor line (1) into holder (2) and install it.



- Insert and install the connector (1) in the **direction of arrow**.
- Ensure that the lock (2)engages audibly.



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

115 – Install the front oxygen sensor

TECHNICAL INFORMATION

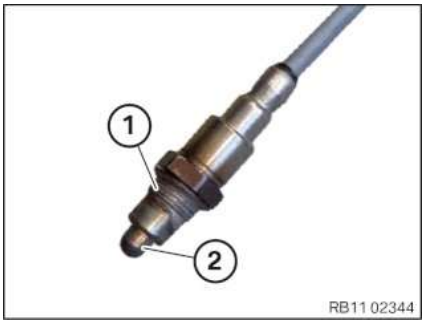
New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

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- Prepare the oxygen sensor.

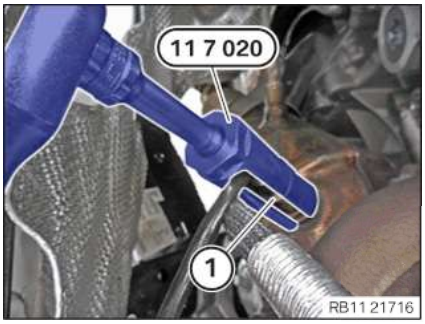
  Do not damage the sensor ceramics.

  (1) = Thread

  (2) = Sensor ceramics
- Apply a thin and even coat of grease to the thread (1) of the front oxygen sensor.

Expendable materials

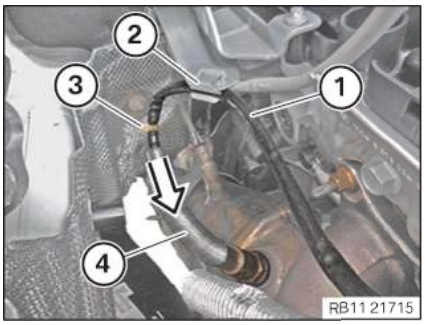
Brake block paste * TU = Trade Unit. TU numbers cannot be ordered! For invoicing purposes only.	3 g, Bag	83192158851
	100 g, Tube	83192158852
	5 g, TU*	83230140233



- Screw the control sensor (1) in and tighten it with the special tool .

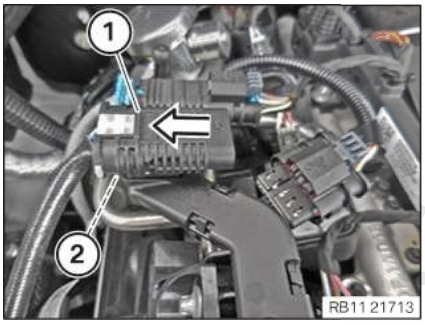
Front oxygen sensor to catalytic converter

M18X1.5		Tightening torque	50 Nm



- Guide in the heat protection (4) in the **direction of arrow** and install.
- Renew the cable straps (3).

  Parts: Cable strap
- Guide in and install the cable strap (3).
- Feed in and install the line of the front oxygen sensor (1) in the holder (2).



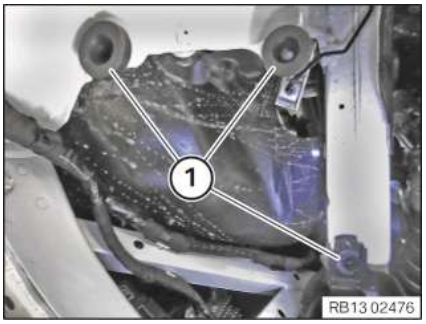
- Insert and install the connector (1) in the **direction of arrow**.
- Ensure that the lock (2)engages audibly.



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

116 – Installing intake silencer housing

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- Check the rubber mount (1) for correct fit.



- Feed the intake filter housing (3) in and engage it in the rubber mounts.
- Tighten clamp (2).

Clean air pipe to upper section of intake filter housing

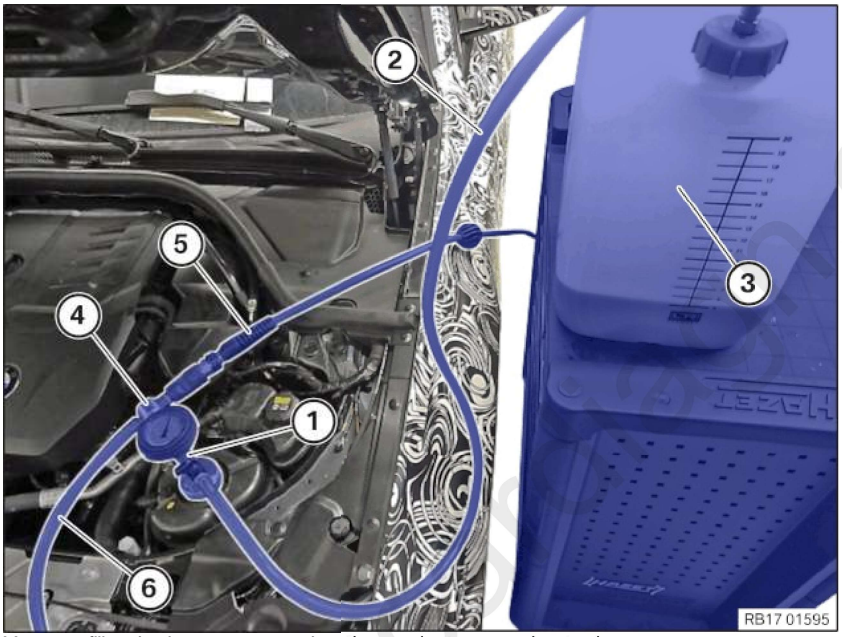
Clamp		Tightening torque	3 Nm

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

117 – Fill the high-temperature cooling system with the vacuum filler device

Vacuum filler device



Vacuum filler device - connected to the coolant expansion tank

1 Vacuum filler device with pressure gauge and shutoff valves

2 Filling hose

3 Fluid tank with coolant

4 Venturi nozzle

5 Compressed air connection (maximum of 6 bar)

6 Out-going hose (lead out-going hose into a collecting vessel)

Prerequisite

The coolant expansion tank for the cooling system must be empty. The fluid tank of the vacuum filler device must have a sufficient quantity of premixed coolant, 1 l to 2 l more than the specified capacity for the vehicle. The fluid tank of the vacuum filler device must be positioned at the same height as the coolant expansion tank. The compressed air connection must have a pressure of 6 bar. Ignition is switched off.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.
For additional information see:
Main group 17
17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

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

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

TECHNICAL INFORMATION

Mixing different coolants is not permitted.

TECHNICAL INFORMATION

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

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

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

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

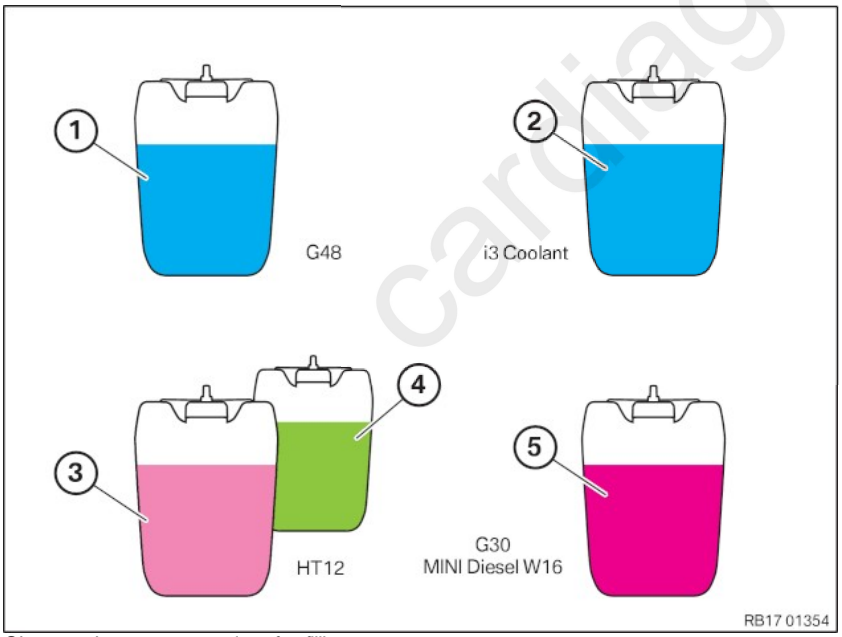
A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

TECHNICAL INFORMATION

Make sure that the ignition (terminal 15) is switched off prior to creating the vacuum with the vacuum filler device.

▸ **Observe the coolant type**

Coolant in the vacuum filler device container



Choose the correct coolant for filling

A vehicle must be filled with the coolant with which it is delivered ex works

1. **G48 (Blue)** G48 must not be mixed with the i3Coolant or the G30 MINI diesel fuelW16.
2. **i3 coolant (blue)** is used only for the i3 heater circuit. i3 coolant must not be filled in the other coolant circuits or mixed with the other coolants.
3. **HT12 (Pink)** HT12 must not be mixed with the i3 coolant or the G30 MINI diesel fuel W16.
4. **HT12 (Green)** HT12 must not be mixed with the i3 coolant or the G30 MINI diesel fuel W16.
5. **G30 (Pink)** must be used only for the **MINI diesel fuel W16**. G30 must not be filled in the other coolant circuits or mixed with the other coolants.

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RISK OF DAMAGE

Damage to the engine.

The use of an incorrect coolant may lead to corrosion or gelling in the engine.

- Use only approved coolants for the specific vehicle.
- Fill the vehicle only with the coolant with which it was delivered ex works.
- Mix only compatible coolants. The colour does not allow any assessment about the compatibility of coolants.
- Selection of the correct coolant only by means of the part number.

- Select a suitable adapter (Y) from the set of special tools 0 494 417 (17 0 100):

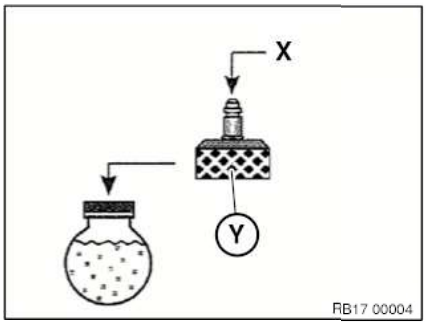
Type	Engine	Adapter (Y) from 17 0 100
G20/G29	B46 / B48 /B58	17 0 113

- The fluid tank of the vacuum filler device must be filled with 1 l to 2 l more than the specified capacity of coolant for the vehicle.

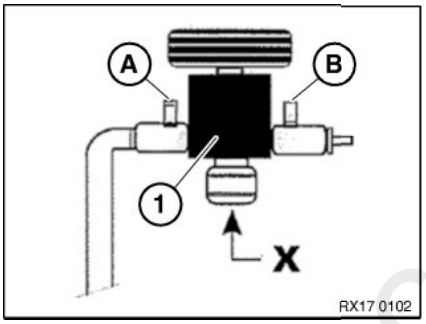
Capacity of high-temperature coolant circuit G20/G29

B58B30O1	10,5 l

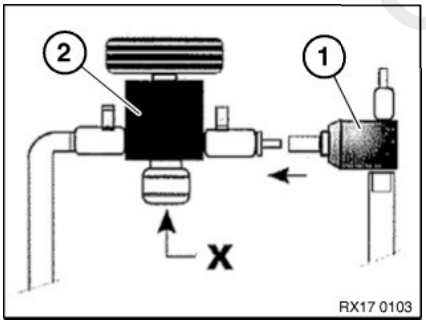
Expendable materials: Technically suitable antifreeze and corrosion inhibitor



- Connect the selected adapter (Y) to the coolant expansion tank.
- Connect vacuum filler device to connection (X) of the adapter.

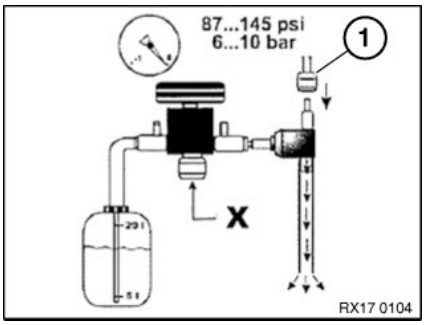


- Check whether shut-off valves (A) and (B) of the vacuum filler device (1) are closed.
- Connect and lock connection (X) to the coolant expansion tank.



- Connect Venturi nozzle (1) to the vacuum filler device (2).

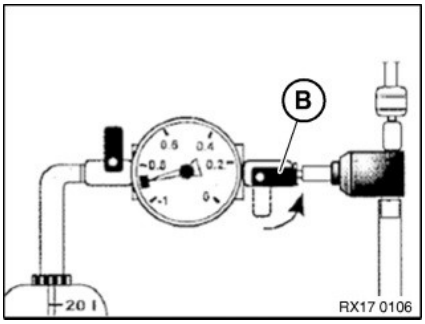
  (X)is the connection on the coolant expansion tank.



- Connect compressed air (1).

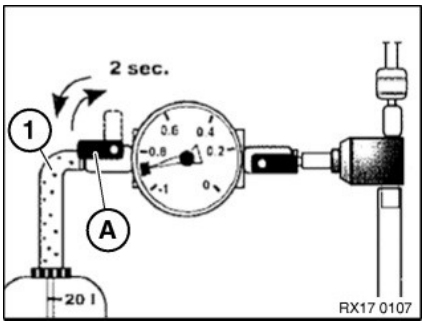
  (X)is the connection on the coolant expansion tank.

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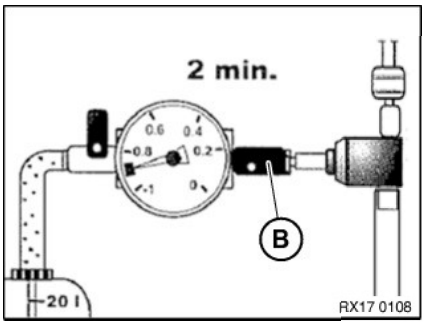
- Open shut-off valve (B).

  The venturi nozzle produces a flow noise.



- Open shutoff valve (A) until the fuel filling hose (1) is full without bubbles.
- Close shutoff valve (A) again.

» The filling hose (1) has now been bled.

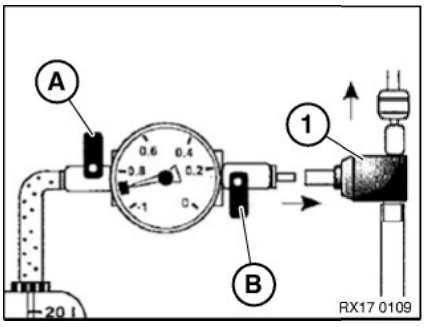


- Check the coolant hoses for porosity and renew porous coolant hoses as required.

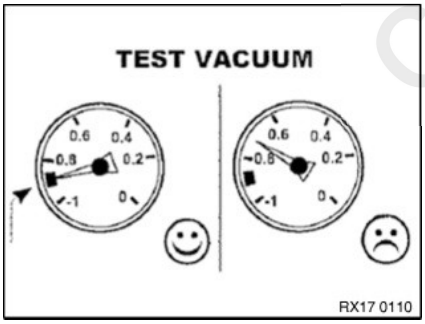
TECHNICAL INFORMATION

The coolant hoses contract during vacuum build-up.

- After having established a vacuum in the coolant circuit of between -0.7 to -0.95 bar (duration approximately 2 min), close the shut-off valve (B).



- Check whether the shutoff valves (A) and (B) are closed.
- Disconnect the Venturi nozzle (1).



Check

- Make sure the vacuum in the coolant circuit is maintained for at least 30 seconds.

Result

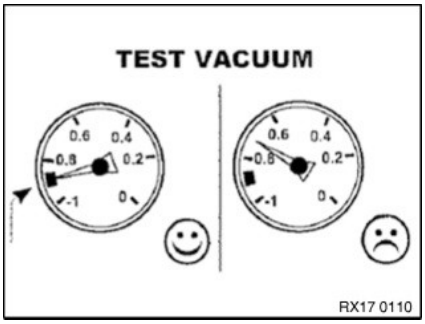
» Vacuum drops.

Measure

- Look for the leak, repair it and start the filling procedure from the beginning.

Check

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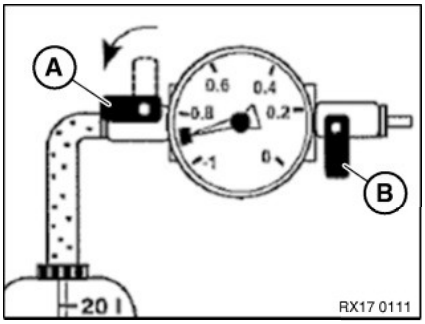
- Make sure the vacuum in the coolant circuit is maintained for at least 30 seconds.

Result

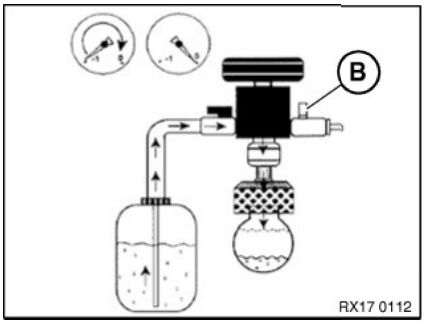
» Vacuum remains constant.

Measure

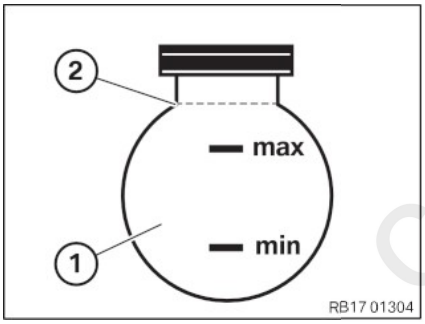
- Continue with filling.



- Keep shutoff valve (B) closed during the filling process.
- To fill the cooling system, open the shutoff valve (A) to the fluid tank of the vacuum filler device.



- Stop the filling procedure when the needle in the pressure measuring device is on 0 bar or it no longer drops.
- If necessary, reduce remaining vacuum. In order to do so, open shutoff valve (B).

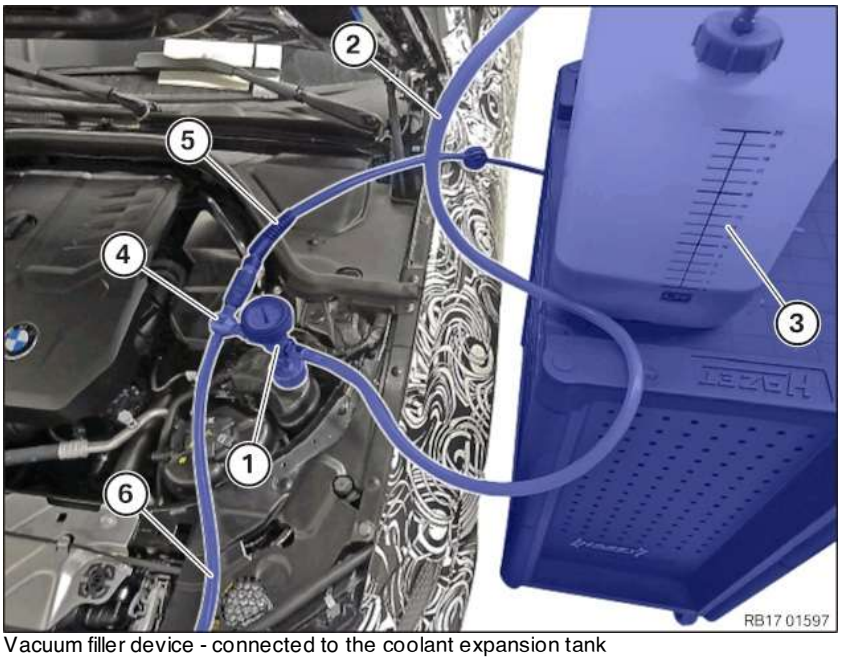


- Remove the vacuum filler device with the adapter from the high temperature coolant expansion tank (1).
- Top up the coolant level in the high temperature coolant expansion tank (1) to the lower edge of the coolant filler neck (2) in the high temperature coolant expansion tank (1).
- After filling the cooling system with the vacuum filler device, **also** run the cooling system bleeding routine.

118 – Filling the low-temperature cooling system with the vacuum filler device

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Vacuum filler device



Vacuum filler device - connected to the coolant expansion tank

1 Vacuum filler device with pressure gauge and shutoff valves

2 Filling hose

3 Fluid tank with coolant

4 Venturi nozzle

5 Compressed air connection (maximum of 6 bar)

6 Out-going hose (lead out-going hose into a collecting vessel)

Prerequisite

The coolant expansion tank for the cooling system must be empty. The fluid tank of the vacuum filler device must have a sufficient quantity of premixed coolant, 1 l to 2 l more than the specified capacity for the vehicle. The fluid tank of the vacuum filler device must be positioned at the same height as the coolant expansion tank. The compressed air connection must have a pressure of 6 bar. Ignition is switched off.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

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

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

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

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

TECHNICAL INFORMATION

Mixing different coolants is not permitted.

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TECHNICAL INFORMATION

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

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

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

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

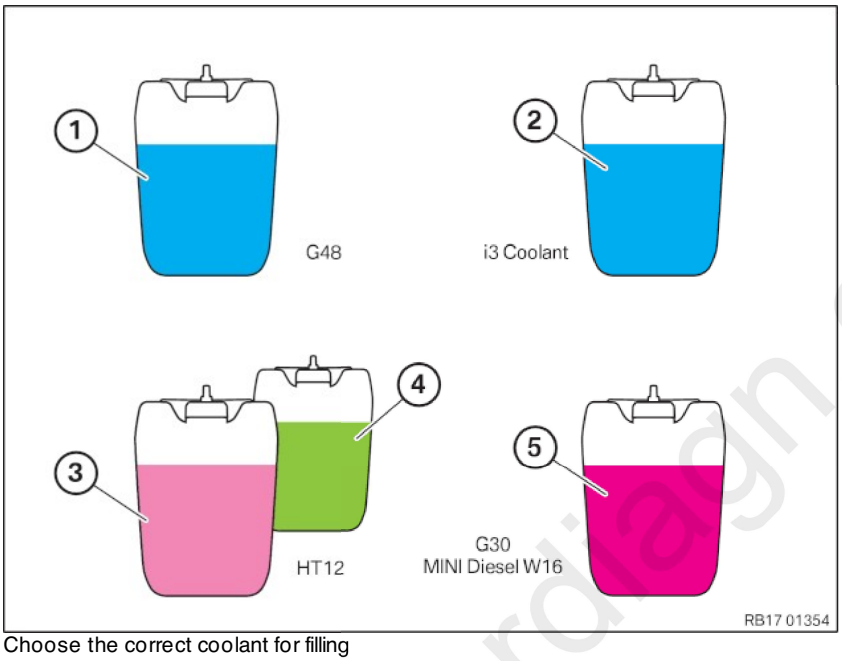
A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

TECHNICAL INFORMATION

Make sure that the ignition (terminal 15) is switched off prior to creating the vacuum with the vacuum filler device.

▸ **Observe the coolant type**

Coolant in the vacuum filler device container



Choose the correct coolant for filling

A vehicle must be filled with the coolant with which it is delivered ex works

1. **G48 (Blue)** G48 must not be mixed with the i3Coolant or the G30 MINI diesel fuelW16.
2. **i3 coolant (blue)** is used only for the i3 heater circuit. i3 coolant must not be filled in the other coolant circuits or mixed with the other coolants.
3. **HT12 (Pink)** HT12 must not be mixed with the i3 coolant or the G30 MINI diesel fuel W16.
4. **HT12 (Green)** HT12 must not be mixed with the i3 coolant or the G30 MINI diesel fuel W16.
5. **G30 (Pink)** must be used only for the **MINI diesel fuel W16**. G30 must not be filled in the other coolant circuits or mixed with the other coolants.

RISK OF DAMAGE

Damage to the engine.

The use of an incorrect coolant may lead to corrosion or gelling in the engine.

- Use only approved coolants for the specific vehicle.
- Fill the vehicle only with the coolant with which it was delivered ex works.
- Mix only compatible coolants. The colour does not allow any assessment about the compatibility of coolants.
- Selection of the correct coolant only by means of the part number.

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- Select a suitable adapter (Y) from the set of special tools 0 494 417 (17 0 100):

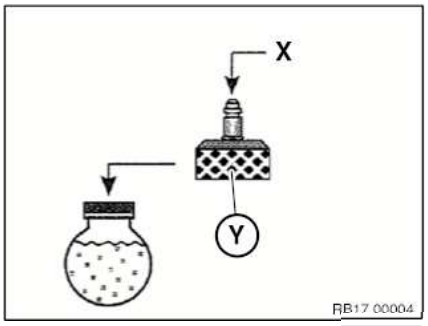
Type	Engine	Adapter (Y) from 17 0 100
G20/G29	B46 / B48 /B58	17 0 109

- The fluid tank of the vacuum filler device must be filled with 1 l to 2 l more than the specified capacity of coolant for the vehicle.

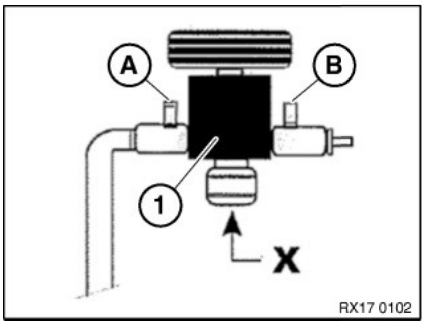
Capacity of low-temperature coolant circuit G20/G29

B58B30O1	4,5 l

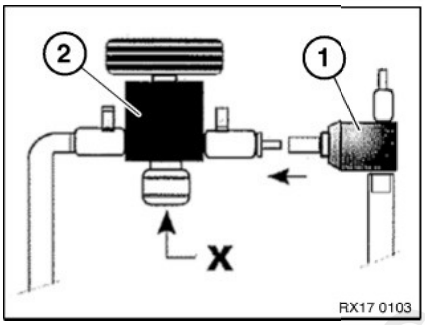
Expendable materials: Technically suitable antifreeze and corrosion inhibitor



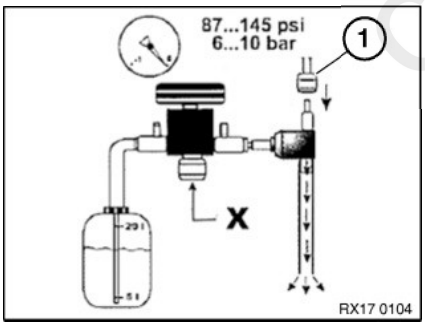
- Connect the selected adapter (Y) to the coolant expansion tank.
- Connect vacuum filler device to connection (X) of the adapter.



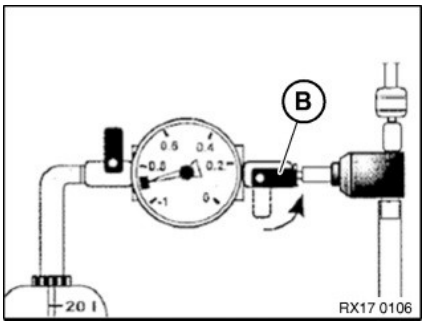
- Check that shutoff valves (A) and (B) of the vacuum filler device (1) are closed.
- Connect and lock connection (X) to the coolant expansion tank.



- Connect Venturi nozzle (1) to the vacuum filler device (2).
  (X)is the connection on the coolant expansion tank.

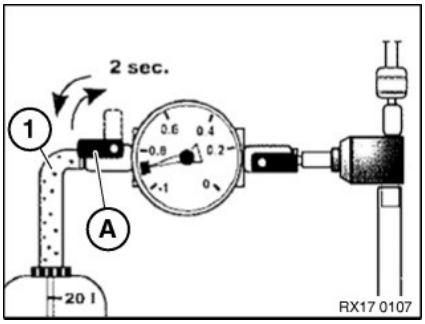


- Connect compressed air (1).
  (X)is the connection on the coolant expansion tank.



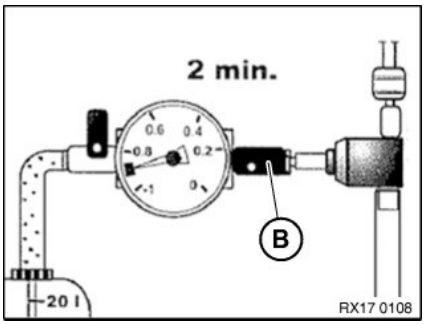
- Open shut-off valve (B).
  The venturi nozzle produces a flow noise.

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- Open shutoff valve (A) until the fuel filling hose (1) is full without bubbles.
- Close shutoff valve (A) again.

» The filling hose (1) has now been bled.

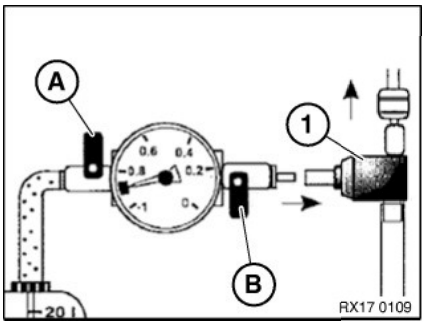


- Check the coolant hoses for porosity and renew porous coolant hoses as required.

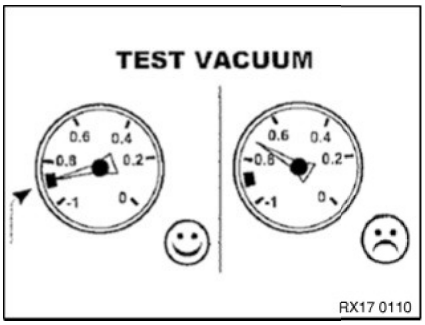
TECHNICAL INFORMATION

The coolant hoses contract during vacuum build-up.

- After a vacuum of -0.7 to -0.95 bar has been created in the coolant circuit (duration approx. 2 min), shut the shutoff valve (B).



- Check whether the shutoff valves (A) and (B) are closed.
- Disconnect the Venturi nozzle (1).



Check

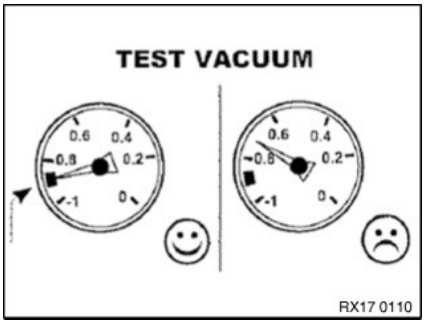
- The vacuum in the coolant circuit must be maintained for at least 30 seconds.

Result

» Vacuum drops.

Measure

- Look for the leak, repair it and start the filling procedure from the beginning.



Check

- The vacuum in the coolant circuit must be maintained for at least 30 seconds.

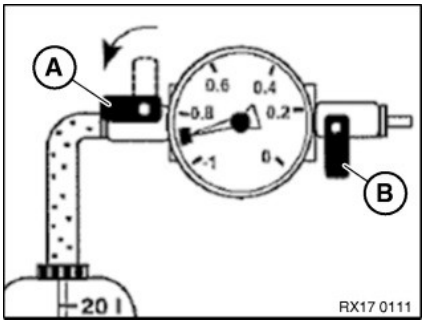
Result

» Vacuum remains constant.

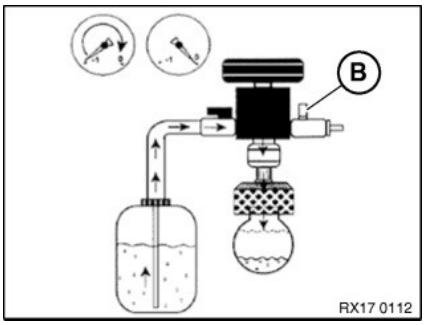
Measure

- Continue with filling.

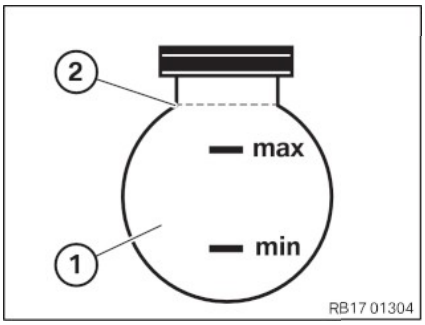
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- Keep shutoff valve (B) closed during the filling process.
- To fill the cooling system, open the shutoff valve (A) to the fluid tank of the vacuum filler device.



- Stop the filling procedure when the needle in the pressure measuring device is on 0 bar or it no longer drops.
- If necessary, reduce remaining vacuum. In order to do so, open shutoff valve (B).



- Remove the vacuum filler device with the adapter from the low-temperature coolant expansion tank (1).
- Adjust the coolant level in the low-temperature coolant expansion tank (1) up to the lower edge of the coolant filler neck (2) of the low-temperature coolant expansion tank (1).
- After filling the cooling system with the vacuum filler device, **also** run the cooling system bleeding routine.

119 – Disconnecting all battery earth leads



- See additional information.

120 – Bleed the high-temperature coolant circuit

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

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

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

TECHNICAL INFORMATION

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

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

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

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

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

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TECHNICAL INFORMATION

Before starting the automatic cooling system bleeding routine, make sure that **all coolant circuits** are **filled**. If the cooling system bleeding routine is started while one of the coolant circuits is empty, there is a risk of damage to the electric coolant pump when running it dry.

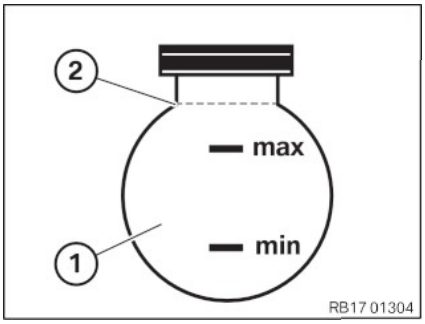
Make sure that terminal 15 is not disconnected for the bleeding procedure. Switch on low-beam headlights and hazard warning lights. If the low-beam headlights and hazard warning lights are not switched on, the ignition (terminal 15) will switch off automatically after a certain period of time and interrupt the bleeding procedure.

TECHNICAL INFORMATION

The electrical fan is activated during the entire cooling system bleeding routine.

TECHNICAL INFORMATION

The driving experience switch must not be set to the ECO PRO switch position.



- Open the bleeder screw on the coolant expansion tank for the high-temperature coolant circuit and close it again after approx. **10 s**.

  You can close the bleeder screw prior to expiry of the 10 s once coolant escapes.
- Adjust the coolant level in the high temperature coolant expansion tank (1) to the lower edge (2) of the coolant filler neck of the the high temperature coolant expansion tank (1) .
- Close the sealing cap on the coolant expansion tank of the high--temperature cooling circuit.
- Make sure the bonnet is **closed**.
- Make sure that the wheels touch the ground.
- Engage the parking brake.
- Do not engage any gear in manual-shift gearbox, and engage the gear to "P" or "N" automatic transmission.
- Connect battery charger.
- Switch on the ignition and make sure that it remains **switched on** (for example, activate the low-beam headlight and the **hazard warning light at the same time**).

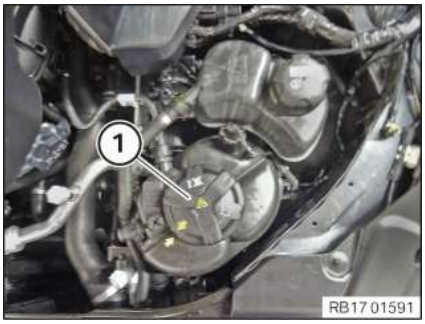
  If the low-beam headlight and the hazard warning light are **not** switched on, the ignition (**terminal 15**) will switch off automatically after some time and interrupts the bleeding procedure.
- Check that the driving experience control is **not** in the **"ECO-PRO"** switch position.
- Adjust the heating to **maximum** temperature and adjust the blower to the **lowest** stage.
- Hold the accelerator pedal down to the limit position for at least **10 s** and do **no** kick the brake pedal.
- Start engine.
- Start the cooling system bleeding routine, pay attention to the display on the instrument cluster (KOMBI). ("Service function started")

  The engine speed (up to 3500 rpm) and the actuators in the cooling system are activated **automatically** for 11 minutes according to a cooling system bleeding routine.

  The cooling system bleeding routine ends approx. 11 min **after** the engine starts.

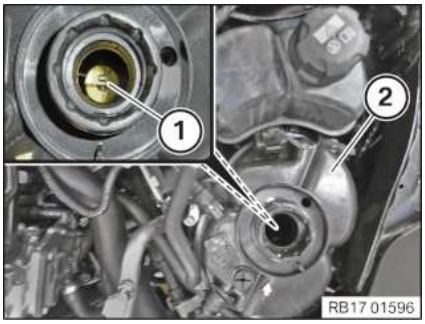
  The engine speed **drops** to the idle speed.
- Observe the display in the instrument cluster (KOMBI).

  If the service function is interrupted, the cooling system bleeding routine **must** be repeated.
- Switch off engine.
- Allow the coolant temperature to cool down to **< 50°C**.



- Loosen sealing cap (1).

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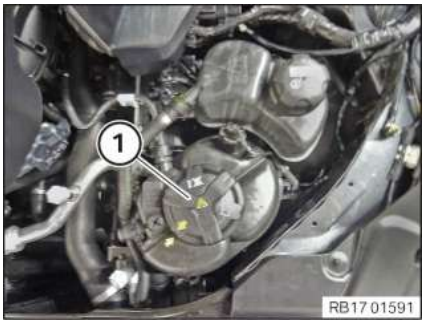
TECHNICAL INFORMATION

After the cooling system bleeding routine, the cooling system is topped up above the maximum mark.

Overfilling the cooling system serves to balance the remaining air in the cooling system.

The normal filling level of the coolant is reached while driving.

- Adjust the filling level in the coolant expansion tank (2) of the high-temperature coolant circuit to **200 ml** over the **maximum mark**(1) .



- Close sealing cap (1).
- Close the sealing cap (1) until the **arrows** are flush.

121 – Bleeding the low-temperature cooling system

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

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

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

TECHNICAL INFORMATION

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

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

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

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

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

TECHNICAL INFORMATION

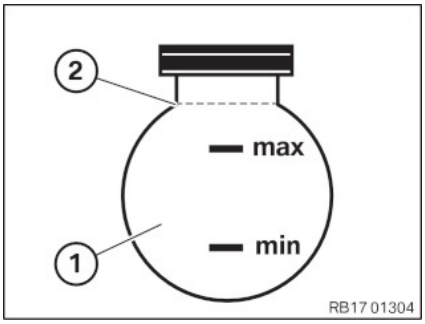
Before starting the automatic cooling system bleeding routine, make sure that **all coolant circuits** are **filled**. If the cooling system bleeding routine is started while one of the coolant circuits is empty, there is a risk of damage to the electric coolant pump when running it dry.

Make sure that terminal 15 is not disconnected for the bleeding procedure. Switch on low-beam headlights and hazard warning lights. If the low-beam headlights and hazard warning lights are not switched on, the ignition (terminal 15) will switch off automatically after a certain period of time and interrupt the bleeding procedure.

TECHNICAL INFORMATION

The driving experience switch must not be set to the ECO PRO switch position.

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- Adjust the coolant level in the low-temperature coolant expansion tank (1) up to lower edge (2) of the coolant filler neck of low-temperature coolant expansion tank (1).
- Close the sealing cap on the coolant expansion tank of the low-temperature coolant circuit.
- Ensure that the bonnet is **open**.
- Connect battery charger.
- Switch on the ignition and ensure that it remains **switched on** (for example, activate the low-beam headlight and the hazard warning lights **at the same time**).
- If the low-beam headlight and the hazard warning light are **not** switched on, the ignition (**terminal 15**) will switch off automatically after some time and interrupts the bleeding procedure.
- Ensure that the Driving Experience Control is **not** in the **"ECO-PRO"** switch position.
- Adjust the heating to **maximum** temperature and adjust the blower to the **lowest** stage.
- Hold the accelerator pedal down to the limit position for at least **10 s** and do **not** press on the brake pedal.
- Do **not** start engine.

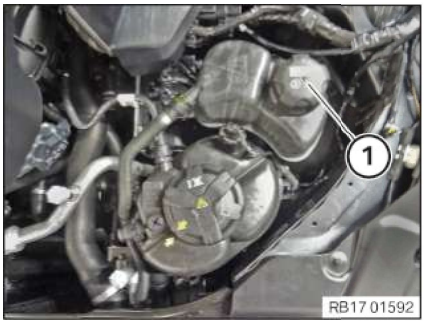
  The cooling system bleeding routine will start.

  The electric coolant pump in the low-temperature coolant circuit is activated for 11 minutes according to a cooling system bleeding routine.

  The cooling system bleeding routine ends after 11 minutes.

  The electric coolant pump is **no** longer activated.
- Note the display in the instrument cluster (KOMBI).

  If the service function is interrupted, the cooling system bleeding routine **must** be repeated.
- Allow the coolant temperature to cool down to **< 50°C**.



- Loosen sealing cap (1).



TECHNICAL INFORMATION

After the cooling system bleeding routine, the cooling system is topped up above the maximum mark.
Overfilling the cooling system serves to balance the remaining air in the cooling system.
The normal filling level of the coolant is reached while driving.

- Adjust the filling level in coolant expansion tank (2) of the low-temperature coolant circuit to **100 ml** above the **maximum mark** (1) .
- Close sealing cap (1).

122 – Check the high-temperature cooling system for watertightness

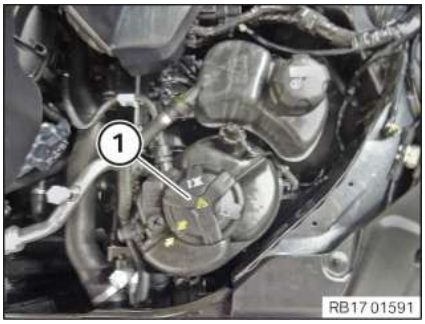
WARNING

Hot surfaces.

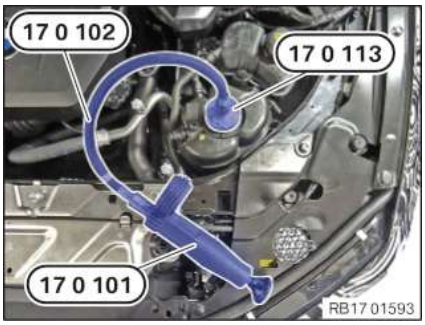
Risk of burning!

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

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- Loosen sealing cap (1).



- Attach the special tool 0 494 418 (17 0 101) with special tools 0 494 419 (17 0 102) and 0 494 642 (17 0 113) from the set of special tools 0 494 417 (17 0 100).
- Build up excess pressure and wait for approximately 2 minutes.

Opening pressure of sealing cap / test pressure of high-temperature coolant circuit cooling system

Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure.	max. 0,1 bar
Test pressure for cooling system (gauge pressure)	1,5 bar



TECHNICAL INFORMATION

If the described test step is not completed successfully: repeat test step twice. Only replace the sealing cap after three tests with an incorrect opening pressure.

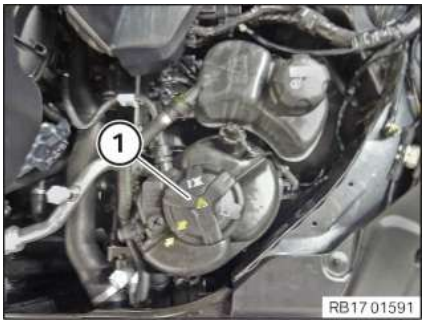
When driving at high ambient temperatures, the design may cause the pressure relief valve in the sealing cap to open slightly and air to escape together with dissolved coolant. This coolant vapour condenses on the surface of the coolant expansion tank and leaves traces of coolant when the vehicle has cooled down. These traces of coolant do not indicate whether the sealing cap is defective or not.

Escaping coolant vapours when the vehicle is at standstill may cause the pressure relief valve to stick to the sealing cap. This may cause an incorrect opening pressure.

- Screw on sealing cap (1) on special tool 0 494 643 (17 0 114) from the set of special tools 0 494 417 (17 0 100).
- Build up the pressure with special tools 0 494 418 (17 0 101) and 0 494 419 (17 0 102) from the set of special tools 0 494 417 (17 0 100).
- Observe on the pressure measuring device when the opening pressure has been reached.

Opening pressure of sealing cap / test pressure of high-temperature coolant circuit cooling system

Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure.	max. 0,1 bar
Test pressure for cooling system (gauge pressure)	1,5 bar



- Close sealing cap (1).
- Close the sealing cap (1) until the **arrows** are flush.

123 – Checking low-temperature cooling system for watertightness

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WARNING

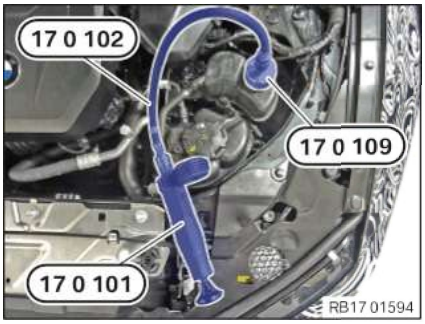
Hot surfaces.

Risk of burning!

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



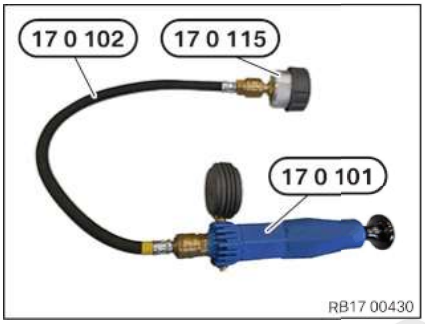
- Loosen sealing cap (1).



- Attach the special tool 0 494 418 (17 0 101) with special tools 0 494 419 (17 0 102) and 0 494 426 (17 0 109) from the set of special tools 0 494 417 (17 0 100).
- Build up excess pressure and wait for approximately 2 minutes.

Opening pressure of sealing cap / test pressure of high-temperature coolant circuit cooling system

Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure.	max. 0,1 bar
Test pressure for cooling system (gauge pressure)	1,5 bar



TECHNICAL INFORMATION

If the described test step is not completed successfully: repeat test step twice. Only replace the sealing cap after three tests with an incorrect opening pressure.

When driving at high ambient temperatures, the design may cause the pressure relief valve in the sealing cap to open slightly and air to escape together with dissolved coolant. This coolant vapour condenses on the surface of the coolant expansion tank and leaves traces of coolant when the vehicle has cooled down. These traces of coolant do not indicate whether the sealing cap is defective or not.

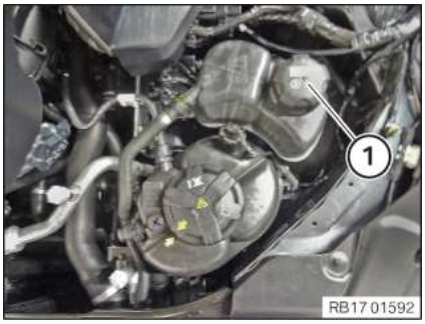
Escaping coolant vapours when the vehicle is at standstill may cause the pressure relief valve to stick to the sealing cap. This may cause an incorrect opening pressure.

- Screw on sealing cap (1) on special tool 0 495 889 (17 0 115) from the set of special tools 0 494 417 (17 0 100).
- Build up the pressure with special tools 0 494 418 (17 0 101) and 0 494 419 (17 0 102) from the set of special tools 0 494 417 (17 0 100).
- Observe on the pressure measuring device when the opening pressure has been reached.

Opening pressure of sealing cap / test pressure of high-temperature coolant circuit cooling system

Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure.	max. 0,1 bar
Test pressure for cooling system (gauge pressure)	1,5 bar

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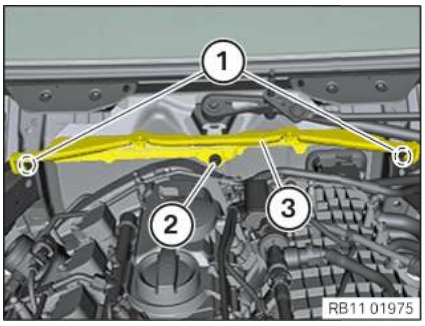


- Close sealing cap (1).

124 – Check engine oil level

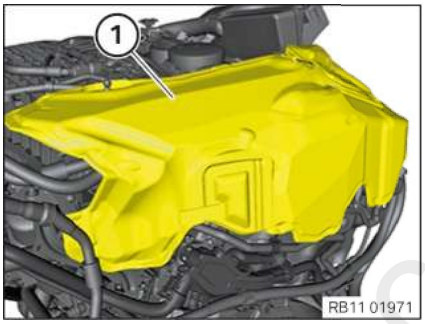
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.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

125 – Installing centre bulkhead lower section



- Position the centre bulkhead lower part (3).
- Tighten nut (2) and screws (1).

126 – Installing acoustic cover at rear

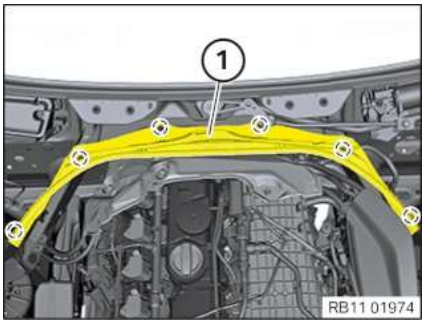


- Make sure the acoustic cover (1) is correctly positioned on the rear side of the engine.



- Install the acoustic cover (1) from the top and clip it in into the marked areas.

127 – Installing the centre bulkhead upper part

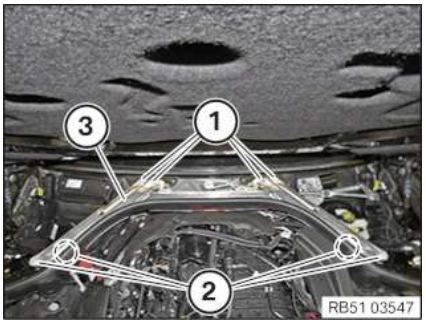


- Position the centre bulkhead upper part (1).
- Tighten the bolts in the marked areas.

Bulkhead upper part to bottom bulkhead

	Tightening torque	3 Nm

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- **If installed:** Install tension strut on spring strut dome.
- Install the tension strut (3) on the spring strut dome.
- Tighten the screws (1).

Tension strut on bulkhead

M10x25 screw		Tightening torque	56 Nm

- Renew screws (2).

  Parts: Bolts
- Tighten the screws (2).

Tension strut to spring strut dome

Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

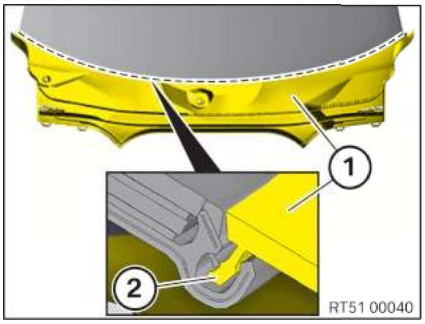
128 – Installing cowl panel cover

RISK OF DAMAGE

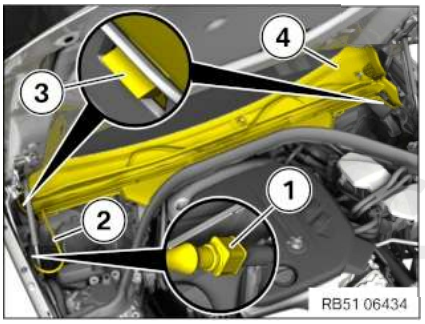
Damage caused by water ingress into the vehicle.

Water ingress into the vehicle may result in damage to components, malfunctions and corrosion.

- Ensure correct installation of the components.
- Only use undamaged components.

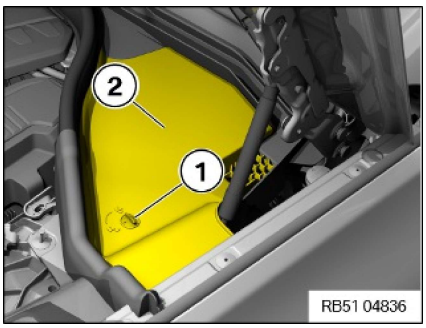


- Push the cowl panel cover (1) into the latch mechanism (2) beginning on the side.



- Clip cowl panel cover (4)in by means of the latch mechanisms (3).
- Position windscreen wash hose (2) and connect windscreen wash hose (1)quick lock.

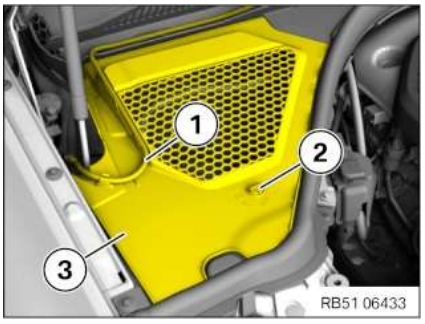
129 – Install the cover of the engine compartment on the rear left



- Position the engine compartment cover at the rear left (2) .
- Close lock (1).

130 – Install the rear right engine compartment cover

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- Position the cover of the engine compartment on the rear right (3).
- Close lock (2).
- Insert washer fluid hose (1) into the guides.

131 – Installing both wiper arms

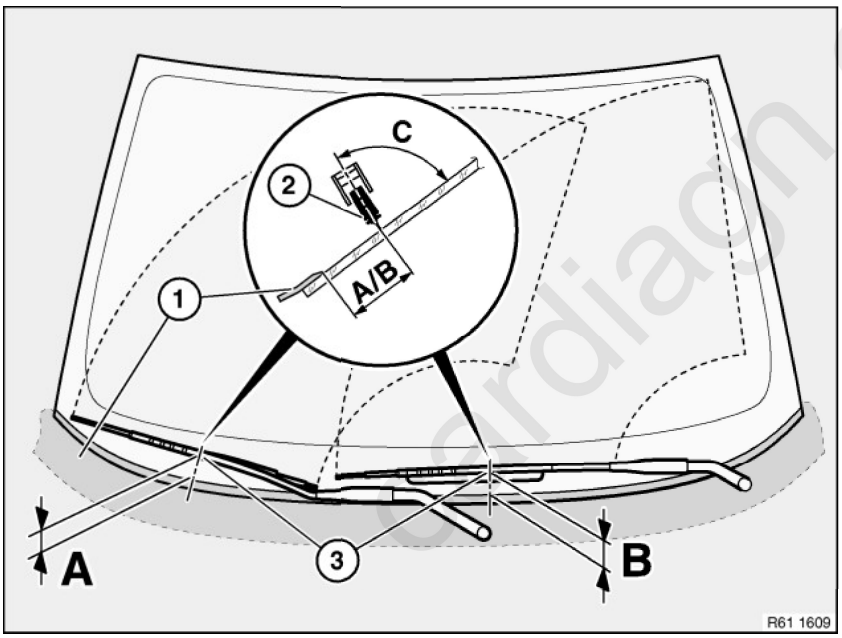
NOTICE

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

▸ **Install the wiper arm**

TECHNICAL INFORMATION

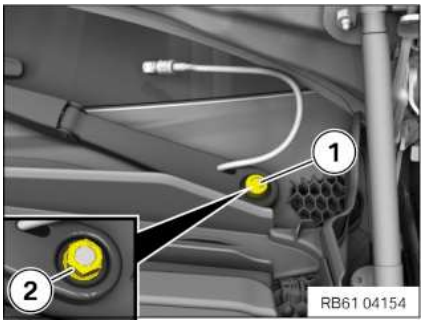
The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).

Distance from window pane edge to wiper blade

Wiper arm right (A)	57,5 ±5 mm
Wiper arm left (B)	63,3 ±4 mm

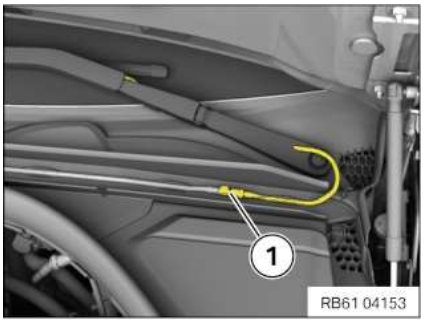


- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).



- Insert windscreen wash hose (1) into the cowl and connect at the separating point.

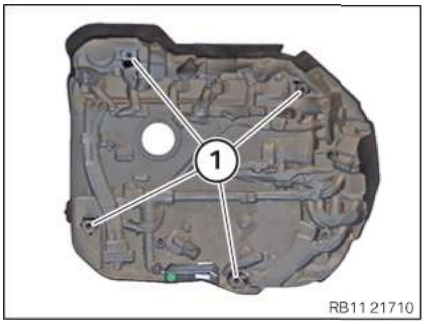
132 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

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

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



- Check the rubber mount (1) for correct fit in the acoustic cover.



- Install acoustic cover (1) and fix in the rubber mounts (marks).

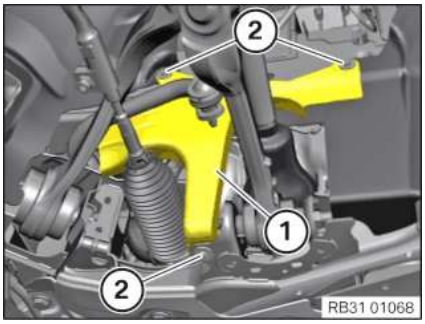
133 – Install the seal for the bonnet



- Press the rear bonnet seal (2) into the guide.
- Feed in cable (1) into the brackets.
- Check that the rear bonnet seal (2) and the cable (1) are seated correctly.

134 – Install the cover of the steering assembly

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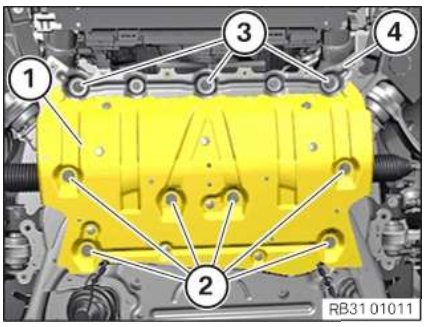


- Position the cover (1).
- Tighten the screws (2).

Cover, steering unit

Screw		Tightening torque	3 Nm

135 – Installing the stiffening plate

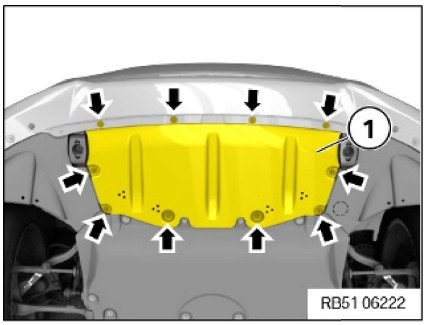


- Position stiffening plate (1).
- Screw screws (2) in.
- Position holder of underride protection (4).
- Screw screws (3) in.
- Tighten down screws (2) and (3).

Stiffening plate to front axle support

M10		Tightening torque	56 Nm

136 – Installing the front underbody protection



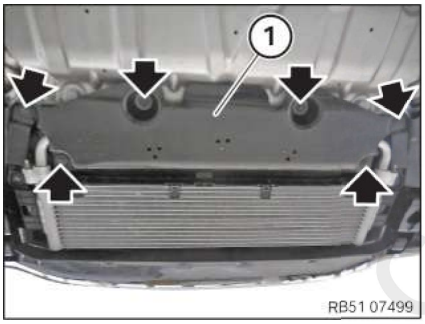
- **Version 1:**

  Feed in the front underbody protection (1) towards the front under the bumper panel and position.

  Tighten screws (arrows).

Underbody protection front

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



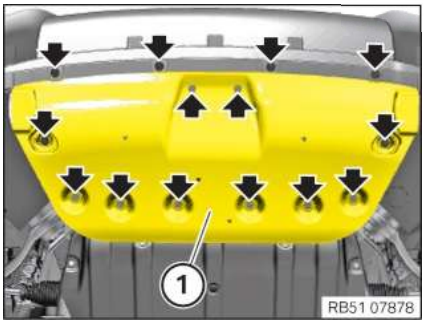
- **Version 2:**

  Feed in and position the front underbody protection (1).

  Tighten screws (arrows).

Underbody protection front

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



- **Version 3:**

  Feed in and install front underbody protection (1).

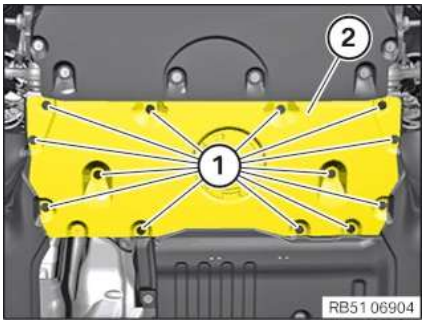
  Tighten screws (arrows).

Underbody protection front

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

137 – Installing the centre underbody protection

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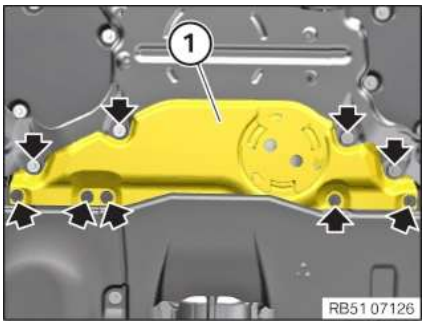
- **Version with rear-wheel drive:**

  Position central underbody protection (2).

  Tighten the screws (1).

Underbody protection

Hexagon screw		Tightening torque	3 Nm



- **Version with all-wheel drive:**

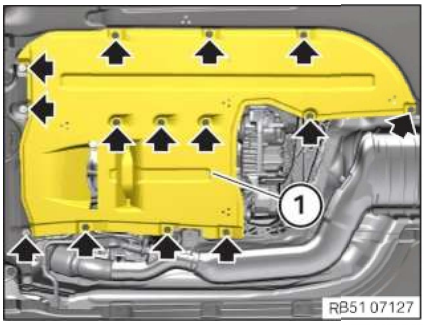
  Guide in and install the centre of underbody protection (1).

  Tighten screws (arrows).

Underbody protection

Hexagon screw		Tightening torque	3 Nm

138 – Installing underbody protection at rear



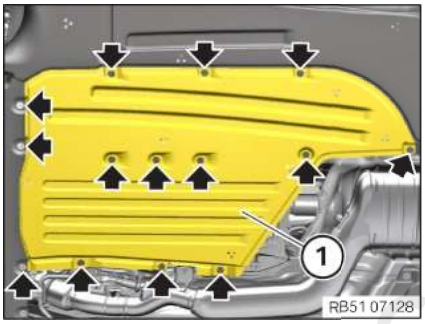
- **Version 1:**

  Insert and install the rear underbody protection (1).

  Tighten screws (arrows).

Underbody protection

Hexagon screw		Tightening torque	3 Nm



- **Version 2:**

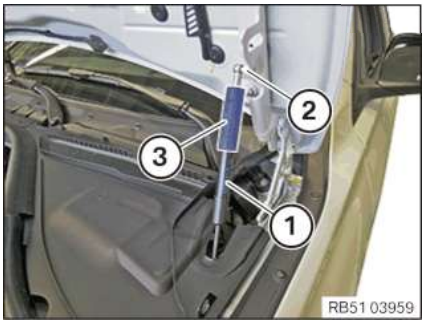
  Insert and install the rear underbody protection (1).

  Tighten screws (arrows).

Underbody protection

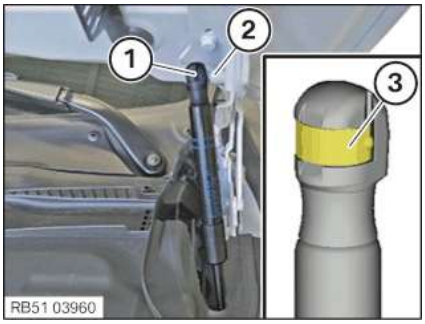
Hexagon screw		Tightening torque	3 Nm

139 – Take bonnet out of the service position



- Support the bonnet by hand.
- Remove the special tool (3) from the ball pin (2).
- Pull off the special tool (3) from the gas pressure spring (1).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.

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CAUTION

Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.

- Check the clamp (3) is fitted correctly.
- Connect ball socket (1) to ball pin (2).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.

Additional Information

Overview of Tightening Torques

Cover, front bottom on side — Used in step 4893

Hexagon screw for thermoplastic		Tightening torque	3 Nm

Basic carrier to cylinder head — Used in step 547282

M6		Tightening torque	8 Nm

Test gauge to basic carrier — Used in step 547282

M6		Tightening torque	8 Nm

Special tool to cylinder head — Used in step 63

M8		Tightening torque	21,5 Nm

Special tool 2 466 467 to special tool 2 446 919 — Used in step 64

M8		Tightening torque	5 Nm

Ventilation connection/special tool to cylinder head — Used in step 69

M10			18 Nm

Coolant temperature sensor at cylinder head — Used in step 69

Sensor		Tightening torque	13,5 Nm

Exhaust manifold to cylinder head — Used in step 70

Flange nutM7	*Replace flange nuts*	1. Jointing torque	10 Nm
		2. Jointing torque	10 Nm
		3. Jointing torque	16 Nm
		4. Jointing torque	16 Nm
		5. Jointing torque	16 Nm

Cylinder head to crankcase — Used in step 71

M11	Observe tightening sequence. Fit new cylinder head bolts.	1. Jointing torque	30 Nm
		2. Angle of rotation	90 °
		3. Angle of rotation	180 °

Cylinder head bolt to timing case cover — Used in step 71

M8x40	Renew screws.	Tightening torque	19 Nm

Camshaft sensor wheel to intake camshaft — Used in step 71

M4 x35			4,5 Nm

Bearing journal to cylinder head — Used in step 71

Bearing journal	Renew the bearing journal!	Tightening torque	20 Nm

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Sliding rail to cylinder head — Used in step 71

M6x16			8 Nm

Cover on rear cylinder head — Used in step 71

M6		Tightening torque	8 Nm

Cable routing to cylinder head, rear — Used in step 71

M6 x 20		Tightening torque	8 Nm

Oil feed line for exhaust turbocharger to crankcase — Used in step 71

M6 x 12	Replace sealing ring.	Tightening torque	8 Nm

Coolant return line holder bracket to crankcase — Used in step 71

M6X12		Tightening torque	8 Nm

Heat shield to cylinder head — Used in step 71

M8X12	Renew screws.	Tightening torque	19 Nm

Heat shield to clamping strip — Used in step 71

M6X16	Renew screw.	Tightening torque	8 Nm

Coolant feed line to crankcase — Used in step 71

M6X12		Tightening torque	8 Nm

Exhaust turbocharger support to crankcase — Used in step 71

M8 x 20	Renew screws.		19 Nm

Exhaust turbocharger to support — Used in step 71

M8 x 25	Renew screw.		19 Nm

VANOS central valve to camshaft — Used in step 7879

M20 x 1.5		1. Jointing torque	10 Nm
		2. Jointing torque	30 Nm
		3. Jointing torque	50 Nm
		4. Angle of rotation	35 °

Chain tensioner to cylinder head — Used in step 81

Chain tensioner		Tightening torque	20 Nm
		Angle of rotation	40 °

Intake plenum to cylinder head — Used in step 83

M6		Tightening torque	10 Nm

Intake plenum to support — Used in step 83

M6X25		Tightening torque	8 Nm

Tank ventilation line to intake plenum — Used in step 83

Oval-head screw		Tightening torque	3 Nm

Charge air line to throttle valve — Used in step 83105

M6x30		Tightening torque	8 Nm

Control unit holder on spring strut dome — Used in step 85

Hexagon screw		Tightening torque	8 Nm

Coolant line to coolant pump/cylinder head — Used in step 88

M6x20		Tightening torque	8 Nm

Oil return line to turbocharger — Used in step 89

M6 x 12			8 Nm

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Oil return line to crankcase			Used in step 89
M6 x 12			8 Nm

Catalytic converter to turbocharger			Used in step 90
V-band clamp	Replace V-band clamp.	Tightening torque	19 Nm

Catalytic converter to holder			Used in step 90
M8 nut	Renew nut.	Tightening torque	28 Nm

Rear silencer to body / bumper support			Used in step 91
M8	Replace nuts.	Tightening torque	19 Nm

Exhaust system to rear axle carrier			Used in step 91
Nut M8	Renew nut.	Tightening torque	19 Nm

Front pipe / petrol particulate filter on transmission holder			Used in step 91
M8	Renew nut.	Tightening torque	19 Nm

Exhaust system to catalytic converter			Used in step 91
Ribbon cable clamp	Renew flat band clip.	Tightening torque	26 Nm

V-clip to catalytic converter			Used in step 91
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Connecting support to tunnel			Used in step 92
M8x25 screw		Tightening torque	20 Nm
Screw		Tightening torque	3 Nm

Engine oil cooler to bumper support			Used in step 93
M6X25		Tightening torque	8 Nm

Cylinder head cover to cylinder head			Used in step 94
M6X30		Jointing torque	8 Nm

Cylinder head cover to cylinder head			Used in step 94
M6X30		Tightening torque	11 Nm

Auxiliary coolant pump holder to cylinder head			Used in step 94
M6		Tightening torque	7 Nm

Standard screw connection M6			Used in step 94
M6			8 Nm

Differential pressure sensor to holder			Used in step 94
TS6X18		Tightening torque	3,5 Nm

Holder, positive battery cable to cylinder head cover			Used in step 94
6X18		Tightening torque	6 Nm

High pressure pump to high pressure pump flange			Used in step 96
M6x25	*Renew screws.*	Jointing torque	12 Nm
		Tightening torque	90 °

Ground cable to rail			Used in step 9899
M6			5 Nm

High pressure line between rail and high pressure pump			Used in step 100
M14x1,5		Tightening torque	33 Nm

Fuel delivery line to high pressure pump			Used in step 101
M14		Tightening torque	31 Nm

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Fuel line to cylinder head cover			Used in step 101
6x18		Tightening torque	6,5 Nm

Spark plugs			Used in step 102
M12x1.25		Tightening torque	23 Nm

Ignition coil			Used in step 103
Screw		Tightening torque	8 Nm

Engine ventilation line adapter with heating element to exhaust turbocharger			Used in step 104
M6x26 screw		Tightening torque	8 Nm

Electric coolant pump to holder			Used in step 105
M6		Tightening torque	8 Nm

Fan cowl with electric fan on radiator			Used in step 108
TS6x20		Tightening torque	6,5 Nm

Top rear cross connection to bonnet catch support			Used in step 109
Flat-head screw M6x20		Tightening torque	11,8 Nm

Rear top cross connection to wheel arch carrier support			Used in step 109
M10x20 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Cross connection, top			Used in step 110
M8x20		Tightening torque	28 Nm

Cross connection, top			Used in step 110
M6x20		Tightening torque	11,8 Nm

Monitoring oxygen sensor to catalytic converter			Used in step 114
M18X1.5		Tightening torque	50 Nm

Front oxygen sensor to catalytic converter			Used in step 115
M18X1.5		Tightening torque	50 Nm

Clean air pipe to upper section of intake filter housing			Used in step 116
Clamp		Tightening torque	3 Nm

Bulkhead upper part to bottom bulkhead			Used in step 127
		Tightening torque	3 Nm

Tension strut on bulkhead			Used in step 127
M10x25 screw		Tightening torque	56 Nm

Tension strut to spring strut dome			Used in step 127
Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

Windscreen wiper arm			Used in step 131
Combination hexagon nut		Tightening torque	35 Nm

Cover, steering unit			Used in step 134
Screw		Tightening torque	3 Nm

Stiffening plate to front axle support			Used in step 135
M10		Tightening torque	56 Nm

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Underbody protection front Used in step 136

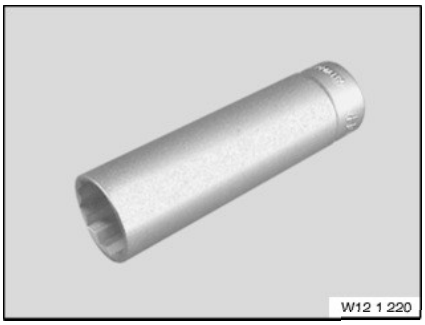
Hexagon screw for thermoplastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Underbody protection Used in step 137138

Hexagon screw		Tightening torque	3 Nm

Overview of Special Tools

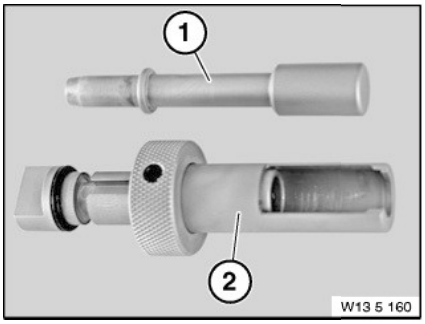
0 495 560 (12 1 220) Socket



Common Used in step 26102

Usage	For removing and installing the spark plugs (WAF 14 bihexal).
Included in the tool or work	
Storage location	C18
Replaced by	
In connection with	
SI-Number	01 20 06 (299)

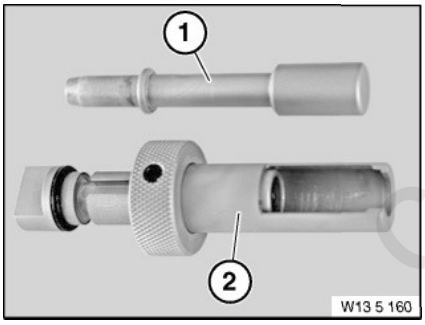
0 496 567 (13 5 161) Fastener



Common Used in step 28

Usage	(Cap (2 piece)) For sealing the quick connectors Deletion, only available via tool set
Included in the tool or work	0 496 565
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 568 (13 5 162) Fastener

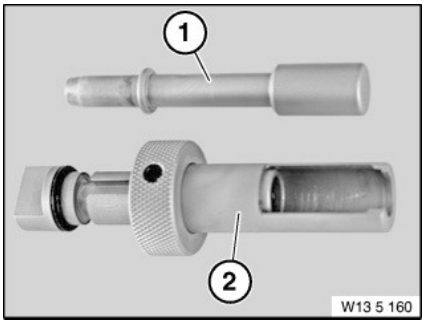


Common Used in step 28

Usage	(Cap (2 x)) To close off the fuel lines. Discontinued, can only be ordered using complete tool
Included in the tool or work	0 496 565
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 496 565 (13 5 160) Fastener



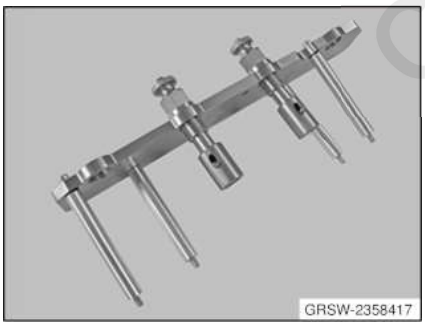
Common	Used in step 28
Usage	(Caps (2x)) To close off the fuel lines when removing and installing the engine.
Included in the tool or work	
Storage location	B26
Replaced by	
In connection with	
SI-Number	01 22 08 (498)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 567 (13 5 161)		**Fastener** (Cap (2 piece)) For sealing the quick connectors Deletion, only available via tool set	
2	0 496 568 (13 5 162)		**Fastener** (Cap (2 x)) To close off the fuel lines. Discontinued, can only be ordered using complete tool	

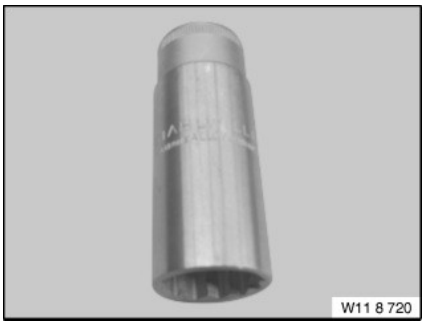
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2 358 417 Device



Common	Used in step 3031
Usage	For removing and installing injectors. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A57
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

0 496 106 (11 8 720) Socket WAF 46



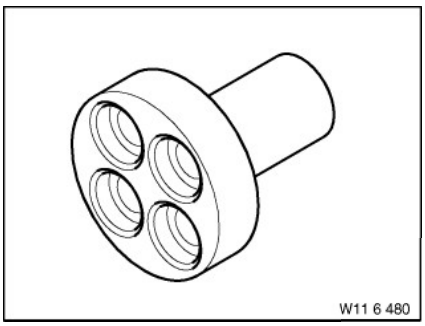
Common	Used in step 3031
Usage	(Long socket SW24) For removal and installation of oil pressure sensor. (Stahlwille or HAZET)
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 04 07 (352)

2 360 895 Pin wrench



Common	Used in step 3295
Usage	For removal and installation of the magnetic actuator. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

0 493 380 (11 6 480) Connector



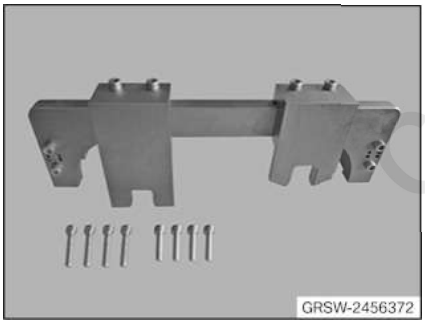
Common	Used in step 54808296
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud



Common	Used in step 548082
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

2 456 372 Gauge



Common	Used in step 5462728082
Usage	For securing camshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B57
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 358 122 Gauge



Common	Used in step 546282
Usage	For securing camshaft at TDC. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A57
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

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0 496 855 Ratchet handle



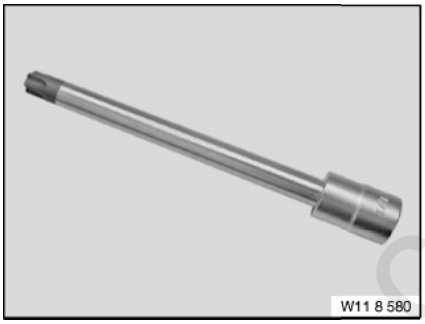
Common	Used in step 56577879
Usage	Insert reversible ratchet with nut for installation and disassembly of the VANOS- SW22. (only in longitudinal installation). Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A55
Replaced by	
In connection with	
SI-Number	01 34 15 (306)

2 450 487 Socket



Common	Used in step 56577879
Usage	For removing and installing the VANOS adjuster. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B55
Replaced by	
In connection with	0496855
SI-Number	01 07 17 (487)

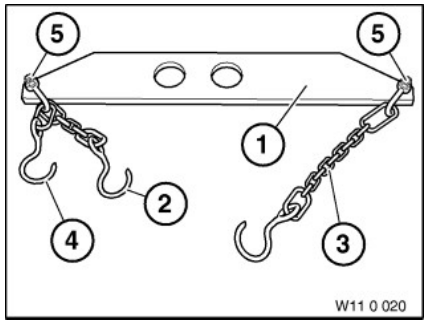
0 495 747 (11 8 580) Socket wrench



Common	Used in step 6371
Usage	(wrench socket Torx T60) For removing and installing cylinder head (outside diameter 13.5 mm).
Included in the tool or work	
Storage location	A19
Replaced by	
In connection with	
SI-Number	01 20 06 (299)

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0 490 567 (11 0 020) Lifting gear



Common Used in step 6371

Usage	For removing and installing the engines. 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
5	0 490 572 (11 0 029)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 568 (11 0 021)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 569 (11 0 022)		**Chain** (Chain) As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 570 (11 0 023)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
4	0 490 571 (11 0 024)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	

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2 220 718 Workshop crane



Common	Used in step 63
Usage	WSK 1000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	06 01 11 (701)

2 446 919 Locating fixture



Common	Used in step 6470
Usage	For installation and de-installation of the exhaust turbocharger module. Engine: B58.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 08 16 (383)

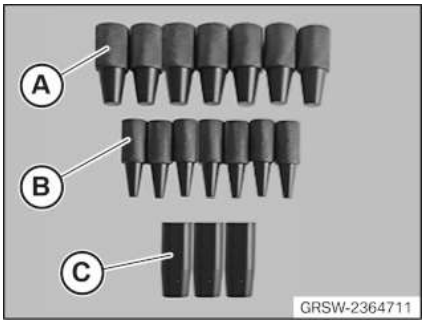
2 466 467 Device



Common	Used in step 6470
Usage	For removing and installing the exhaust turbocharger. Engine: B58O1.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 18 (545)

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2 364 711 Plug



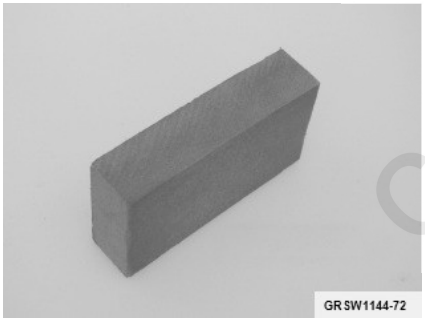
Common	Used in step 6667
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper



Common	Used in step 67
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

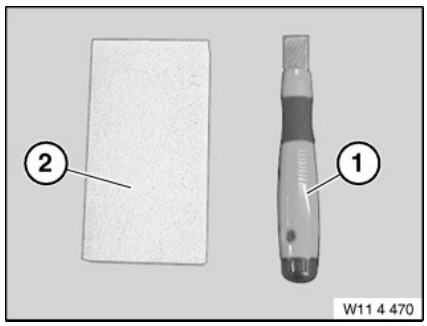
0 495 104 (11 4 472) Extractor



Common	Used in step 67
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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0 495 102 (11 4 470) Tool



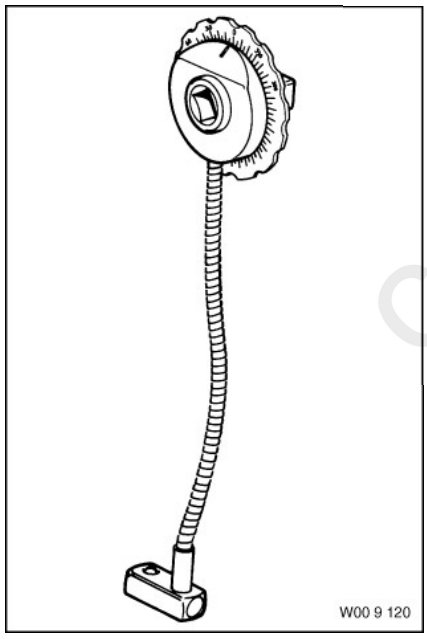
Common Used in step 70

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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

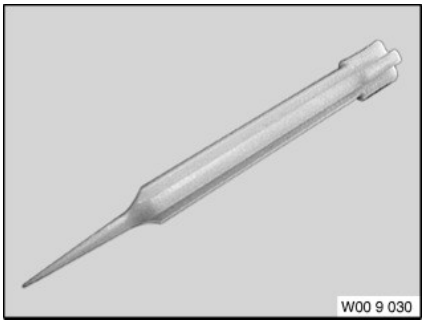


Common Used in step 71

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

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0 496 714 (00 9 030) Wedge



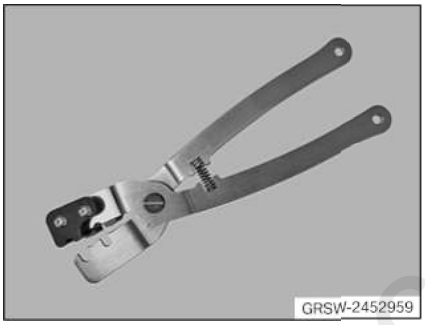
Common	Used in step 71104105
Usage	For dismantling O-rings, gaskets and trim panels. This special tool replaces special tool 00 9 316.
Included in the tool or work	
Storage location	A50
Replaced by	
In connection with	
SI-Number	01 20 09 (581)

2 455 654 Tensioning tool



Common	Used in step 7780
Usage	To pretension the timing chain when adjusting the timings. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 452 959 Pliers



Common	Used in step 97
Usage	For disassembly of the PTFE sealing rings on the injector HDEV5 & HDEV6. Replaces 0495757 (SWZ number 13 0 191). Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A5
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 448 401 Fitting aid



Common	Used in step 97
Usage	For installation of PTFE rings on injector. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C55
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

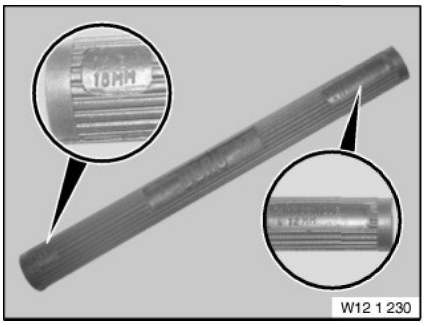
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2 358 022 Gauge



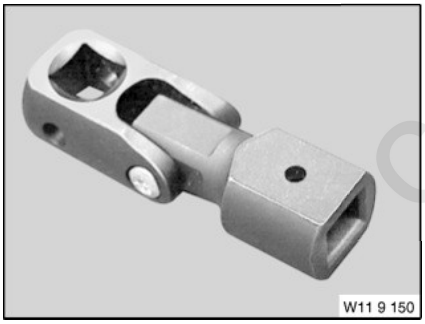
Common	Used in step 9899
Usage	To position the injector during installation. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

0 496 065 (12 1 230) Fitting aid



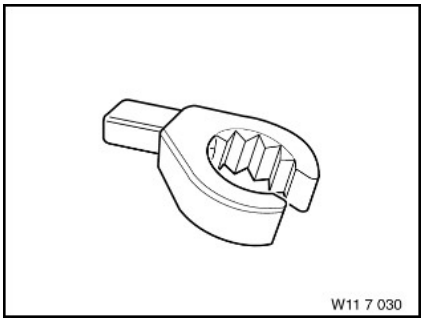
Common	Used in step 102
Usage	Fitting aid for spark plug installation. Original BERU ZMH 001 rubber hose 0 890 00 001.
Included in the tool or work	
Storage location	individual
Replaced by	
In connection with	
SI-Number	01 04 07 (352)

0 493 751 (11 9 150) Extension



Common	Used in step 114
Usage	(Socket wrench extension) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	C41
Replaced by	
In connection with	
SI-Number	01 15 00 (609)

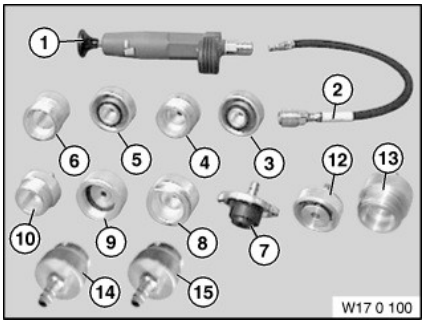
0 491 075 (11 7 030) Socket wrench insert



Common	Used in step 114
Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 95 (963)

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0 494 417 (17 0 100) Tester



Common Used in step 117118122123

Usage	For checking engine cooling system on watertightness. For checking radiator cap.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 02 (884)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
5	0 494 422 (17 0 105)		**Adapter** For radiator cap (sawtooth thread)	
10	0 494 427 (17 0 111)		**Adapter** For radiator cap R53/W11, R50/W17 adapter replaced 17 0 052.	
1	0 494 418 (17 0 101)		**Pump**	
2	0 494 419 (17 0 102)		**Hose** (hose with quick-release coupling)	
3	0 494 420 (17 0 103)		**Adapter** For radiator cap (normal thread)	
4	0 494 421 (17 0 104)		**Adapter** For radiator cap (normal thread)	
6	0 494 423 (17 0 106)		**Adapter** For radiator cap (sawtooth thread)	
7	0 494 424 (17 0 107)		**Adapter** For radiator cap R50 / W10	
8	0 494 425 (17 0 108)		**Adapter** For radiator cap R50 / W10	
9	0 494 426 (17 0 109)		**Adapter** For radiator connection R53/W11, R50/W17 adapter corresponds to 17 0 051	
11	0 494 428 (17 0 112)		**Case**	
12	0 494 642 (17 0 113)		**Adapter** For radiator cap Model series: E60, E61, E63, E64 SI no.: 1 08 03 (988)	
13	0 494 643 (17 0 114)		**Adapter** For radiator cap Model series: E60, E61, E63, E64 SI no.: 1 08 03 (988)	
14	0 495 889 (17 0 115)		**Adapter** For radiator cap Model series: N12, N14	

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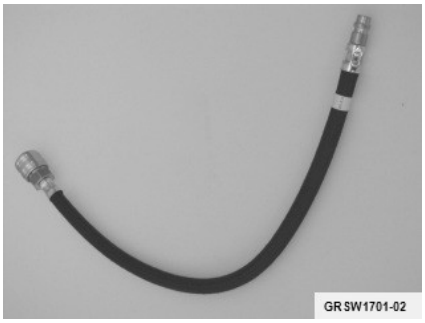
0 494 418 (17 0 101) Pump



Common Used in step 122123

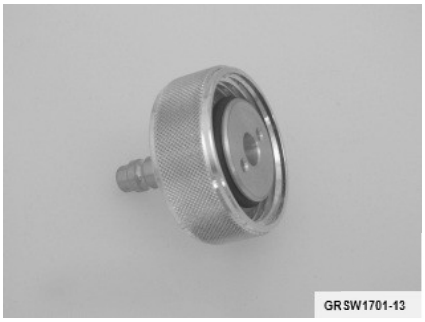
Usage	
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 419 (17 0 102) Hose



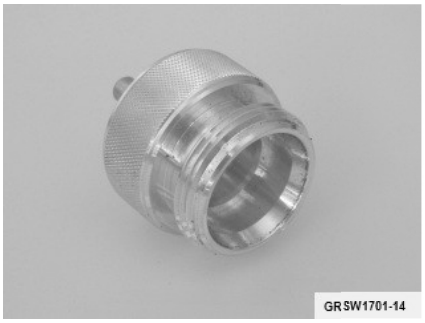
Common	Used in step 122123
Usage	(hose with quick-release coupling)
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 642 (17 0 113) Adapter



Common	Used in step 122
Usage	For radiator cap Model series: E60, E61, E63, E64 SI no.: 1 08 03 (988)
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 643 (17 0 114) Adapter



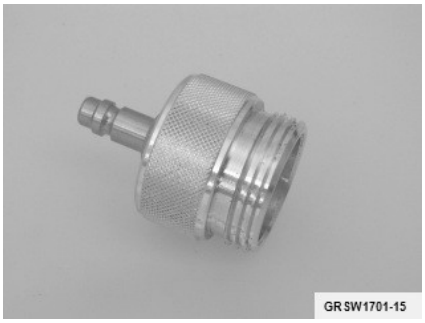
Common	Used in step 122
Usage	For radiator cap Model series: E60, E61, E63, E64 SI no.: 1 08 03 (988)
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 426 (17 0 109) Adapter



Common	Used in step 123
Usage	For radiator connection R53/W11, R50/W17 adapter corresponds to 17 0 051
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 889 (17 0 115) Adapter



Common	Used in step 123
Usage	For radiator cap Model series: N12, N14
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	01 26 06 (321)

Overview Technical Data

Opening pressure of sealing cap / test pressure of high-temperature coolant circuit cooling system Used in step 122123

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Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure.	max. 0,1 bar
Test pressure for cooling system (gauge pressure)	1,5 bar

Distance from window pane edge to wiper blade	Used in step 131
Wiper arm right (A)	57,5 ±5 mm
Wiper arm left (B)	63,3 ±4 mm

Capacity of high-temperature coolant circuit G20/G29	Used in step 117
B58B30O1	10,5 l
Expendable materials: Technically suitable antifreeze and corrosion inhibitor	

Capacity of low-temperature coolant circuit G20/G29	Used in step 118
B58B30O1	4,5 l
Expendable materials: Technically suitable antifreeze and corrosion inhibitor	

Screw-in depth of upper stud bolt on cylinder head	Used in step 70
Dimension A	30 mm

Links

Repair instructions (PRE)	**Used in step**
Repair notes on renewing the cylinder head	

General repair instructions	**Used in step**
12 00 ... Instructions for removal and replacement of control units	3586
11 00 ... Overview of consumables (Electronic Parts Catalogue)	114115

Repair instructions	**Used in step**
61 20 900 Disconnecting and connecting battery earth lead	1119
61 20 900 Disconnecting and connecting battery earth lead	1119
61 20 900 Disconnecting and connecting battery earth lead	1119
61 20 900 Disconnecting and connecting battery earth lead	1119
61 20 900 Disconnecting and connecting battery earth lead	1119
61 20 900 Disconnecting and connecting battery earth lead	1119
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1119
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1119
61 20 900 Disconnecting and connecting battery earth lead	1119
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1119
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1119
61 20 900 Disconnecting and connecting battery earth lead	1119
61 20 900 Disconnecting and connecting battery earth lead	1119
61 20 900 Disconnecting and connecting battery earth lead	1119
61 20 900 Disconnecting and connecting battery earth lead	1119
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61 20 900 Disconnecting and connecting battery earth lead	1119
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61 20 900 Disconnecting and connecting battery earth lead	1119
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1119
61 20 900 Disconnecting and connecting battery earth lead	1119

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61 20 900 Disconnecting and connecting battery earth lead	1119
61 20 900 Disconnecting and connecting battery earth lead	1119
61 20 900 Disconnecting and connecting battery earth lead	1119
61 20 900 Disconnecting and connecting battery earth lead	1119
61 20 900 Disconnecting and connecting battery earth lead	1119
61 20 900 Disconnecting and connecting battery earth lead	1119
61 35 ... Notes on ESD protection (Electro Static Discharge)	22253234355287
13 53 ... Clean the cylinder heads in the area of injectors to prevent sand/dust contamination.	3031
61 35 ... Notes on ESD protection (Electro Static Discharge)	32
61 00 730 Encode/program control unit(s) (after vehicle test)	86
17 11 035 Removing and installing/replacing fan cowl with electric fan	96
17 00 ... Notes for working on cooling system.	117118

Operating materials	**Used in step**
Main group 17	117118

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11 12 101 Replace cylinder head gasket

WARNING

Hot surfaces.

Risk of burning!

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

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

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

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Damage to battery terminal, the safety battery terminal or the intelligent battery sensor (IBS).

Damaged battery terminals can lead to malfunctions or vehicle electrical system faults.

- Pull off battery terminal from battery pole by carefully moving to and fro. Do not pry off using a tool.

TECHNICAL INFORMATION

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

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

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- See additional information.

2 – Bring front compartment lid in the service position

Prerequisite

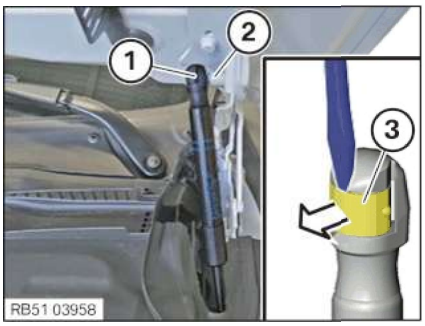
Engine compartment lid is open.

CAUTION

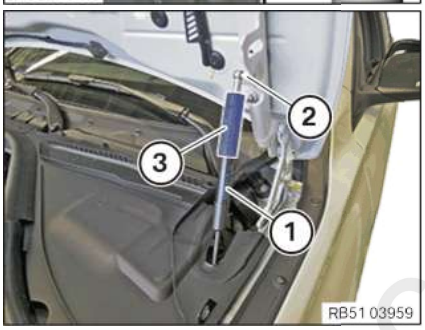
Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.



- Lift clamp (3) slightly using a screwdriver, in the direction of the arrow.
- Lift off ball socket (1) from ball pin (2).
- Repeat the operation on the other side of vehicle.



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Remove the bonnet support and open the bonnet further.
- Push special tool or (3) over gas pressure spring (1).
- Place special tool on the ball pin (2) and engage using force.
- Repeat the operation on the other side of vehicle.

3 – Remove the seal for the rear bonnet



- Feed the cable (1) out of the brackets toward the front.
- Remove the rear bonnet seal (2) from the guide toward the inside.

4 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

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

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RISK OF DAMAGE

Damage to the acoustic cover.

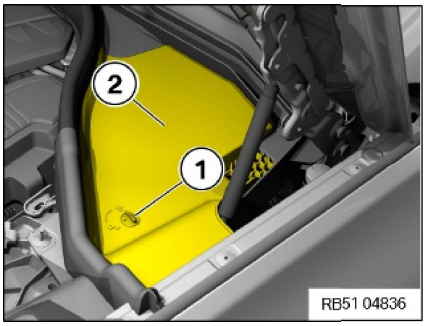
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

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



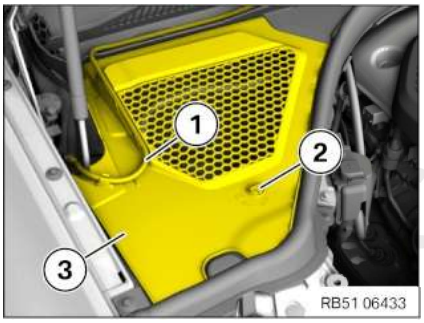
- Release the acoustic cover (1) towards the top from the rubber mounts (marks).

5 – Remove the cover of the engine compartment at the rear left



- Loosen the lock (1).
- Remove rear left cover of engine compartment (2).

6 – Remove the cover of the rear right engine compartment



- Release washer fluid hose (1) from the guides.
- Loosen the lock (2).
- Remove the cover of rear right engine compartment (3).

7 – Removing both wiper arms

NOTICE

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

▶ **Remove the wiper arm**

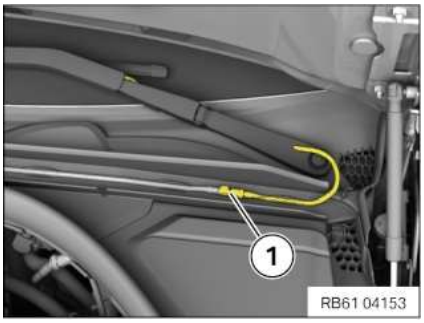
RISK OF DAMAGE

Damage to wiper console

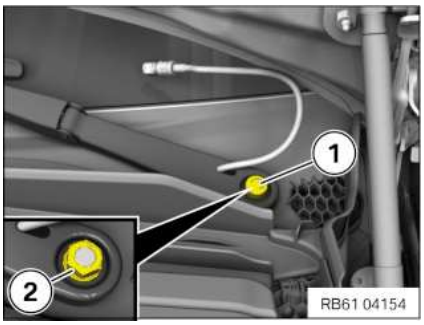
While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.

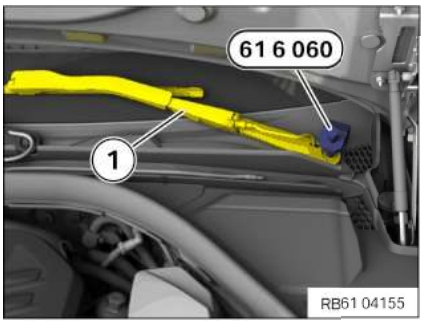
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- Disconnect the windscreen wash hose(1) at the separation point and remove from the cowl guide.

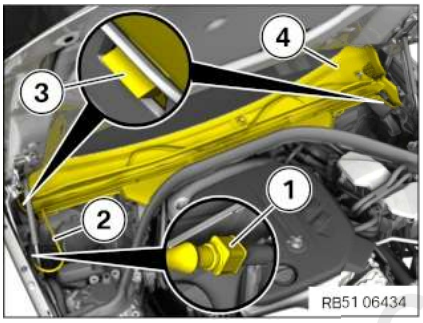


- Remove the protective cap (1).
- Loosen nut (2).

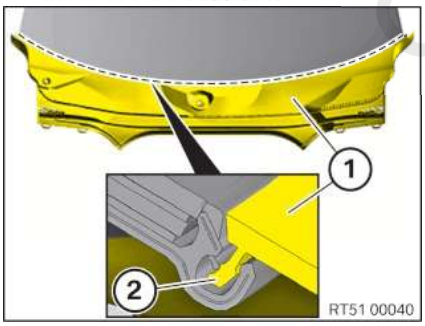


- Pull off the wiper arm (1) using special tool .

8 – Remove cowl panel cover



- Release snap fastener of the washer fluid hose (1) and put the washer fluid hose(2) to one side.
- Unclip clips (3) on the cowl panel cover (4).



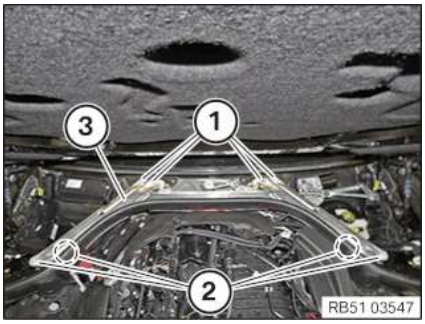
- Pull the cowl panel cover (1) upward out of the latch mechanism (2) beginning on the side.

9 – Removing the centre bulkhead upper part

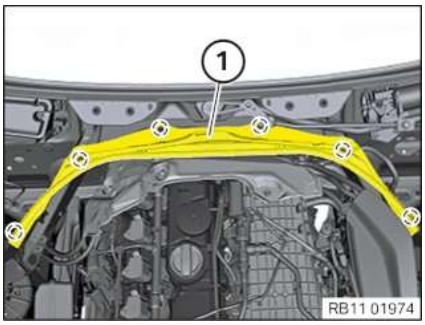
TECHNICAL INFORMATION

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

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- **If installed:** Remove tension strut on spring strut dome.
- Loosen screws (1) and (2).
- Remove tension strut (3) in the spring strut dome upwards.



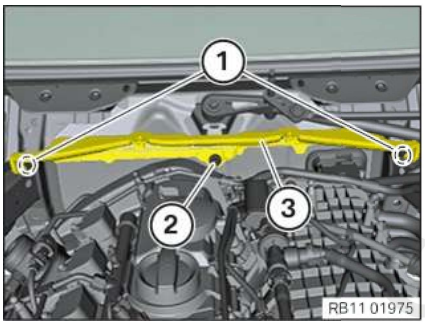
- Unscrew the bolts in the marked areas.
- Remove the centre bulkhead upper part (1).

10 – Removing acoustic cover at rear



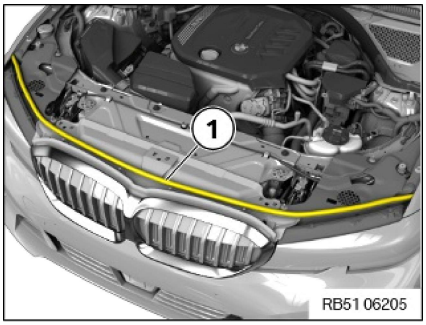
- Unclip the acoustic cover (1) in the marked areas and remove it to the top.

11 – Removing the centre bulkhead lower section



- Loosen screws (1).
- Loosen nut (2).
- Remove the centre bulkhead lower part (3).

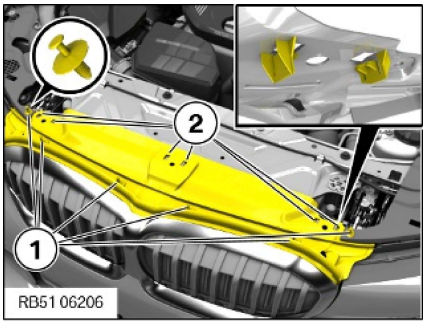
12 – Remove the seal for the bonnet in front



- Pull off front bonnet seal (1) upwards.

13 – Removing the centre engine compartment cover

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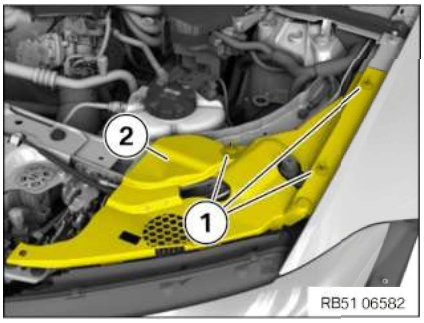
- Detach all expanding rivets (1).
- Release the cover of the centre engine compartment with the latch mechanisms (2) .
- Feed the cover for the centre engine compartment out to the rear.

14 – Partially remove the top left and right cover in the engine compartment

NOTICE

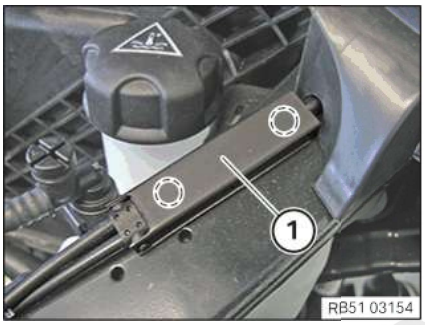
Description is for left component only. Procedure on the right side is identical.

▶ **Removing the cover in the engine compartment on top partially**

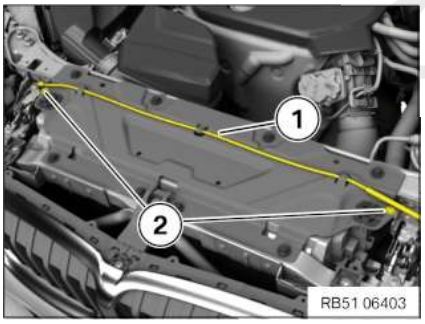


- Loosen the expanding rivet (1).
- Remove the cover in the engine compartment on top (2) partially.

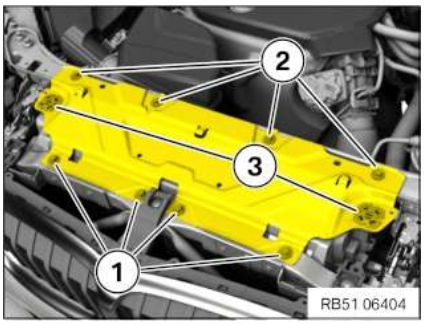
15 – Removing the top cross connection



- Release the housing for the coupling of the Bowden cables (1) from the body.



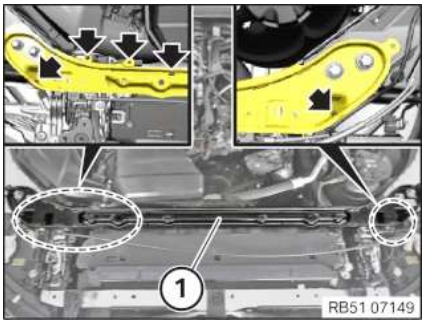
- Detach Bowden cable (1) at the top cross connection.
- Loosen screws (2).



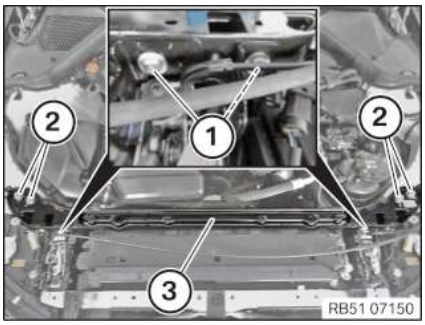
- Loosen screws (1) and (2).
- Remove the top cross connection with the holders(3) towards the top.

16 – Remove the rear top cross connection

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- Release the clips (arrows) in the marked areas from the top rear cross connection (1).

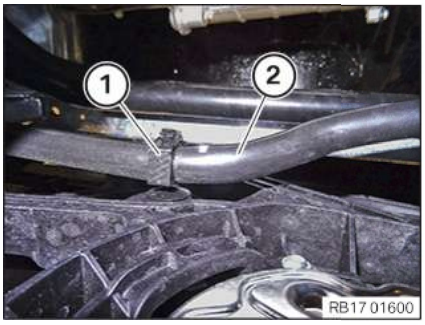


- Loosen screws (1).
- Loosen screws (2).
- Guide out and remove top rear cross connection (3).

17 – Remove fan cowl.

TECHNICAL INFORMATION

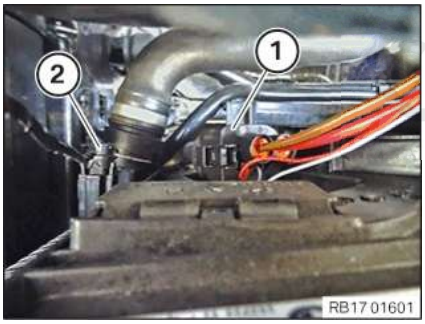
- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!



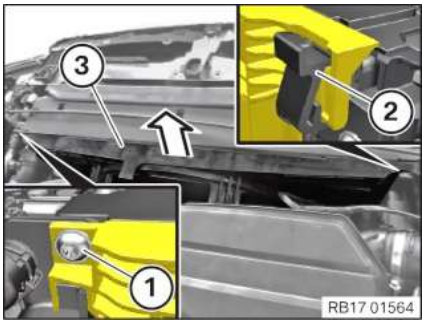
- **If installed:** Release transmission oil line (2).

  Unlock the holder (1).

  Thread out transmission oil line (2) and set aside.



- Unlock plug connection (1) and disconnect.
- Unlock plug connection (2) and disconnect.



- Loosen screw (1).
- Unlock lock (2).
- Guide out and remove fan cowl (3) **carefully** in the direction of the arrow.

18 – Removing intake silencer housing

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RISK OF DAMAGE

Damage to the clean air line. Damage to the air filter.

For changing the air filter insert, if the upper section of intake filter housing is only raised and not completely removed, the clean air line and the air filter insert may be damaged.

- Do not lift upper section of intake filter housing by force.
- Unfasten clamp.
- Remove upper section of intake filter housing completely.



- Unlock plug connection (1) and disconnect.
- Unfasten clamp (2).
- Pull out and remove the intake silencer housing (3) from the rubber mounts towards the top.

19 – Removing engine ventilation line

WARNING

Hot surfaces.

Risk of burning!

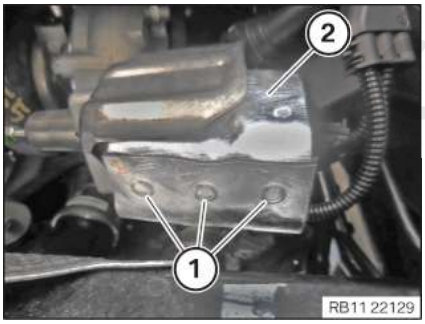
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

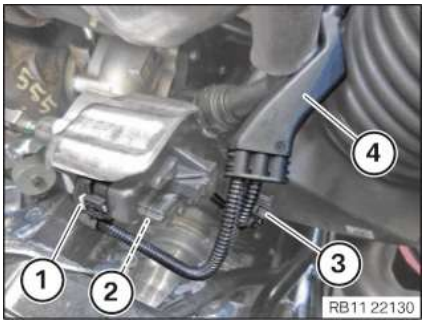
Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

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

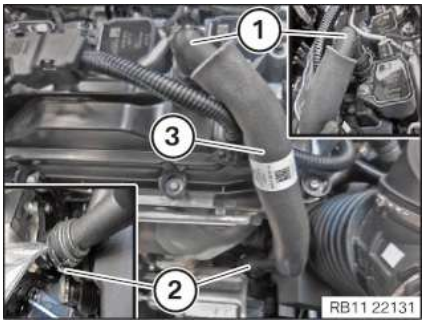


- Unlock the locks (1).
- Feed out and remove heat protection (2).

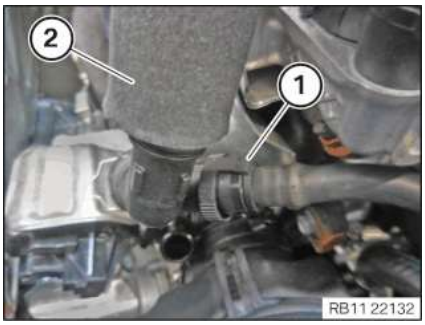


- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Loosen clamp (3).
- Feed out wiring harness section for sensor system **2** (4) and set it aside.

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- Unlock and loosen the locks (1).
- Unlock and loosen lock (2).
- Feed the engine ventilation line (3) out and set it aside.



- Unlock and release tank ventilation line (1).
- Feed out the engine ventilation line (2) and remove.

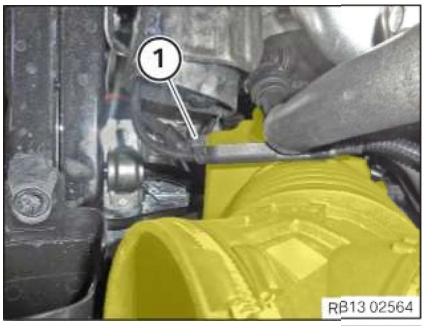
20 – Removing clean air pipe

WARNING

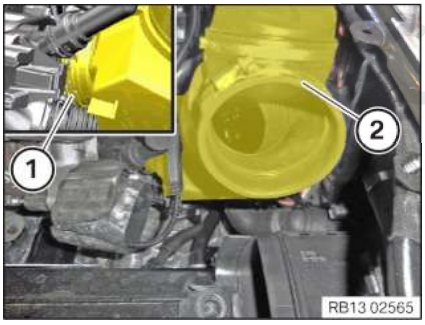
Hot surfaces.

Risk of burning!

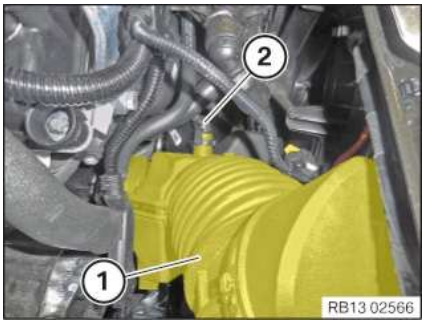
- Perform all work only on components that have cooled down.



- Loosen clamp (1).



- Unlock the clamp (1).
- Thread out clean air pipe (2) and set it aside.



- Position clean air pipe (1).
- Unlock and loosen engine ventilation line (2).
- Feed out clean air pipe and remove (1).

21 – Remove charge air line

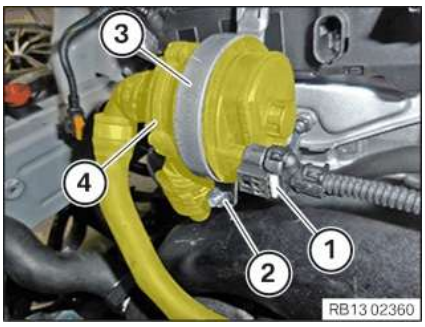
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WARNING

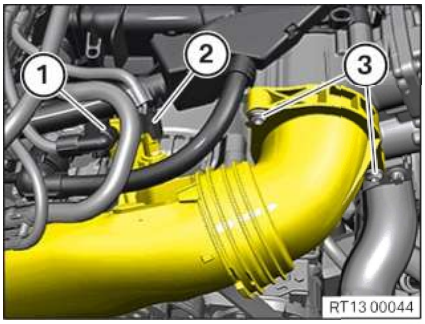
Hot surfaces.

Risk of burning!

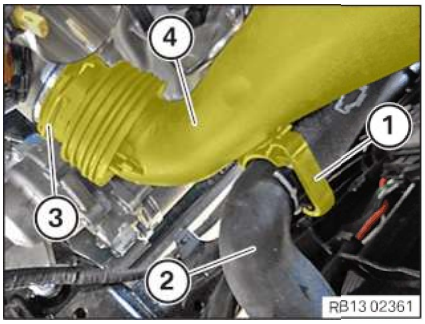
- Perform all work only on components that have cooled down.



- Unlock plug connection (1) and disconnect.
- Loosen nut (2).
- Guide the retaining bracket (3)out and remove.
- Guide out auxiliary coolant pump (4) and place it aside.



- Unlock plug connection (1) and disconnect.
- Unlock plug connection (2) and disconnect.
- Loosen screws (3).



- Unlock the clamp (1).
- Feed out the coolant hose (2) and set it aside.
- Unlock the clamp (3).
- Feed the charge air line (4) out upwards and remove it.

22 – Remove the adapter for engine ventilation line with heating element on exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

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

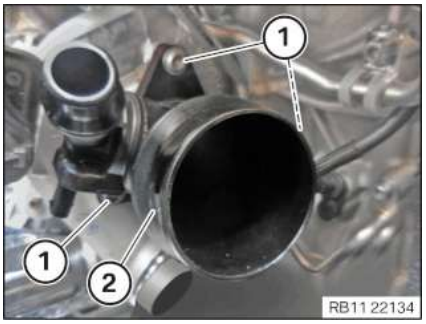
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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



- Loosen screws (1).
- Feed out the connecting branch (2) with heating element on the exhaust turbocharger and remove.

23 – Remove the front oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

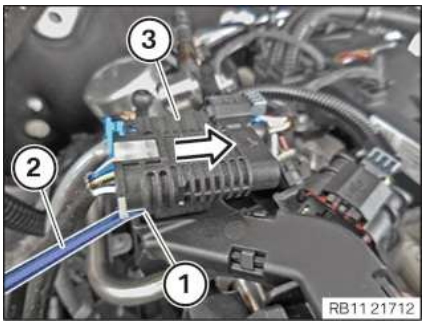
Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

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

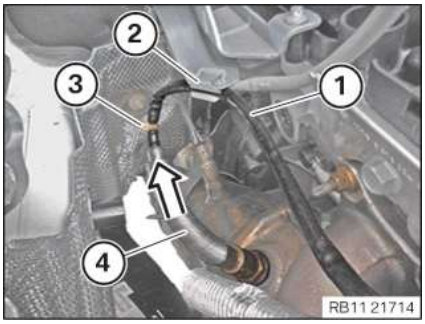


- Unlock and loosen connector (1).



- Unlock the locks (1) with a conventional screwdriver (2) and release.
- Feed out the connector (3) in **the direction of arrow** and set aside.

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- Detach the line of the front oxygen sensor (1) from the holder (2).
- Unfasten cable strap (3).
- Feed out the heat shield (4) **in direction of arrow** and set it aside.



- Release and remove the control sensor (1) with the special tool .

24 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

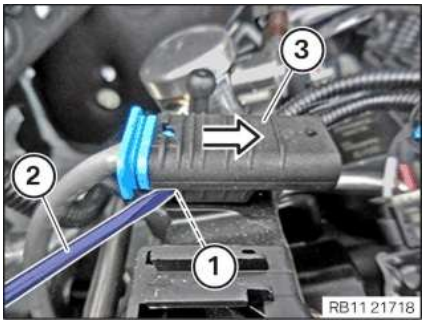
Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

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

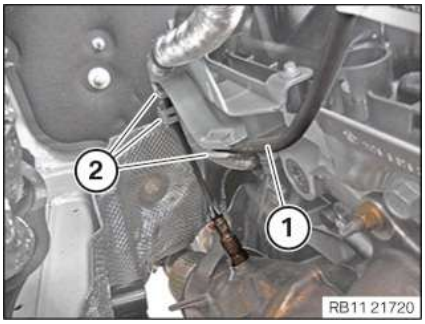


- Unlock and loosen connector (1).

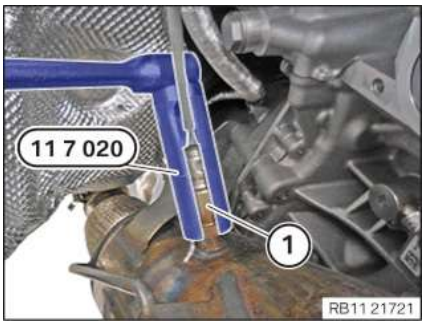


- Unlock the lock (1) with a suitable screwdriver (2).
- Feed out the connector (3) in the direction of the **arrow** and set it aside.

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- Detach the line of the monitoring oxygen sensor (1) from the holder (2).



- Release the monitoring oxygen sensor (1) using special tool .
- Remove the monitoring sensor (1).

25 – Remove all ignition coils.

NOTICE

The description is for one component only. The procedure is identical for all further components.

▸ **Removing the ignition coil**

WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

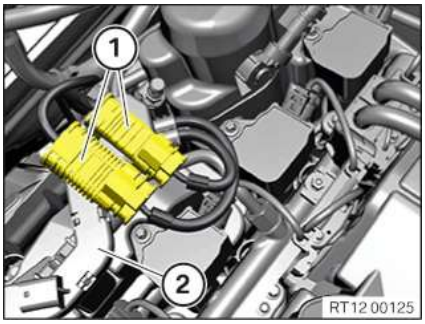
RISK OF DAMAGE

Electrostatic discharge.

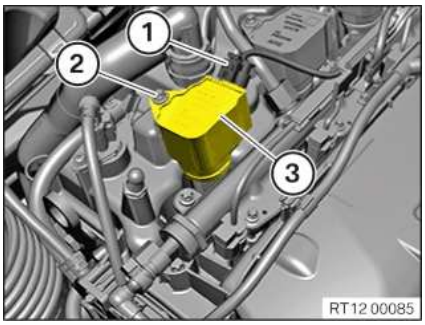
Damage to or destruction of electrical components.

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

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- Disconnect the connector (1) of the front oxygen sensor and the monitoring oxygen sensor from the cable channel (2) and set aside.



- Unlock plug connection (1) and disconnect.
- Loosen screw (2).
- Remove ignition coil (3).

26 – Removing all spark plugs

WARNING

Hot surfaces.

Risk of burning!

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

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

TECHNICAL INFORMATION

Clean spark plug slot with compressed air.

The spark plug shaft must be cleaned using compressed air after having removed the ignition coils and before removing the spark plugs. After having removed the spark plugs, once again check the sealing surface for contamination and (if necessary) clean using a moist cloth or clean using compressed air.

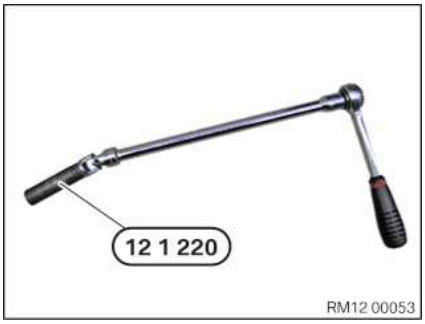
Deposits that are not removed according to instructions may enter the combustion chamber and lead to uncontrolled combustion. Remaining deposits on the spark plug sealing surfaces may lead to leaks and the spark plugs may come loose during engine operation.

Spark plug threads must not be greased or oiled. Insufficiently tightened spark plugs may cause leaks and the sparks plugs may come loose during engine operation.

NOTICE

The description is for one component only. The procedure is identical for all further components.

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TECHNICAL INFORMATION

Exclusively swivelling extensions may be used for the reversible ratchet. Rigid mounting tool and variable plug connections with rigid option may not be used; there is a risk that the insulator breaks.

- Mount the special tool 0 495 560 (12 1 220) on a pivoting extension.



- Unscrew spark plugs with the special tool 0 495 560 (12 1 220) and a pivoting extension.

27 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

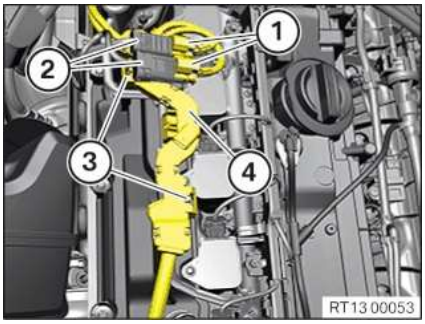
On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

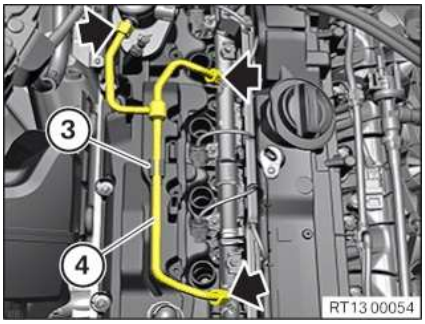
TECHNICAL INFORMATION

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



- Unlock and disconnect the plug connections (1) and (2).
- Unlock the locks (3).
- Guide out the wiring harness section of the engine wiring harness (4) and set it aside.

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- Position a lint-free rag under the union nuts.
- Unscrew union nuts (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Thread out the high pressure line (4) from the bracket (3) and remove it.
- Feed out and dispose of the lint-free cleaning clothes .

28 – Remove fuel delivery line

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

Contaminant or foreign body.

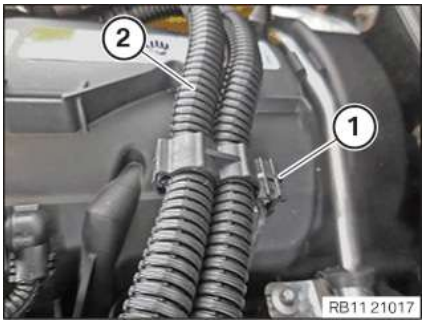
Contamination can result in malfunctions, operating failure or leaks.

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

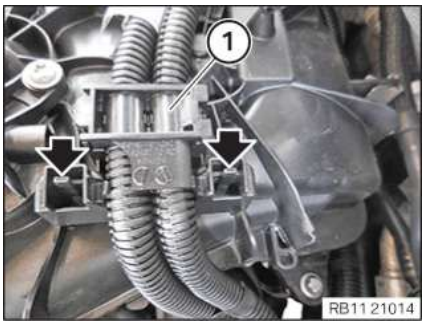
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

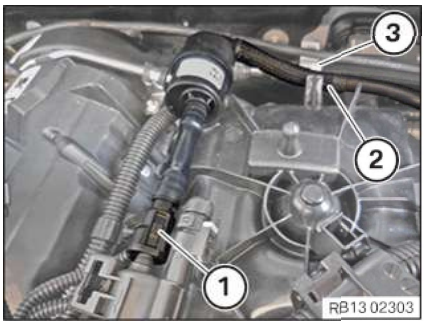
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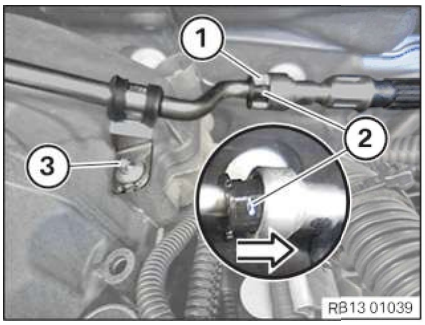
- Loosen clamp (1).
- Guide out wiring harness section (2) for the injectors and ignition coils and place it aside.



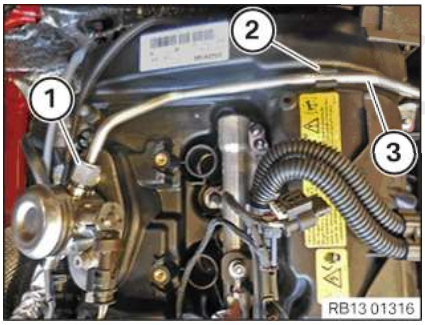
- Unlock the locks (arrows).
- Guide out wiring harness section (1) for the injectors and ignition coils and place it aside.



- Unlock and loosen lock (1).
- Guide tank ventilation line (2) out of clamp (3) and place it aside.



- Unlock and loosen clamp (1).
- Unlock and remove the snap fastener (2) in the direction of the arrow.
- Catch and dispose of escaping fuel.
- Seal the fuel lines with special tools 0 496 567 (13 5 161) and 0 496 568 (13 5 162) from the set of special tools 0 496 565 (13 5 160).
- Loosen screw (3).



- Slacken the union nut (1) on the high pressure pump.
- Catch and dispose of escaping fuel.
- Seal all openings with the special tool .
- Guide the fuel feed line (3) out and remove.
- Make sure that the rubber damper (2) is not lost.

29 – Remove high pressure pump

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

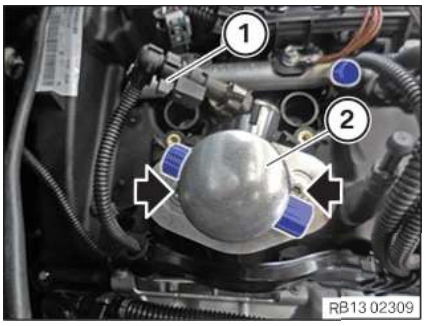
TECHNICAL INFORMATION

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

TECHNICAL INFORMATION

The high pressure pump can be pre-tensioned by camshaft cams. If when loosening the screws, the high pressure pump is forced out, the engine will have to be turned to bring the camshafts to a different position.

Before installing the high pressure pump, the cam of the high pressure pump drive must be turned to BDC. To do this, twist the engine if necessary in the direction of engine rotation to the central bolt of the crankshaft. Otherwise, it will not be possible to install the high-pressure pump.



- Unlock plug connection (1) and disconnect.
- Unscrew the bolts (arrows) **in alternating order**.
- Have a rag ready and catch any engine oil that may emerge.
- Feed out high pressure pump (2) and remove.

30 – Removing rail with injectors of cylinders 1 to 3

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

Damage to the injector tips and Teflon ring.

Improper handling of the injector tips and Teflon ring can lead to malfunctioning of the injector.

- Avoid mechanical contact with injector tip.
- When exchanging Teflon ring, hands and work surface must be clean and free of oil. Do not use any lubricating agents.
- Do not use fingernails to slide Teflon ring on.

RISK OF DAMAGE

Damage to injectors.

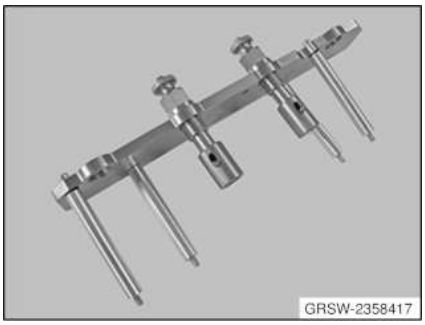
Excessive force may damage the injector and this means having to renew the injector.

- Twist the injectors with a maximum torsional movement of 13 Nm.

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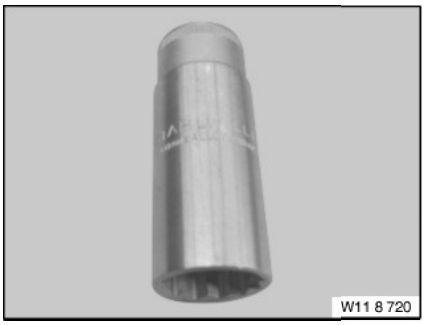
- Prepare special tool .



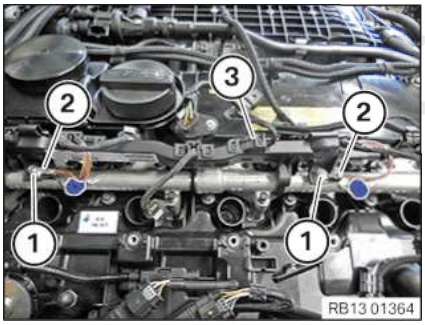
- Prepare special tool 2 358 417.



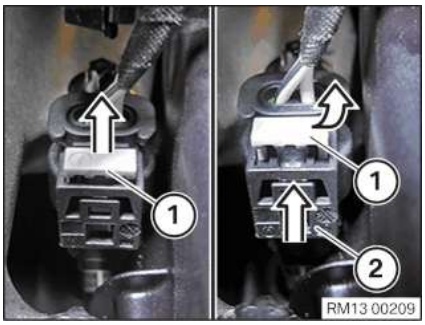
- Prepare special tool .



- Prepare special tool 0 496 106 (11 8 720).

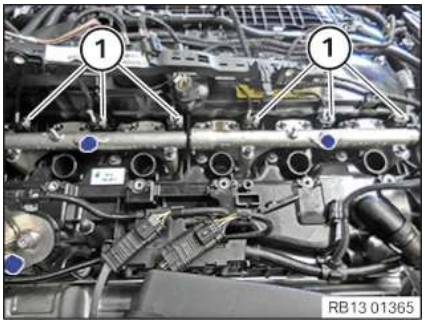


- Loosen nut (1).
- Feed out ground cable (2) and set it aside.
- Feed out cable channel (3) and set it aside.

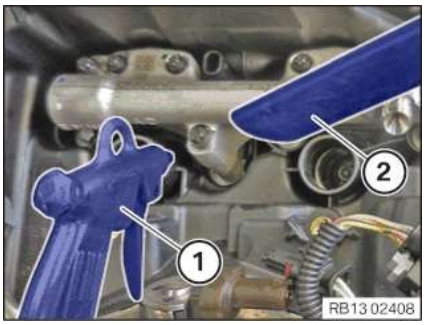


- Unlock lock (1) in direction of arrow from the top.
- Press lock (1) together and release.
- Pull out the connector (2) from the injectors.

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- Unlock and release all connectors (1) of the injectors.

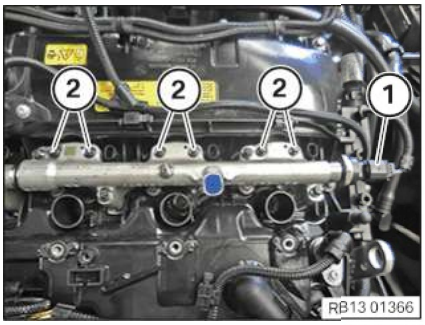


TECHNICAL INFORMATION

In case of dusty / sandy operating conditions of the vehicle, the injector shafts must be cleaned before removal.

For additional information see: 13 53 ... Cleaning the cylinder head in the area of the injectors in case of sandy / dusty contamination

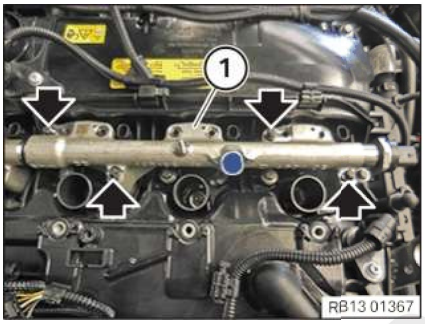
- Before releasing the high pressure lines: Blow out the injector shafts with an air gun(1) with less pressure.
- Simultaneously, draw off the dirt particles with an **explosion proof** vacuum cleaner (2).



- Unlock and loosen connector (1).
- Release screws (M5x30) (2).
- Remove screws (2).

  Do not reuse the bolts (2).

  Parts: Screws (M5x30)
- Catch and dispose of escaping fuel with suitable materials.

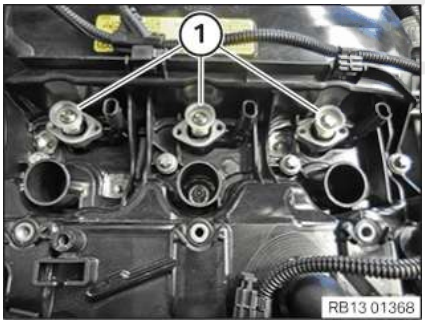


- Unscrew the screws (M6x30) (arrows).

  The screws may not be reused!
- Renew screws.

  Parts: Screws (M6x30)
- Remove rail (1) in upward direction.

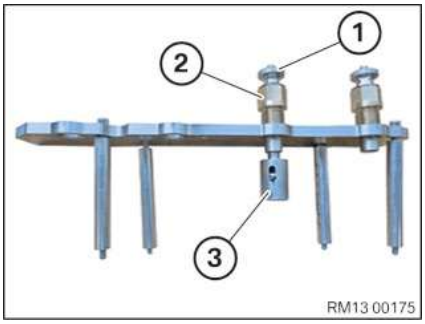
  The injectors remain in the cylinder head.



- Remove the gaskets (1).

  The seals (1) are only required during the initial assembly at the plant and will not be installed again.

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RISK OF DAMAGE

Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

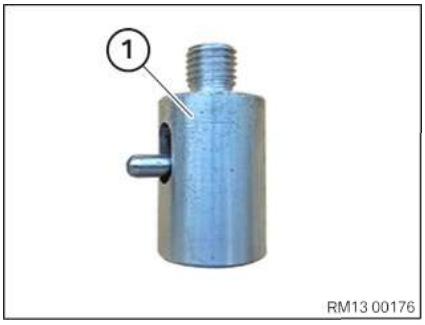
- Twist the injectors with a maximum torsional movement of 13 Nm.

- In the event that the specified value for the tensile force is exceeded: Replace injectors.
- Use the special tool 2 358 417to remove the injectors.

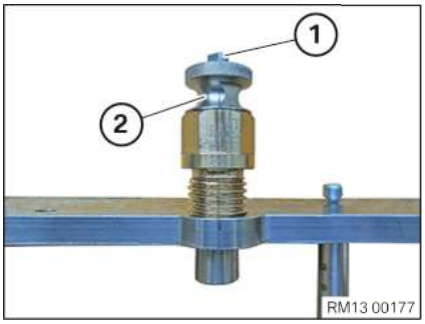
  The special tool 2 358 417 is used to ensure that the tensile force is not exceeded.

  Special tool 2 358 417 consists of:

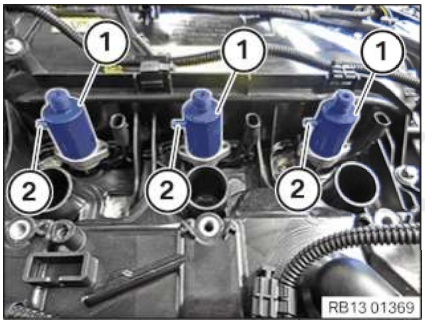
  - **(1)** Threaded sleeves
  - **(2)** Pull-out thread (left-hand thread)
  - **(3)** Mounting for the injectors



- Unscrew the fixture for the injectors (1) from the special tool 2 358 417.

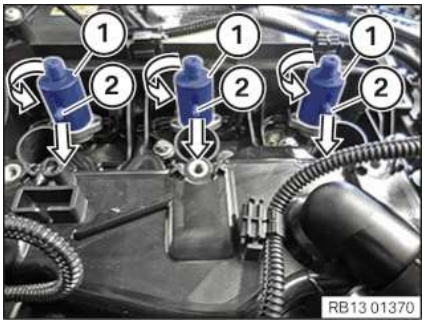


- Press the lock (1) in and remove threaded sleeve (2) from the special tool 2 358 417.



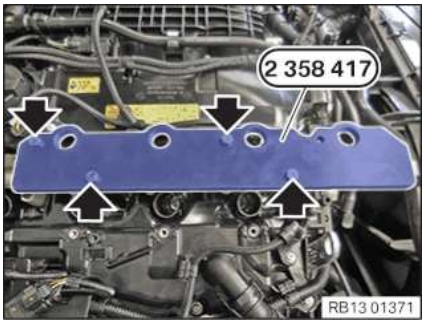
- Install all fixtures (1) for the injectors.

  The fixture (1) is not locked if the lever (2) is on the top.



- Turn fixtures (1) by 90° and lock the lever (2) downwards.

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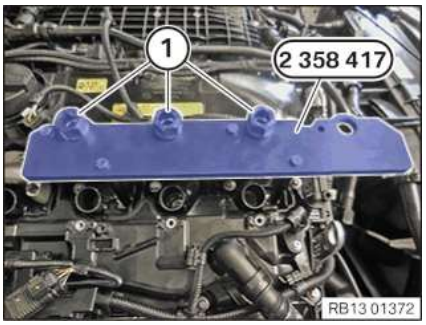
RISK OF DAMAGE

Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

- Do not use the puller plate as a support.

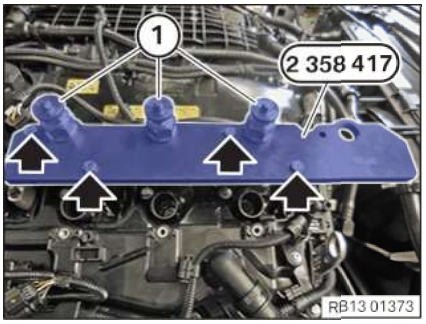
- Attach special tool 2 358 417 to cylinder head.
- Hand-tighten the bolts (arrows).



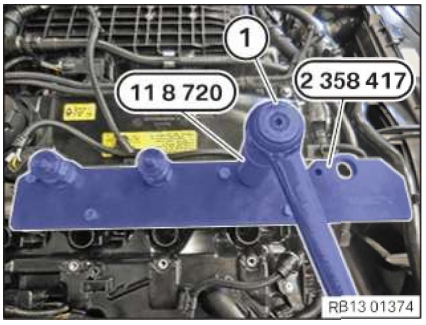
TECHNICAL INFORMATION

The extraction thread is a left-hand thread.

- Screw in pull-out thread (1) on the special tool 2 358 417fully.



- Insert threaded sleeves (1) again and screw threaded sleeves completely onto the fixtures for injectors.
- Then tighten screws (arrows) on special tool 2 358 417 to 5 Nm.

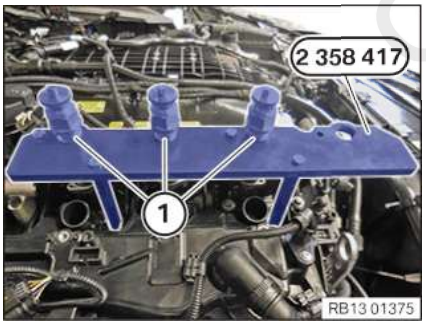


- Adjust torque wrench to 13 Nm **clockwise** .
- Turn torque wrench (1) in **clockwise** direction with special tool 0 496 106 (11 8 720)until the injector is pulled out.

TECHNICAL INFORMATION

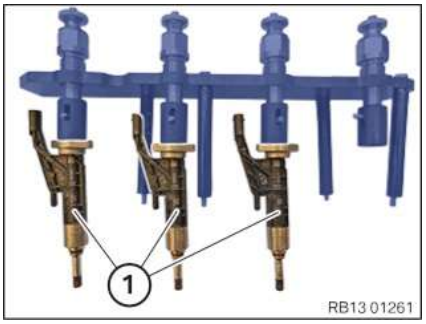
If the torque wrench makes a cracking noise when the injector is pulled out, **the injector must be renewed.**

- Disassemble all injectors individually.



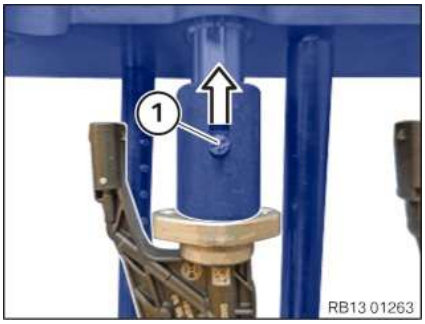
- Before removing the special tool 2 358 417 with the injectors, check if all the injectors were completely pulled out of the cylinder head.

  This can be recognised on the completely visible threads of the sleeves (1).
- Loosen screws on special tool 2 358 417.



- Carefully remove the special tool 2 358 417with injectors (1) from the cylinder head vertically upwards.
- Place the combination of the special tool 2 358 417 and the injectors (1) flat on a clean table.

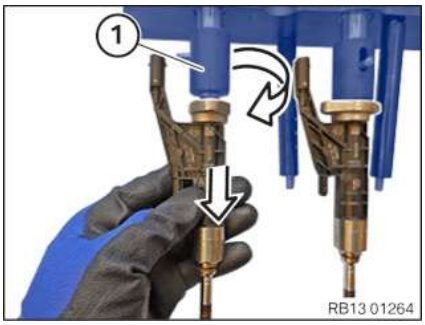
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NOTICE

The description is for one component only. The procedure is identical for all further components.

- Unlock the fixture lock (1) from the top.



- Turn the unlocked fixture (1) by 90°.
- Release and remove the injector downwards.

31 – Removing rail with injectors of cylinders 4 to 6

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

Damage to the injector tips and Teflon ring.

Improper handling of the injector tips and Teflon ring can lead to malfunctioning of the injector.

- Avoid mechanical contact with injector tip.
- When exchanging Teflon ring, hands and work surface must be clean and free of oil. Do not use any lubricating agents.
- Do not use fingernails to slide Teflon ring on.

RISK OF DAMAGE

Damage to injectors.

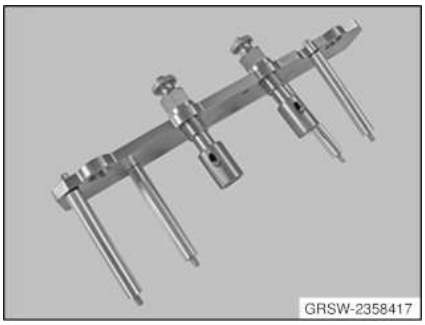
Excessive force may damage the injector and this means having to renew the injector.

- Twist the injectors with a maximum torsional movement of 13 Nm.

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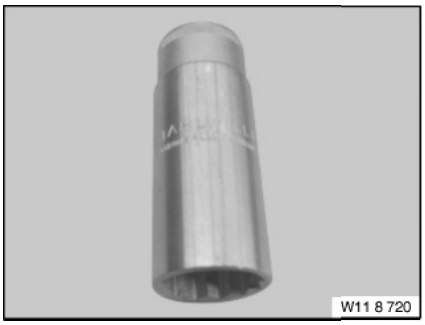
- Prepare special tool .



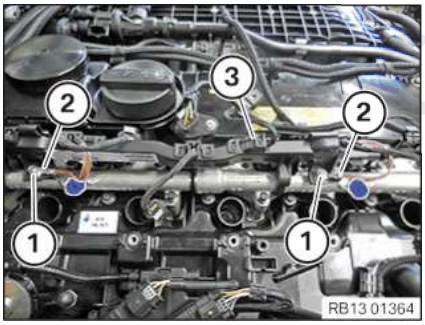
- Prepare special tool 2 358 417.



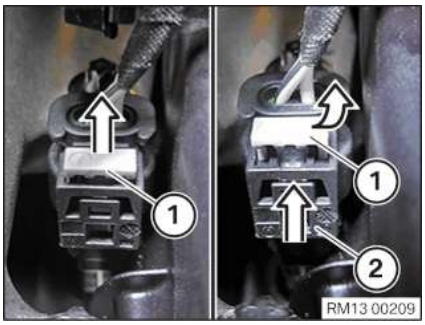
- Prepare special tool .



- Prepare special tool 0 496 106 (11 8 720).

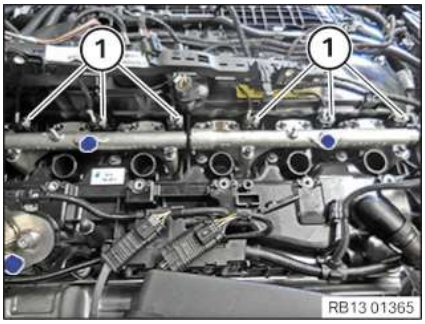


- Release nuts (1) .
- Feed out ground cable (2) and set aside.
- Feed out cable channel (3) and set it aside.

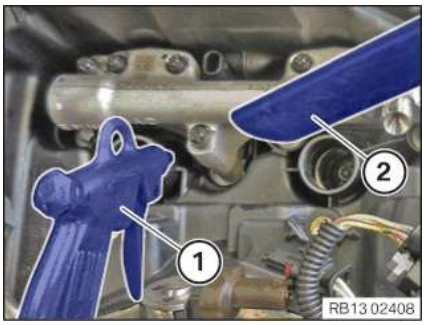


- Unlock lock (1) in direction of arrow upwards.
- Press lock (1) together and release.
- Disconnect the connector (2) from the injectors in the direction of the arrow.

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- Unlock and release all connectors (1) of the injectors.

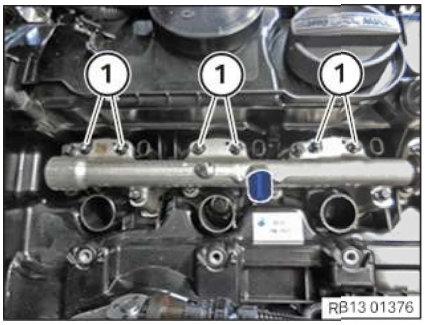


TECHNICAL INFORMATION

In case of dusty / sandy operating conditions of the vehicle, the injector shafts must be cleaned before removal.

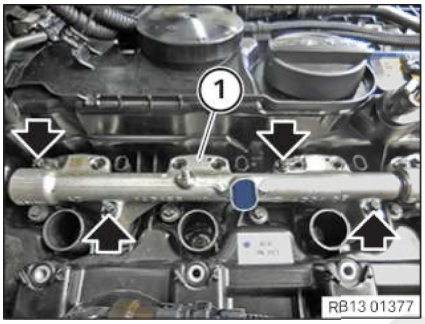
For additional information see: 13 53 ... Cleaning the cylinder head in the area of the injectors in case of sandy / dusty contamination

- Before releasing the high pressure lines: Blow out the injector shaft with an air gun (1) with less pressure.
- Simultaneously, draw the dirt particles off **using an** explosion proof (2) vacuum cleaner.



- Release screws (M5x30) (1).
- Remove screws (M5x30) (1) .

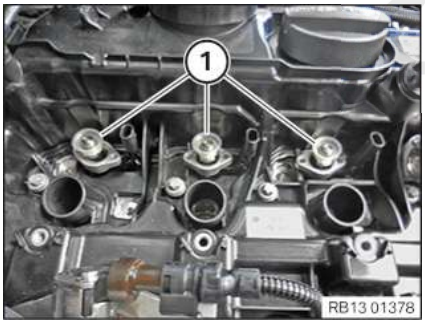
  Do **not** reuse screws (M5x30) (1).
- Catch and dispose of escaping fuel with suitable materials.



- Release screws (M6x30) (arrow).
- Remove screws (M6x30) (arrows).

  Do **not** reuse the screws (M6x30).
- Remove rail (1) upwards.

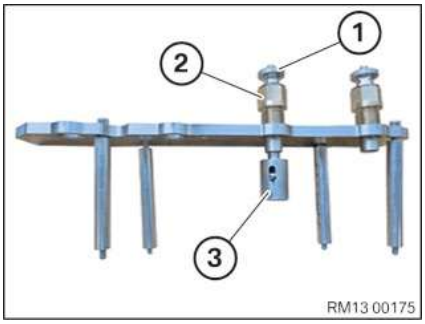
  The injectors remain in the cylinder head.



- Remove seals (1) .

  The seals (1) are required during first assembly within the plant only and will not be installed again.

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RISK OF DAMAGE

Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

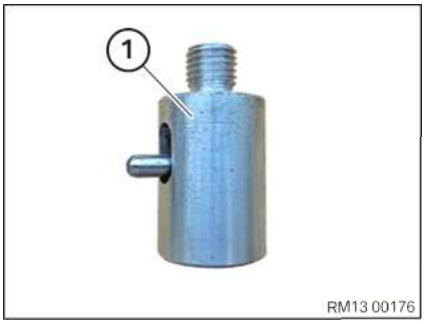
- Twist the injectors with a maximum torsional movement of 13 Nm.

- In the event that the specified value for the tensile force is exceeded: Replace injectors.
- Use the special tool 2 358 417 to remove the injectors.

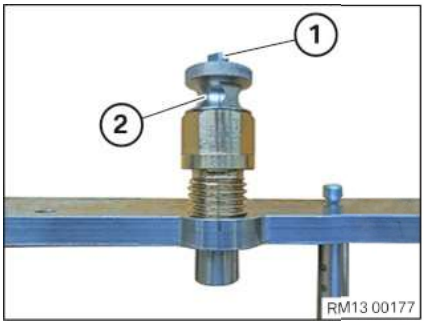
  The special tool 2 358 417 is used to ensure that the tensile force is not exceeded.

  The special tool 2 358 417 consists of:

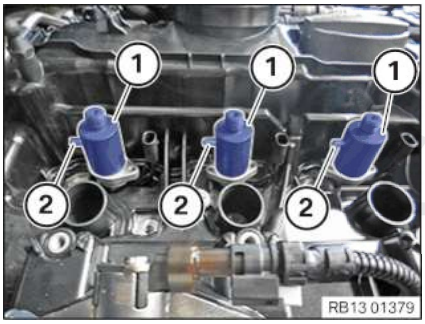
  - (1) Threaded sleeves
  - (2) Pull-out thread (left-hand thread)
  - (3) Mounting for the injectors



- Unscrew the fixture for injectors (1) from special tool 2 358 417.

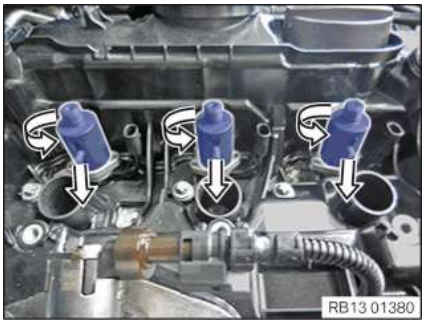


- Press lock (1) in and remove the threaded sleeve (2) from the special tool 2 358 417.



- Install all fixtures (1) for the injectors.

  The fixture (1) is not locked, if the lever is (2) on top.



- Turn fixtures (1) by 90° and lock the lever (2) downwards.

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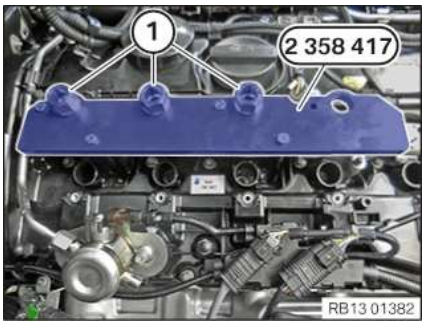
RISK OF DAMAGE

Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

- Do not use the puller plate as a support.

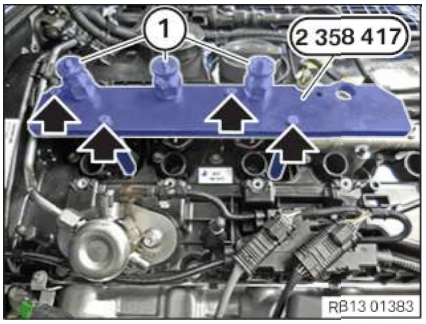
- Attach special tool 2 358 417 to cylinder head.
- Hand-tighten the bolts (arrows).



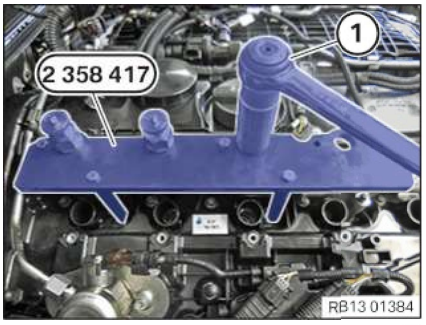
TECHNICAL INFORMATION

The extraction thread is a left-hand thread.

- Screw in pull-out thread (1) on the special tool 2 358 417 fully.



- Insert the threaded sleeves (1) again and screw threaded sleeves completely onto the fixtures for the injectors.
- Then tighten screws (arrows) on special tool 2 358 417 to 5 Nm.

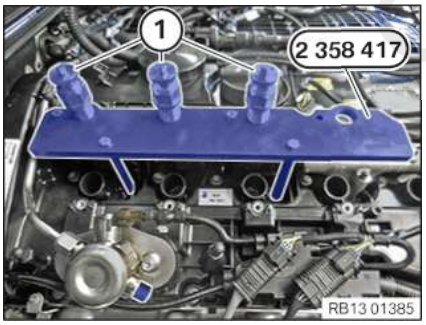


- Adjust torque wrench to 13 Nm **in clockwise** direction.
- Turn the torque wrench (1) with the special tool 0 496 106 (11 8 720) **clockwise**, until the injector is pulled out.

TECHNICAL INFORMATION

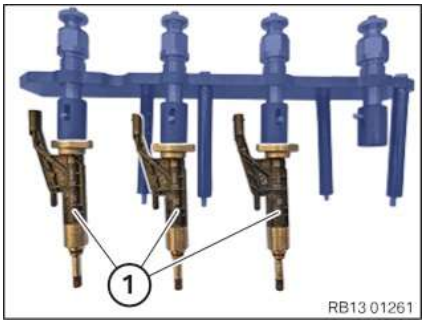
If the torque wrench makes a cracking noise when the injector is pulled out, **the injector must be renewed.**

- Disassemble all injectors individually.



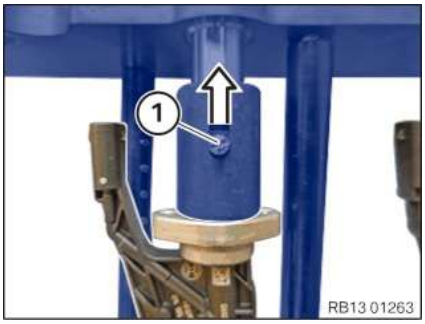
- Before removing the special tool 2 358 417 with the injectors, check if all the injectors were completely pulled out of the cylinder head.

  This can be recognised on the completely visible thread starts of the threaded sleeves (1).
- Loosen screws on special tool 2 358 417.



- Carefully remove the special tool 2 358 417 with the injectors (1) vertically straight up from the cylinder head.
- Place the combination of the special tool 2 358 417 and the injectors (1) flat onto a clean table.

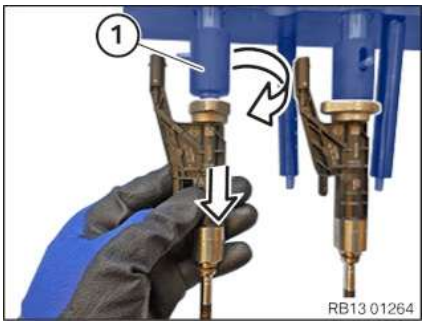
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NOTICE

The description is for one component only. The procedure is identical for all further components.

- Unlock the fixture lock (1) from the top.



- Turn the unlocked fixture(1) by 90°.
- Release and remove the injector downwards.

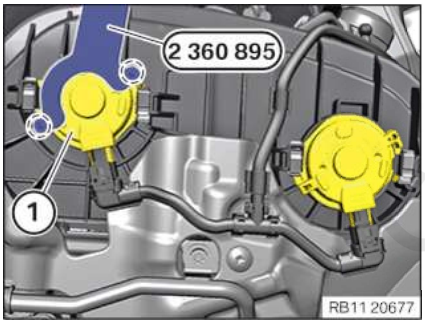
32 – Removing both actuators

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

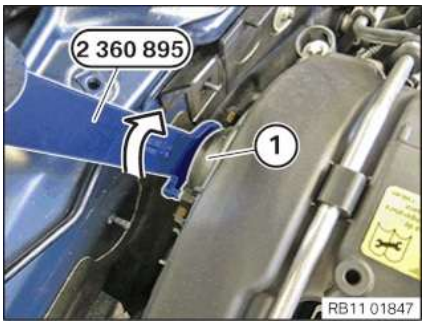
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the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



NOTICE

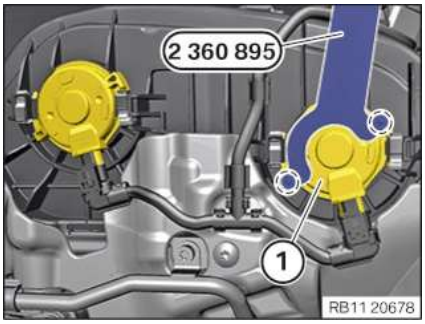
The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the intake side.



- Turn the actuator (1) on the intake side with the special tool 2 360 895 by about 50° in the direction of arrow and release it.

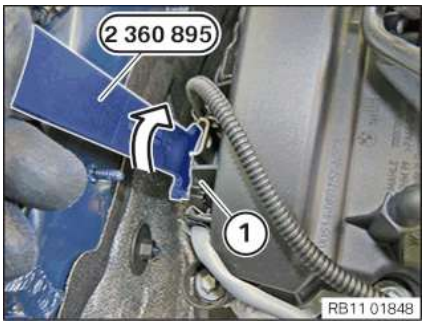
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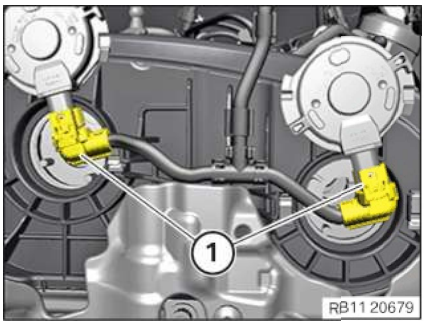
NOTICE

The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the exhaust side.



- Turn the actuator (1) on the exhaust side with the special tool 2 360 895 by about 50° in the direction of arrow and release it.



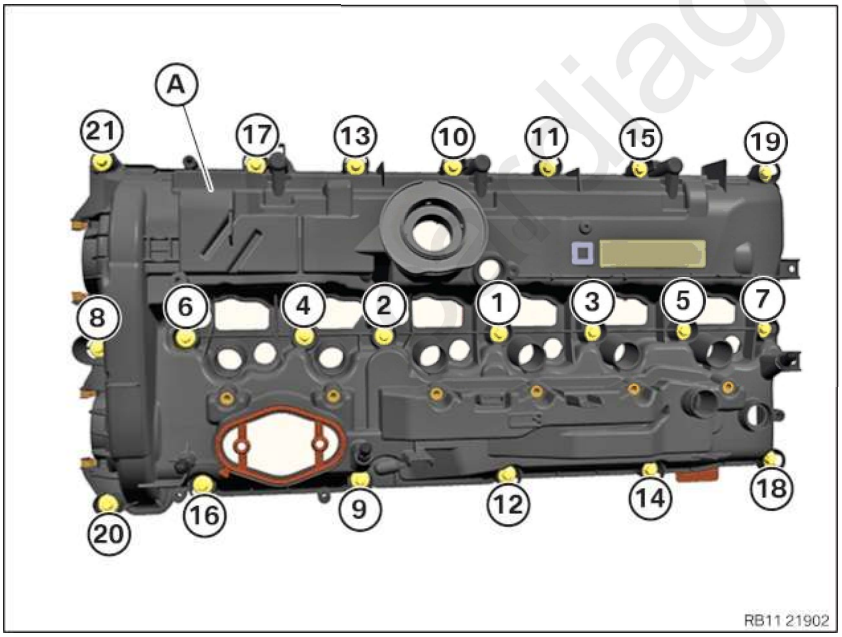
NOTICE

The figure shows the rear side of the engine.

- Unlock and disconnect both connectors (1).
- Feed out and remove both actuators.

33 – Removing the cylinder head cover

Overview: Bolts of the cylinder head cover



1 - 21 Bolts of the cylinder head cover

A Cylinder head cover

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

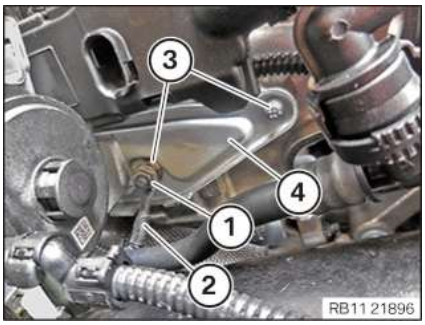
Sheared wires can cause a short circuit.

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

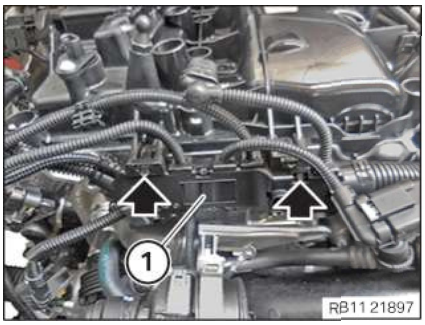
.com



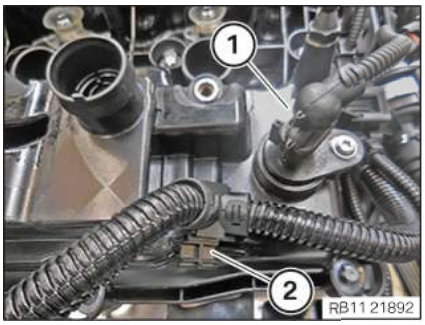
- Unlock the locks (1).
- Feed the engine ventilation line (2) out and set it aside.



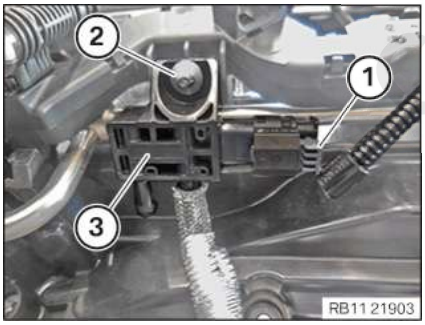
- Loosen nut (1).
- Feed out ground cable (2) and set it aside.
- Loosen screws (3).
- Thread out holder (4) and set aside.



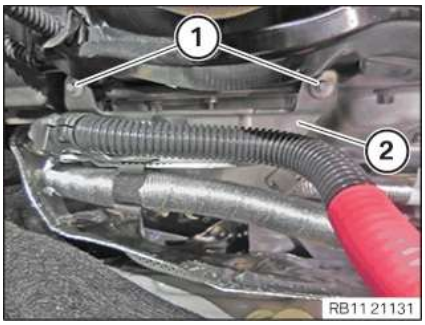
- Unlock and detach the locks (arrows).
- Guide out the wiring harness section (1) for the sensor system **2** and place to one side.



- Unlock and detach connector (1) on exhaust camshaft sensor .
- Loosen clamp (2).

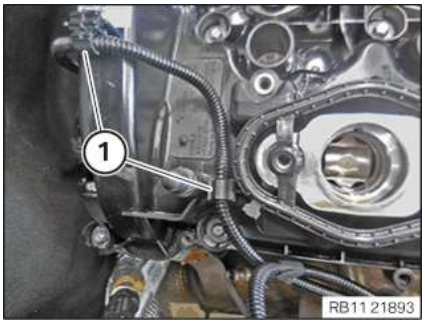


- **If installed:**
- Unlock and loosen connector (1).
- Loosen screw (2).
- Remove the differential pressure sensor (3) and put it to one side.

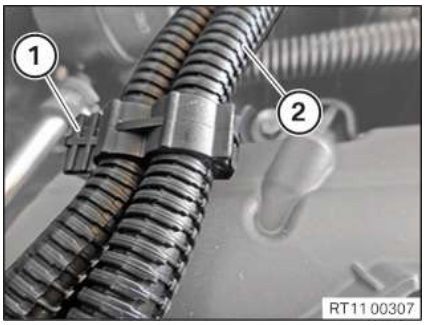


- Loosen screws (1).
- Feed out the bracket (2) of the positive battery cable and set it aside.

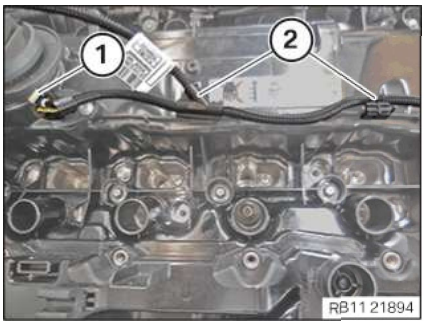
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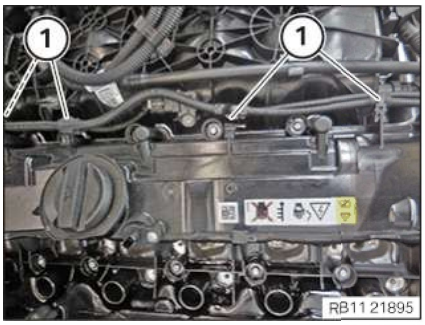
- Loosen clamps (1).



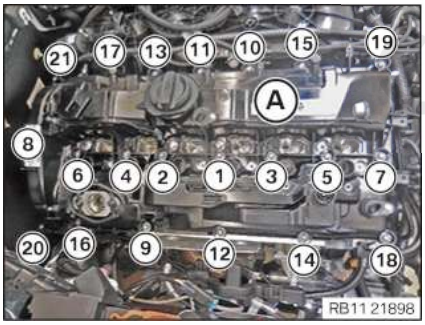
- Loosen clamp (1).
- Thread out the wiring harness section (2) for the injectors and ignition coils and set it aside.



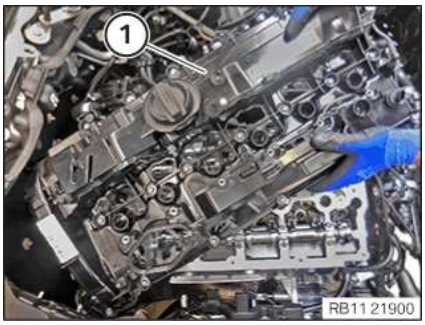
- Unlock and detach connector (1) on the intake camshaft sensor.
- Loosen clamps (2).



- Loosen clamps (1).



- Release all screws on the cylinder head cover (A) in the sequence (21) to (1).



- Guide the cylinder head cover (1) out and remove it.

34 – Removing integrated supply module (PDM)

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WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

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

RISK OF DAMAGE

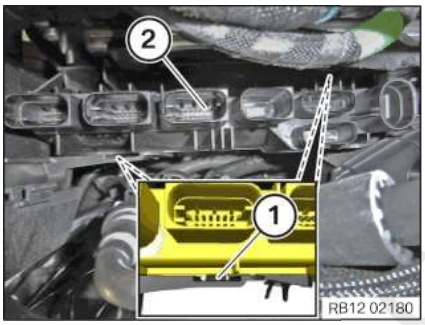
Electrostatic discharge.

Damage to or destruction of electrical components.

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



- Unlock and disconnect plug connections (1).



- Unlock the latch mechanisms (1).
- Guide out and remove integrated supply module (PDM) (2) upwards.

35 – Removing the DME control unit

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

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

TECHNICAL INFORMATION

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

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TECHNICAL INFORMATION

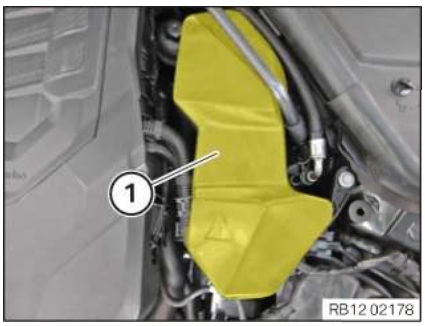
In a warranty case, you must always provide a fault memory printout with the defective part, even if the fault memory does not contain an entry.

TECHNICAL INFORMATION

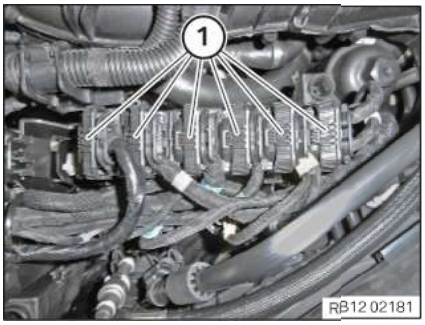
Control unit must be programmed after it is replaced.
For additional information see: 61 00 ... Programming/encoding control unit(s)

TECHNICAL INFORMATION

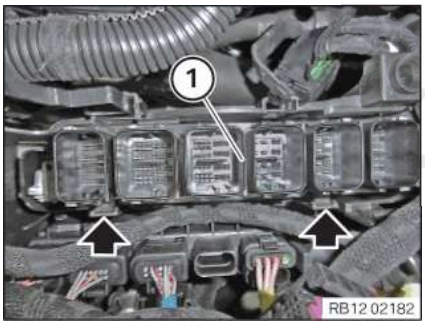
Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Pull the cover (1) towards the top and feed out.

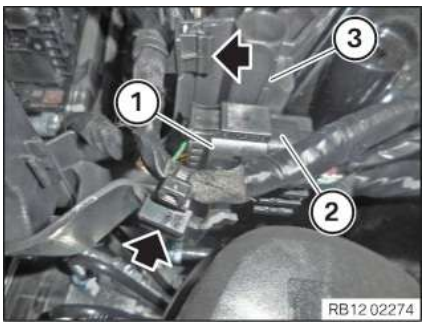


- Unlock and disconnect the plug connection (1).



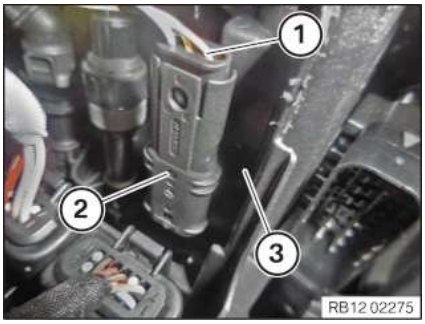
- Unlock the locks (arrows).
- Guide out and remove DME control unit (1).

36 – Removing the control unit holder

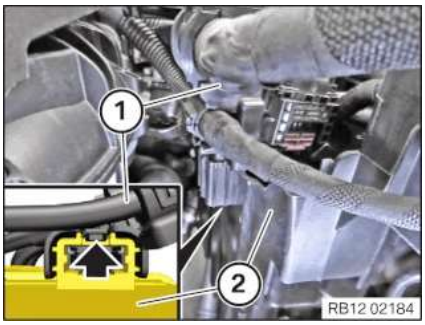


- Unlock plug connection (1) and disconnect.
- Unlock the connector (2) and disconnect from the control unit holder (3).
- Release the clamps (arrows).

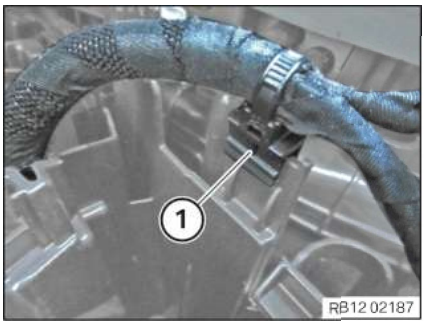
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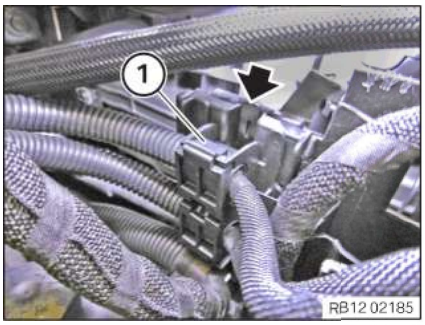
- Unlock plug connection (1) and disconnect.
- Unlock the connector and disconnect from the control unit holder (3).



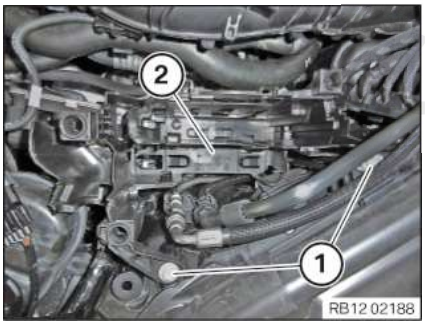
- Unlock the lock (arrow).
- Disconnect the cable holder (1) upwards from the control unit holder (2).



- Loosen clamp (1).

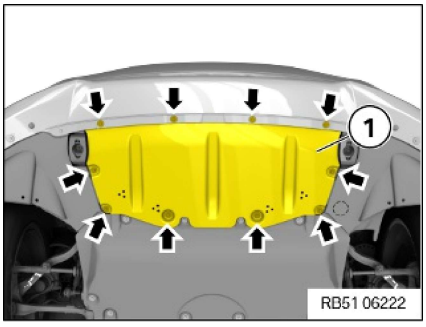


- Unlock the lock (arrow).
- Feed out the cable clip (1) upwards and set it aside.



- Loosen screws (1).
- Guide out and remove the control unit holder (2).

37 – Removing the front underbody protection

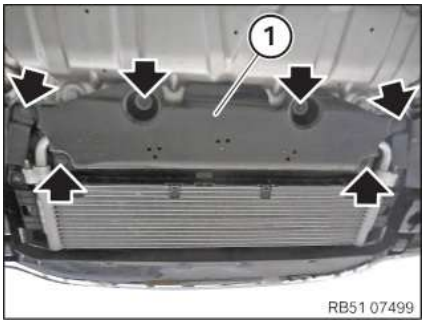


- **Version 1:**

  Remove screws (arrows).

  Feed front underbody protection (1) backwards out of the bumper panel.

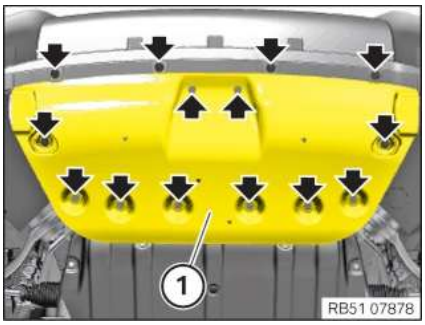
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- **Version 2:**

  Remove screws (arrows).

  Guide out front underbody protection (1) and remove it.



- **Version 3:**

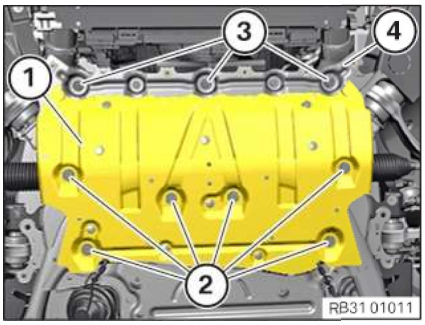
  Remove screws (arrows).

  Guide out front underbody protection (1) and remove it.

38 – Removing the stiffening plate

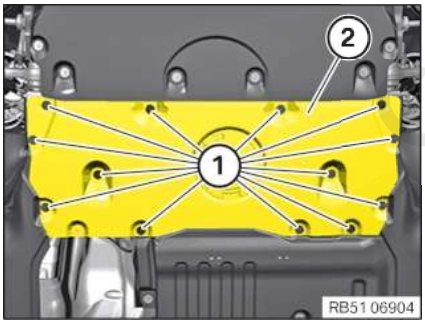
TECHNICAL INFORMATION

Driving without stiffening plate is not permissible.



- Loosen screws (3).
- Remove the holder of the underride protection (4).
- Loosen screws (2).
- Remove stiffening plate (1).

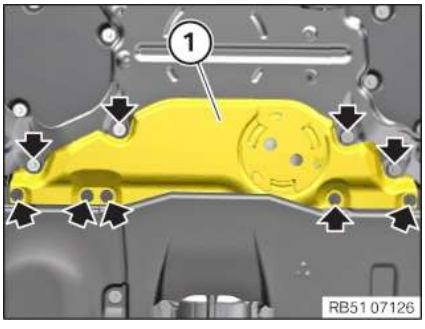
39 – Removing the centre underbody protection



- **Version with rear-wheel drive:**

  Loosen screws (1).

  Remove centre underbody protection (2) .



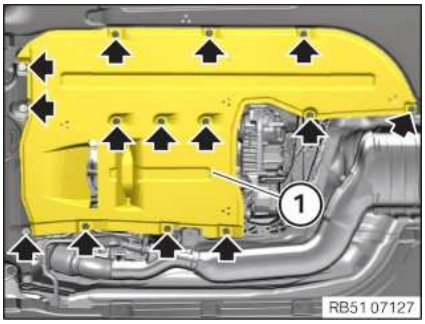
- **Version with all-wheel drive:**

  Remove screws (arrows).

  Feed out and remove the centre underbody protection (1).

40 – Remove rear underbody protection

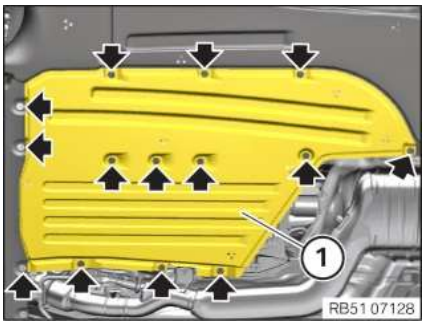
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- **Version 1:**

  Remove screws (arrows).

  Feed out the rear underbody protection (1).

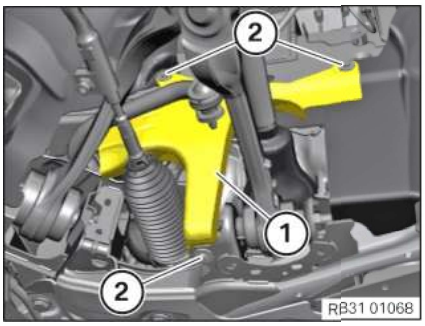


- **Version 2:**

  Remove screws (arrows).

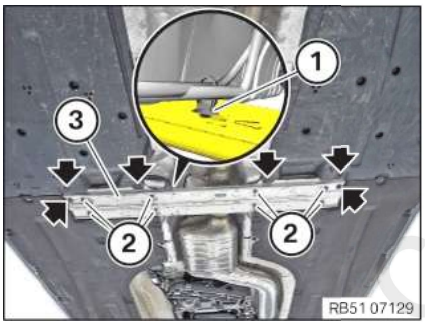
  Guide out rear underbody protection (1) and remove it.

41 – Remove the cover of the steering assembly



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

42 – Remove the connecting support from the tunnel



- Remove screws (arrows).
- **If installed:** Loosen clamp (1).
- Loosen screws (2).
- Guide out and remove connecting support (3) on the tunnel.

43 – Remove complete exhaust system

WARNING

Hot surfaces.

Risk of burning!

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

CAUTION

Component with heavy weight.

Danger of injury!

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

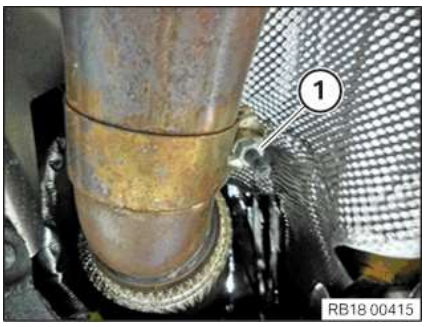
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CAUTION

Heavy component.

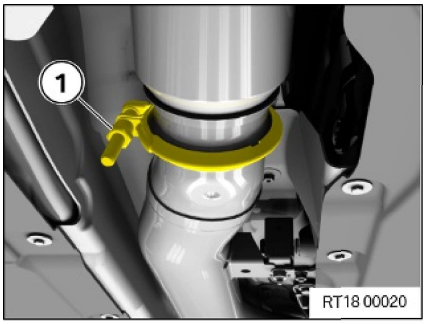
Heavy components can lead to injury or damage.

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



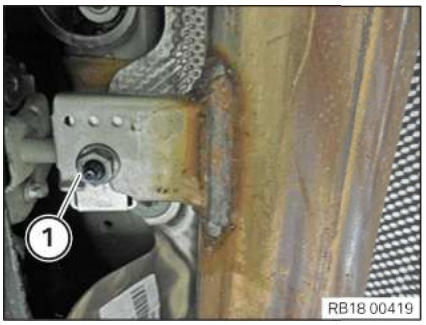
- **Equipment specification 1 (ribbon clamp)**

  Detach the ribbon clamp (1).

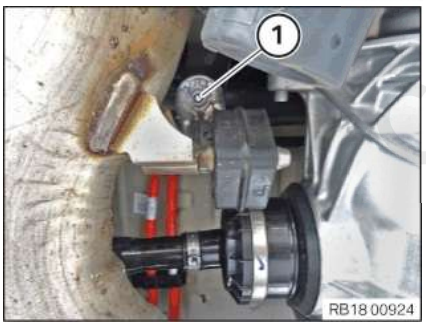


- **Equipment specification 2 (V-clips)**

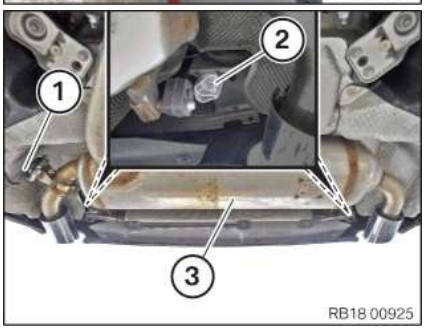
  Unfasten clamp (1).



- Loosen nut (1).



- Release nut (1) on the rear axle support.



- Unlock plug connection (1) and disconnect.
- Loosen nuts (2).
- Lower and remove the exhaust system (3) with the assistance of a second person.

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WARNING

Hot surfaces.

Risk of burning!

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

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

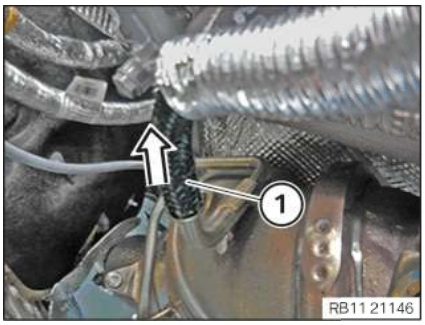
- Remove and install heavy components with the aid of another person/other persons.

CAUTION

Component with heavy weight.

Danger of injury!

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

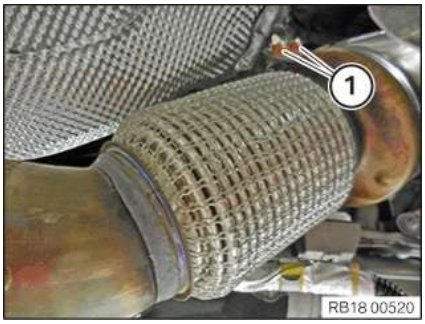


- **If installed: Disconnect pressure hose.**

  Pull off pressure hose (1) in direction of arrow and set it aside.



- Loosen V-band clamp (1).



- Loosen nuts (1).

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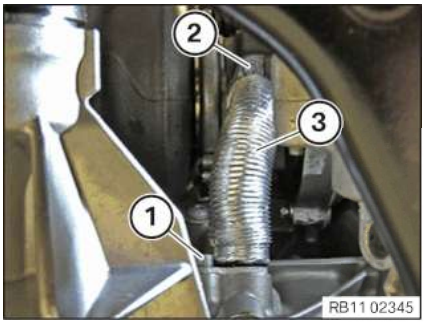


- Unlock and loosen clamp (1).
- Feed out catalytic converter and remove.

45 – Removing the oil return line for the exhaust turbocharger

TECHNICAL INFORMATION

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



- Have cleaning rags ready for any escaping engine oil.
- Loosen screws (1) and (2).
- Guide out and remove the oil return line (3).

46 – If installed: Partially release the engine oil cooler

WARNING

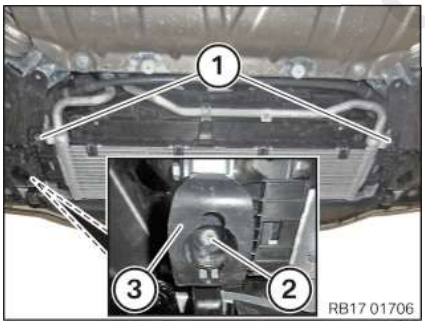
Hot surfaces.

Risk of burning!

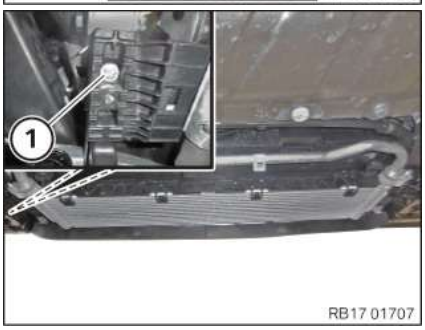
- Perform all work only on components that have cooled down.

TECHNICAL INFORMATION

The work must be performed with care to prevent component damage.

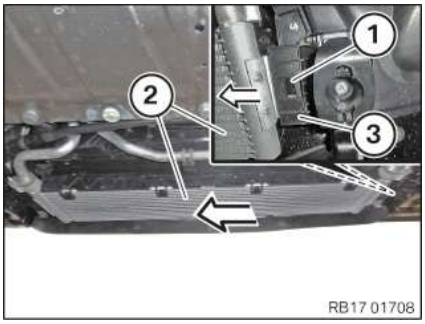


- Loosen screws (1).
- Drill out rivet on the left (2).
- Remove the left-hand damper (3).

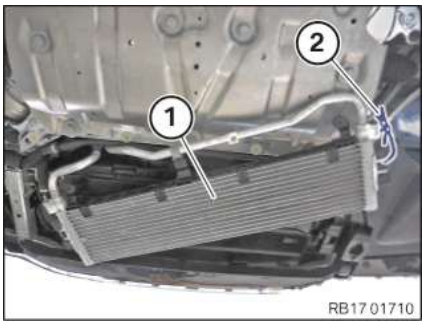


- Loosen screw (1).

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- Unlock lock (1).
- Feed out engine oil cooler (2) from the holder in the direction of arrow (3) and place to one side.



- Affix the engine oil cooler (1) with a cable strap (2) as shown.

47 – Draining the coolant from the low-temperature cooling system

WARNING

Hot surfaces.

Risk of burning!

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

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

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

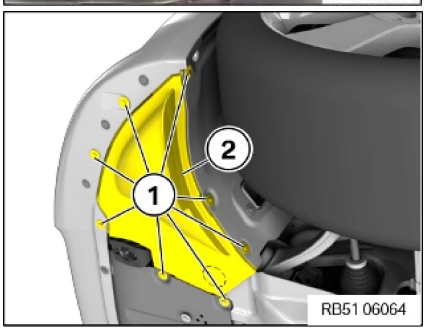
In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

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

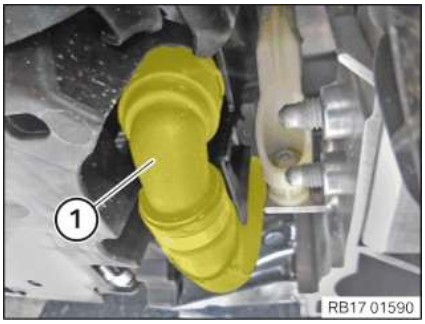


- Loosen sealing cap (1).



- Loosen screws (1).
- Guide out and remove bottom left cover (2) to the front.

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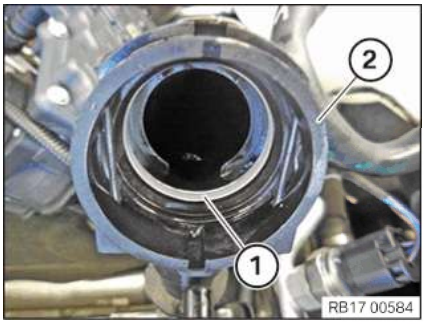


- Unlock and disconnect the coolant line (1).
- Catch and dispose of escaping coolant.

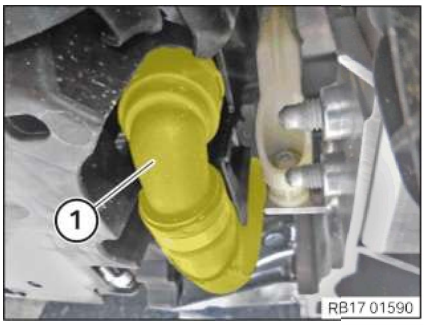
48 – Connecting the coolant lines for the low-temperature coolant circuit

TECHNICAL INFORMATION

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

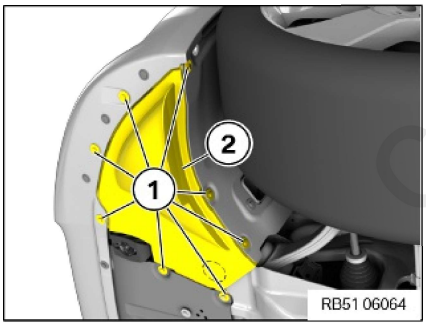


- Check the sealing rings (1) of the coolant lines (2) for damage and renew if necessary.



- Connect and lock the coolant line (1).

  The coolant line (1) must audibly engage.



- Feed in and install cover (2) at the bottom front left.
- Tighten the screws (1).

Cover, front bottom on side

Hexagon screw for thermoplastic		Tightening torque	3 Nm

49 – Draining the coolant from the high-temperature cooling system

WARNING

Hot fluids.

Risk of scalding!

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

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CAUTION

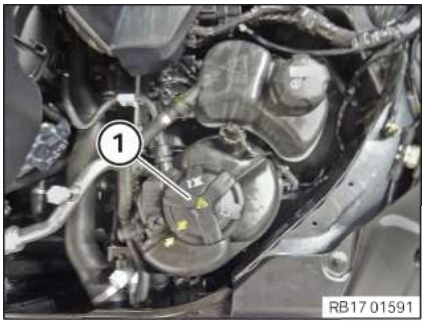
Materials harmful to health.

Contact with fluids harmful to health!

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

TECHNICAL INFORMATION

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



- Loosen sealing cap (1).

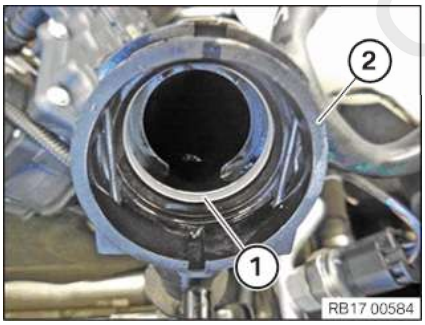


- Unlock lower right coolant hose (1) on the high-temperature coolant radiator and pull it off.
- Catch and dispose of escaping coolant.

50 – Connecting coolant hose to high-temperature coolant radiator

TECHNICAL INFORMATION

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



- Check the sealing rings (1) of the coolant lines (2) for damage and renew if necessary.



- Connect coolant hose (1), bottom right to the high-temperature coolant radiator and lock it audibly.

51 – Remove the coolant line between the cylinder head and the coolant pump

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WARNING

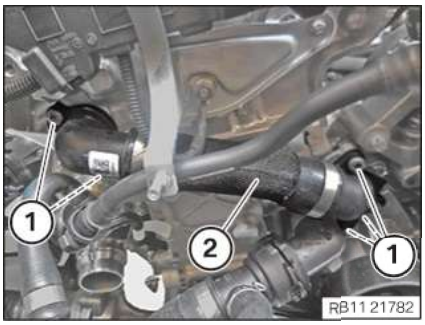
Hot surfaces.

Risk of burning!

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

TECHNICAL INFORMATION

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



- Loosen screws (1).
- Remove the coolant line (2).
- Catch and dispose of escaping coolant.

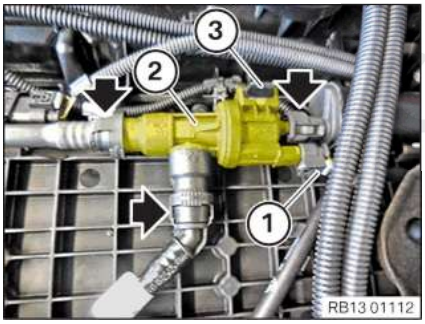
52 – Remove tank vent valve

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

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



- Unlock and disconnect connector (1).
- Unlock and disconnect the tank ventilation lines (arrows).
- Detach and remove the tank vent valve (2) from the holder (3).

53 – Removing the intake plenum

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

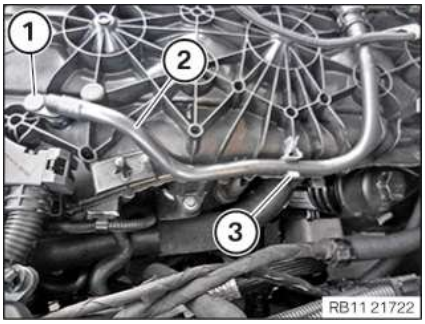
- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

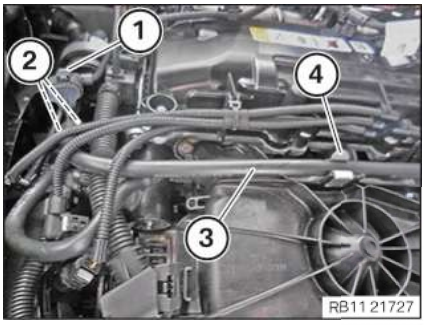
Additional coolant can escape. Make sure that no coolant enters the intake port of the cylinder head.

TECHNICAL INFORMATION

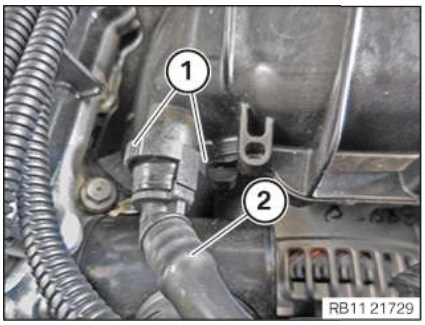
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



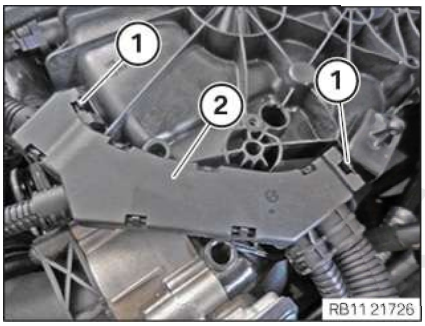
- Loosen screw (1).
- Guide tank ventilation line (2) out of clamp (3) and remove it.



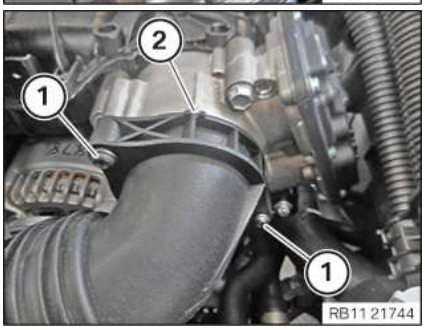
- Unlock and loosen connector (1).
- Unlock the locks (2).
- Guide tank ventilation line (3) out of clamp (4) and remove it.



- Unlock the locks (1).
- Feed the tank ventilation line (2) out and set it aside.

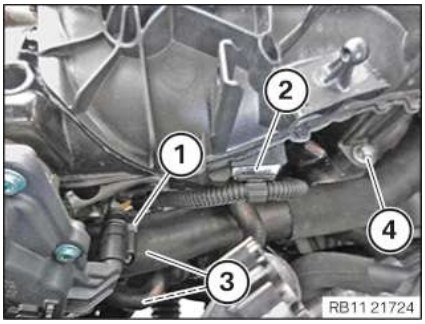


- Unlock the locks (1).
- Guide out the wiring harness section (2) for the sensor system **2** and place to one side.

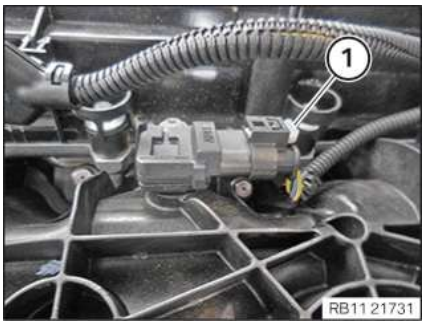


- Loosen screws (1).
- Feed out charge air line (2) and place to one side.

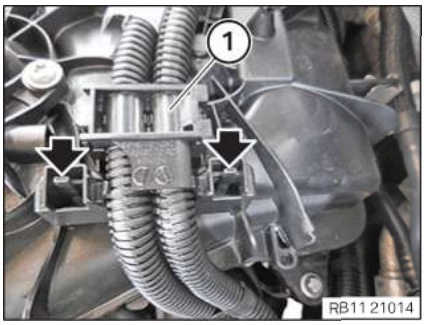
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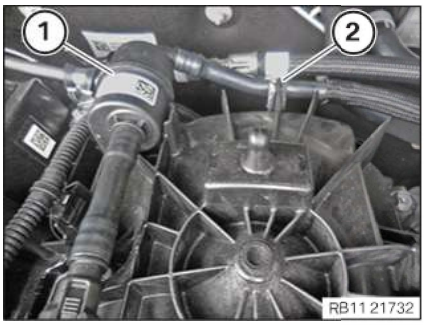
- Unlock and loosen connector (1).
- Loosen clamp (2).
- Thread off coolant line (3) and place to the side.
- Loosen screw (4).



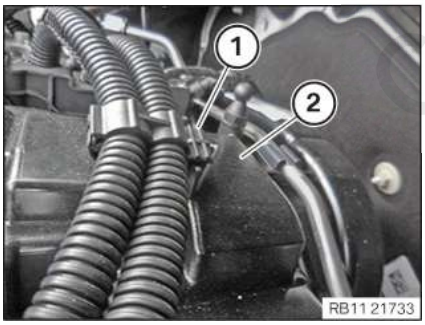
- Unlock and loosen connector (1).



- Unlock the locks (arrows).
- Thread out the wiring harness section (1) for the injectors and ignition coils and set it aside.



- Guide tank ventilation line (1) out of clamp (2) and place it aside.

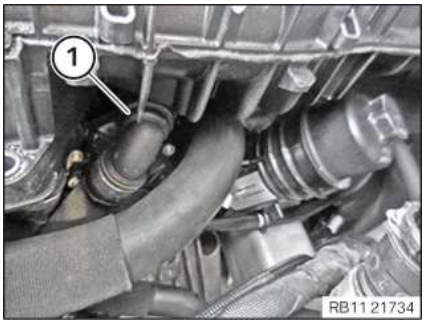


- Guide out the wiring harness section (1) for the injectors and ignition coils of the cylinder head cover (2) and set it aside.

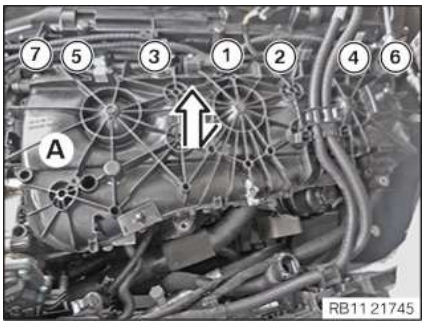


- Loosen screw (1).

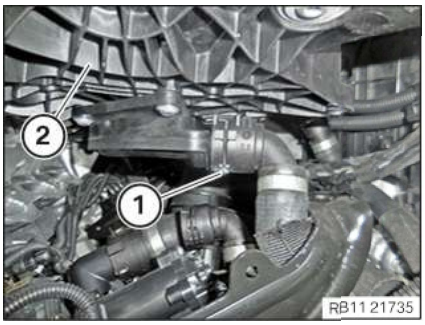
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- Unlock and loosen coolant line (1).
- Catch and dispose of escaping coolant.



- Loosen screws in the order (7) to (1).
- Slightly raise intake plenum (A) in direction of arrow.



TECHNICAL INFORMATION

Additional coolant can escape. Make sure that no coolant enters the intake port of the cylinder head.

- Unlock and release coolant line (1) below the intake plenum (2).
- Catch and dispose of escaping coolant.
- Thread out intake plenum (2) and remove.

54 – Block the engine with the special tool in TDC firing position



- Thread the sealing cap (1) out and remove.



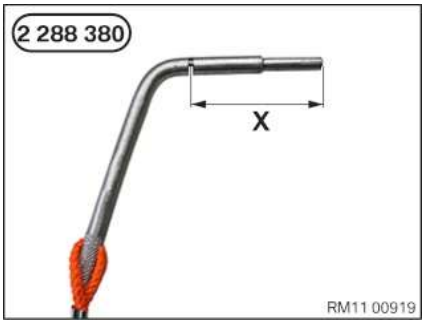
RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Turn the engine in **direction of arrow** with the special tool 0 493 380 (11 6 480) to the TDC firing position of **cylinder 1**.

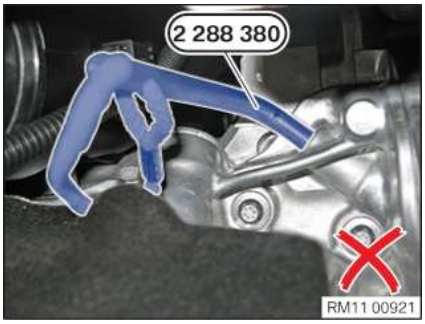


- **Vehicles with automatic transmission:**

  Dimension (X) = 66 mm

  The special tool 2 288 380 must be inserted in the dowel hole to dimension (X).

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- **Vehicles with automatic transmission:**

  Special tool 2 288 380 **incorrectly** positioned.

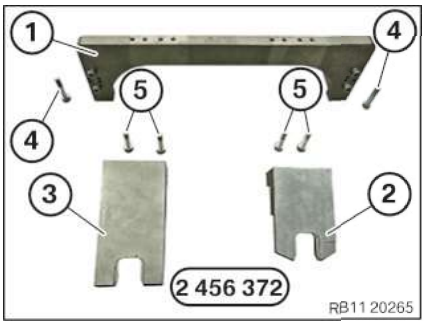
  The TDC firing position of cylinder 1 was **not** reached.



- **Vehicles with automatic transmission:**

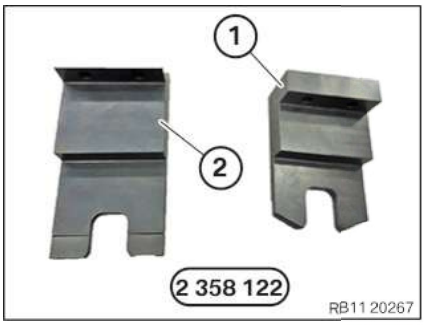
  Special tool 2 288 380 **correctly** positioned.

  The engine is in the TDC firing position of cylinder 1.



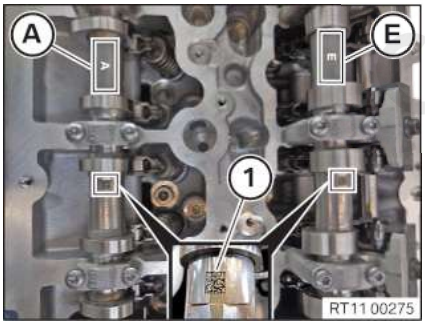
- Overview of the set of special tools 2 456 372:

Number	Description
1	Basic carrier
2	Setting gauge to adjust the intake camshaft
3	Setting gauge to adjust the exhaust camshaft
4	Basic carrier screws on cylinder head
5	Screw gauge on basic carrier

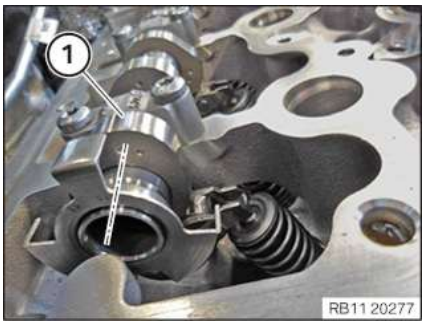


- Overview of the test gauges from the set of special tools 2 358 122:

Number	Description
1	Test gauge to fix the intake camshaft
2	Test gauge to fix the exhaust camshaft



- Turn intake camshaft (E) and exhaust camshaft (A) until marks (1) can be read from the top.

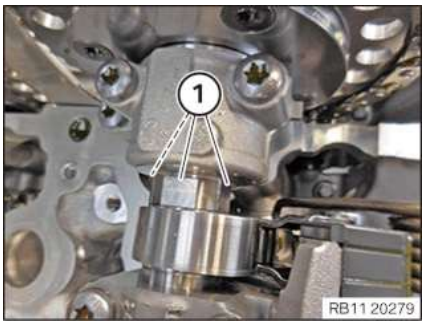


- Ensure that the cam (1) on the exhaust camshaft on **cylinder 1** points to the inside right at a slight angle.

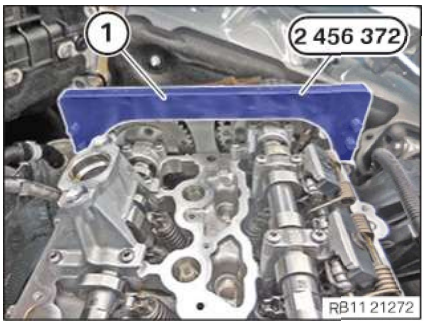
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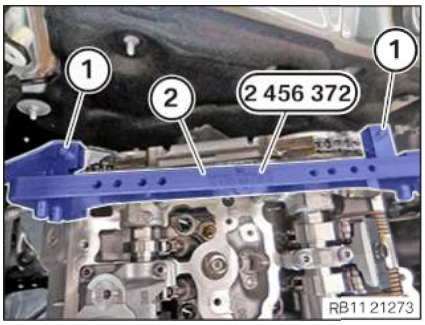
- Ensure that the cam (1) on the intake camshaft on **cylinder 1** points to the inside left at an angle.



- Ensure that the flattened areas (1) on the intake camshaft and the exhaust camshaft point upwards.



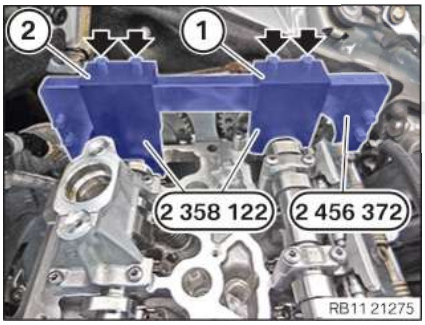
- Position basic carrier (1) from the set of special tools 2 456 372 on the cylinder head.



- Tighten the screws (1) from the set of special tools 2 456 372 on the basic carrier (2).

Basic carrier to cylinder head

M6		Tightening torque	8 Nm



- Position the test gauge (1) from the set of special tools 2 358 122 between the intake camshaft and the basic carrier from the set of special tools 2 456 372.
- Position the test gauge (2) from the set of special tools 2 358 122 between the exhaust camshaft and the basic carrier from the set of special tools 2 456 372.
- Tighten screws (arrows).

Test gauge to basic carrier

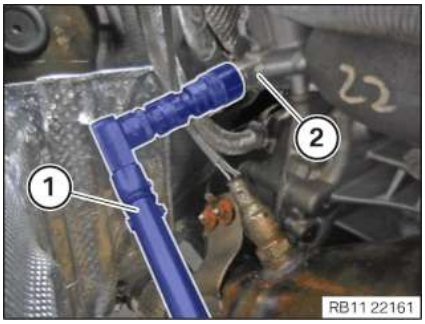
M6		Tightening torque	8 Nm

55 – Removing chain tensioner

TECHNICAL INFORMATION

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

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- A small amount on engine oil emerges when removing the chain tensioner (2), have a cleaning cloth ready.
- Release the chain tensioner (2) with conventional tools (1).



- Feed out and remove the chain tensioner (1).

56 – Releasing the VANOS central valve of the intake adjuster



- To release the VANOS central valve (1), use the reversible ratchet (2) from the special tool 0 496 855 with the special tool 2 450 487.



NOTICE

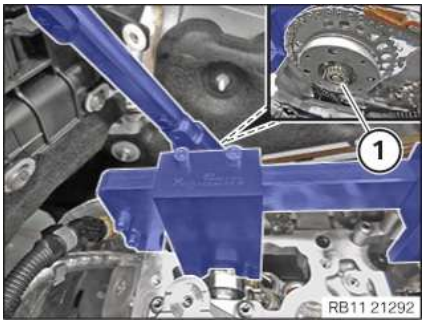
The figure shows the rear side of the engine.

- Release the VANOS central valve (1) of the intake adjuster.

57 – Releasing VANOS central valve of the exhaust camshaft adjuster



- To release the VANOS central valve (1), use the reversible ratchet (2) from the special tool 0 496 855 with the special tool 2 450 487.



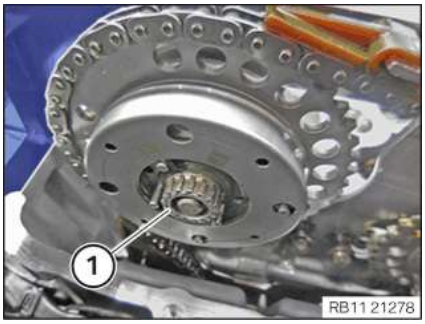
NOTICE

The figure shows the rear side of the engine.

- Release the VANOS central valve (1) of the exhaust camshaft adjuster.

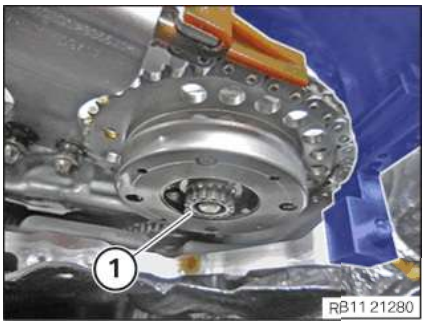
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58 – Removing the VANOS central valve of the intake adjuster



- Guide out and remove the VANOS central valve (1) of the intake adjuster.

59 – Remove the VANOS central valve of the exhaust camshaft adjuster

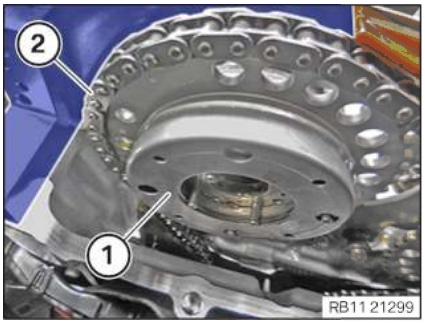


- Guide out and remove the VANOS central valve (1) of the exhaust camshaft adjuster.

60 – Removing intake adjuster

NOTICE

The figure shows the rear side of the engine.

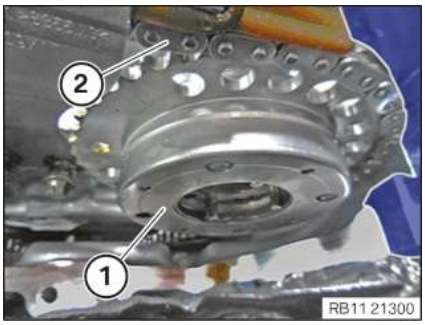


- Guide out the intake adjuster (1) from the timing chain (2) and remove.

61 – Remove exhaust camshaft adjuster

NOTICE

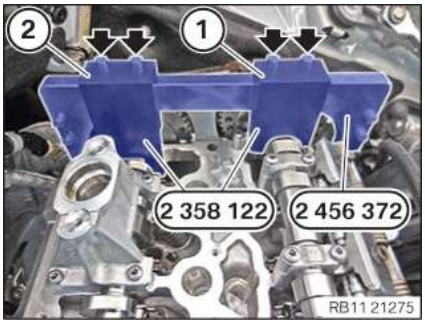
The figure shows the rear side of the engine.



- Guide out the exhaust camshaft adjuster (1) from the timing chain (2) and remove.

62 – Remove the test gauges to fix the camshafts

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- Remove screws (arrows).
- Guide out and remove test gauge (1) from the set of special tools 2 358 122 between the intake camshaft and the basic carrier of the set of special tools 2 456 372.
- Guide out and remove test gauge (2) from the set of special tools 2 358 122 between the exhaust camshaft and the basic carrier of the set of special tools 2 456 372.

63 – Remove cylinder head.

CAUTION

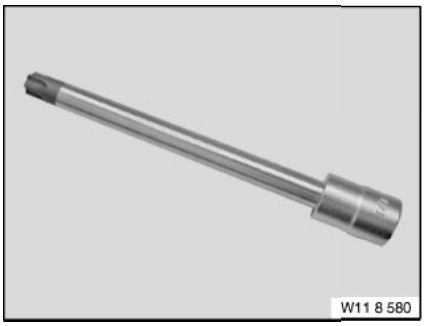
Heavy component.

Heavy components can lead to injury or damage.

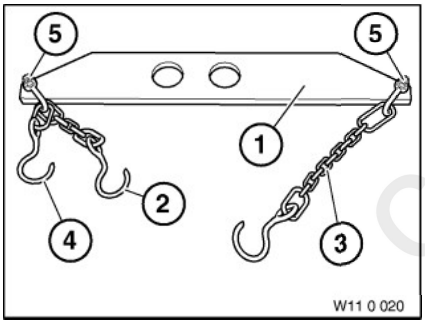
- Remove and install heavy components with the aid of another person/other persons.

TECHNICAL INFORMATION

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



- Prepare special tool 0 495 747 (11 8 580).



- Prepare special tool 0 490 567 (11 0 020).

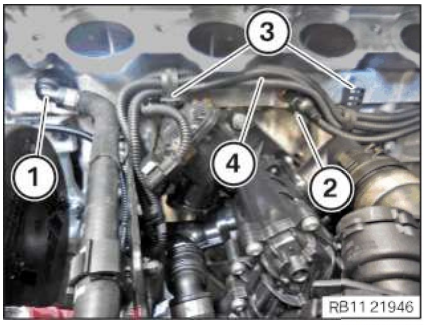
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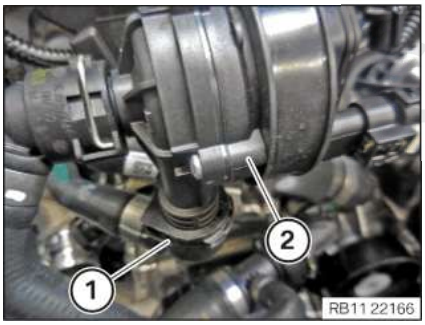
- Prepare the workshop crane 2 220 718.



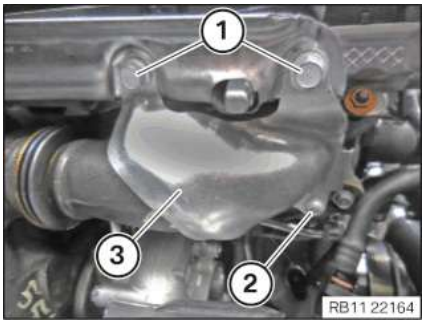
- Unlock plug connection (1) and disconnect.



- Unlock and loosen coolant line (1).
- Catch and dispose of escaping coolant.
- Unlock plug connection (2) and disconnect.
- Loosen clamps (3).
- Feed out wiring harness section (4) for sensor system **1** and set it aside.



- Unlock and release coolant return line (1) on coolant pump (2) for the exhaust turbocharger.
- Catch and dispose of escaping coolant.

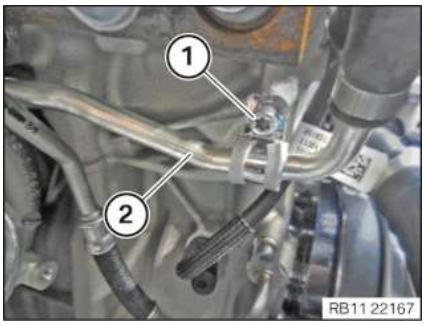


- Loosen screws (1).
- Loosen screw (2).
- Feed out and remove the heat shield (3).

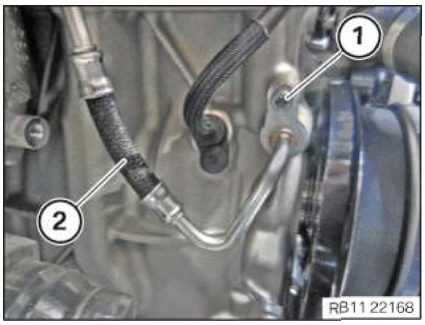
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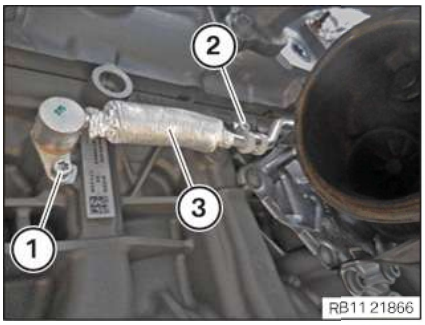
- Loosen screws (1).
- Feed out and remove the heat shield (2).



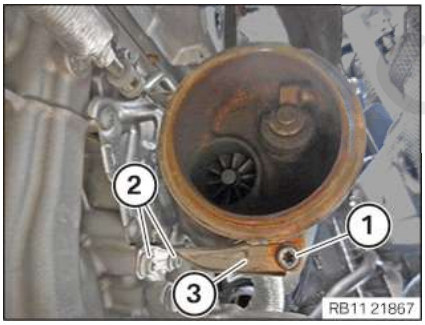
- Release screw (1) on coolant return line (2).



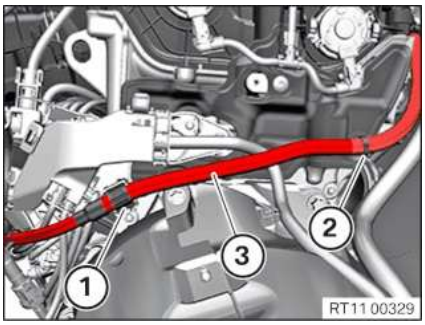
- Loosen screw (1).
- Guide out oil feed line (2) for the exhaust turbocharger and place it aside.
- Catch and dispose of emerging engine oil.



- Loosen screws (1) and (2).
- Guide the coolant feed line for exhaust turbocharger (3) from the crankcase and place it aside.
- Catch and dispose of escaping coolant.

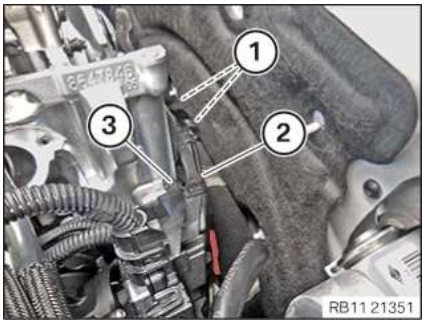


- Loosen screws (1) and (2).
- Feed the support (3) out and remove.

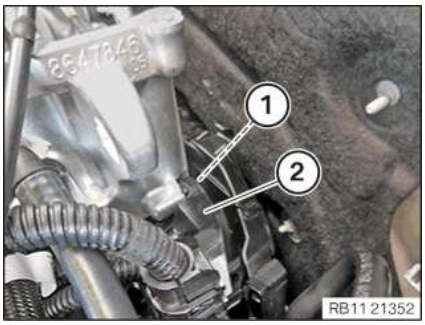


- Unlock and release clamps (1) and (2).
- Feed out positive battery cable (3) and put to one side.

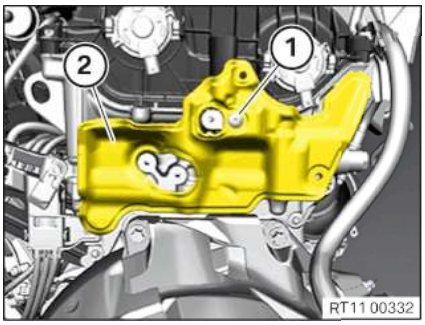
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- Loosen screws (1).
- Guide out transmission wiring harness (2) on wiring harness section (3) for sensor system 1 and set it aside.



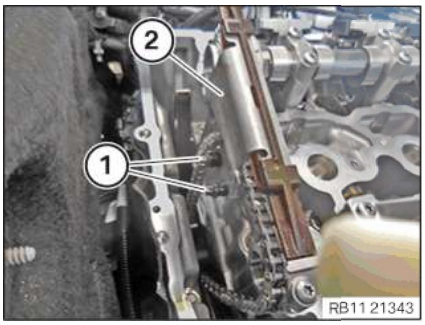
- Loosen screw (1).
- Guide out the wiring harness section (2) for sensor system 1 and place to one side.



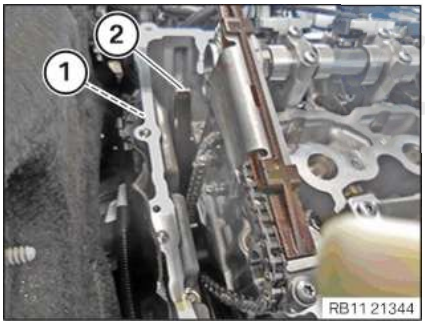
NOTICE

The figure shows the rear side of the engine.

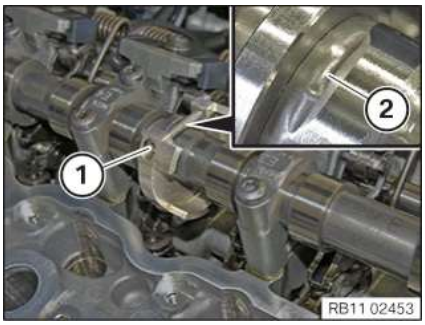
- Loosen screw (1).
- Guide out and remove the cover (2).



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



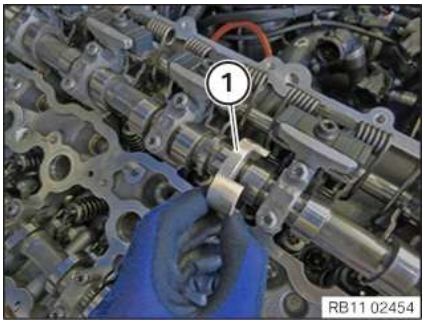
- Release the bearing journal (1) from the guide rail (2).



- Rotate intake camshaft, if necessary in the position shown.

  The recess (2) must point upwards.
- Loosen screw (1).

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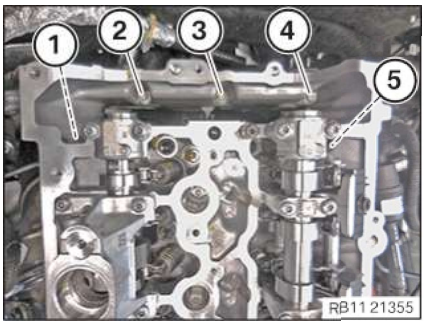
- Slide camshaft sensor wheel (1) in the direction of cylinder 1 and guide it out from the intake camshaft.



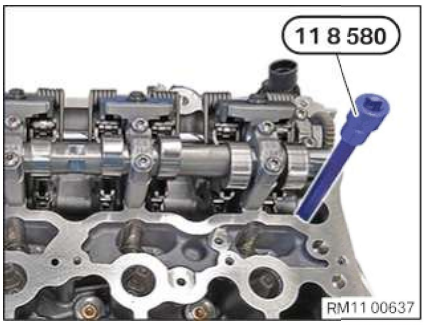
- Guide in and position special tool on the cylinder head.
- Tighten the screws (1) of special tool .

Special tool to cylinder head

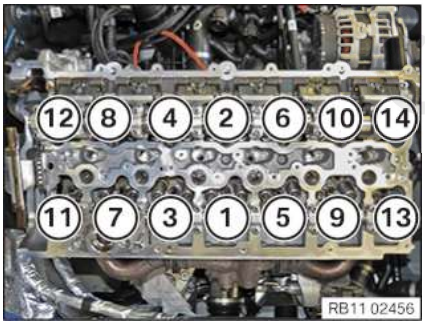
M8		Tightening torque	21,5 Nm



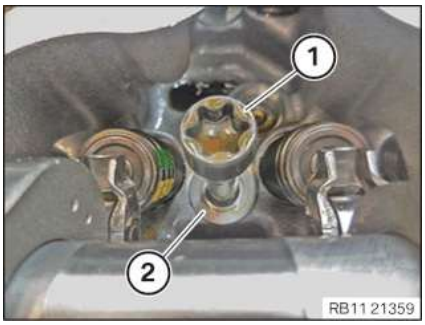
- Loosen the cylinder head bolts in the sequence from (5) to (1).



- Release cylinder head bolts with the special tool 0 495 747 (11 8 580).

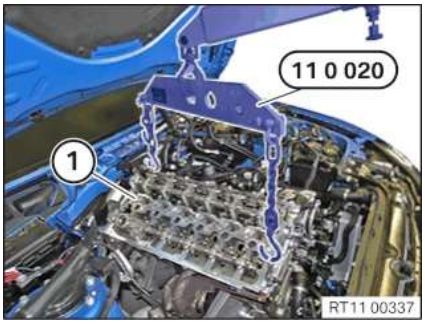


- Undo the screws using the special tool 0 495 747 (11 8 580) in the order (14) to (1) .



- Feed out and remove all the cylinder head bolts (1).
- Feed out and remove all the washers (2).

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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

RISK OF DAMAGE

Damage to the guide rails.

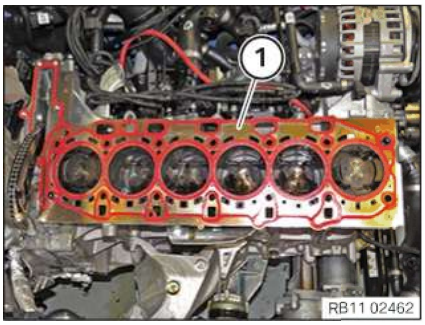
Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Attach special tool 0 490 567 (11 0 020) to workshop crane.
- Lift out cylinder head (1) and the exhaust turbocharger with an auxiliary person, the workshop crane and special tool 0 490 567 (11 0 020).

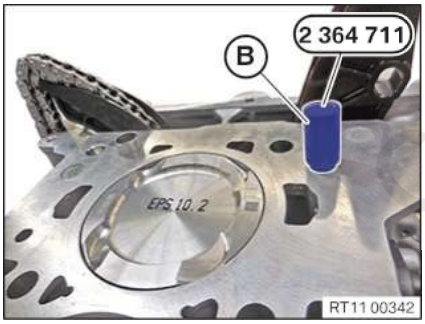
MAIN WORK

64 – Removing the cylinder head gasket



- Thread out and remove cylinder head gasket (1).

65 – Sealing the oil duct



- Seal the oil duct using special tool (B) from the set of special tools 2 364 711.

66 – Clean sealing surfaces

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

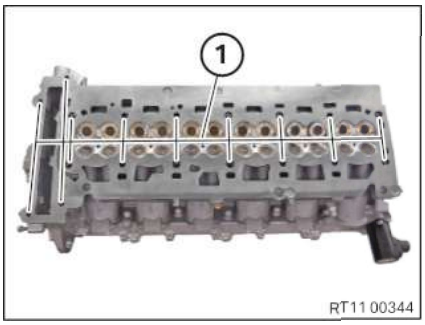
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- Remove coarse backlogs from the sealing surfaces of the cylinder head using special tool 0 495 103 (11 4 471).



- Remove fine residues from the sealing surfaces of the cylinder head using special tool 0 495 104 (11 4 472).



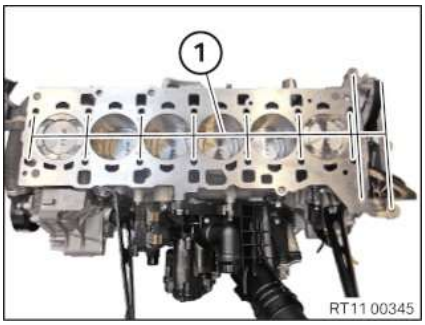
- Clean all blind holes (1) of the cylinder head.



- Remove coarse backlogs from the sealing surfaces of the crankcase using special tool 0 495 103 (11 4 471).



- Remove fine backlogs from the sealing surfaces of the crankcase using special tool 0 495 104 (11 4 472).
- Clean all blind holes of the crankcase.



CAUTION

Swirling dirt particles caused by compressed air.

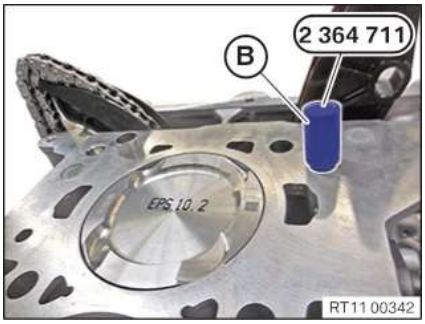
Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

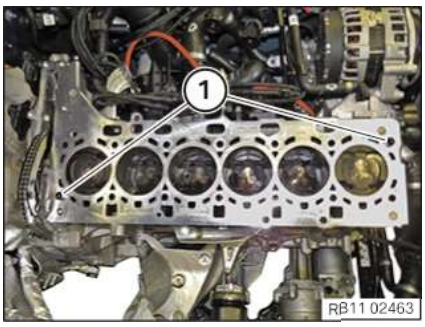
- Clean all threaded holes (1) of the crankcase with compressed air.

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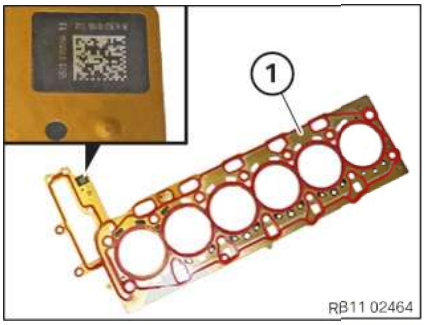


- Remove special tool (B) contained in the set of special tools 2 364 711.

67 – Installing the cylinder head gasket

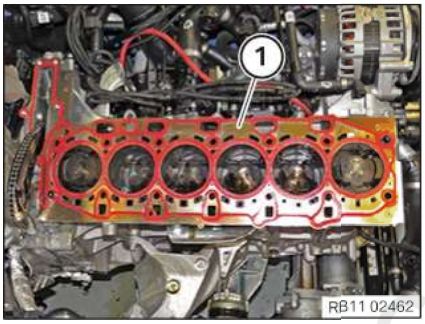


- Check the fitting sleeves (1) for damage and renew if necessary.



- Renew cylinder head gasket (1).

  Parts: Cylinder head gasket
- Install a thicker cylinder head gasket (1) with +0.3 mm in rebuilt cylinder heads.
- Check cylinder head gasket (1) using the part number.



- Install cylinder head gasket (1) and place it correctly on the fitting sleeves.

POSTPROCESSES

68 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

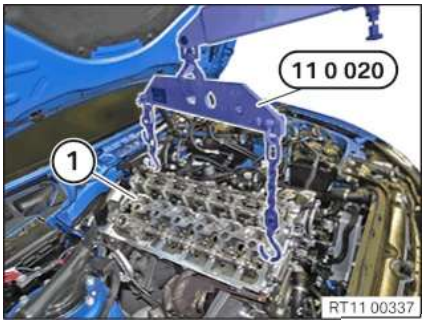
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TECHNICAL INFORMATION

Do not remove bolt coating.

TECHNICAL INFORMATION

When replacing the cylinder head: The complete valve control and the Valvetronic servomotor are already pre-assembled for new cylinder heads.



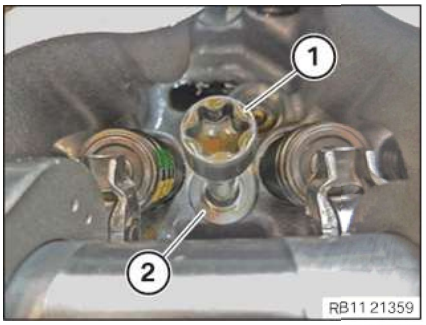
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

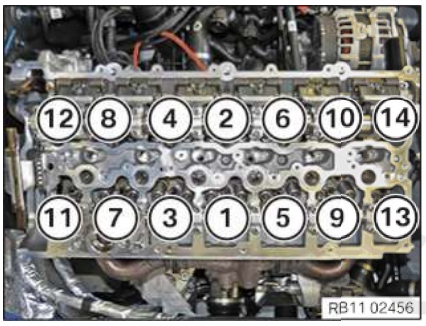
- Feed in, position and install cylinder head (1) and exhaust turbocharger with the help of an auxiliary person, the workshop crane and the special tool 0 490 567 (11 0 020).
- Ensure that the **guide rails** of the timing chain are **not** damaged.



- Insert and install washer (2).
- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do not wash off the coating (1) **of the cylinder head bolts** .
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of crankcase.
- Guide in and install cylinder head bolts (1).



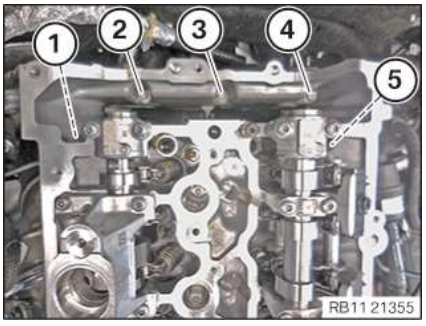
TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Screw in the cylinder head bolts in the sequence (1) to (14).
- Tighten the cylinder head bolts using the special tool 0 495 747 (11 8 580) and 0 490 504 (00 9 120) in the sequence (1) to (14).

Cylinder head to crankcase

M11	Observe tightening sequence. Fit new cylinder head bolts.	1. Jointing torque 2. Angle of rotation 3. Angle of rotation	30 Nm 90 ° 180 °



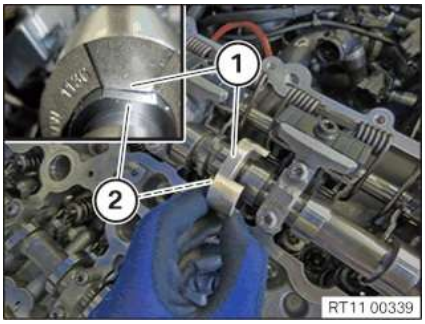
- Renew cylinder head bolts (1) to (5).

  Parts: Cylinder head bolts
- Make sure that there is **no** coolant, water or engine oil in the threaded holes of the timing case cover.
- Screw in cylinder head bolts (1) to (5).
- Tighten the cylinder head bolts in the order (1) to (5).

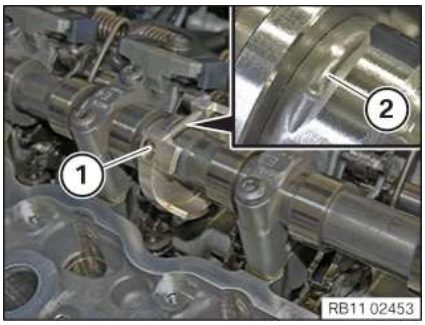
Cylinder head bolt to timing case cover

M8x40	Renew screws.	Tightening torque	19 Nm

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- Feed in and position camshaft sensor wheel (1) on the intake camshaft (2).



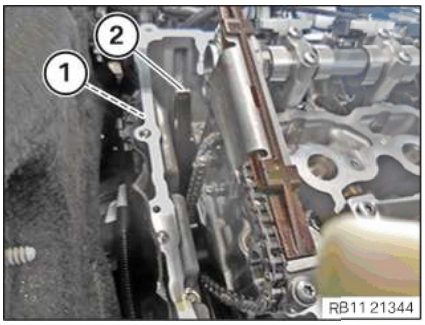
- Rotate intake camshaft, if necessary in the position shown.
  The recess (2) must point upwards.
- Tighten down screw (1).

Camshaft sensor wheel to intake camshaft

M4 x35		4,5 Nm



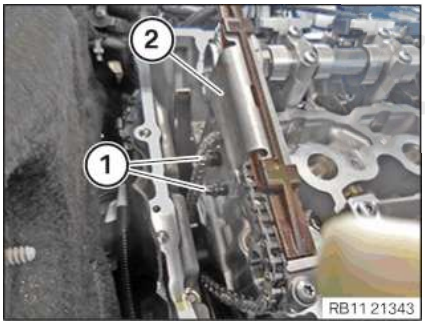
- Renew bearing journal (1).
  Parts: Bearing journal



- Feed in and install bearing journal (1) on the guide rail (2).
- Tighten the bearing journals (1).

Bearing journal to cylinder head

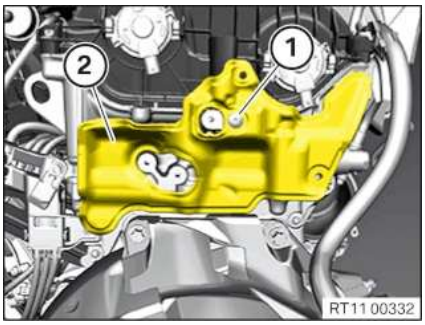
Bearing journal	Renew the bearing journal!	Tightening torque	20 Nm



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

Sliding rail to cylinder head

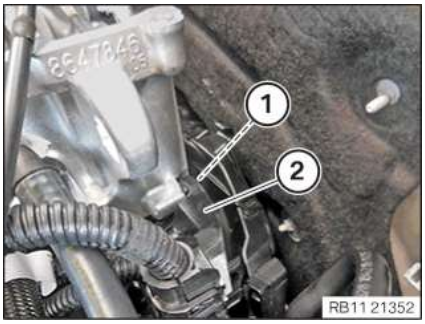
M6x16			8 Nm



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

Cover on rear cylinder head

M6		Tightening torque	8 Nm



RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

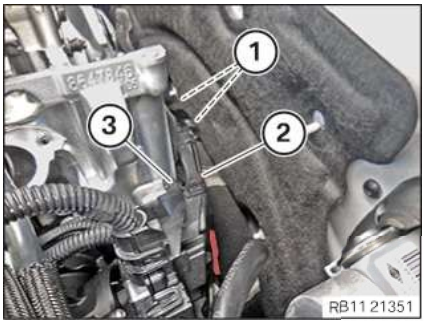
Trapped, crushed or damaged cables may cause short circuits and malfunctions.

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

- Guide in and install wiring harness section (2) for sensor system 1.
- Tighten down screw (1).

Cable routing to cylinder head, rear

M6 x 20		Tightening torque	8 Nm



RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

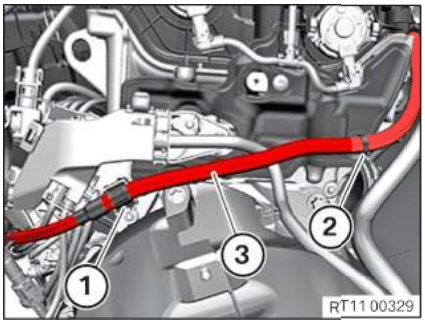
Trapped, crushed or damaged cables may cause short circuits and malfunctions.

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

- Guide in and install transmission wiring harness (2) on wiring harness section (3) for sensor system 1.
- Tighten the screws (1).

Cable routing to cylinder head, rear

M6 x 20		Tightening torque	8 Nm



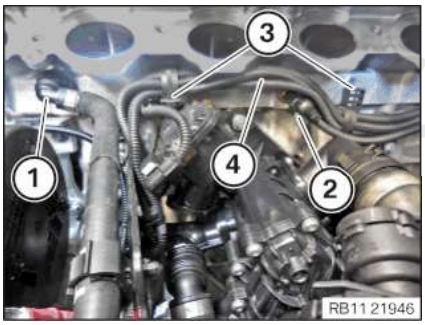
CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

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

- Insert and install the positive battery cable (3).
- Secure clamps (1) and (2).



RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

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

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

- Connect connectors (2) and lock.

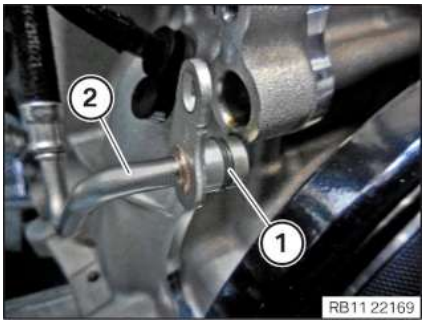
  The connector must engage audibly.
- Guide in and position the wiring harness section (4) of sensor system **1**.
- Secure clamps (3).
- Connect and lock coolant line (1).
- Make sure that the cooling line (1) engages audibly.



- Connect connectors (1) and lock.

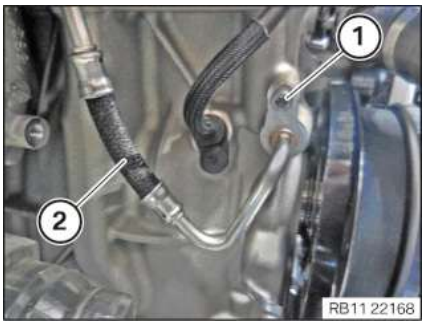
  The connector (1) must engage audibly.

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- Renew sealing ring (1) on the oil feed line (2) of the exhaust turbocharger with special tool 0 496 714 (00 9 030).

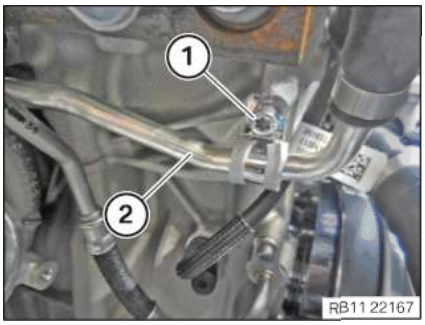
  Parts: Sealing ring



- Feed in and install the oil feed line (2) for the exhaust turbocharger.
- Tighten down screw (1).

Oil feed line for exhaust turbocharger to crankcase

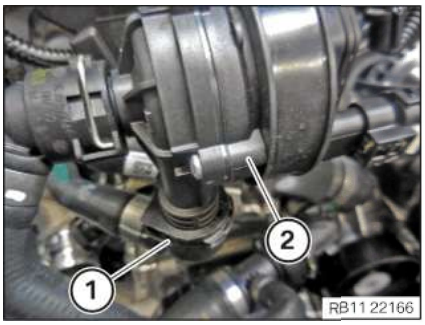
M6 x 12	Replace sealing ring.	Tightening torque	8 Nm



- Tighten screw (1) on the coolant return line (2).

Coolant return line holder bracket to crankcase

M6X12		Tightening torque	8 Nm



- Connect coolant return line (1) to the coolant pump (2) for the exhaust turbocharger and lock.

  The coolant return line (1) must engage audibly.

- Connect coolant return line (1) for the exhaust turbocharger and lock.
- Ensure the coolant return line (1) audibly engages.



- Feed in and install the heat shield (2).
- Renew screws (1).

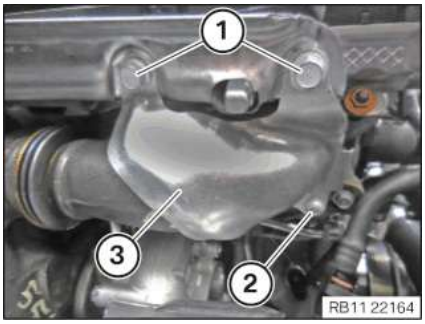
  Parts: Bolts

  Tighten the screws (1).

Heat shield to cylinder head

M8X12	Renew screws.	Tightening torque	19 Nm

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- Feed in and install the heat shield (3).
- Renew screws (1).

  Parts: Bolts

  Tighten the screws (1).

Heat shield to cylinder head

M8X12	Renew screws.	Tightening torque	19 Nm

- Renew the screw (2).

  Parts: Screw

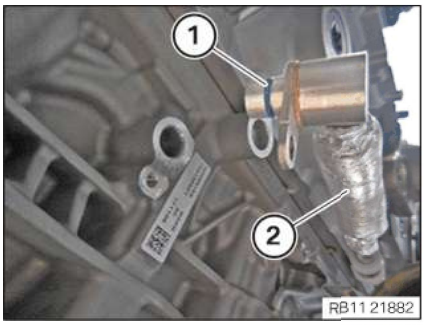
  Tighten down screw (2).

Heat shield to clamping strip

M6X16	Renew screw.	Tightening torque	8 Nm

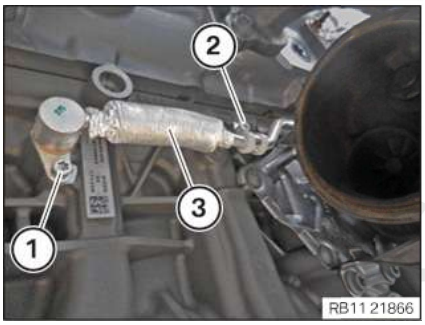


- Unscrew the bolts (1) of the special tool .
- Feed out the special tool at the cylinder head and remove.



- Renew sealing ring (1) on the coolant feed line (2) of the exhaust turbocharger with special tool 0 496 714 (00 9 030).

  Parts: Sealing ring



- Feed in and install coolant feed line for the exhaust turbocharger (3).
- Tighten down screw (1).

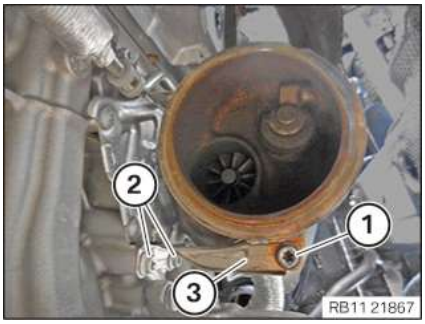
Coolant feed line to crankcase

M6X12		Tightening torque	8 Nm

- Tighten down screw (2).

Coolant feed line to crankcase

M6X12		Tightening torque	8 Nm



- Renew screws (1) and (2).

  Parts: Bolts

- Feed in and install support (3).
- Tighten the screws (2).

Exhaust turbocharger support to crankcase

M8 x 20	Renew screws.		19 Nm

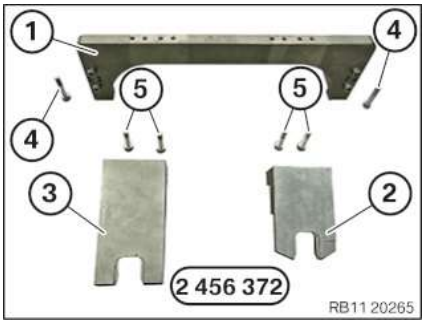
- Tighten the screws (1).

Exhaust turbocharger to support

M8 x 25	Renew screw.		19 Nm

69 – Adjust the camshafts with the special tool

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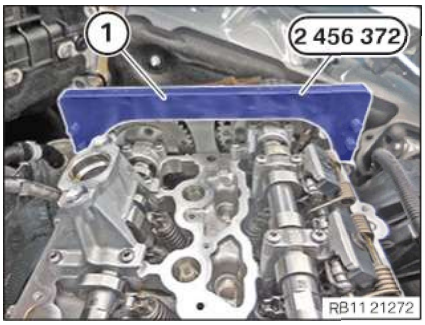


- Overview of the set of special tools 2 456 372:

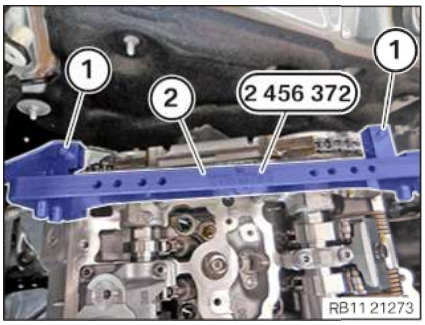
Number	Description
1	Basic carrier
2	Setting gauge to adjust the intake camshaft
3	Setting gauge to adjust the exhaust camshaft
4	Basic carrier screws on cylinder head
5	Screw gauge on basic carrier



- Use the setting gauge 0.7 ° (1) from the set of special tools 2 456 372 to adjust the intake camshaft.
- Use the setting gauge 0.5 ° (2) from the set of special tools 2 456 372 to adjust the exhaust camshaft.



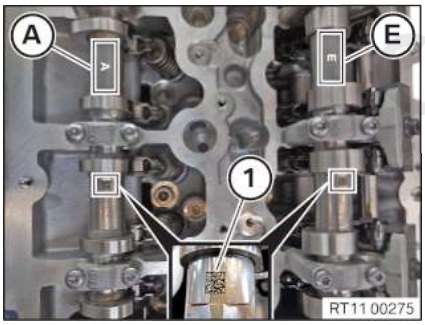
- Position the basic carrier (1) from the set of special tools 2 456 372 on the cylinder head.



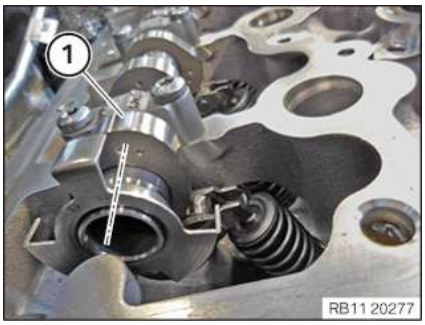
- Tighten the screws (1) from the set of special tools 2 456 372 on the basic carrier (2).

Basic carrier to cylinder head

M6	Tightening torque	8 Nm



- Turn the intake camshaft (E) and the exhaust camshaft (A) such that the marks (1) can be read from the top.

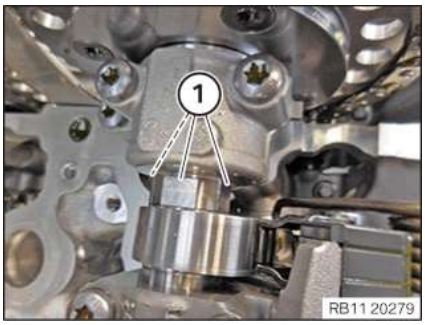


- Ensure that the cam (1) on the exhaust camshaft on **cylinder 1** points to the inside right at a slight angle.

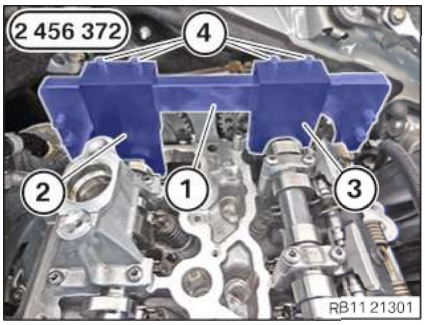
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- Ensure that the cam (1) on the intake camshaft on **cylinder 1** points to the inside left at an angle.



- Ensure that the flattened areas (1) on the intake camshaft and the exhaust camshaft point upwards.



- Position the setting gauge 0.5° (2) from the set of special tools 2 456 372 between the exhaust camshaft and the basic carrier (1) from the set of special tools 2 456 372.
- Position the setting gauge 0.7° (3) from the set of special tools 2 456 372 between the intake camshaft and the basic carrier (1) from the set of special tools 2 456 372.
- Tighten the screws (4).

Test gauge to basic carrier

M6		Tightening torque	8 Nm

70 – Installing the intake adjuster

NOTICE

The figure shows the rear side of the engine.



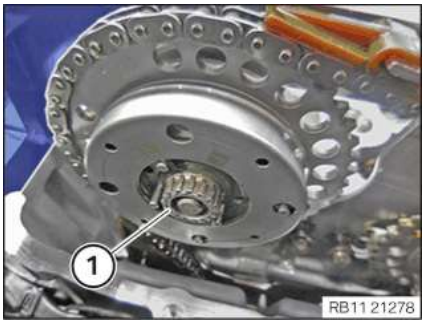
- Keep intake adjuster (1) marked IN ready.



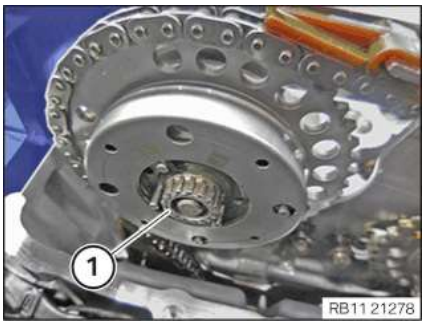
- Feed in intake adjuster (1) in the timing chain (2) and position on the intake camshaft .

71 – Install the VANOS central valve of the intake adjuster

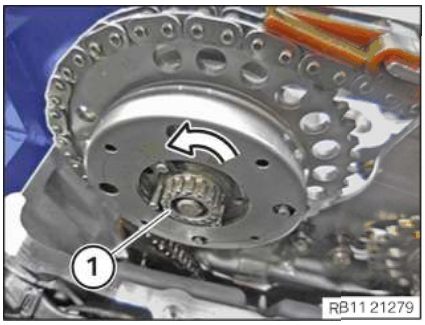
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- Guide in the VANOS central valve (1) of the intake adjuster and install.



- Hand-tighten the VANOS central valve (1) of the intake adjuster.



- Release the VANOS central valve (1) of the intake adjuster in the **direction of the arrow** by 60 °.

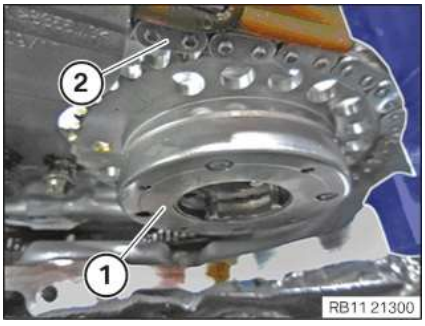
72 – Install exhaust camshaft adjuster

NOTICE

The figure shows the rear side of the engine.



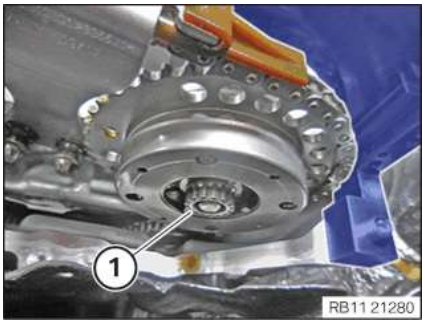
- Keep exhaust camshaft adjuster (1) marked EX ready.



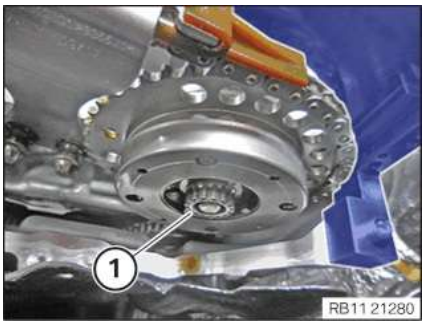
- Feed in exhaust camshaft adjuster (1) in the timing chain (2) and position on the exhaust camshaft .

73 – Installing the VANOS central valve of the exhaust camshaft adjuster

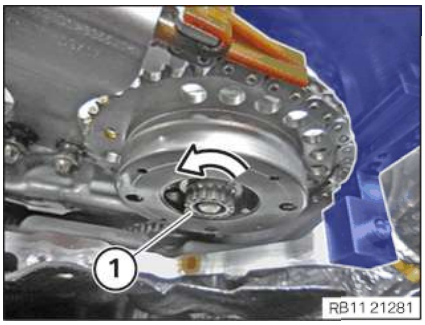
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- Guide in the VANOS central valve (1) of the exhaust camshaft adjuster and install.

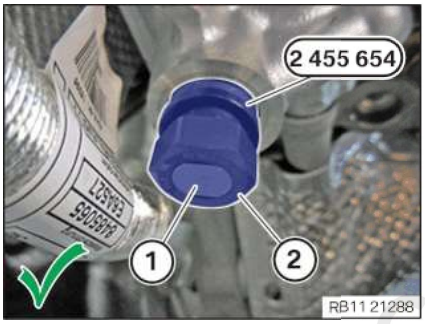


- Hand-tighten the VANOS central valve (1) of the exhaust camshaft adjuster.



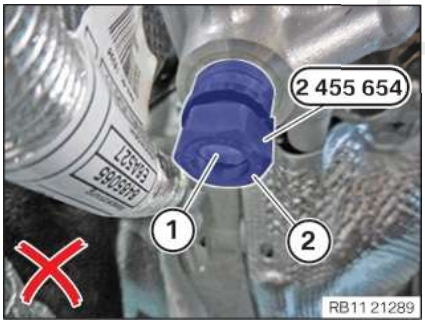
- Release the VANOS central valve (1) of the exhaust camshaft adjuster in the **direction of the arrow** by 60 °.

74 – Pretension the timing chain with the special tool



- Make sure that the timing chain is **correctly** pre-tensioned with the special tool 2 455 654.

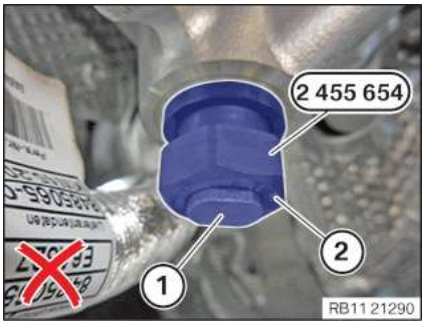
  The pin (1) must align **precisely** with housing (2).



- Make sure that the preload of the timing chain is no **insufficient**.

  The preload is insufficient when the pin (1) of the special tool 2 455 654 is not aligned flush with the housing (2).

  The timing chain is **not correctly** pre-tensioned.



- Make sure that the preload of the timing chain is not **too high**.

  The preload is too high when the pin (1) of the special tool 2 455 654 is not aligned flush with the housing (2).

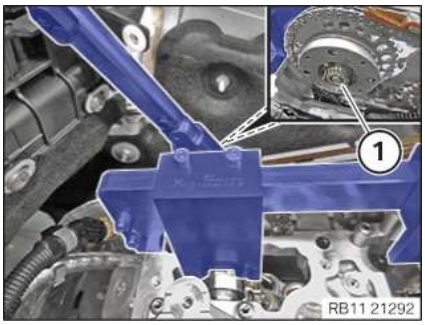
  The timing chain is **not correctly** pre-tensioned.

75 – Tightening the VANOS central valve of the exhaust camshaft adjuster

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- To tighten the VANOS central valve (1), use the reversible ratchet (2) from the special tool 0 496 855 with special tool 2 450 487.



- Tighten the VANOS central valve (1) of the exhaust camshaft adjuster.

VANOS central valve to camshaft

M20 x 1.5		1. Jointing torque	10 Nm
		2. Jointing torque	30 Nm
		3. Jointing torque	50 Nm
		4. Angle of rotation	35 °

76 – Tightening the VANOS central valve of the intake adjuster



- To tighten the VANOS central valve (1), use the reversible ratchet (2) from the special tool 0 496 855 with special tool 2 450 487.

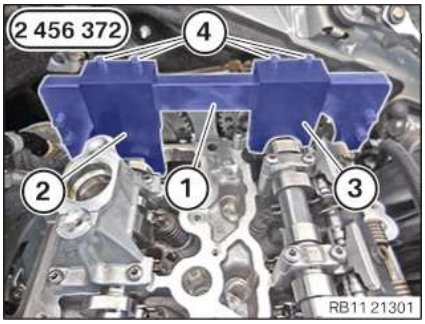


- Tighten the VANOS central valve (1) of the intake adjuster.

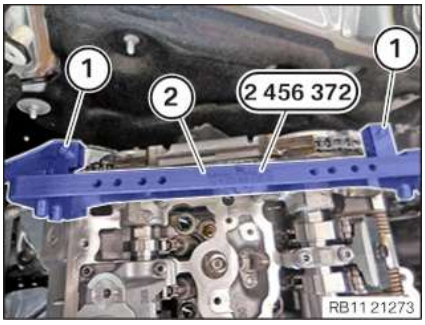
VANOS central valve to camshaft

M20 x 1.5		1. Jointing torque	10 Nm
		2. Jointing torque	30 Nm
		3. Jointing torque	50 Nm
		4. Angle of rotation	35 °

77 – Disassembling all special tools

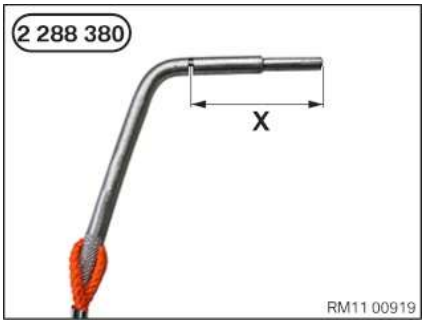


- Unscrew the bolts (4) from the set of special tools 2 456 372.
- Feed out the setting gauge 0.5 ° (2) from the set of special tools 2 456 372 between the exhaust camshaft and the basic carrier (1) and remove.
- Feed out the setting gauge 0.7 ° (3) from the set of special tools 2 456 372 between the intake camshaft and the basic carrier (1) and remove.



- Unscrew the bolts (1) from the set of special tools 2 456 372.
- Thread the basic carrier (2) out of the special tool 2 456 372 and remove.

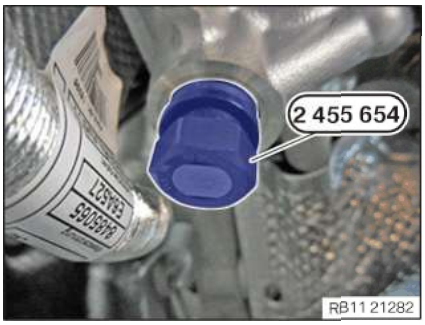
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- Guide the special tool 2 288 380 out and remove.



- Guide the special tool 0 493 380 (11 6 480) out and remove.



- Guide the special tool (1)2 455 654 out and remove.

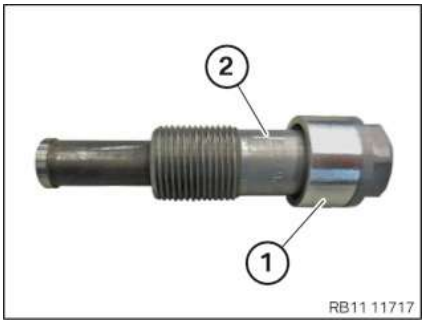
78 – Install chain tensioner

TECHNICAL INFORMATION

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



- Drain the oil chamber in the chain tensioner when reusing the chain tensioner.
- Place the chain tensioner on a level support and slowly compress and release it again in the direction of the arrow.
- Catch and dispose of emerging engine oil.
- Repeat process twice.



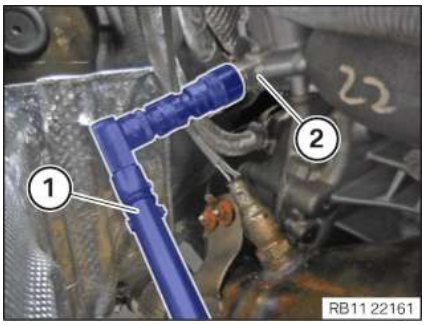
- Renew the sealing sleeve (1).

  Parts: Sealing sleeve
- Guide the sealing sleeve (1) onto the chain tensioner (2) and install.

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- Insert and install the chain tensioner (1).

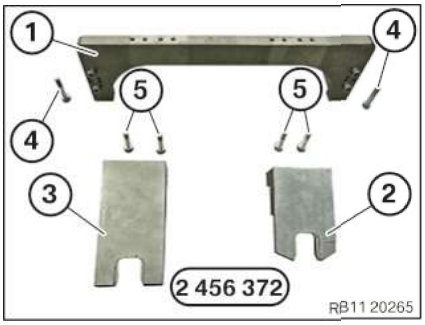


- Tighten the chain tensioner (2) using commercially available tools (1).

Chain tensioner to cylinder head

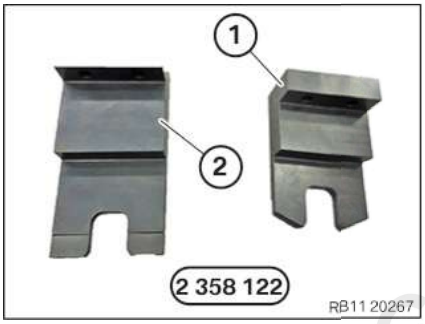
Chain tensioner		Tightening torque	20 Nm
		Angle of rotation	40 °

79 – Checking camshaft timing



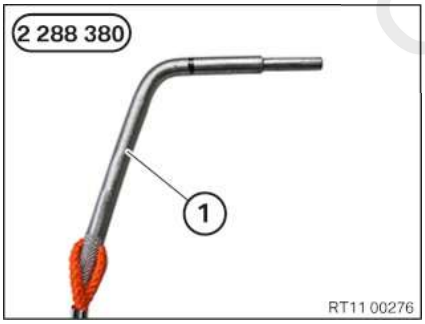
- Have the set of special tools 2 456 372 ready.

Number	Description
1	Basic carrier
2	0.7° setting gauge to adjust the intake camshaft
3	0.5° setting gauge to adjust the exhaust camshaft
4	Basic carrier screws on cylinder head
5	Screw gauge on basic carrier



- Keep the test gauge from the set of special tools 2 358 122 ready.

Number	Description
1	Test gauge to fix the intake camshaft
2	Test gauge to fix the exhaust camshaft



- Have the special tool 2 288 380 ready.

Number	Description
1	Locating stud



RISK OF DAMAGE

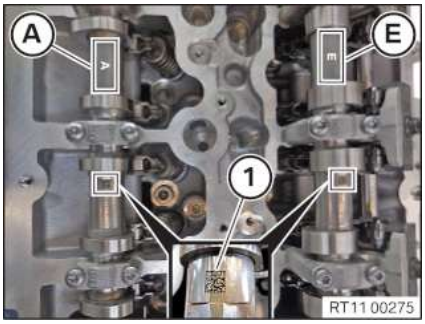
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

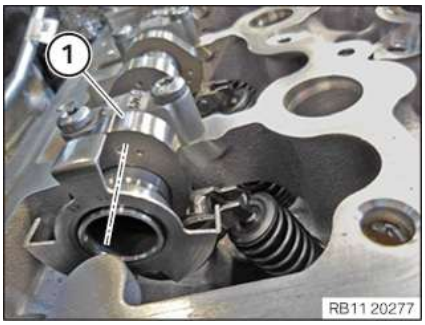
- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Turn the engine with the special tool 0 493 380 (11 6 480) to the TDC firing position of **cylinder 1**.

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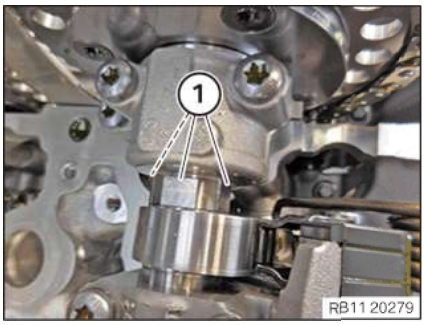
- Make sure that the marks (1) on the intake camshaft (E) and the exhaust camshaft (A) are legible from above.



- Ensure that the cam (1) on the exhaust camshaft on **cylinder 1** points to the inside right at a slight angle.



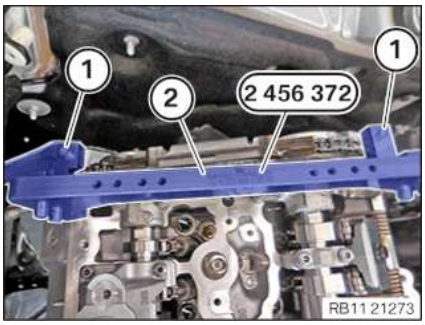
- Ensure that the cam (1) on the intake camshaft on **cylinder 1** points to the inside left at an angle.



- Ensure that the flattened areas (1) on the intake camshaft and the exhaust camshaft point upwards.



- Position the basic carrier (1) from the set of special tools 2 456 372 on the cylinder head.

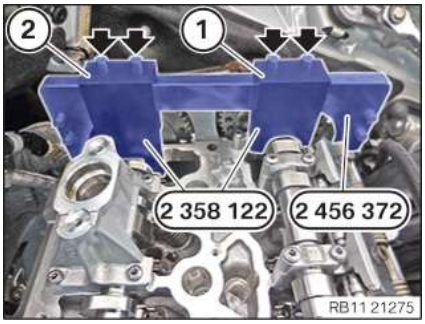


- Tighten the screws (1) from the set of special tools 2 456 372 on the basic carrier (2).

Basic carrier to cylinder head

M6		Tightening torque	8 Nm

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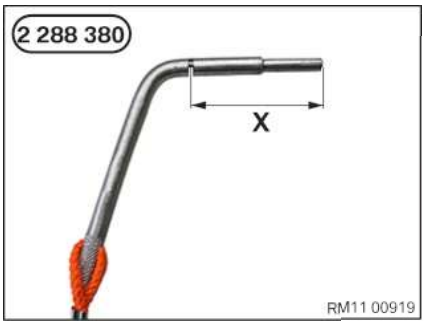
- Position the test gauge (1) from the set of special tools 2 358 122 between the intake camshaft and the basic carrier from the set of special tools 2 456 372.
- Position the test gauge (2) from the set of special tools 2 358 122 between the exhaust camshaft and the basic carrier from the set of special tools 2 456 372.
- Tighten screws (arrows).

Test gauge to basic carrier

M6		Tightening torque	8 Nm



- Thread the sealing cap (1) out and remove.



- **Vehicles with automatic transmission:**

  Dimensions (X) = 66 mm

  The special tool 2 288 380 must be inserted in the dowel hole to dimension (X).



- **Vehicles with automatic transmission:**

  Special tool 2 288 380 **incorrectly** positioned.

  The TDC firing position of cylinder 1 was **not** reached.



- **Vehicles with automatic transmission:**

  Special tool 2 288 380 has been **correctly** positioned.

  The engine **is in the** TDC firing position of cylinder 1.

80 – Installing the intake plenum

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

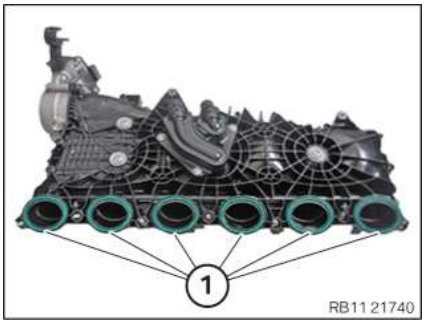
Trapped, crushed or damaged cables may cause short circuits and malfunctions.

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

TECHNICAL INFORMATION

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

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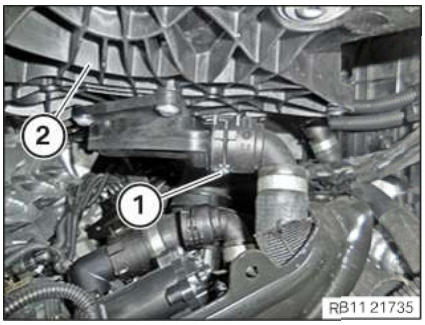


- Renew gaskets (1).

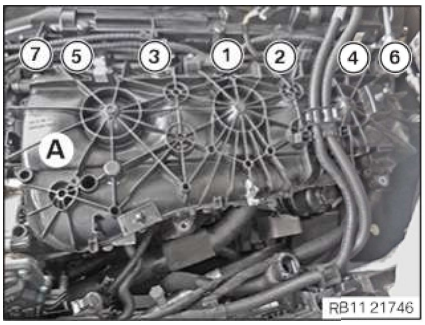
  Parts: Seals



- Clean contact surface (1).



- Feed in and position intake plenum (2).
- Connect and lock coolant line (1).
- Make sure that the cooling line (1) engages audibly.



TECHNICAL INFORMATION

Additional coolant can escape. Make sure that no coolant enters the intake port of the cylinder head.

- Position the intake plenum (A).
- Tighten screws in the order (1) to (7).

Note: Tighten the bolts in 360 degree steps.

Intake plenum to cylinder head

M6		Tightening torque	10 Nm



- Connect and lock coolant line (1).
- Make sure that the cooling line (1) engages audibly.

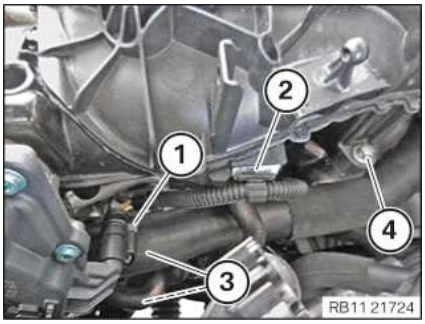


- Tighten down screw 1.

Intake plenum to support

M6X25		Tightening torque	8 Nm

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- Tighten down screw (4).

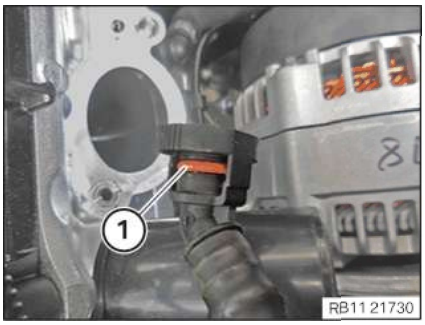
Intake plenum to support

M6X25		Tightening torque	8 Nm

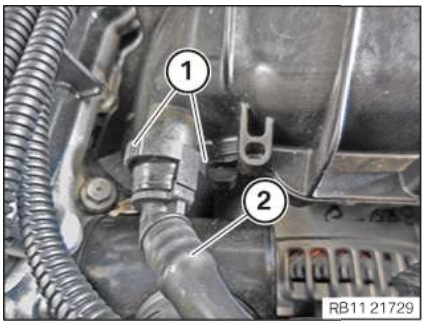
- Thread in and install coolant line (3).
- Secure clamps (2).
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.



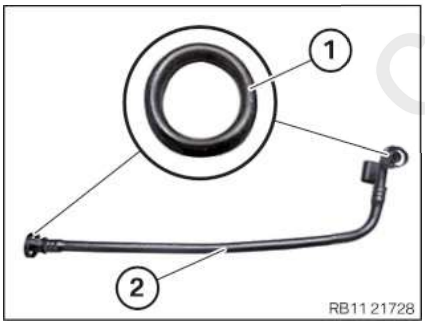
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.



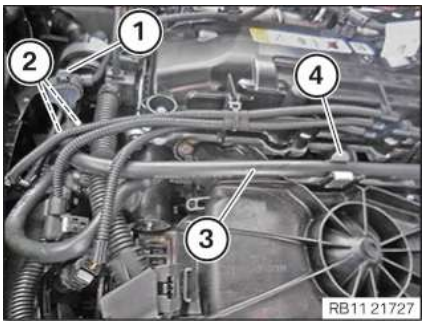
- Check sealing ring (1) for damage and renew tank ventilation line if necessary.



- Insert and install the tank ventilation line (2).
- Ensure that the locks (1) engage audibly.

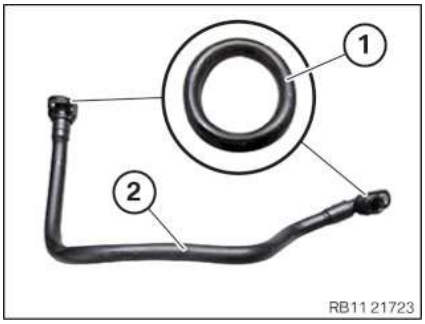


- Check sealing ring (1) for damage and renew tank ventilation line (2) if necessary.

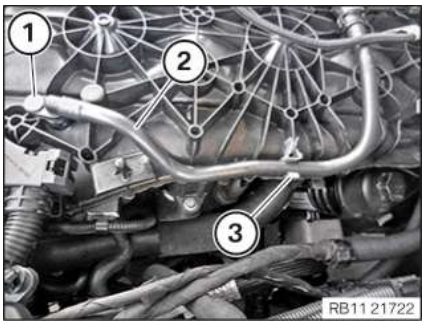


- Insert and install the tank ventilation line (3).
- Ensure that the locks (2) engage audibly.
- Secure the tank ventilation line (3) to the clamp (4).
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

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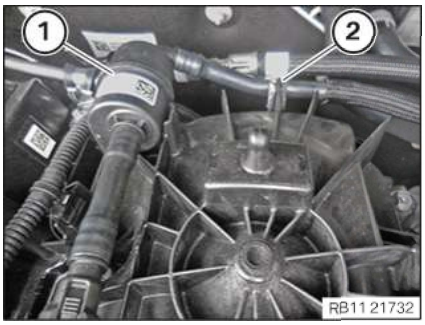
- Check sealing ring (1) for damage and renew tank ventilation line (2) if necessary.



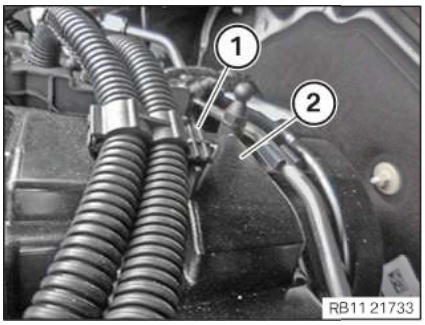
- Insert and install the tank ventilation line (2).
- Secure the tank ventilation line (2) to the clamp (3).
- Tighten down screw (1).

Tank ventilation line to intake plenum

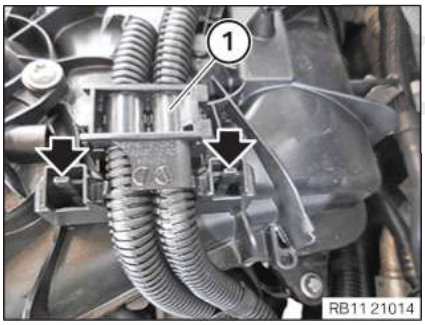
Oval-head screw		Tightening torque	3 Nm



- Insert and install the tank ventilation line (1).
- Secure the tank ventilation line (1) to the clamp (2).

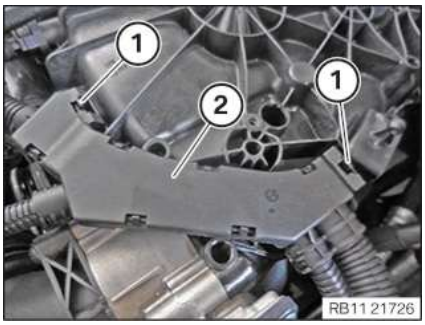


- Secure the wiring harness section(1) for the injectors and ignition coils on the cylinder head cover (2).



- Insert and install the wiring harness section (1) for the injectors and ignition coils.

  The locks (arrows) must engage audibly.

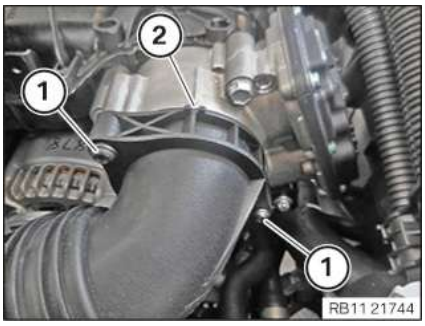


- Feed in and install wiring harness section (2) for sensor system **2**.
- Ensure that the locks (1) engage audibly.

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

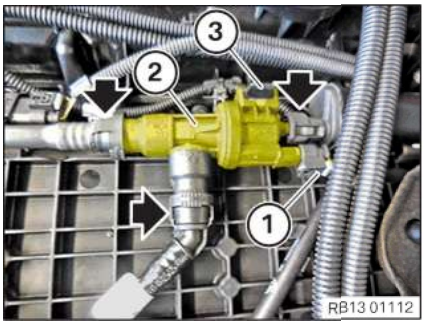


- Insert and install charge air line (2).
- Tighten the screws (1).

Charge air line to throttle valve

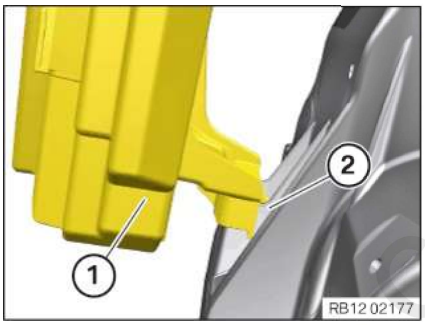
M6x30		Tightening torque	8 Nm

81 – Installing the tank vent valve

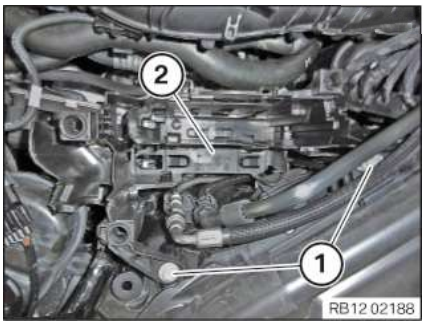


- Secure the tank vent valve (2) to the holder (3).
- Connect and lock the tank ventilation lines (arrows).
  The tank ventilation lines (arrows) must audibly engage.
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.

82 – Installing the control unit holder



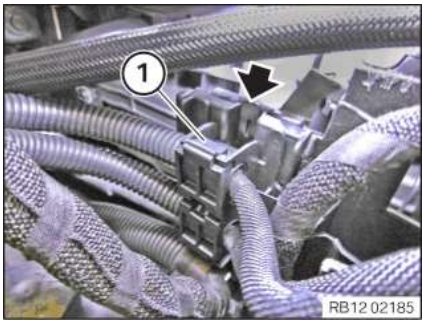
- Make sure the bottom control unit holder (1) is inserted correctly into the fixture (2).



- Guide in and install control unit holder (2).
- Tighten the screws (1).

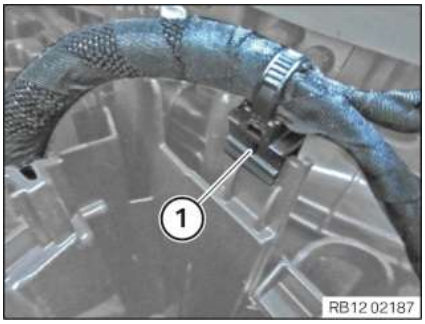
Control unit holder on spring strut dome

Hexagon screw		Tightening torque	8 Nm

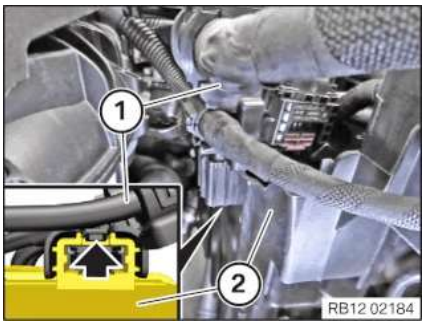


- Feed in and install the cable clip (1).
  Lock (arrow) must audibly engage.

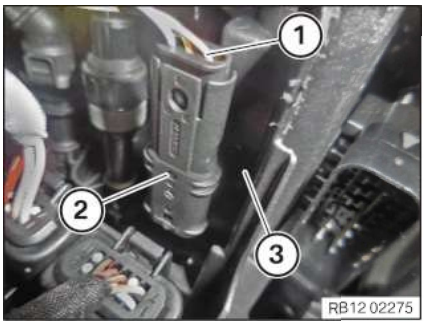
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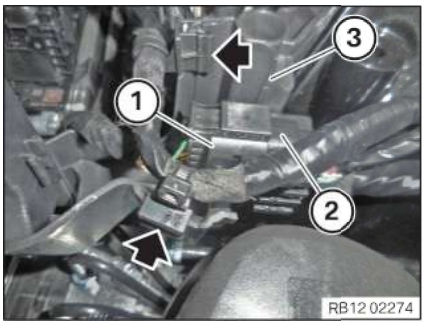
- Secure clamps (1).



- Connect the cable clip (1) with the control unit holder (2) and lock it.
  Lock (arrow) must audibly engage.

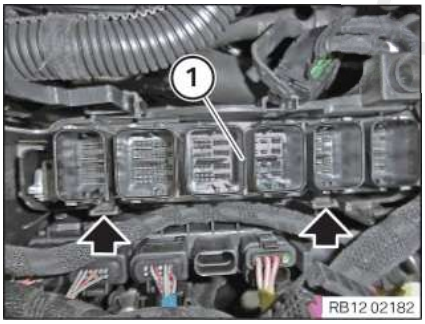


- Connect connector (2) to the control unit holder (3) and lock it.
  The connector (2) must engage audibly.
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.



- Connect and lock the connector (2) with the control unit holder (3).
  The connector (2) must engage audibly.
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.
- Secure the clamps (arrows).

83 – Installing the DME control unit

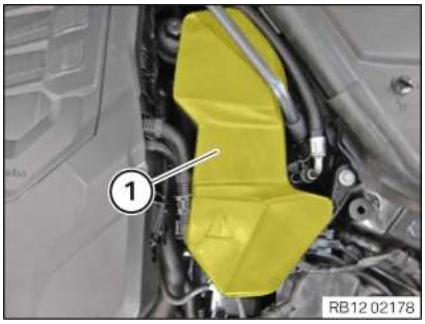


- Feed in and install DME control unit (1).
  The locks (arrows) must engage audibly.



- Connect connectors (1) and lock.
  All connectors (1) must engage audibly.

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- Insert and install cover (1) into guides.

84 – Installing the integrated supply module (PDM)

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

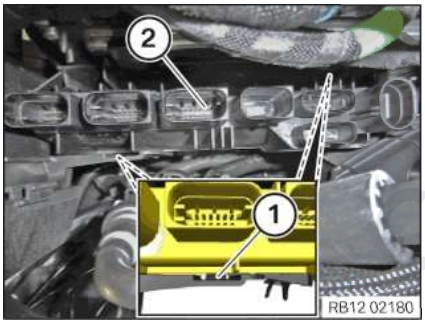
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

RISK OF DAMAGE

Electrostatic discharge.

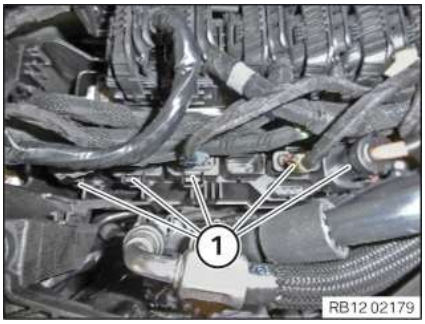
Damage to or destruction of electrical components.

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



- Insert and install the integrated supply module (PDM) (2).

  The latch mechanisms (1) must engage audibly.
- Unlock the latch mechanisms (1).

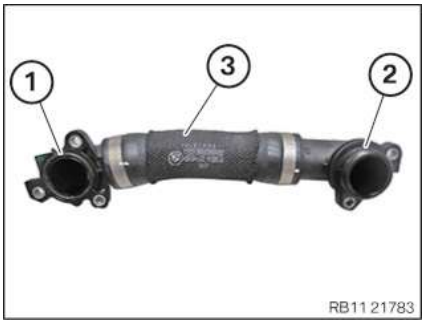


- Connect connectors (1) and lock.

  The connectors (1) must engage audibly.

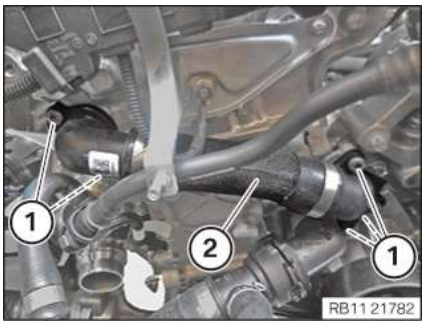
85 – Install the coolant line between the cylinder head and the coolant pump

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- Check sealing rings (1) and (2) for damage; renew coolant line (3) if necessary.

  Parts: Sealing ring



TECHNICAL INFORMATION

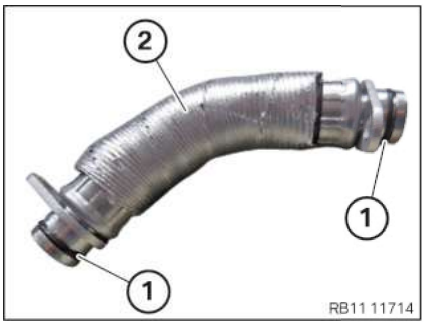
When assembling, it is essential to observe screwing sequences and tightening torques. Non-observance of these requirements may result in leaks and damage.

- Feed in and install coolant line (2).
- Hand-tighten the bolts (1).
- Tighten the screws (1).

Coolant line to coolant pump/cylinder head

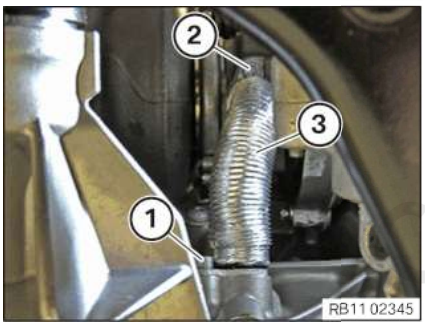
M6x20		Tightening torque	8 Nm

86 – Installing the oil return line for the exhaust turbocharger



- Renew the sealing rings (1) on the oil return line (2).

  Parts: Sealing ring



- Feed in and install the oil return line (3).
- Tighten down screw (2).

Oil return line to turbocharger

M6 x 12			8 Nm

- Tighten down screw (1).

Oil return line to crankcase

M6 x 12			8 Nm

87 – Install catalytic converter



- Renew the V-clip (1).

  Parts: V-band clamp

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- Renew the gasket (1).

  Parts: Gasket



- Feed in and install catalytic converter.
- Lock clamp (1).

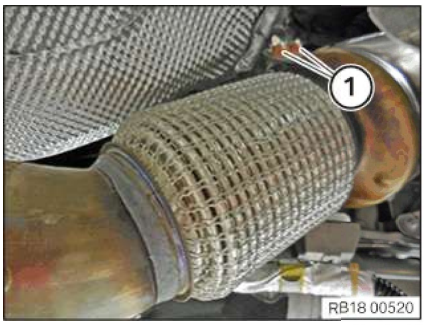
  The clamp (1) must engage audibly.



- Tighten V-band clamp (1).

Catalytic converter to turbocharger

V-band clamp	Replace V-band clamp.	Tightening torque	19 Nm

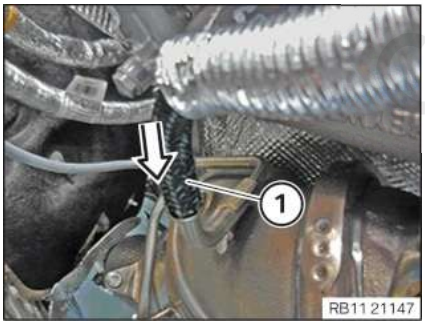


- Renew nuts (1).

  Parts: Nuts
- Tighten nuts (1).

Catalytic converter to holder

M8 nut	Renew nut.	Tightening torque	28 Nm



- **If installed: Connect pressure hose.**

  Renew pressure hose (1).

  Parts: Pressure hose
- Connect the pressure hose (1) in direction of arrow to the limit position.

88 – Installing the complete exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

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

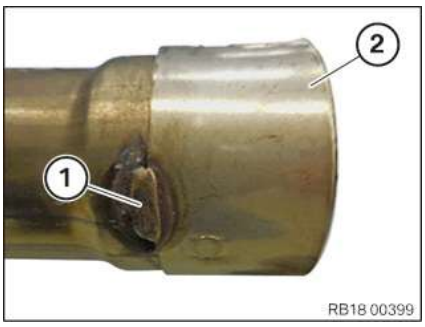
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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

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



CAUTION

Swarf resulting from sawing or grinding components.

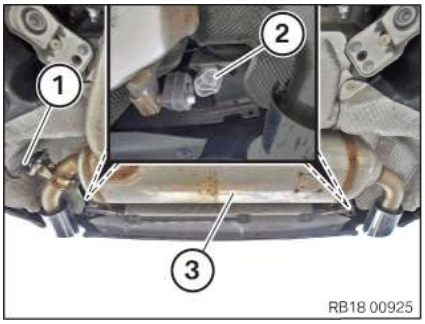
Danger of injury!

- Conduct all work in appropriate personal protective equipment only.
- Wear safety goggles and protective gloves.

- **Equipment specification 1 (ribbon clamp)**

  Open the weld seam (1) with a conventional tool.
- Remove ribbon clamp (2).
- Renew the (2) ribbon clamp.

  Parts: Ribbon cable clamp



- Feed in and install the exhaust system (3) with a second person.
- Renew nuts (2).

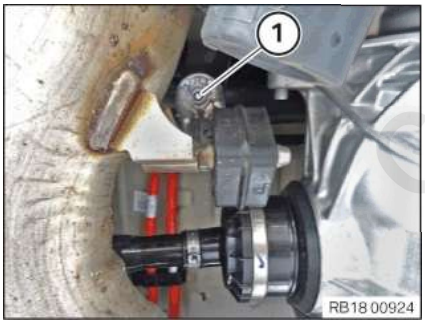
  Parts: Nuts
- Tighten nuts (2).

Rear silencer to body / bumper support

M8	Replace nuts.	Tightening torque	19 Nm

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.



- Renew nut (1).

  Parts: Nut
- Tighten the bolt (1) on the rear axle support.

Exhaust system to rear axle carrier

Nut M8	Renew nut.	Tightening torque	19 Nm



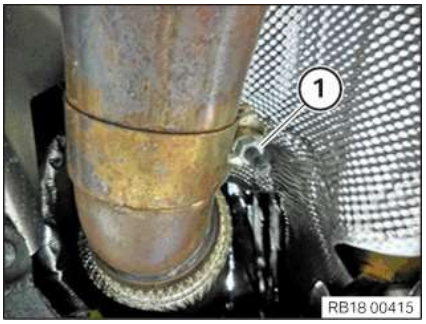
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Front pipe / petrol particulate filter on transmission holder

M8	Renew nut.	Tightening torque	19 Nm

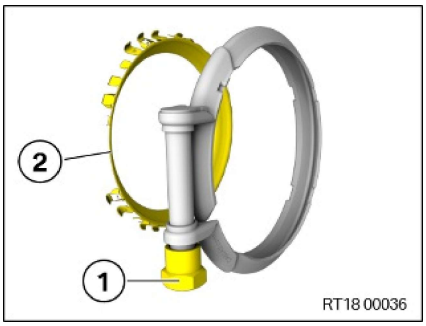
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- Tighten the ribbon clamp (1).

Exhaust system to catalytic converter

Ribbon cable clamp	Renew flat band clip.	Tightening torque	26 Nm

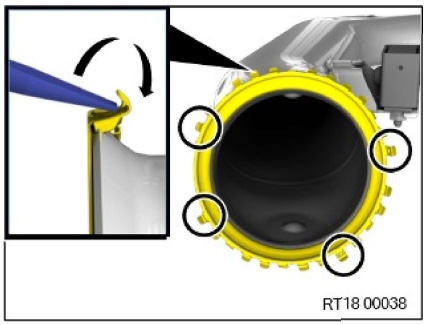


- **Equipment specification 2 (V-clips)**

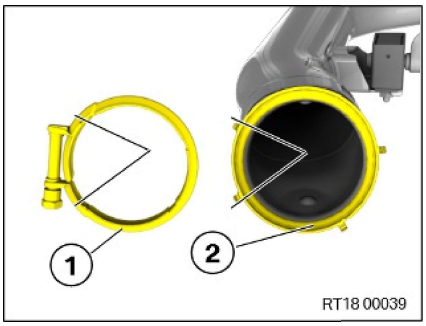
  Renew V-band clamp.

  Parts: V-band clamp

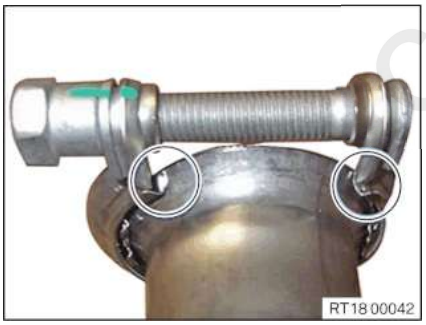
  Unscrew the nut (1) and remove the sealing ring (2).



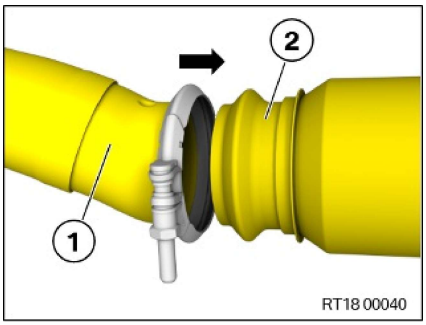
- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.



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

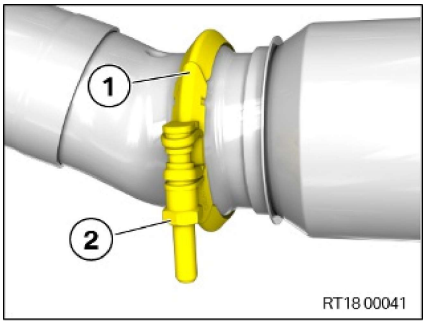


- Ensure that the V-clip rests against the sheet metal tabs in the marked areas after mounting.



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

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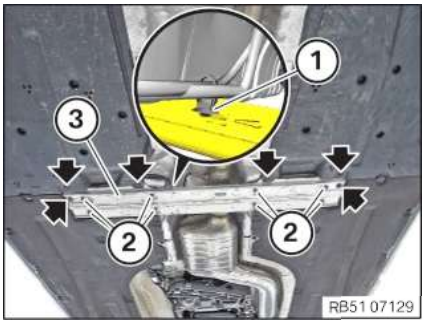


- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

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

89 – Install the connecting supports on the tunnel



- Guide in and install connecting support (3) on the tunnel.
- Tighten the screws (2).

Connecting support to tunnel

M8x25 screw		Tightening torque	20 Nm
Screw		Tightening torque	3 Nm

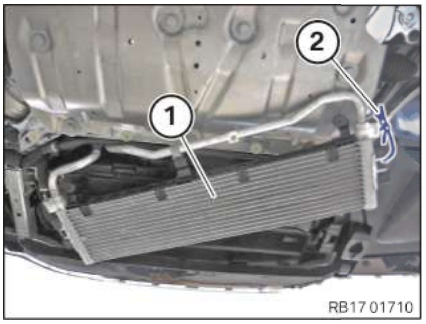
- Tighten screws (arrows).

Connecting support to tunnel

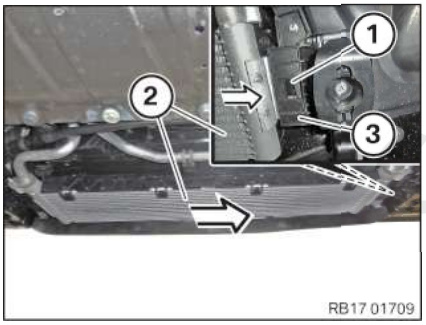
M8x25 screw		Tightening torque	20 Nm
Screw		Tightening torque	3 Nm

- **If installed:** Secure clamps (1).

90 – If installed: Secure engine oil cooler



- Remove the cable straps (2).
- Position engine oil cooler (1).



- Feed in and install the engine oil cooler (2) on the holder (3) in the direction of the arrow.
- Ensure that the lock (1)engages audibly.

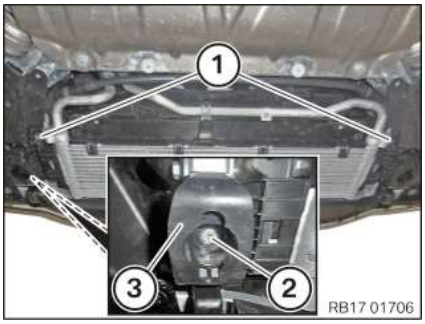


- Tighten down screw (1).

Engine oil cooler to bumper support

M6X25		Tightening torque	8 Nm

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- Renew rivet (2).

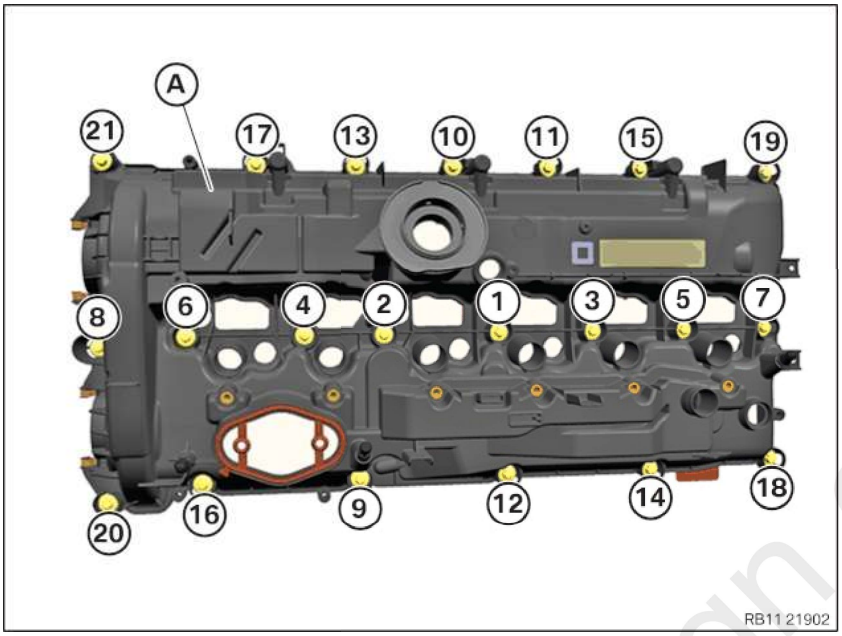
  Parts: Rivet
- Install and rivet damper (3).
- Tighten the screws (1).

Cover, front bottom on side

Hexagon screw for thermoplastic		Tightening torque	3 Nm

91 – Installing cylinder head cover

Overview: Bolts of the cylinder head cover



1 - 21 Bolts of the cylinder head cover

A Cylinder head cover

RISK OF DAMAGE

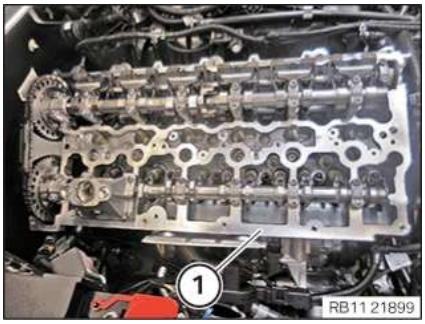
Improper routing of cables and wiring harnesses.

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

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

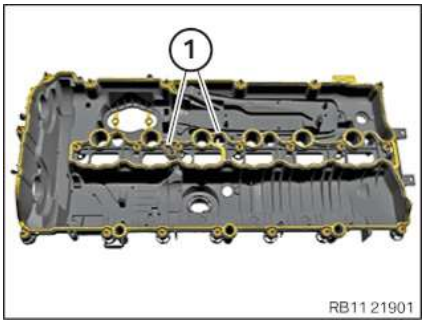
TECHNICAL INFORMATION

Latch mechanisms, guides and mounting elements must not be damaged or missing.



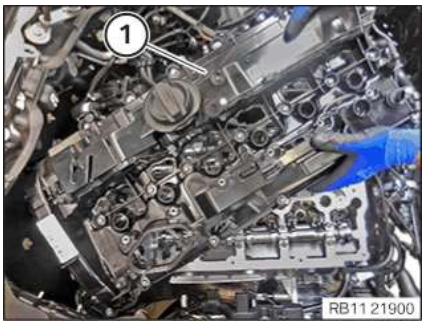
- Contact surface (1) must be free from oil and grease.

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- Replace the seals (1).

  Parts: Seals

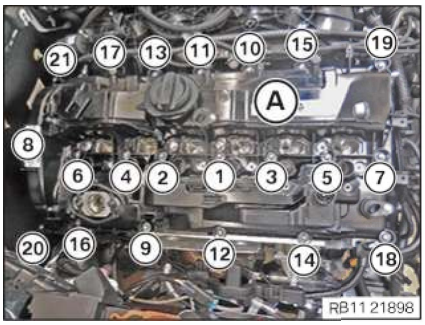


- Insert and install cylinder head cover (1).



- Ensure that the cylinder head cover (1) is installed in the **marked** area correctly on the high pressure pump bracket(2).

  The cylinder head cover (1) must not touch the high pressure pump bracket (2) in the **marked** area.



- Position the cylinder head cover (A).
- Make sure that the cylinder head cover (A) does not touch the high pressure pump bracket!
- Tighten all bolts in sequence (1) to (21).

Cylinder head cover to cylinder head

M6X30	Jointing torque	8 Nm

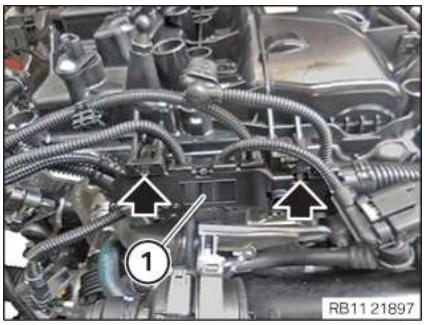
- Tighten all screws in a sequence from (1) to (21).

Cylinder head cover to cylinder head

M6X30		Tightening torque	11 Nm

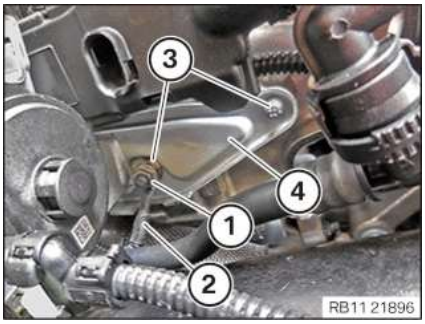


- Insert and install the engine ventilation line (2).
- Ensure that the locks (1) engage audibly.



- Feed in and install wiring harness section (1) for sensor system **2**.
- Make sure that you can hear the locks (arrows) engage.

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- Insert and position the holders (4).
- Tighten the screws (3).

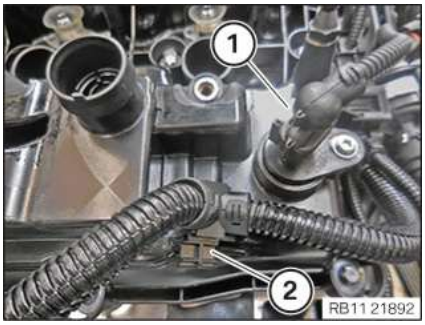
Auxiliary coolant pump holder to cylinder head

M6		Tightening torque	7 Nm

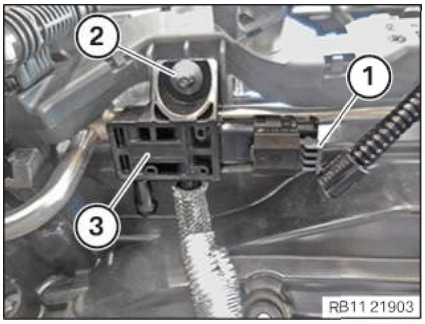
- Thread in ground cable (2) and install.
- Tighten nut (1).

Standard screw connection M6

M6			8 Nm



- Connect and lock the connector (1) on the exhaust camshaft sensor .
- Ensure that connector (1) on the exhaust camshaft sensor engages audibly.
- Secure clamps (2).

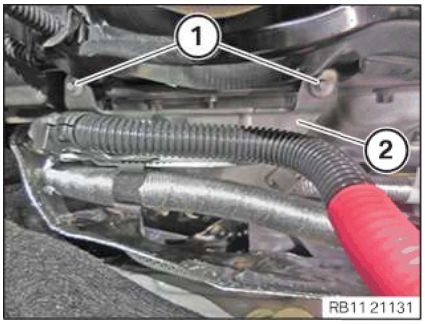


- **If installed:**
- Feed in and install the differential pressure sensor (3).
- Tighten down screw (2).

Differential pressure sensor to holder

TS6X18		Tightening torque	3,5 Nm

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



CAUTION

Improper routing of the positive battery cable.

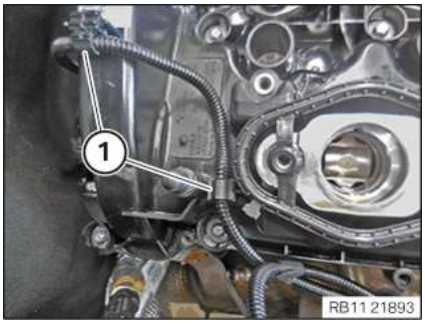
Risk of short circuits!

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

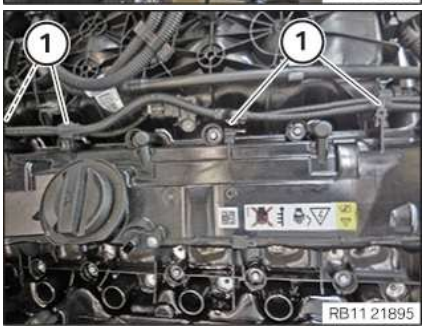
- Guide in and install holder (2) of the positive battery cable.
- Tighten the screws (1).

Holder, positive battery cable to cylinder head cover

6X18		Tightening torque	6 Nm

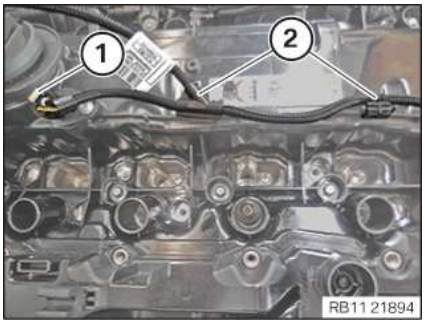


- Secure clamps (1).



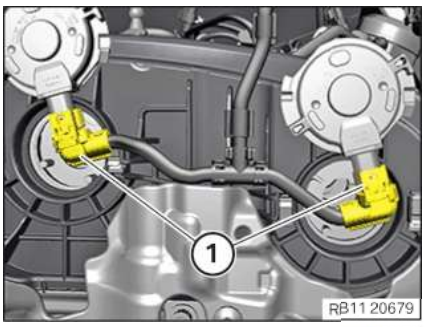
- Secure clamps (1).

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- Connect connector (1) to the intake camshaft sensor and lock it.
- Make sure the connector (1) engages audibly.
- Secure clamps (2).

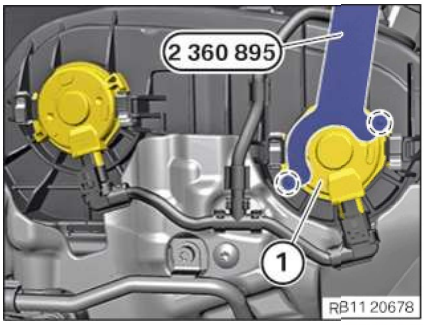
92 – Installing both actuators



NOTICE

The figure shows the rear side of the engine.

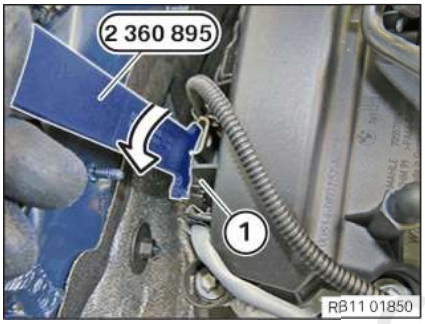
- Position both actuators.
- Connect and lock both connectors (1).
- Make sure the connectors (1) engage audibly.



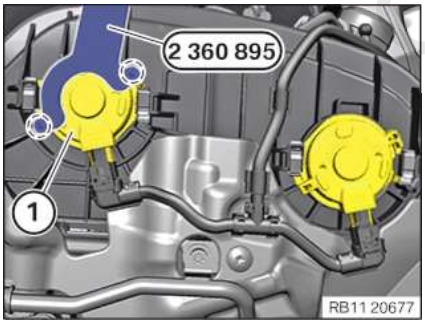
NOTICE

The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the exhaust side.



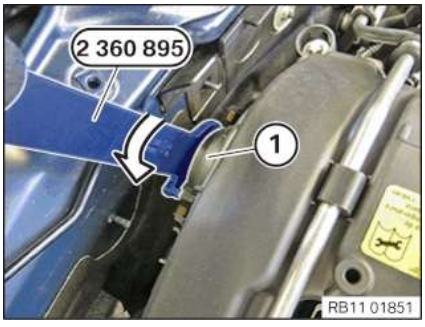
- Position the actuator (1) of the exhaust side and turn it in the direction of arrow with the special tool 2 360 895 until the limit stops touch the clamps.



NOTICE

The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the intake side.



- Position the actuator (1) of the intake side and turn it in the direction of arrow with the special tool 2 360 895 until the limit stops touch the clamps.

93 – Install high pressure pump

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RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

TECHNICAL INFORMATION

Only G05 and G07

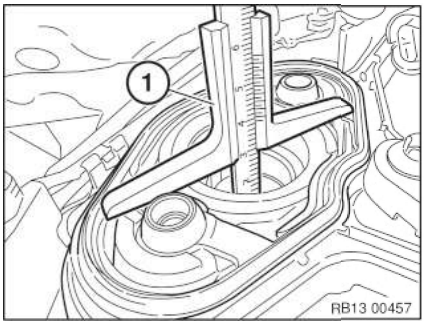
In vehicles with active anti-roll bar (ARS) the fan cowl must be removed in order to spin the engine.

For additional information see: 17 11 035 Removing and installing/replacing the fan cowl including electric fan

TECHNICAL INFORMATION

The high pressure pump can be pre-tensioned by camshaft cams. If when loosening the screws, the high pressure pump is forced out, the engine will have to be turned to bring the camshafts to a different position.

Before installing the high pressure pump, the cam of the high pressure pump drive must be turned to BDC. To do this, twist the engine if necessary in the direction of engine rotation to the central bolt of the crankshaft. Otherwise, it will not be possible to install the high-pressure pump.



- Place the depth gauge (1) flat onto the high pressure pump flange.
- Turn the engine at the central bolt in the direction of engine rotation until the BDC position of the camshaft is reached.

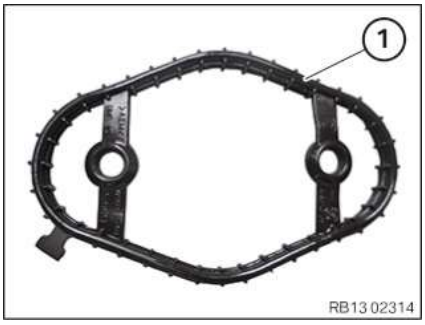
  The depth gauge (1) is in the deepest position.



- Rotate the engine with the special tool 0 493 380 (11 6 480) in the **direction of the arrow** until the cam of the high pressure pump drive is at the **BDC position** .



- Guide out and remove gasket (1).



- Renew the gasket (1).

  Parts: Gasket

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TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Check the threads (1) on the high pressure pump flange for sealing compound residue: Remove sealing compound residue as needed.
- Clean the thread (1) with a thread cutter **M6**.
- Make sure that no contamination enters the engine.
- Cover opening at the high pressure pump flange with suitable materials.



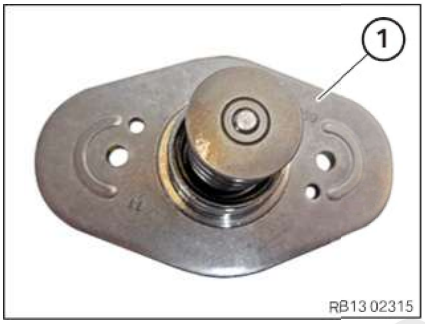
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Clean sealing surface (1).



- Insert and install the gasket (1).
- Make sure the seal (1) has been correctly positioned in the **highlighted** area.



RISK OF DAMAGE

Damage to the surface.

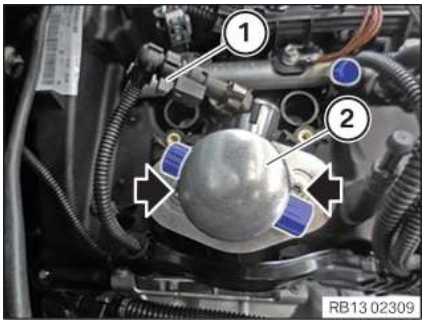
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Clean sealing surface (1).



- Feed in and install high pressure pump (2).
- Renew the bolts (arrows).

  Parts: Bolts
- Position screws (arrows) of the high pressure pump (2) and tighten **in alternating order** in **90°** increments.

  Compliance with this specification is imperative to make sure that the piston will not break due to twisting.

High pressure pump to high pressure pump flange

M6x25	*Renew screws.*	Jointing torque	12 Nm
		Tightening torque	90 °

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

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RISK OF DAMAGE

Damage to the injector tips and Teflon ring.

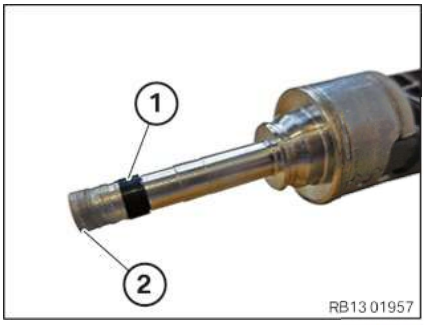
Improper handling of the injector tips and Teflon ring can lead to malfunctioning of the injector.

- Avoid mechanical contact with injector tip.
- When exchanging Teflon ring, hands and work surface must be clean and free of oil. Do not use any lubricating agents.
- Do not use fingernails to slide Teflon ring on.

TECHNICAL INFORMATION

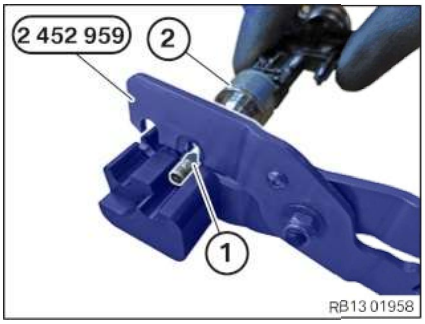
Before re-installing the injector, the Teflon ring must be renewed. Once a Teflon ring has been installed, it may not be re-used. New injectors are supplied with a new Teflon ring.

After the installation of a new Teflon ring on the injectors, the injector must be installed in the cylinder head within 10 minutes or protected with protective caps; otherwise, the Teflon ring will swell.



- Before installing the injectors: Renew the Teflon rings (1).

  Parts: Teflon rings
- Avoid mechanical contact with injector tip (2).



- Remove Teflon ring (1) by using special tool 2 452 959 from injector (2).
- If necessary, use a lint-free cloth to clean the cylindrical part of the injector tip. Do not use ultrasonic sound or other auxiliary materials.
- Do **not** clean the injector tip.

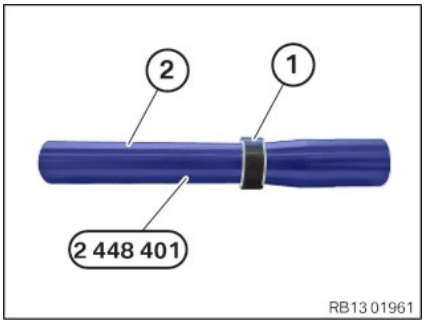


- For the installation of the new Teflon rings: Use the set of special tools 2 448 401:

  (1) Installation cone

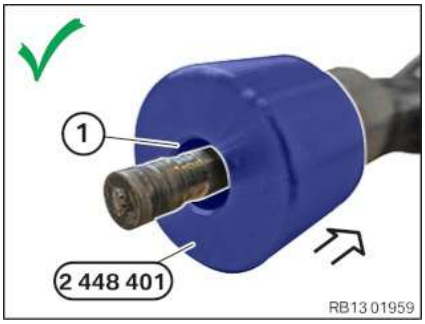
  (2) Sliding sleeve

  (3) Assembly sleeve



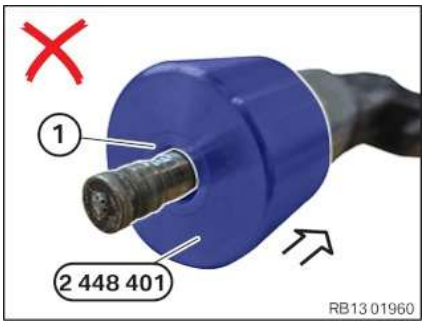
- Slide the new Teflon ring (1) onto the installation cone (2) from the set of special tools 2 448 401.

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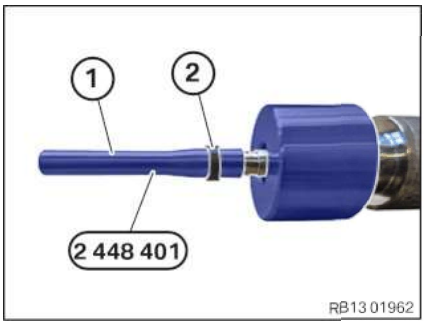
- Make sure the installation position of the assembly sleeve (1) from the set of special tools 2 448 401 is correct:

  The larger diameter of the assembly sleeve (1) must point to the injector tip.

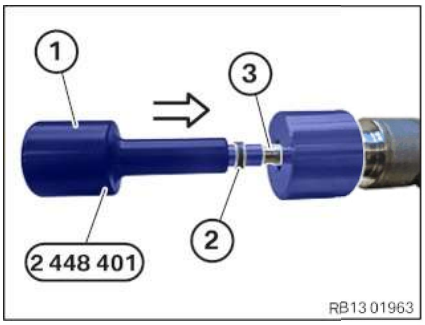


- Make sure the installation position of the assembly sleeve (1) from the set of special tools 2 448 401 is correct:

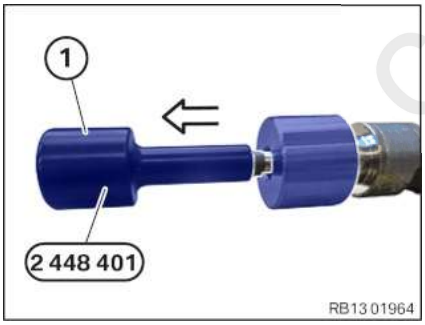
  The assembly sleeve (1) is **not** mounted correctly when the smaller diameter points to the injector tip.



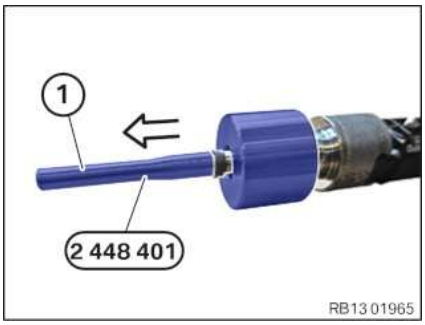
- Mount the Teflon ring (2) with the installation cone (1) from the set of special tools 2 448 401 on the injector tip .



- Use the sliding sleeve (1) from the set of special tools 2 448 401 to push the Teflon ring (2) into the groove (3) on the injector in the direction of the arrow.

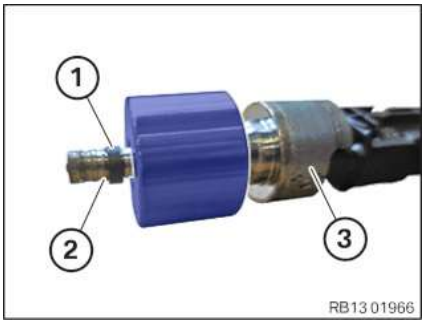


- Thread out the sliding sleeve (1) from the set of special tools 2 448 401 in the direction of the arrow and remove.

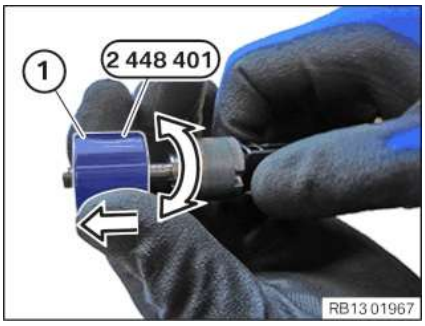


- Thread out the installation cone (1) from the set of special tools 2 448 401 in the direction of the arrow and remove.

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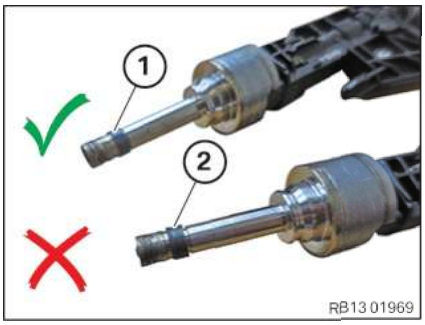


- Make sure that the expanded Teflon ring (1) is properly inserted in the groove (2) of the injector (3) and can be moved easily with your fingers.



- Calibrate the expanded Teflon ring with the assembly sleeve (1) from the set of special tools 2 448 401 to the installation dimension in the direction of the arrow.
- Perform **rotational movements** in increments of 180° synchronous to the **pull-off movement**. Perform the movements slowly and **not** jerky.

  This calibrates the Teflon ring (1) to the installation dimension.
- Thread out and remove the assembly sleeve (1).

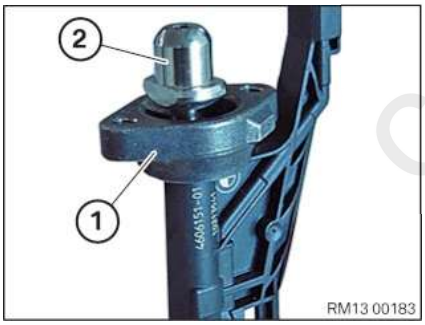


- Check the correct installation dimension of the Teflon ring (1):
  - (1) indicates a correct installation dimension of the Teflon ring.
  - (2) indicates an incorrect installation dimension of the Teflon ring.

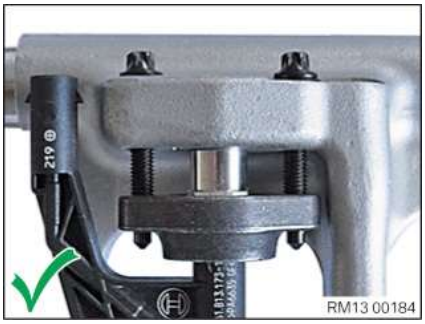
95 – Installing the high-pressure rail with injectors of the cylinders 4 to 6

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.



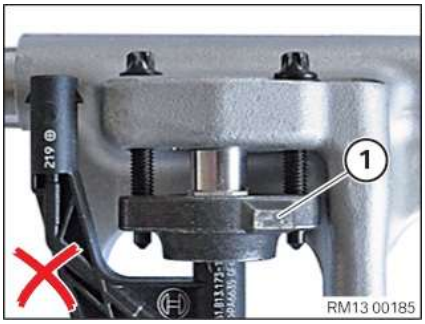
- Mount the holder (1) above the bayonet fitting (2) on the injector.
- **If the holder**(1) **has a cast lug**: Make sure that the holder is installed in the correct position.



- If applicable, note the position of the cast lug:

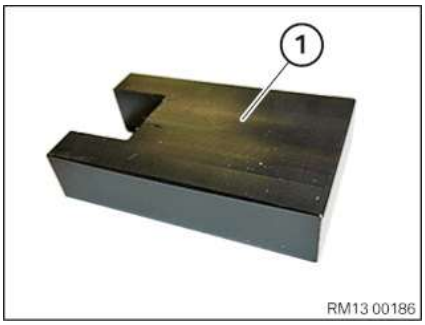
  The holder is mounted **correctly** when the cast lug is located at the rear.

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- If applicable, note the position of the cast lug:

  The holder is mounted **incorrectly** when the cast lug (1) is in front.



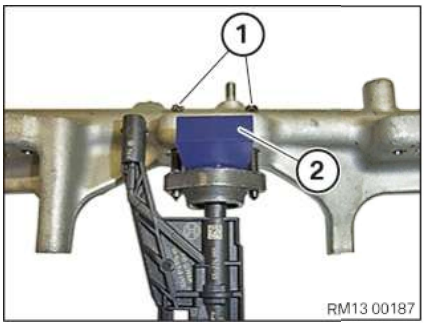
RISK OF DAMAGE

Damage to injectors.

Weld seams on the injector may tear due to incorrect distances between the rail and injector so that the injector must be renewed.

- Insertion of the distance gauge is compulsory.
- Replace distance gauge, if a thickness of 8.5 mm is no longer given in the distance gauge.

- Use the special tool (distance gauge) 2 358 022 (1).



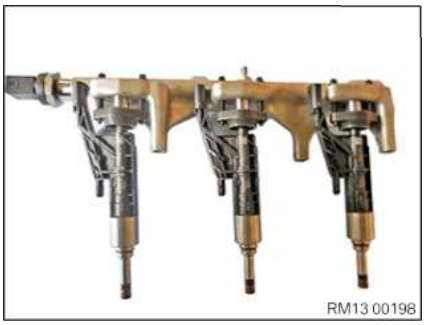
- Replace (M5x30) screws.

  Parts: Screws (M5x30)
- Mount the injectors with the holders and the bolts (M5x30) (1) on the rail.
- Keep the rail on a clean table in such a way that the openings on the rail for the injectors point upwards.

  The electrical injector connections must point to the fuel pressure sensor.
- Slide the special tool (distance gauge) 2 358 022 (2) between the holders and the rail onto the injector head.
- Make sure that the special tool (distance gauge) 2 358 022 (2) rests flat on the retaining bridge.
- Hand-tighten both screws (M5x30) (1) evenly until the special tool (distance gauge) 2 358 022 (2) rests flat against the rail and the holder.



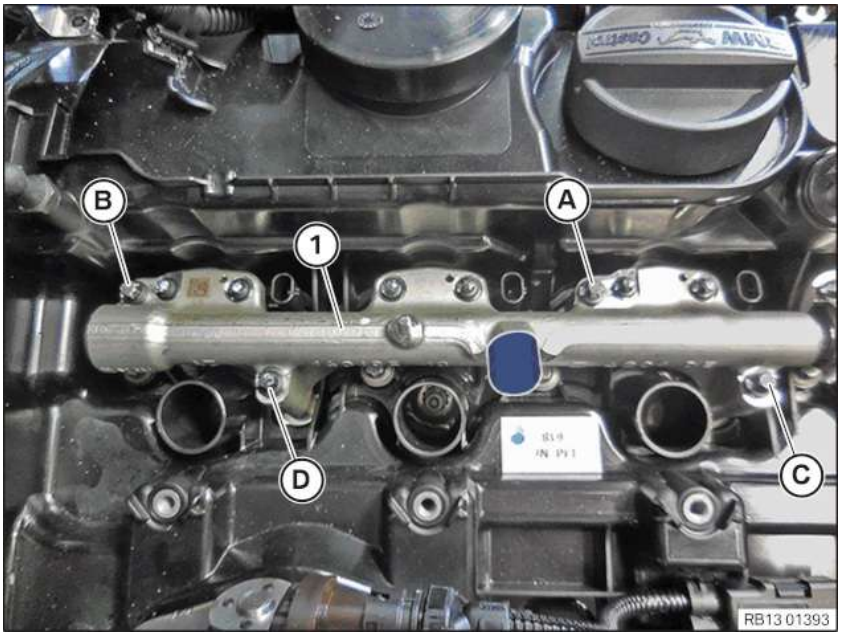
- Remove the special tool (distance gauge) 2 358 022 (1).
- Repeat this operation for all injectors.



- Check injectors for loose fit at the rail.
- Align the electrical injector connections parallel to the rail.

  The injectors must move freely.

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- Renew screws (A) to (D).

  Parts: Bolts
- Attach the rail (1) with the injectors to the cylinder head from the top.
- Make sure the injector tips catch the corresponding holes in the cylinder head.
- Make sure the guides on the injector are properly inserted into the guide bores in the cylinder head.
- Press the rail (1) down until a resistance can be felt; join and hand-tighten the bolts (M6x30) (A) and (B).
- Set the torque wrench to 2 Nm.
- Tighten the screws (A) and (B) in alternating order by **180°** each with the torque wrench until the rail is positioned flush on the cylinder head.

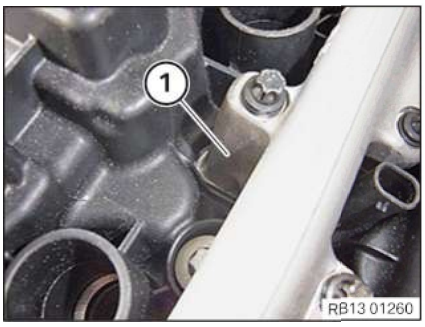
  The figure shows the rail resting flat against the cylinder head.
- Insert bolts (C) and (D).

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

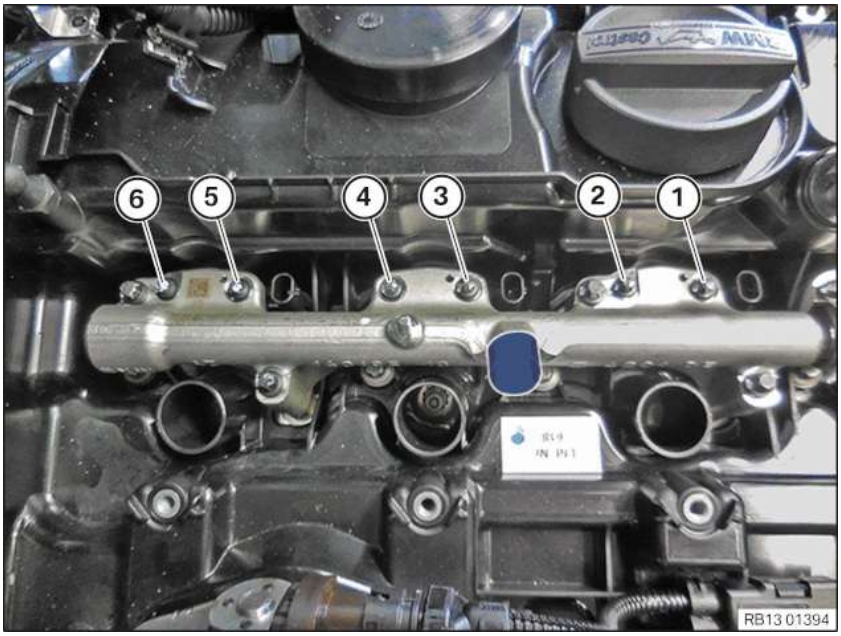
Non-observance of these requirements may result in leaks and damage.

- Tighten bolt (A) to 5 Nm.
- Tighten bolt (D) to 5 Nm.
- Tighten bolt (B) to 5 Nm.
- Tighten bolt (C) to 5 Nm.



- Make sure that the rail (1) rests flat against the cylinder head.

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- Attach a socket to an extension.

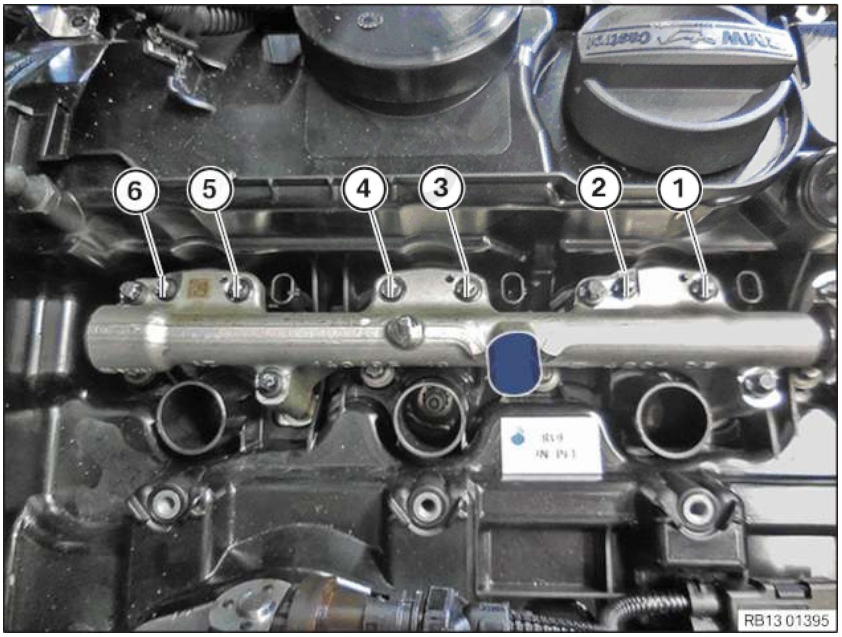
  Do not use a reversible ratchet or torque wrench.
- Tighten the bolts (M5x30) in pairs ((1) with (2), (3) with (4), (5) with (6)) in alternating order **90° hand-tight**.
- Set the torque wrench to 5 Nm.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- **Screw the (M5x30) bolts according to the following plan:**
  - **Fuel injector 4:**
  - Tighten screw (1) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (2) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (1) and (2) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 5:**
  - Tighten screw (3) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (4) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (3) and (4) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 6**:
  - Tighten screw (5) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (6) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (5) and (6) until both bolts reach a torque of 5 Nm.



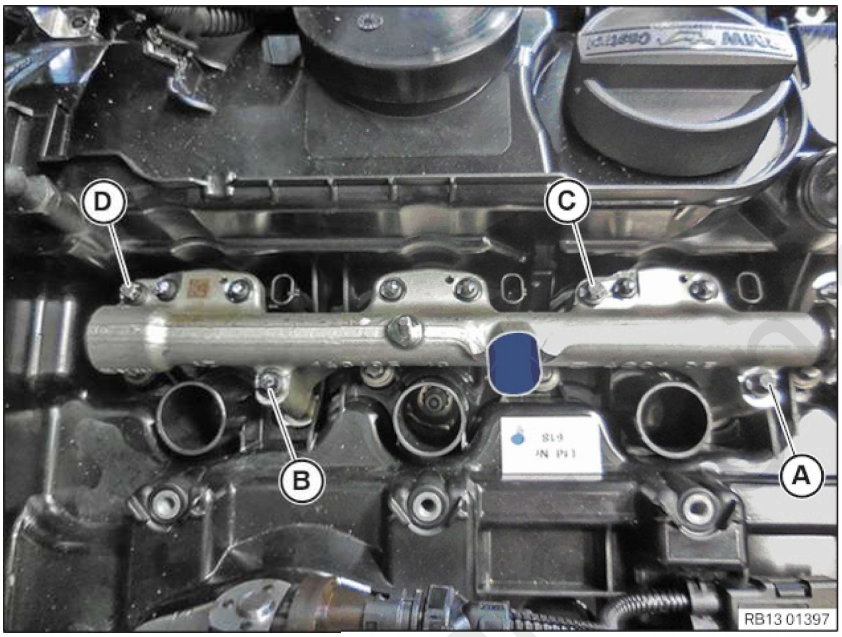
- Mark all bolts (1) to (6) with a vertical line (see figure).
- **Tighten screws using an angle of rotation.**
  - Tighten the screw (1) with an angle of rotation of 90° ±15°.
  - Tighten the screw (2) with an angle of rotation of 90° ±15°.
  - Tighten the screw (3) with an angle of rotation of 90° ±15°.
  - Tighten the screw (4) with an angle of rotation of 90° ±15°.
  - Tighten the screw (5) with an angle of rotation of 90° ±15°.
  - Tighten the screw (6) with an angle of rotation of 90° ±15°.

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- Check if all bolts (1) to (6) have been tightened with a 90° ±15° angle of rotation.

  All marks (lines) must be horizontal (see figure).



- Unscrew the bolts (M6x70) (A) to (D).

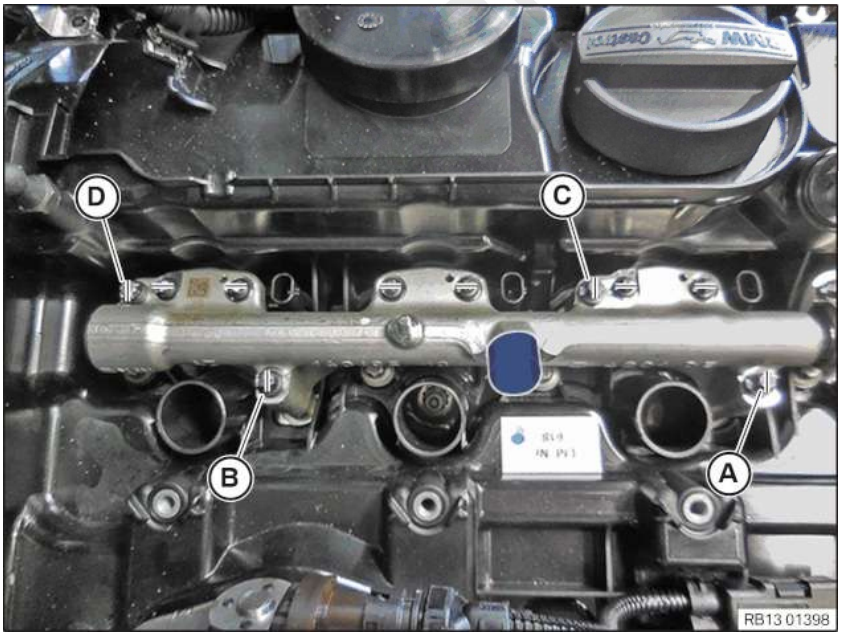
  It is imperative that the bolts are unscrewed.

TECHNICAL INFORMATION

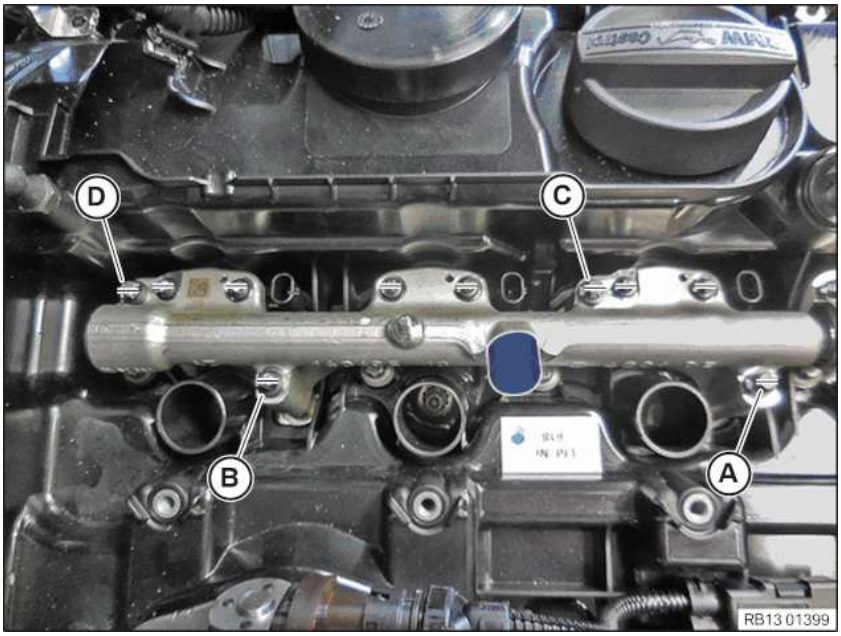
When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten bolt (A) to 5 Nm.
- Tighten bolt (D) to 5 Nm.
- Tighten bolt (B) to 5 Nm.
- Tighten bolt (C) to 5 Nm.

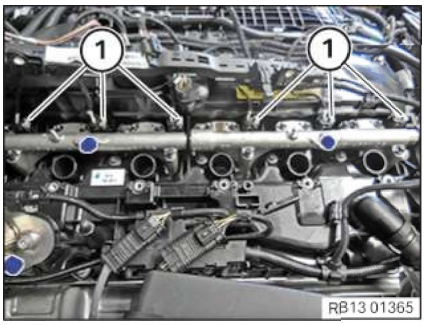


- Mark all bolts (A) to (D) with a vertical line (see figure).
- Tighten bolts (M6x70) (A) to (D) to a 90° angle of rotation.



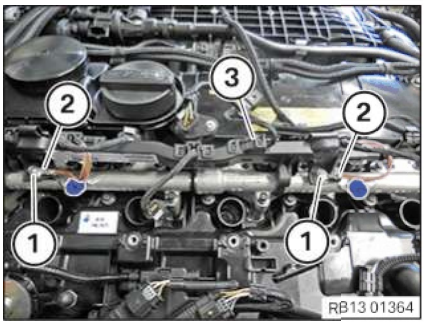
- Check if all bolts (A) to (D) have been tightened with a 90° angle of rotation.

  All marks (lines) must be horizontal (see figure).



- Connect and lock all connectors (1) to the injectors.

  All connectors (1) must engage audibly.



- Thread in cable channel (3) and install.
- Thread in ground cable (2) and install.
- Tighten nuts (1).

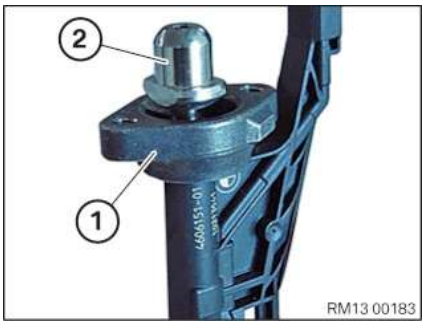
Ground cable to rail

M6		5 Nm

96 – Installing rail with injectors of cylinders 1 to 3

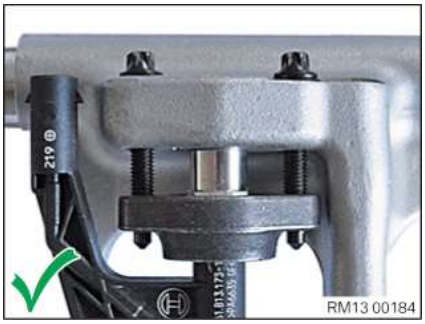
TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.



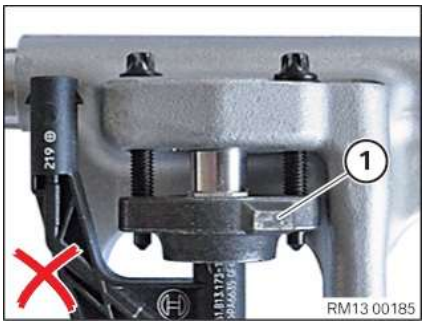
- Mount the holder (1) above the bayonet fitting (2) on the injector.
- **If there is a cast lug on the holder** (1) **:** Make sure that the holder is installed in the correct position.

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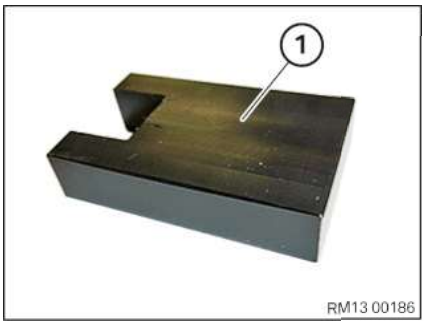
- Observe position of cast lug:

  The holder is mounted **correctly** when the cast lug is located at the rear.



- Observe position of cast lug:

  The holder is mounted **incorrectly** when the cast lug (1) is in front.



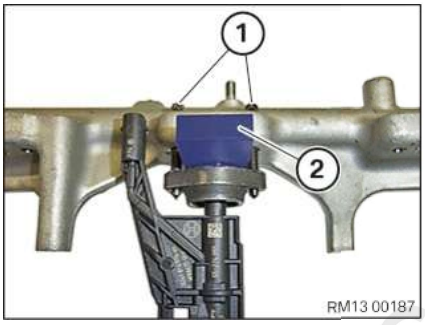
RISK OF DAMAGE

Damage to injectors.

Weld seams on the injector may tear due to incorrect distances between the rail and injector so that the injector must be renewed.

- Insertion of the distance gauge is compulsory.
- Replace distance gauge, if a thickness of 8.5 mm is no longer given in the distance gauge.

- Use special tool 2 358 022(1) .



- Replace (M5x30) screws.

  Parts: Screws (M5x30)
- Mount the injectors with the holders and the bolts (M5x30) (1) on the rail.
- Keep the rail on a clean table in such a way that the openings on the rail for the injectors point upwards.

  The electrical injector connections must point to the fuel pressure sensor.
- Slide special tool 2 358 022 (2) between the holders and the rail onto the injector head.
- Make sure the special tool 2 358 022 (2) rests flat on the retaining bridge.
- Hand-tighten both screws (M5x30) (1) uniformly until the special tool 2 358 022 (2) rests flat against the rail and the holder.



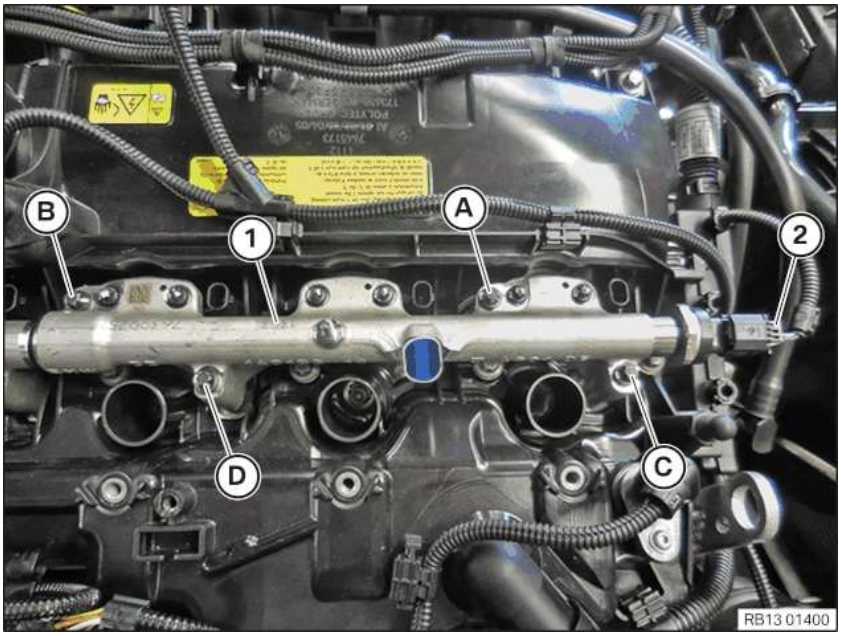
- Remove special tool 2 358 022(1) .
- Repeat this operation for all injectors.



- Check injectors for loose fit at the rail.
- Align the electrical injector connections parallel to the rail.

  The injectors must move freely.

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- Renew screws (A) to (D).

  Parts: Bolts
- Attach the rail (1) with the injectors to the cylinder head from the top.
- Make sure the injector tips catch the corresponding holes for the injectors in the cylinder head.
- Make sure the guides on the injector are properly inserted into the guide bores in the cylinder head.
- Press rail (1) down until a resistance can be felt; join and hand-tighten screws (M6x30) (A) and (B).
- Tighten screws (A) and (B) alternately by **180°** each with the torque wrench until the rail is positioned on the cylinder head.

  The figure shows the rail resting flat against the cylinder head.
- Insert screws (C) and (D).

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

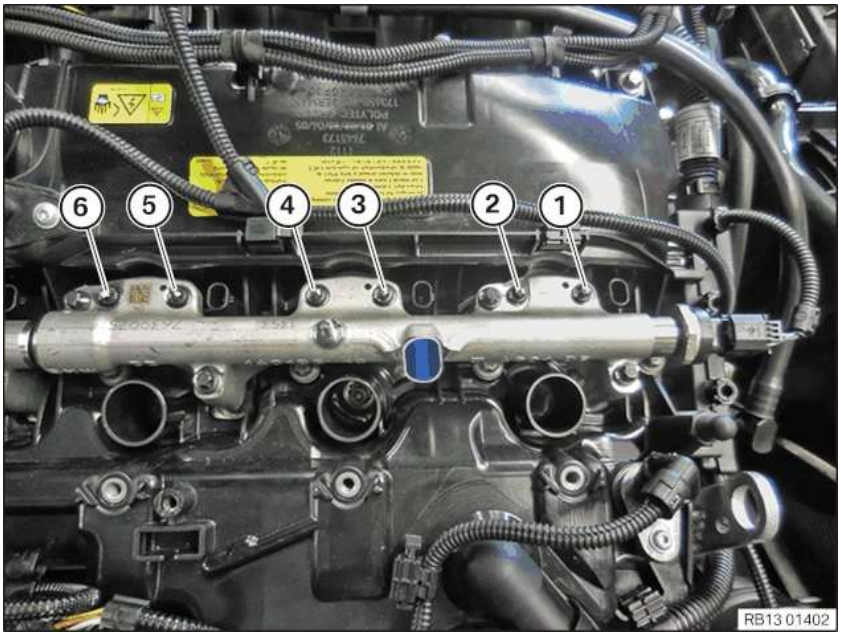
- Tighten screw (A) to 5 Nm.
- Tighten screw (D) to 5 Nm.
- Tighten screw (B) to 5 Nm.
- Tighten screw (C) to 5 Nm.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.



- Make sure that the rail (1) rests flat against the cylinder head.

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- Attach a socket to an extension.

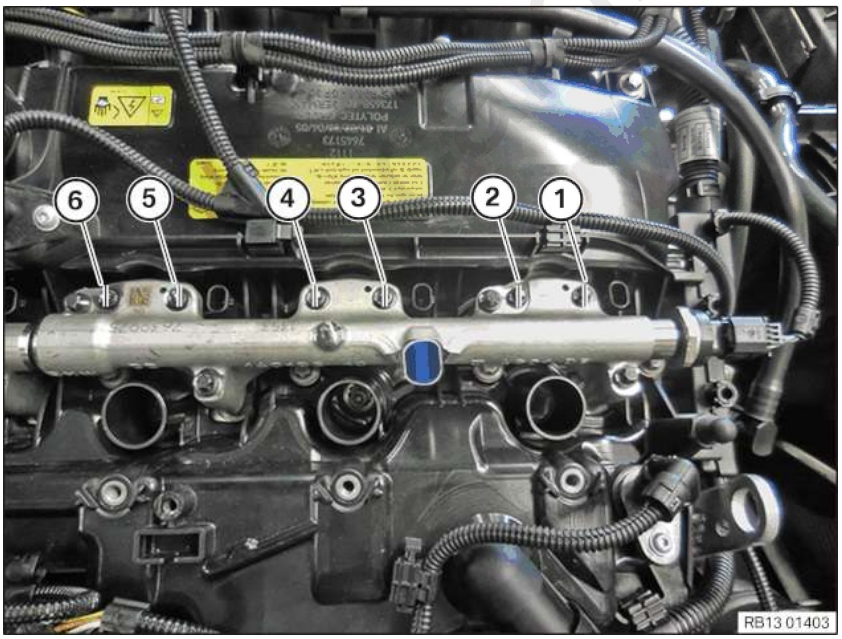
  Do not use a reversible ratchet or torque wrench.
- Hand-tighten screws (M5x30) in pairs ((1) with (2), (3) with (4), (5) with (6)) alternately by **90°**.
- Set torque wrench to 5 Nm.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

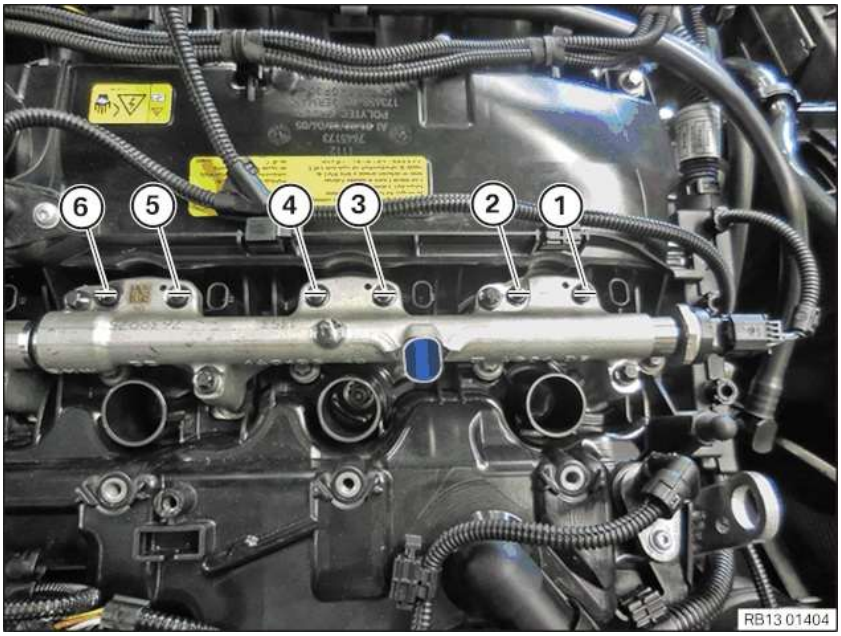
Non-observance of these requirements may result in leaks and damage.

- **Screw the (M5x30) bolts according to the following plan:**
  - **Fuel injector 1:**
  - Tighten screw (1) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (2) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (1) and (2) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 2:**
  - Tighten screw (3) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (4) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (3) and (4) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 3**:
  - Tighten screw (5) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (6) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (5) and (6) until both bolts reach a torque of 5 Nm.



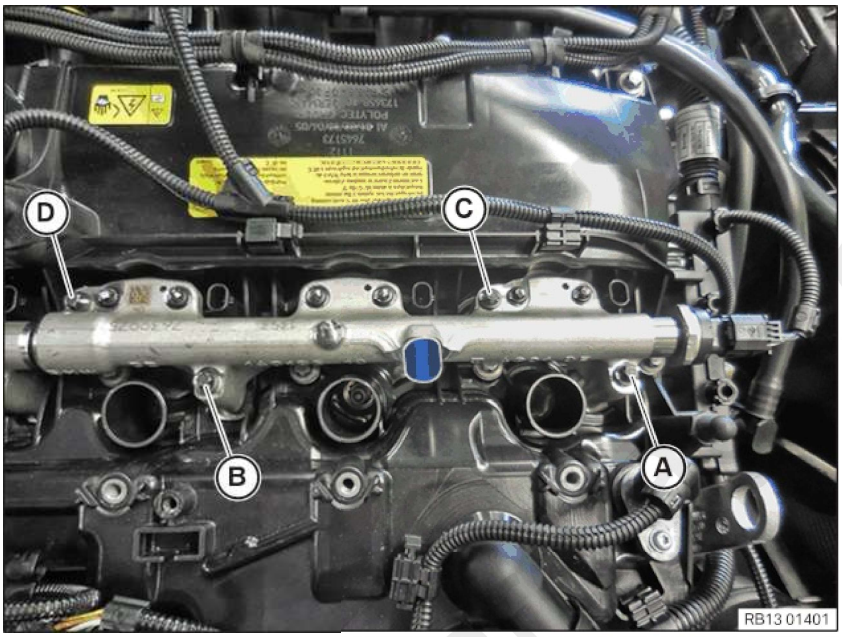
- Mark all bolts (1) to (6) with a line (see figure).
- **Tighten screws using an angle of rotation.**
  - Tighten the screw (1) with an angle of rotation of 90° ±15°.
  - Tighten the screw (2) with an angle of rotation of 90° ±15°.
  - Tighten the screw (3) with an angle of rotation of 90° ±15°.
  - Tighten the screw (4) with an angle of rotation of 90° ±15°.
  - Tighten the screw (5) with an angle of rotation of 90° ±15°.
  - Tighten the screw (6) with an angle of rotation of 90° ±15°.

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- Check if all bolts (1) to (6) have been tightened with a 90° ±15° angle of rotation.

  All markings (lines) must be horizontal (see Figure).



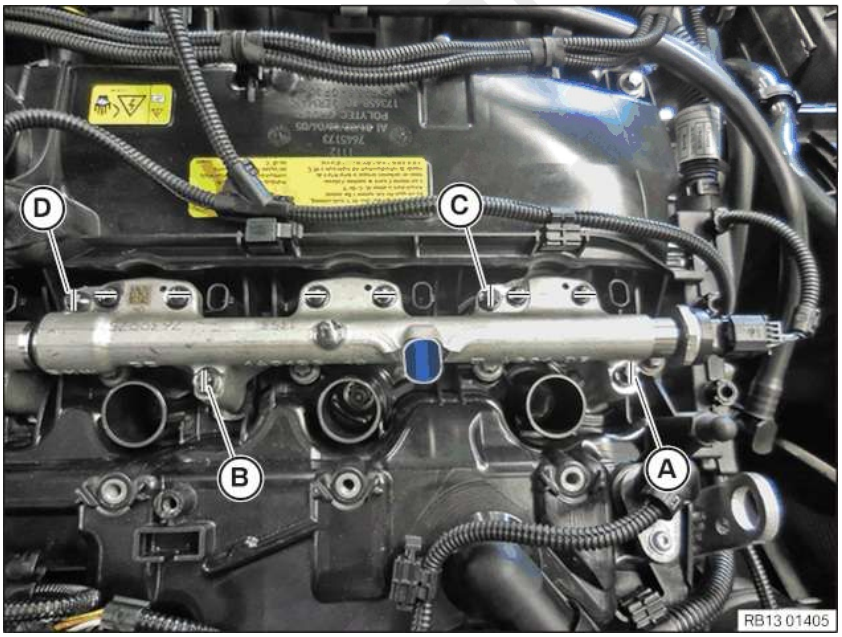
- Release screws (M6x70) (A) to (D) **without fail**.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten screw (A) to 5 Nm.
- Tighten screw (D) to 5 Nm.
- Tighten screw (B) to 5 Nm.
- Tighten screw (C) to 5 Nm.

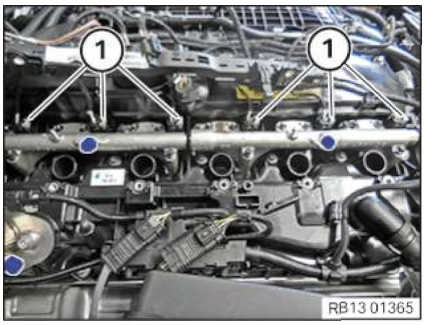


- Mark all the bolts (A) to (D) with a vertical line (see Figure).
- Tighten bolts (M6x70) (A) to (D) with an angle of rotation of 90°.



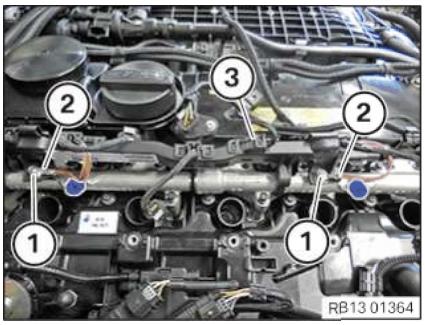
- Check whether all screws (A) to (D) have been tightened with an angle of rotation of 90°.

  All marks (lines) must be horizontal (see figure).



- Connect and lock all the connectors (1) to the injectors.

  All connectors (1) must engage audibly.

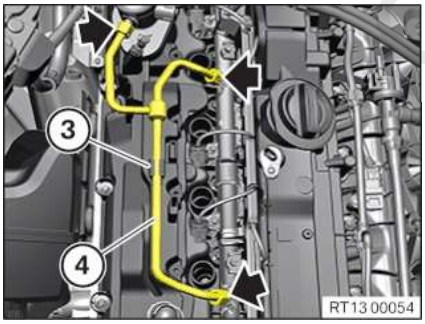


- Thread the cable channel (3) in and install.
- Thread in ground cable (2) and install.
- Tighten nuts (1).

Ground cable to rail

M6		5 Nm

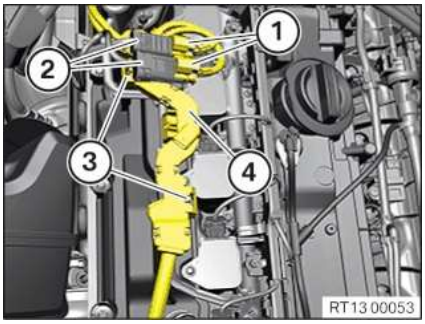
97 – Installing high pressure line between rail and high pressure pump



- Insert the high pressure line (4) into the holder (3) and install.
- Tighten union nuts (arrows) with the special tool .

High pressure line between rail and high pressure pump

M14x1,5		Tightening torque	33 Nm



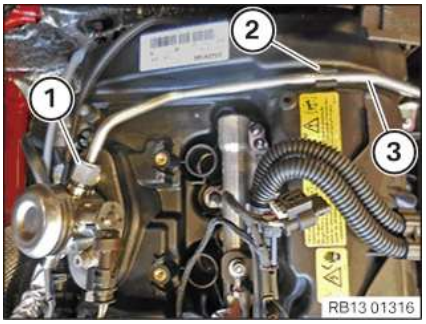
- Insert and install the wiring harness section of the engine wiring harness (4).

  The locks (3) must engage audibly.
- Connect connectors (1) and (2) and lock.

  The connectors (1) and (2) must audibly engage.

98 – Installing fuel delivery line

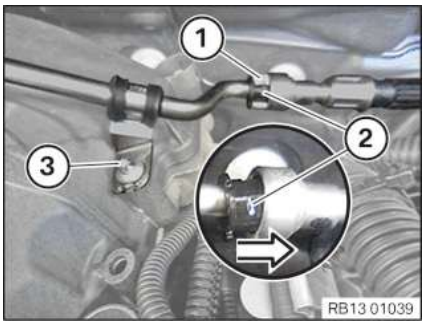
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- Guide the fuel delivery line (3) in and install.
- Install rubber damper (2).
- Check the rubber damper (2) for the correct fit.
- Tighten the union nut (1) hand-tight.
- Tighten union nut (1).

Fuel delivery line to high pressure pump

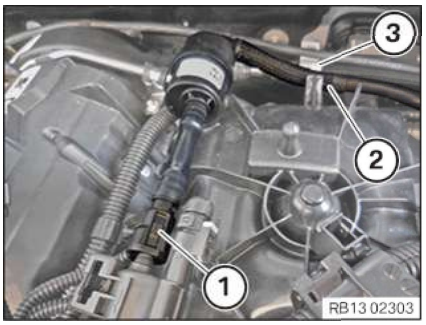
M14		Tightening torque	31 Nm



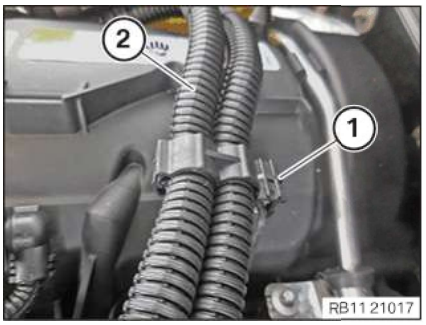
- Slide in and lock the fuel feed line in the direction of the arrow in the snap fastener (2).
  The fuel feed line must be audibly engage in the snap fastener (2).
- Secure clamps (1).
- Tighten down screw (3).

Fuel line to cylinder head cover

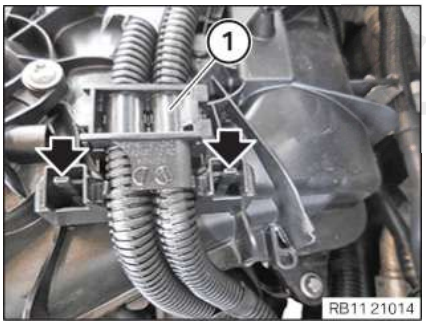
6x18		Tightening torque	6,5 Nm



- Insert and install the tank ventilation line (2).
- Lock (1) must engage audibly.
- Secure the tank ventilation line (2) to the clamp (3).



- Insert and install wiring harness section (2) for injectors and ignition coils.
- Secure clamps (1).



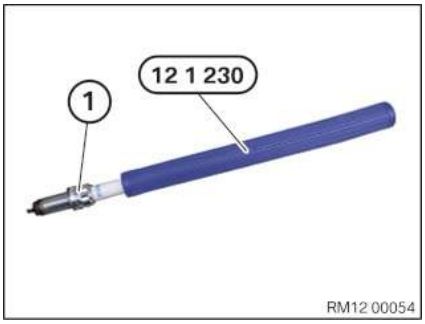
- Insert and install wiring harness section (1) for injectors and ignition coils.
- The locks (arrows) must engage audibly.

99 – Installing all spark plugs

NOTICE

The description is for one component only. The procedure is identical for all further components.

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- Insert spark plug (1) into special tool 0 496 065 (12 1 230).



TECHNICAL INFORMATION

Do not drop spark plug into spark plug shaft! This can lead to a reduction of the electrode gap and can thus impair smooth running of the engine, especially in idle position.

- Screw in the spark plugs in the engine with the special tool 0 496 065 (12 1 230) until hand-tight.



TECHNICAL INFORMATION

Exclusively swivelling extensions may be used for the reversible ratchet. Rigid mounting tool and variable plug connections with rigid option may not be used; there is a risk that the insulator breaks.

- Tighten the spark plugs with the torque wrench, the special tool 0 495 560 (12 1 220) and a swivelling extension.

Spark plugs

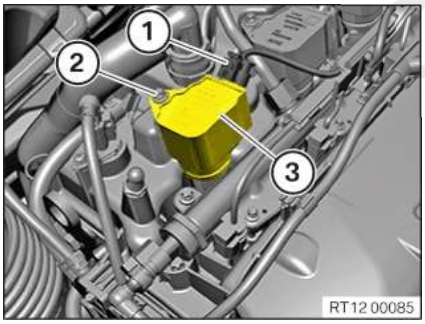
M12x1.25		Tightening torque	23 Nm

100 – Install all ignition coils

NOTICE

The description is for one component only. The procedure is identical for all further components.

▸ **Install ignition coil.**



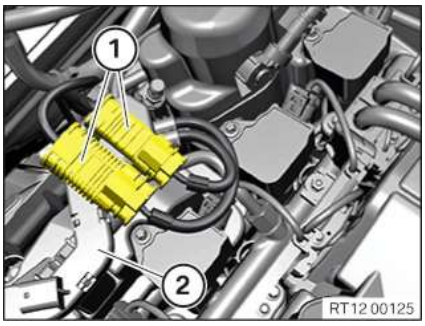
- Install ignition coil (3).
- Tighten down screw (2).

Ignition coil

Screw		Tightening torque	8 Nm

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.



- Connect the connector (1) of the front oxygen sensor and the monitoring oxygen sensor on the cable shaft (2).

101 – Install engine ventilation line adapter with heating element on the exhaust turbocharger

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

RISK OF DAMAGE

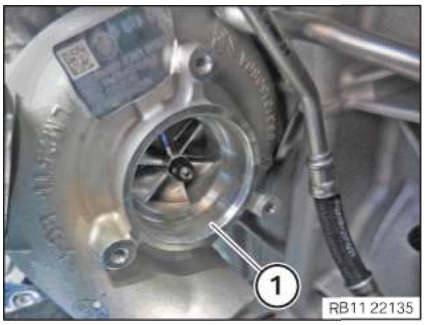
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

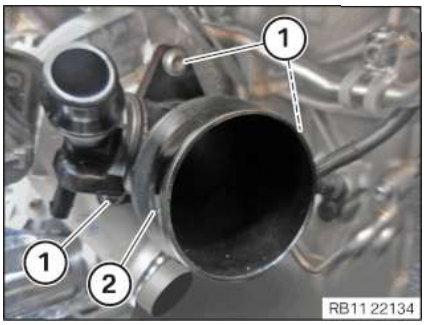


- Clean sealing surface (1).



- Renew the seal (1) using the special tool 0 496 714 (00 9 030).

  Parts: Gasket



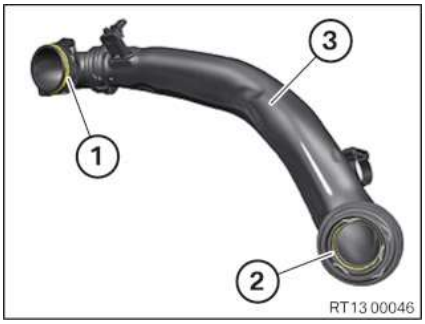
- Feed in and install connecting branch with heating element (2) on exhaust turbocharger.
- Tighten the screws (1).

Engine ventilation line adapter with heating element to exhaust turbocharger

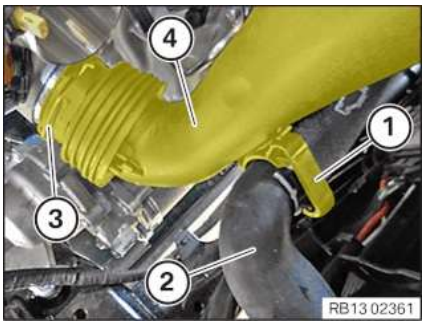
M6x26 screw		Tightening torque	8 Nm

102 – Install charge air line

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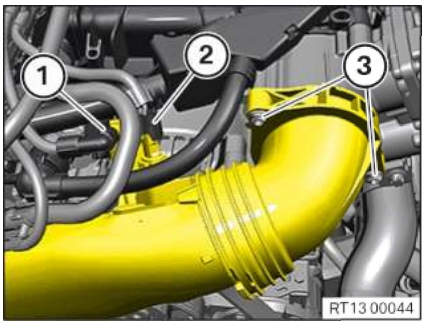


- Check the sealing ring (1) on the charge air line (3) for damage and renew it with the special tool 0 496 714 (00 9 030), if necessary.
- Check the sealing ring (2) on the charge air line (3) for damage and renew it with the special tool 0 496 714 (00 9 030), if necessary.



- Insert and install charge air line (4).
- Lock clamp (3).

  The clamp (3) must engage audibly.
- Insert and install the coolant hose (2).
- Lock clamp (1).



- Tighten the screws (3).

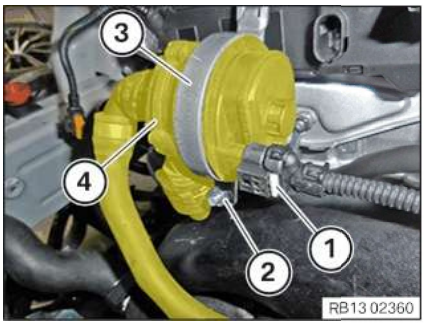
Charge air line to throttle valve

M6x30		Tightening torque	8 Nm

- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.



- Insert and position the additional coolant pump (4).
- Insert and position the retaining bracket (3).
- Tighten nut (2).

Electric coolant pump to holder

M6		Tightening torque	8 Nm

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

103 – Installing clean air pipe



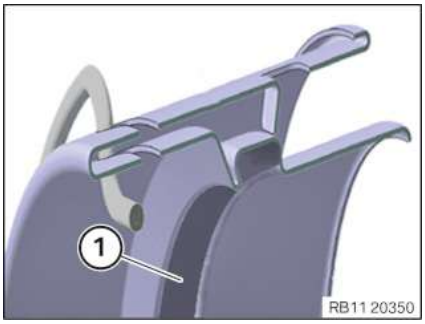
- Check the seal (1) for damage and renew if necessary.

▸ **Replace damaged gasket**

TECHNICAL INFORMATION

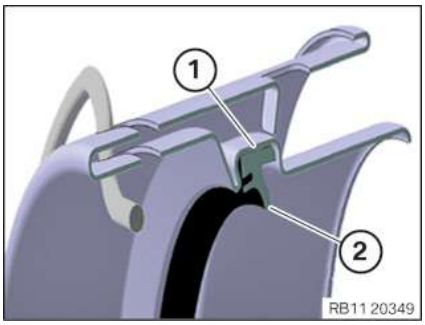
Do not use pointed or sharp-edged tools for the installation and/or removal.

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

  The gasket groove (1) must be clean.



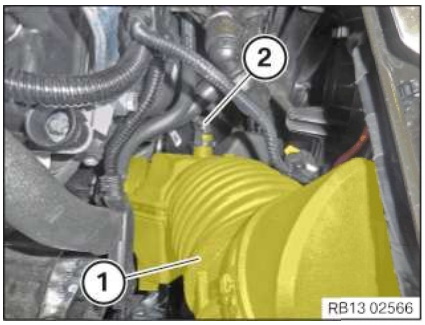
- Renew gasket.

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

TECHNICAL INFORMATION

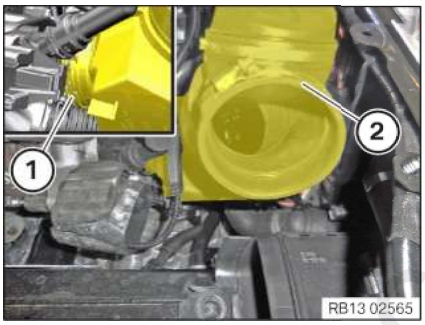
Incorrect assembly is possible. Ensure correct installation position.

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



- Guide in and position clean air pipe (1).
- Connect engine ventilation line (2) and lock.

  The engine ventilation line (2) must engage audibly.



- Install the clean air pipe (2).
- Lock clamp (1).

  The clamp (1) must engage audibly.



- Secure clamps (1).

104 – Install engine ventilation line

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

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

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

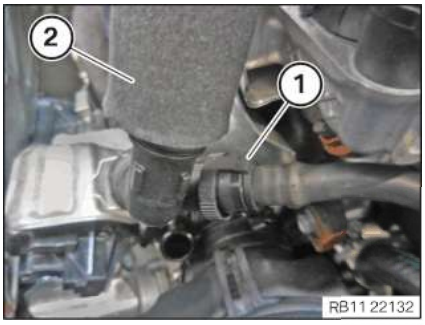
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TECHNICAL INFORMATION

Check the retaining lug on the connector for damage and perform a tension check as needed.

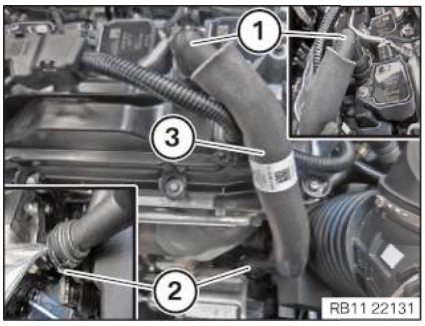


- Check sealing ring (1) for damage and renew tank ventilation line if necessary.

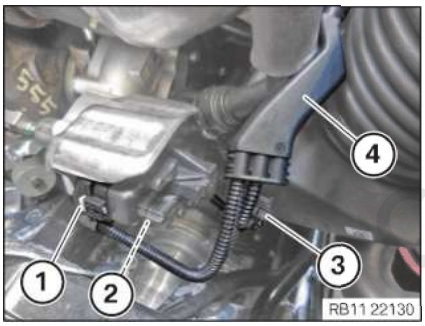


- Insert and position the engine ventilation line (2).
- Insert and install the tank ventilation line (1).

  Tank ventilation line (1) must engage audibly into place.

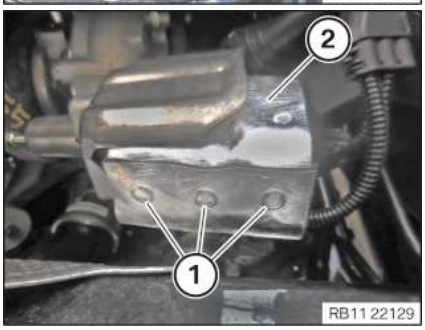


- Insert and install the engine ventilation line (3).
- Make sure you can hear the locks (1) and (2) engage.



- Feed in and position the wiring harness section of sensor system **2** (4).
- Connect connectors (2) and lock.
- Connect connectors (1) and lock.

  The connectors (1) and (2) must audibly engage.
- Secure clamps (3).

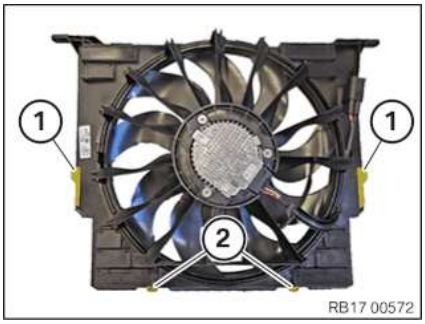


- Feed in and install heat shield (2).
- Lock the locks (1).

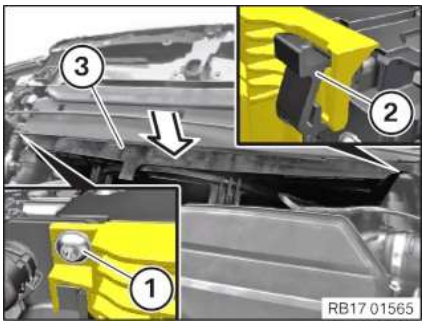
  Locks (1) must engage audibly.

105 – Install fan cowl

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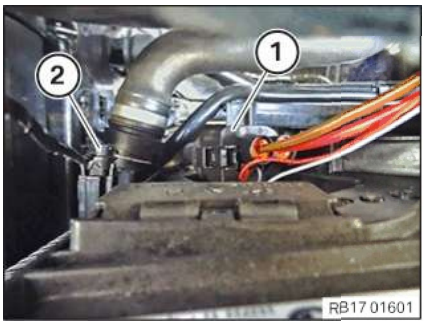
- Feed guides (1) into the radiator.
- Feed guides (2) into the charge air cooler.



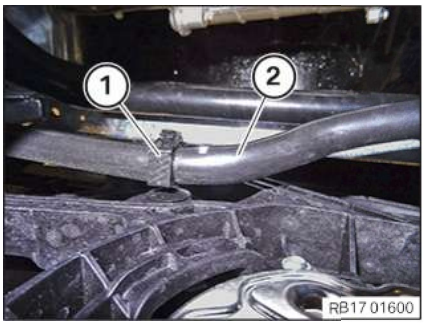
- Guide in and install fan cowl (3) **carefully** in the direction of the arrow.
- Ensure that the lock (2)engages audibly.
- Tighten down screw (1).

Fan cowl with electric fan on radiator

TS6x20		Tightening torque	6,5 Nm

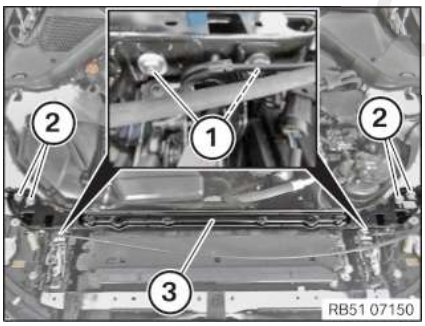


- Connect connectors (2) and lock.
  The connector (2) must engage audibly.
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.



- **If installed:** Secure the transmission oil line (2).
  Insert and install the transmission oil line (2).
  Lock holder (1).

106 – Install the rear top cross connection



- Guide in and position the top rear cross connection (3).
- Tighten the screws (1).

Top rear cross connection to bonnet catch support

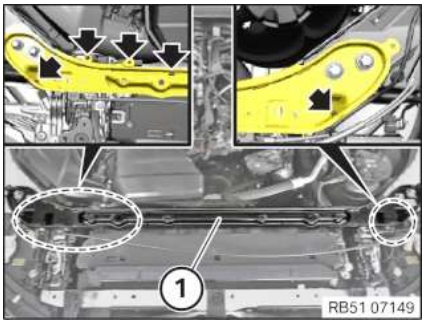
Flat-head screw M6x20		Tightening torque	11,8 Nm

- Renew screws (2).
  Parts: Bolts
- Tighten the screws (2).

Rear top cross connection to wheel arch carrier support

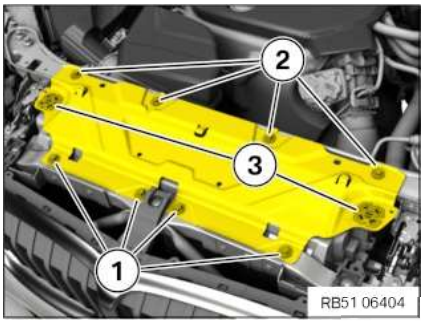
M10x20 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

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- Secure the clips (arrows) in the marked areas to the top rear cross connection (1).

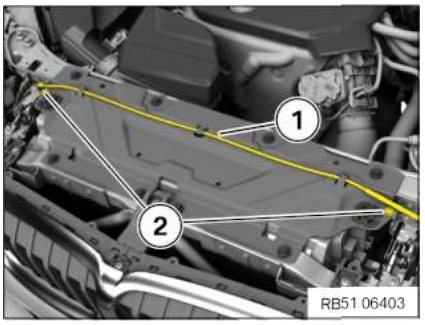
107 – Installing the top cross connection



- Set and position upper cross connection with holders (3) from above.
- Tighten down screws (1) and (2).

Cross connection, top

M8x20		Tightening torque	28 Nm

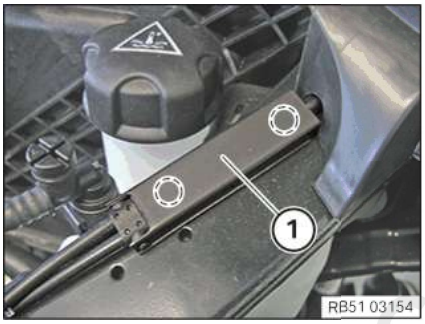


- Tighten down screws (2).

Cross connection, top

M6x20		Tightening torque	11,8 Nm

- Attach Bowden cable (1) on the upper cross connection.



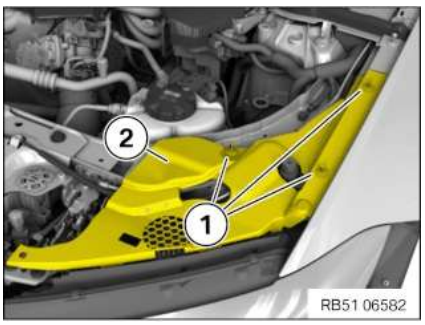
- Clip in the housing for the coupling of the Bowden cables (1).

108 – Install the cover in the engine compartment at top left and right partially

NOTICE

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

▸ **Installing the cover in the engine compartment on top partially**

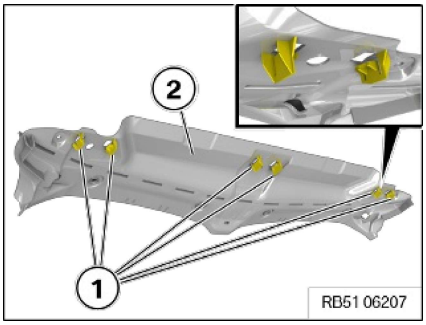


- Install the cover in the engine compartment on top (2).
- Secure expanding rivet (1).

109 – Installing cover for engine compartment centre

Check

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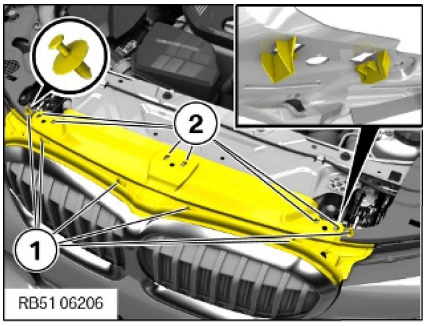
- Check latch mechanisms (1) of cover for engine compartment centre (2) for damage.

Result

» The latch mechanism (1) is damaged.

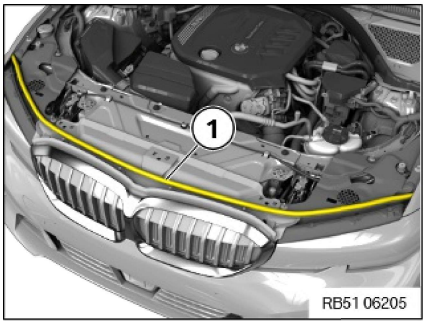
Measure

- Renew cover for engine compartment centre (2).



- Guide in the cover for the engine compartment centre from the rear and position it.
- Clip in the cover for the engine compartment centre with latch mechanisms (2).
- Mount all expanding rivets (1).

110 – Install the seal for the front bonnet



- Position the bonnet seal(1) and connect it on the mounting on the bumper and on the headlights.

111 – Install the monitoring oxygen sensor

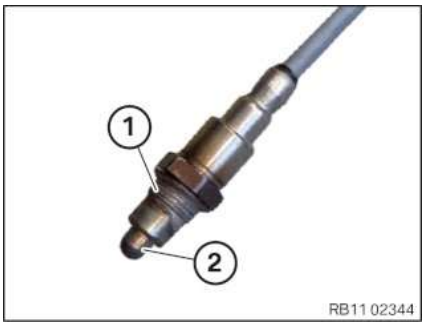
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue



- Prepare the oxygen sensor.

  Do not damage the sensor ceramics.

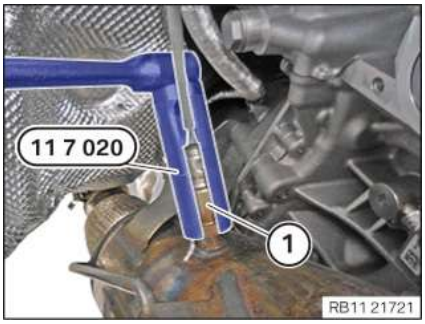
  (1) = Thread

  (2) = Sensor ceramics
- Grease the thread (1) of the Lambda monitoring oxygen sensor thinly and evenly.

Expendable materials

Brake block paste * TU = Trade Unit. TU numbers cannot be ordered! For invoicing purposes only.	3 g, Bag	83192158851
	100 g, Tube	83192158852
	5 g, TU*	83230140233

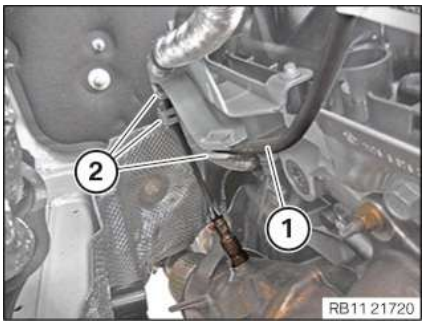
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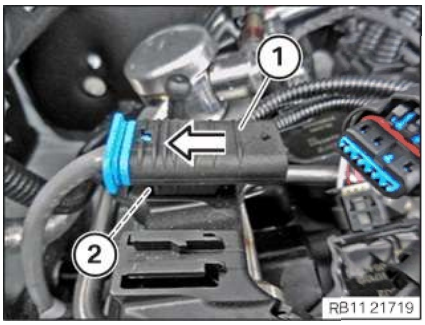
- Feed in the monitoring oxygen sensor (1) and install.
- Tighten monitoring oxygen sensor (1) using special tools 0 493 751 (11 9 150) and 0 491 075 (11 7 030) .

Monitoring oxygen sensor to catalytic converter

M18X1.5		Tightening torque	50 Nm



- Guide monitoring oxygen sensor line (1) into holder (2) and install it.



- Insert and install the connector (1) in the **direction of arrow**.
- Ensure that the lock (2)engages audibly.



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

112 – Install the front oxygen sensor

TECHNICAL INFORMATION

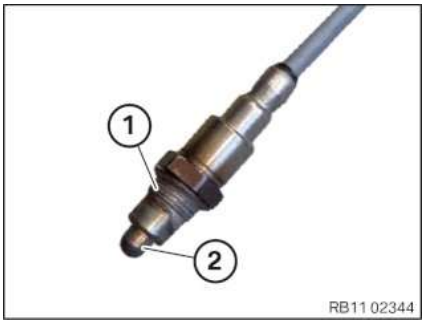
New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

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- Prepare the oxygen sensor.

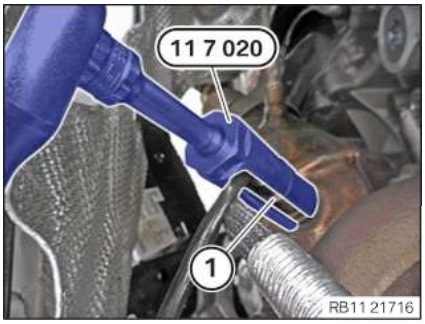
  Do not damage the sensor ceramics.

  (1) = Thread

  (2) = Sensor ceramics
- Apply a thin and even coat of grease to the thread (1) of the front oxygen sensor.

Expendable materials

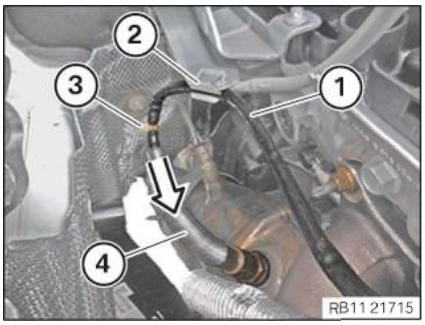
Brake block paste * TU = Trade Unit. TU numbers cannot be ordered! For invoicing purposes only.	3 g, Bag	83192158851
	100 g, Tube	83192158852
	5 g, TU*	83230140233



- Screw the control sensor (1) in and tighten it with the special tool .

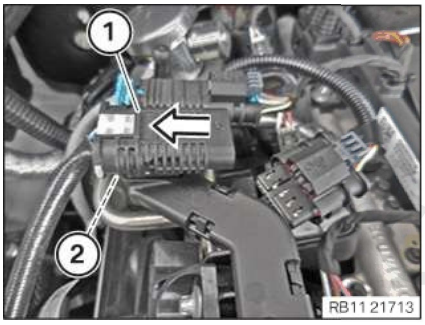
Front oxygen sensor to catalytic converter

M18X1.5		Tightening torque	50 Nm



- Guide in the heat protection (4) in the **direction of arrow** and install.
- Renew the cable straps (3).

  Parts: Cable strap
- Guide in and install the cable strap (3).
- Feed in and install the line of the front oxygen sensor (1) in the holder (2).



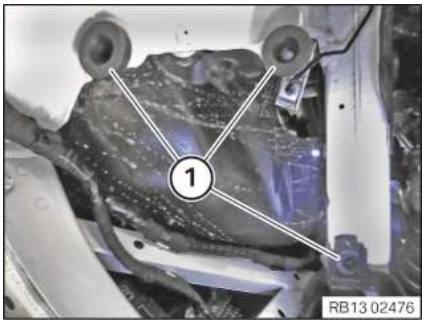
- Insert and install the connector (1) in the **direction of arrow**.
- Ensure that the lock (2)engages audibly.



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

113 – Installing intake silencer housing

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- Check the rubber mount (1) for correct fit.



- Feed the intake filter housing (3) in and engage it in the rubber mounts.
- Tighten clamp (2).

Clean air pipe to upper section of intake filter housing

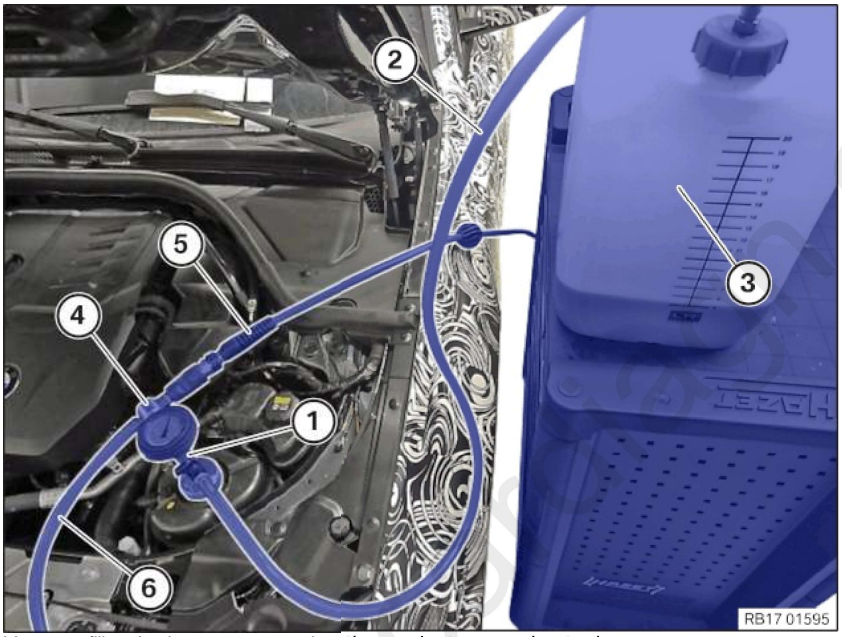
Clamp		Tightening torque	3 Nm

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

114 – Fill the high-temperature cooling system with the vacuum filler device

Vacuum filler device



Vacuum filler device - connected to the coolant expansion tank

1 Vacuum filler device with pressure gauge and shutoff valves

2 Filling hose

3 Fluid tank with coolant

4 Venturi nozzle

5 Compressed air connection (maximum of 6 bar)

6 Out-going hose (lead out-going hose into a collecting vessel)

Prerequisite

The coolant expansion tank for the cooling system must be empty. The fluid tank of the vacuum filler device must have a sufficient quantity of premixed coolant, 1 l to 2 l more than the specified capacity for the vehicle. The fluid tank of the vacuum filler device must be positioned at the same height as the coolant expansion tank. The compressed air connection must have a pressure of 6 bar. Ignition is switched off.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.
For additional information see:
Main group 17
17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

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

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

TECHNICAL INFORMATION

Mixing different coolants is not permitted.

TECHNICAL INFORMATION

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

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

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

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

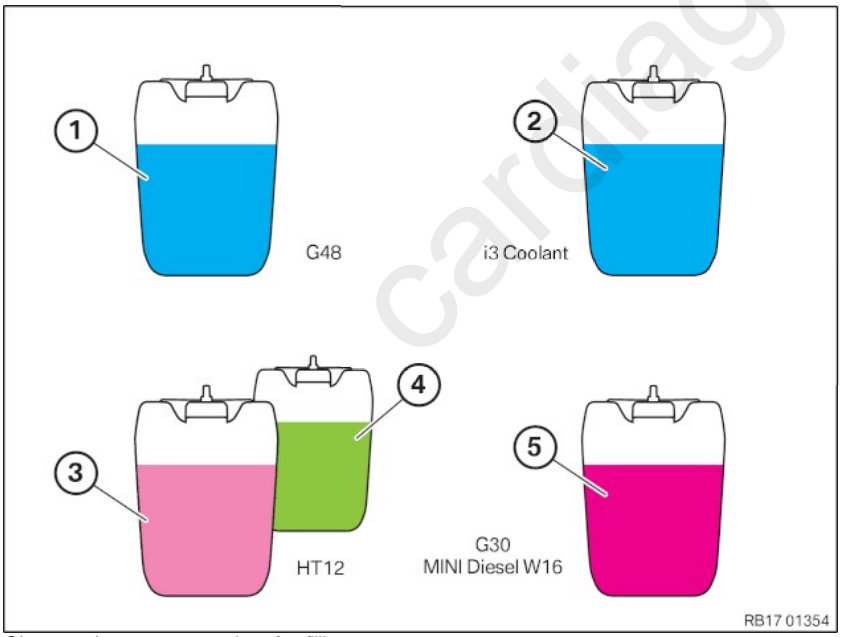
A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

TECHNICAL INFORMATION

Make sure that the ignition (terminal 15) is switched off prior to creating the vacuum with the vacuum filler device.

▸ **Observe the coolant type**

Coolant in the vacuum filler device container



Choose the correct coolant for filling

A vehicle must be filled with the coolant with which it is delivered ex works

1. **G48 (Blue)** G48 must not be mixed with the i3Coolant or the G30 MINI diesel fuelW16.
2. **i3 coolant (blue)** is used only for the i3 heater circuit. i3 coolant must not be filled in the other coolant circuits or mixed with the other coolants.
3. **HT12 (Pink)** HT12 must not be mixed with the i3 coolant or the G30 MINI diesel fuel W16.
4. **HT12 (Green)** HT12 must not be mixed with the i3 coolant or the G30 MINI diesel fuel W16.
5. **G30 (Pink)** must be used only for the **MINI diesel fuel W16**. G30 must not be filled in the other coolant circuits or mixed with the other coolants.

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RISK OF DAMAGE

Damage to the engine.

The use of an incorrect coolant may lead to corrosion or gelling in the engine.

- Use only approved coolants for the specific vehicle.
- Fill the vehicle only with the coolant with which it was delivered ex works.
- Mix only compatible coolants. The colour does not allow any assessment about the compatibility of coolants.
- Selection of the correct coolant only by means of the part number.

- Select a suitable adapter (Y) from the set of special tools 0 494 417 (17 0 100):

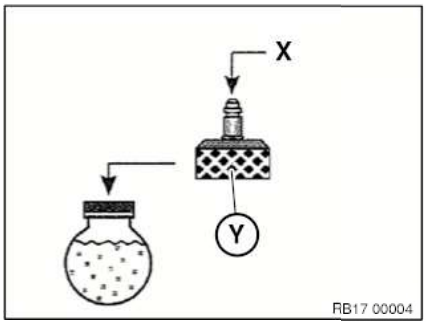
Type	Engine	Adapter (Y) from 17 0 100
G20/G29	B46 / B48 /B58	17 0 113

- The fluid tank of the vacuum filler device must be filled with 1 l to 2 l more than the specified capacity of coolant for the vehicle.

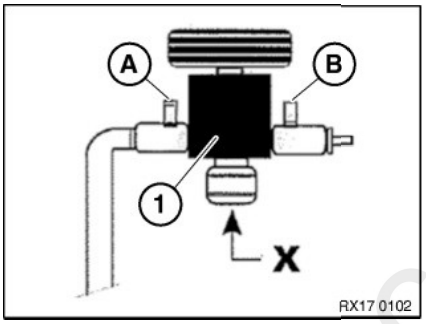
Capacity of high-temperature coolant circuit G20/G29

B58B30O1	10,5 l

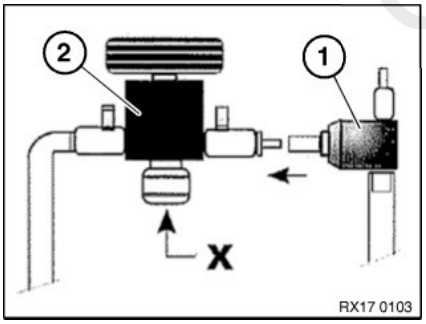
Expendable materials: Technically suitable antifreeze and corrosion inhibitor



- Connect the selected adapter (Y) to the coolant expansion tank.
- Connect vacuum filler device to connection (X) of the adapter.

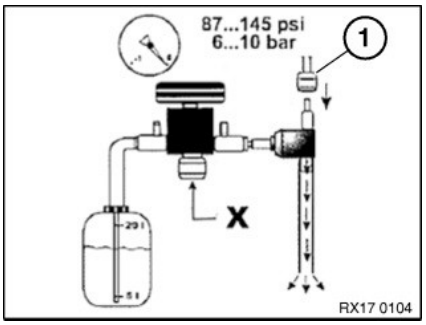


- Check whether shut-off valves (A) and (B) of the vacuum filler device (1) are closed.
- Connect and lock connection (X) to the coolant expansion tank.



- Connect Venturi nozzle (1) to the vacuum filler device (2).

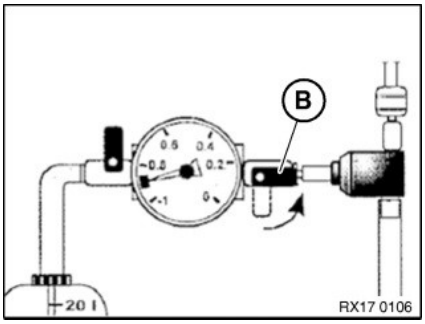
  (X)is the connection on the coolant expansion tank.



- Connect compressed air (1).

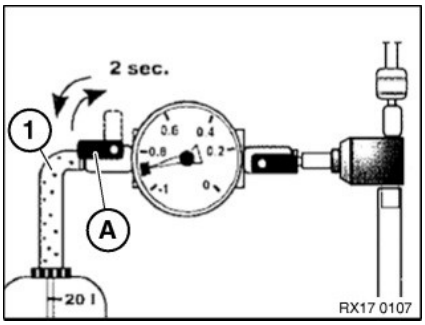
  (X)is the connection on the coolant expansion tank.

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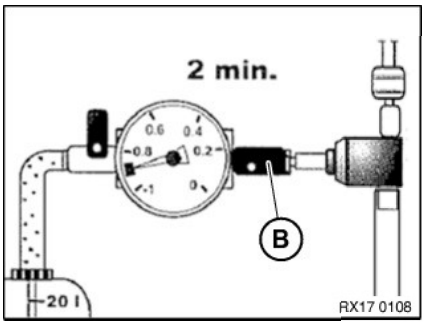
- Open shut-off valve (B).

  The venturi nozzle produces a flow noise.



- Open shutoff valve (A) until the fuel filling hose (1) is full without bubbles.
- Close shutoff valve (A) again.

» The filling hose (1) has now been bled.

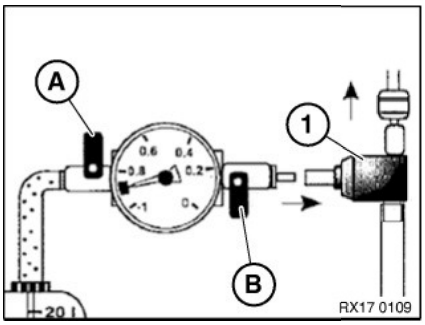


- Check the coolant hoses for porosity and renew porous coolant hoses as required.

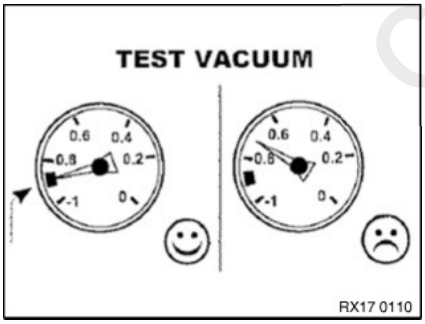
TECHNICAL INFORMATION

The coolant hoses contract during vacuum build-up.

- After having established a vacuum in the coolant circuit of between -0.7 to -0.95 bar (duration approximately 2 min), close the shut-off valve (B).



- Check whether the shutoff valves (A) and (B) are closed.
- Disconnect the Venturi nozzle (1).



Check

- Make sure the vacuum in the coolant circuit is maintained for at least 30 seconds.

Result

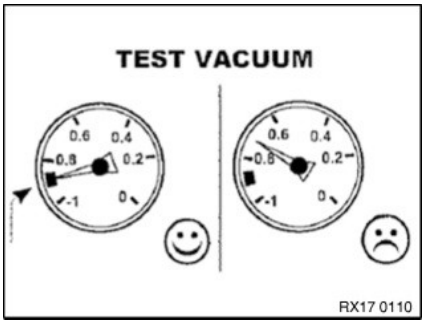
» Vacuum drops.

Measure

- Look for the leak, repair it and start the filling procedure from the beginning.

Check

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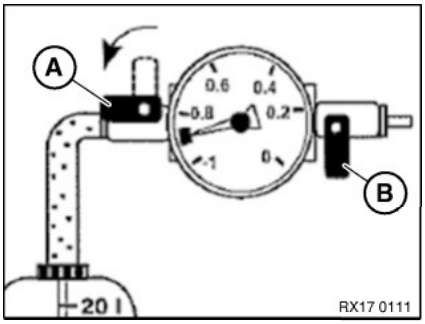
- Make sure the vacuum in the coolant circuit is maintained for at least 30 seconds.

Result

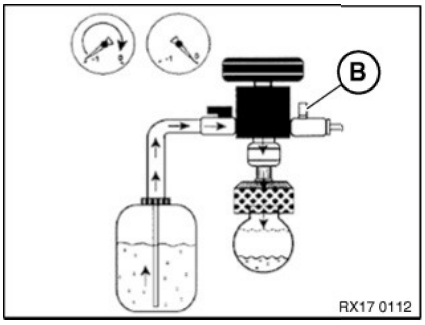
» Vacuum remains constant.

Measure

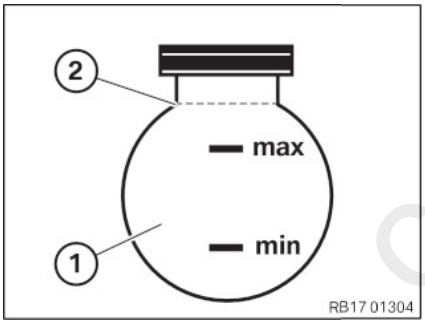
- Continue with filling.



- Keep shutoff valve (B) closed during the filling process.
- To fill the cooling system, open the shutoff valve (A) to the fluid tank of the vacuum filler device.



- Stop the filling procedure when the needle in the pressure measuring device is on 0 bar or it no longer drops.
- If necessary, reduce remaining vacuum. In order to do so, open shutoff valve (B).

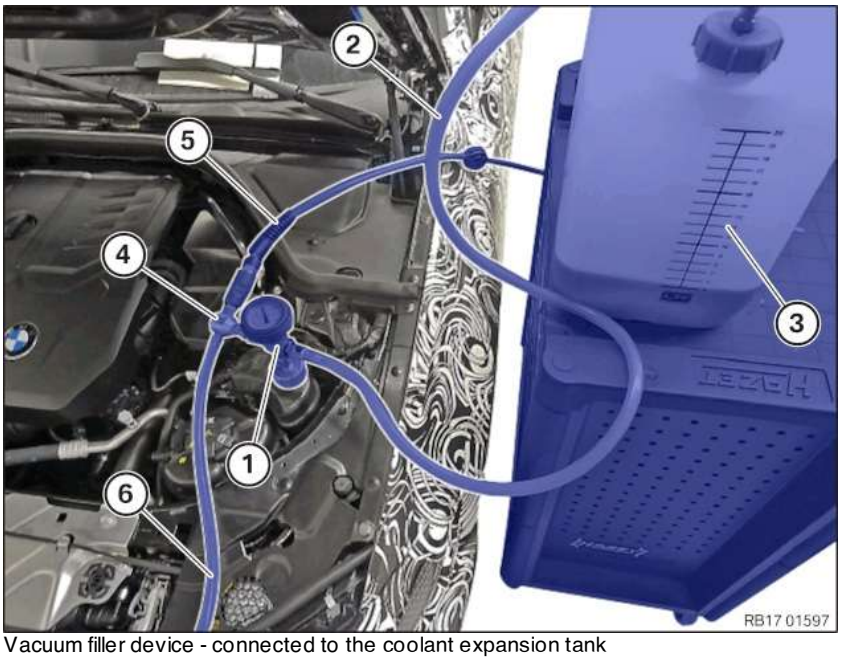


- Remove the vacuum filler device with the adapter from the high temperature coolant expansion tank (1).
- Top up the coolant level in the high temperature coolant expansion tank (1) to the lower edge of the coolant filler neck (2) in the high temperature coolant expansion tank (1).
- After filling the cooling system with the vacuum filler device, **also** run the cooling system bleeding routine.

115 – Filling the low-temperature cooling system with the vacuum filler device

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Vacuum filler device



Vacuum filler device - connected to the coolant expansion tank

1 Vacuum filler device with pressure gauge and shutoff valves

2 Filling hose

3 Fluid tank with coolant

4 Venturi nozzle

5 Compressed air connection (maximum of 6 bar)

6 Out-going hose (lead out-going hose into a collecting vessel)

Prerequisite

The coolant expansion tank for the cooling system must be empty. The fluid tank of the vacuum filler device must have a sufficient quantity of premixed coolant, 1 l to 2 l more than the specified capacity for the vehicle. The fluid tank of the vacuum filler device must be positioned at the same height as the coolant expansion tank. The compressed air connection must have a pressure of 6 bar. Ignition is switched off.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

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

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

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

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

TECHNICAL INFORMATION

Mixing different coolants is not permitted.

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TECHNICAL INFORMATION

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

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

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

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

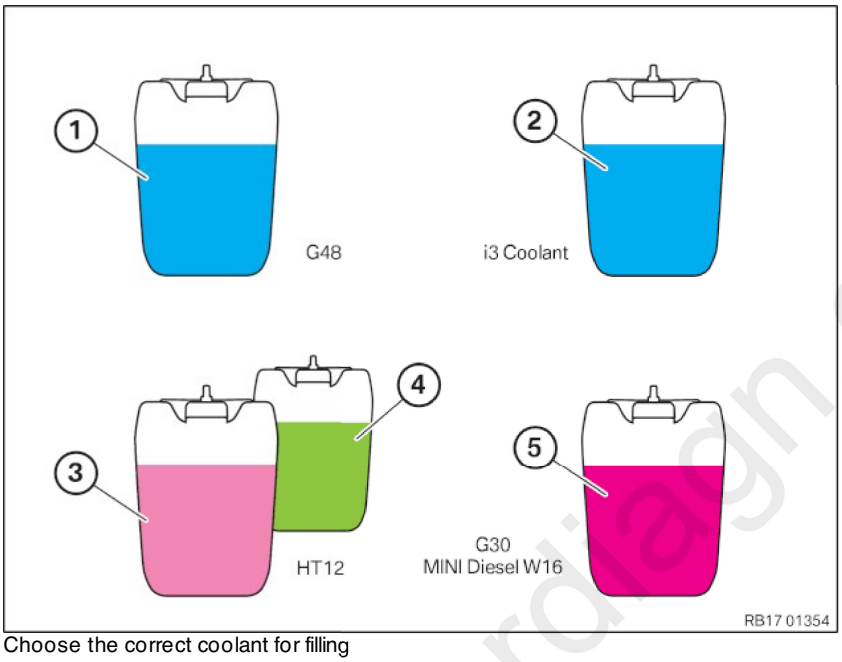
A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

TECHNICAL INFORMATION

Make sure that the ignition (terminal 15) is switched off prior to creating the vacuum with the vacuum filler device.

▸ **Observe the coolant type**

Coolant in the vacuum filler device container



Choose the correct coolant for filling

A vehicle must be filled with the coolant with which it is delivered ex works

1. **G48 (Blue)** G48 must not be mixed with the i3Coolant or the G30 MINI diesel fuelW16.
2. **i3 coolant (blue)** is used only for the i3 heater circuit. i3 coolant must not be filled in the other coolant circuits or mixed with the other coolants.
3. **HT12 (Pink)** HT12 must not be mixed with the i3 coolant or the G30 MINI diesel fuel W16.
4. **HT12 (Green)** HT12 must not be mixed with the i3 coolant or the G30 MINI diesel fuel W16.
5. **G30 (Pink)** must be used only for the **MINI diesel fuel W16**. G30 must not be filled in the other coolant circuits or mixed with the other coolants.

RISK OF DAMAGE

Damage to the engine.

The use of an incorrect coolant may lead to corrosion or gelling in the engine.

- Use only approved coolants for the specific vehicle.
- Fill the vehicle only with the coolant with which it was delivered ex works.
- Mix only compatible coolants. The colour does not allow any assessment about the compatibility of coolants.
- Selection of the correct coolant only by means of the part number.

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- Select a suitable adapter (Y) from the set of special tools 0 494 417 (17 0 100):

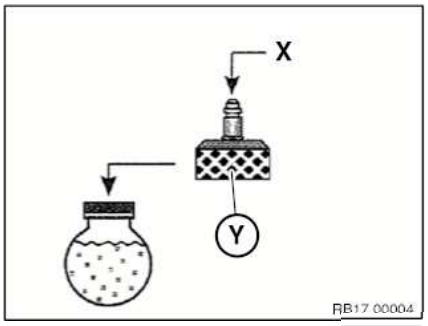
Type	Engine	Adapter (Y) from 17 0 100
G20/G29	B46 / B48 /B58	17 0 109

- The fluid tank of the vacuum filler device must be filled with 1 l to 2 l more than the specified capacity of coolant for the vehicle.

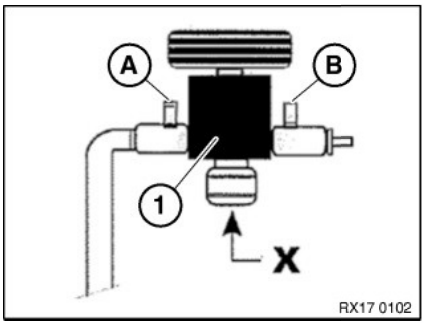
Capacity of low-temperature coolant circuit G20/G29

B58B30O1	4,5 l

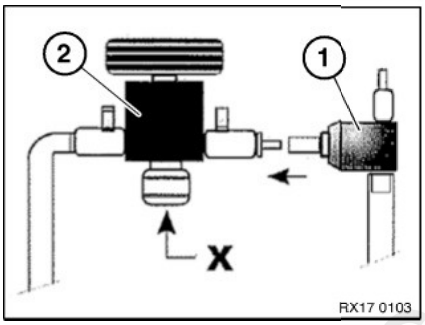
Expendable materials: Technically suitable antifreeze and corrosion inhibitor



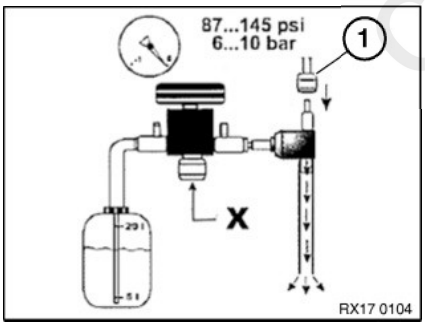
- Connect the selected adapter (Y) to the coolant expansion tank.
- Connect vacuum filler device to connection (X) of the adapter.



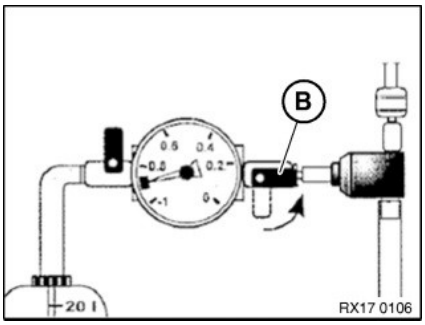
- Check that shutoff valves (A) and (B) of the vacuum filler device (1) are closed.
- Connect and lock connection (X) to the coolant expansion tank.



- Connect Venturi nozzle (1) to the vacuum filler device (2).
  (X)is the connection on the coolant expansion tank.

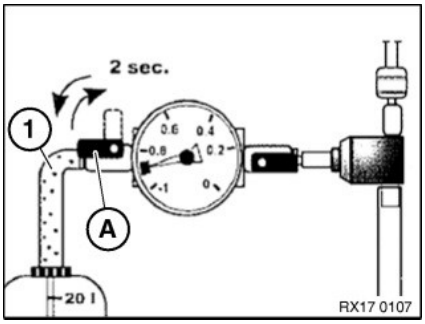


- Connect compressed air (1).
  (X)is the connection on the coolant expansion tank.



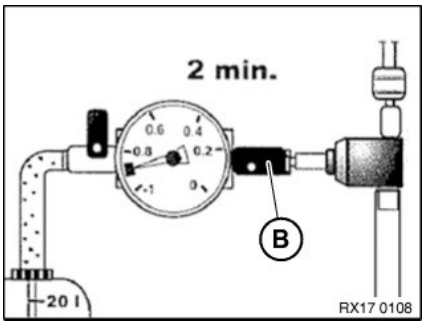
- Open shut-off valve (B).
  The venturi nozzle produces a flow noise.

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- Open shutoff valve (A) until the fuel filling hose (1) is full without bubbles.
- Close shutoff valve (A) again.

» The filling hose (1) has now been bled.

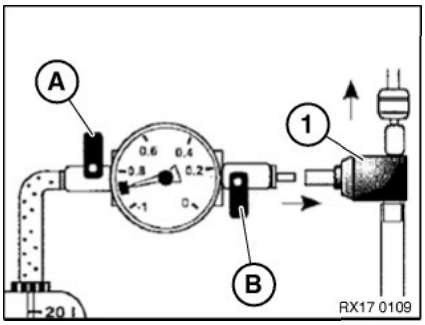


- Check the coolant hoses for porosity and renew porous coolant hoses as required.

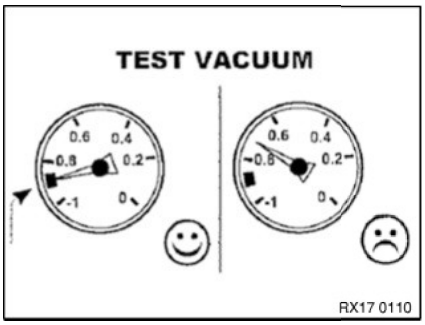
TECHNICAL INFORMATION

The coolant hoses contract during vacuum build-up.

- After a vacuum of -0.7 to -0.95 bar has been created in the coolant circuit (duration approx. 2 min), shut the shutoff valve (B).



- Check whether the shutoff valves (A) and (B) are closed.
- Disconnect the Venturi nozzle (1).



Check

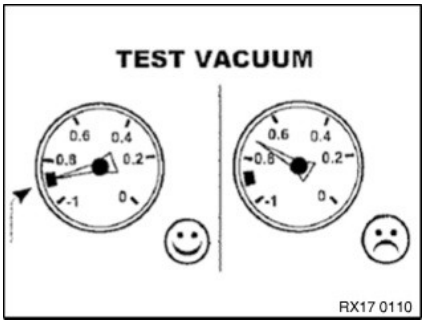
- The vacuum in the coolant circuit must be maintained for at least 30 seconds.

Result

» Vacuum drops.

Measure

- Look for the leak, repair it and start the filling procedure from the beginning.



Check

- The vacuum in the coolant circuit must be maintained for at least 30 seconds.

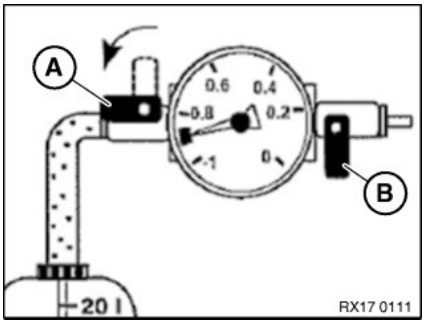
Result

» Vacuum remains constant.

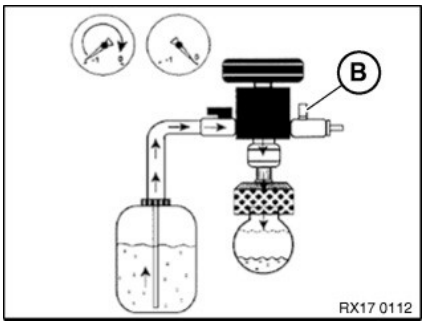
Measure

- Continue with filling.

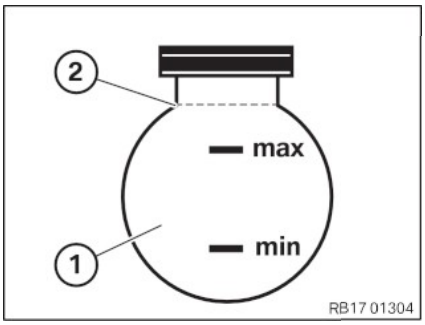
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- Keep shutoff valve (B) closed during the filling process.
- To fill the cooling system, open the shutoff valve (A) to the fluid tank of the vacuum filler device.



- Stop the filling procedure when the needle in the pressure measuring device is on 0 bar or it no longer drops.
- If necessary, reduce remaining vacuum. In order to do so, open shutoff valve (B).



- Remove the vacuum filler device with the adapter from the low-temperature coolant expansion tank (1).
- Adjust the coolant level in the low-temperature coolant expansion tank (1) up to the lower edge of the coolant filler neck (2) of the low-temperature coolant expansion tank (1).
- After filling the cooling system with the vacuum filler device, **also** run the cooling system bleeding routine.

116 – Disconnecting all battery earth leads



- See additional information.

117 – Bleed the high-temperature coolant circuit

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

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

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

TECHNICAL INFORMATION

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

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

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

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

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

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TECHNICAL INFORMATION

Before starting the automatic cooling system bleeding routine, make sure that **all coolant circuits** are **filled**. If the cooling system bleeding routine is started while one of the coolant circuits is empty, there is a risk of damage to the electric coolant pump when running it dry.

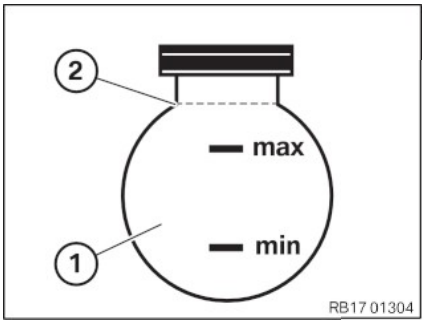
Make sure that terminal 15 is not disconnected for the bleeding procedure. Switch on low-beam headlights and hazard warning lights. If the low-beam headlights and hazard warning lights are not switched on, the ignition (terminal 15) will switch off automatically after a certain period of time and interrupt the bleeding procedure.

TECHNICAL INFORMATION

The electrical fan is activated during the entire cooling system bleeding routine.

TECHNICAL INFORMATION

The driving experience switch must not be set to the ECO PRO switch position.



- Open the bleeder screw on the coolant expansion tank for the high-temperature coolant circuit and close it again after approx. **10 s**.

  You can close the bleeder screw prior to expiry of the 10 s once coolant escapes.
- Adjust the coolant level in the high temperature coolant expansion tank (1) to the lower edge (2) of the coolant filler neck of the the high temperature coolant expansion tank (1) .
- Close the sealing cap on the coolant expansion tank of the high--temperature cooling circuit.
- Make sure the bonnet is **closed**.
- Make sure that the wheels touch the ground.
- Engage the parking brake.
- Do not engage any gear in manual-shift gearbox, and engage the gear to "P" or "N" automatic transmission.
- Connect battery charger.
- Switch on the ignition and make sure that it remains **switched on** (for example, activate the low-beam headlight and the **hazard warning light at the same time**).

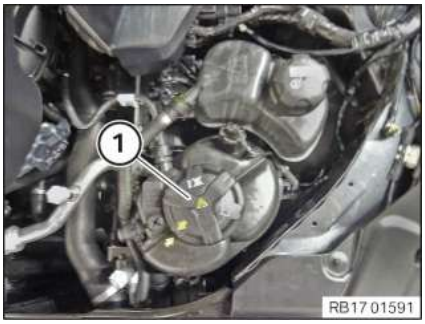
  If the low-beam headlight and the hazard warning light are **not** switched on, the ignition (**terminal 15**) will switch off automatically after some time and interrupts the bleeding procedure.
- Check that the driving experience control is **not** in the **"ECO-PRO"** switch position.
- Adjust the heating to **maximum** temperature and adjust the blower to the **lowest** stage.
- Hold the accelerator pedal down to the limit position for at least **10 s** and do **no** kick the brake pedal.
- Start engine.
- Start the cooling system bleeding routine, pay attention to the display on the instrument cluster (KOMBI). ("Service function started")

  The engine speed (up to 3500 rpm) and the actuators in the cooling system are activated **automatically** for 11 minutes according to a cooling system bleeding routine.

  The cooling system bleeding routine ends approx. 11 min **after** the engine starts.

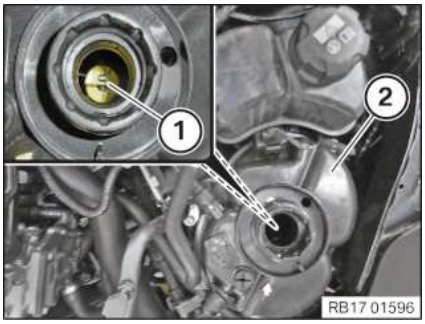
  The engine speed **drops** to the idle speed.
- Observe the display in the instrument cluster (KOMBI).

  If the service function is interrupted, the cooling system bleeding routine **must** be repeated.
- Switch off engine.
- Allow the coolant temperature to cool down to **< 50°C**.



- Loosen sealing cap (1).

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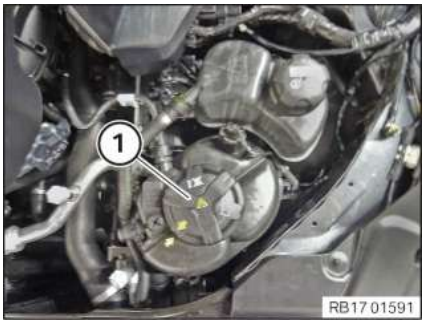
TECHNICAL INFORMATION

After the cooling system bleeding routine, the cooling system is topped up above the maximum mark.

Overfilling the cooling system serves to balance the remaining air in the cooling system.

The normal filling level of the coolant is reached while driving.

- Adjust the filling level in the coolant expansion tank (2) of the high-temperature coolant circuit to **200 ml** over the **maximum mark**(1) .



- Close sealing cap (1).
- Close the sealing cap (1) until the **arrows** are flush.

118 – Bleeding the low-temperature cooling system

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

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

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

TECHNICAL INFORMATION

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

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

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

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

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

TECHNICAL INFORMATION

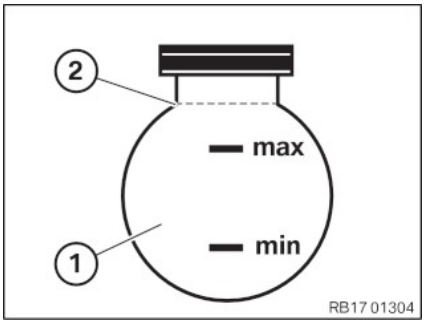
Before starting the automatic cooling system bleeding routine, make sure that **all coolant circuits** are **filled**. If the cooling system bleeding routine is started while one of the coolant circuits is empty, there is a risk of damage to the electric coolant pump when running it dry.

Make sure that terminal 15 is not disconnected for the bleeding procedure. Switch on low-beam headlights and hazard warning lights. If the low-beam headlights and hazard warning lights are not switched on, the ignition (terminal 15) will switch off automatically after a certain period of time and interrupt the bleeding procedure.

TECHNICAL INFORMATION

The driving experience switch must not be set to the ECO PRO switch position.

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- Adjust the coolant level in the low-temperature coolant expansion tank (1) up to lower edge (2) of the coolant filler neck of low-temperature coolant expansion tank (1).
- Close the sealing cap on the coolant expansion tank of the low-temperature coolant circuit.
- Ensure that the bonnet is **open**.
- Connect battery charger.
- Switch on the ignition and ensure that it remains **switched on** (for example, activate the low-beam headlight and the hazard warning lights **at the same time**).
- If the low-beam headlight and the hazard warning light are **not** switched on, the ignition (**terminal 15**) will switch off automatically after some time and interrupts the bleeding procedure.
- Ensure that the Driving Experience Control is **not** in the **"ECO-PRO"** switch position.
- Adjust the heating to **maximum** temperature and adjust the blower to the **lowest** stage.
- Hold the accelerator pedal down to the limit position for at least **10 s** and do **not** press on the brake pedal.
- Do **not** start engine.

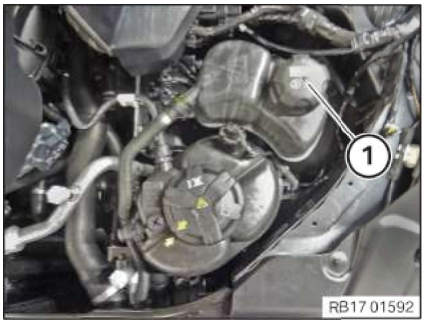
  The cooling system bleeding routine will start.

  The electric coolant pump in the low-temperature coolant circuit is activated for 11 minutes according to a cooling system bleeding routine.

  The cooling system bleeding routine ends after 11 minutes.

  The electric coolant pump is **no** longer activated.
- Note the display in the instrument cluster (KOMBI).

  If the service function is interrupted, the cooling system bleeding routine **must** be repeated.
- Allow the coolant temperature to cool down to **< 50°C**.



- Loosen sealing cap (1).



TECHNICAL INFORMATION

After the cooling system bleeding routine, the cooling system is topped up above the maximum mark.
Overfilling the cooling system serves to balance the remaining air in the cooling system.
The normal filling level of the coolant is reached while driving.

- Adjust the filling level in coolant expansion tank (2) of the low-temperature coolant circuit to **100 ml** above the **maximum mark** (1) .
- Close sealing cap (1).

119 – Check the high-temperature cooling system for watertightness

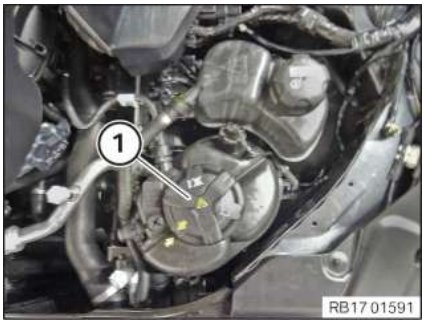
WARNING

Hot surfaces.

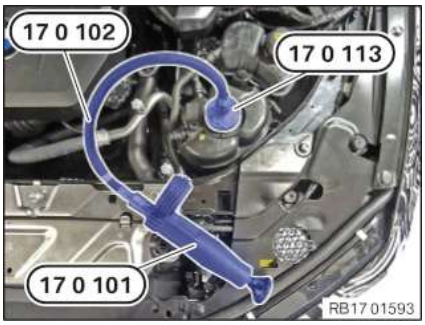
Risk of burning!

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

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- Loosen sealing cap (1).



- Attach the special tool 0 494 418 (17 0 101) with special tools 0 494 419 (17 0 102) and 0 494 642 (17 0 113) from the set of special tools 0 494 417 (17 0 100).
- Build up excess pressure and wait for approximately 2 minutes.

Opening pressure of sealing cap / test pressure of high-temperature coolant circuit cooling system

Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure.	max. 0,1 bar
Test pressure for cooling system (gauge pressure)	1,5 bar



TECHNICAL INFORMATION

If the described test step is not completed successfully: repeat test step twice. Only replace the sealing cap after three tests with an incorrect opening pressure.

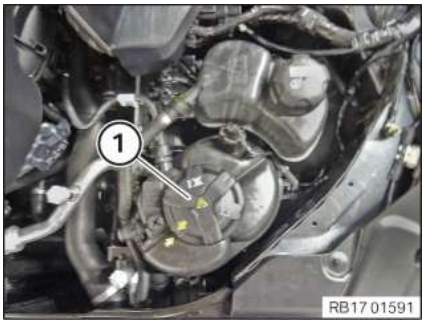
When driving at high ambient temperatures, the design may cause the pressure relief valve in the sealing cap to open slightly and air to escape together with dissolved coolant. This coolant vapour condenses on the surface of the coolant expansion tank and leaves traces of coolant when the vehicle has cooled down. These traces of coolant do not indicate whether the sealing cap is defective or not.

Escaping coolant vapours when the vehicle is at standstill may cause the pressure relief valve to stick to the sealing cap. This may cause an incorrect opening pressure.

- Screw on sealing cap (1) on special tool 0 494 643 (17 0 114) from the set of special tools 0 494 417 (17 0 100).
- Build up the pressure with special tools 0 494 418 (17 0 101) and 0 494 419 (17 0 102) from the set of special tools 0 494 417 (17 0 100).
- Observe on the pressure measuring device when the opening pressure has been reached.

Opening pressure of sealing cap / test pressure of high-temperature coolant circuit cooling system

Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure.	max. 0,1 bar
Test pressure for cooling system (gauge pressure)	1,5 bar



- Close sealing cap (1).
- Close the sealing cap (1) until the **arrows** are flush.

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WARNING

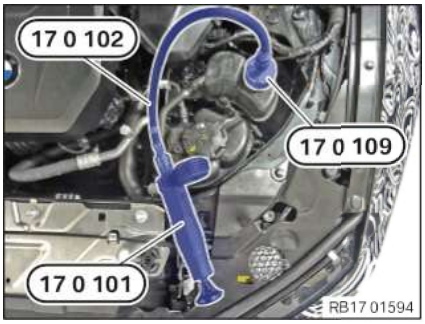
Hot surfaces.

Risk of burning!

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



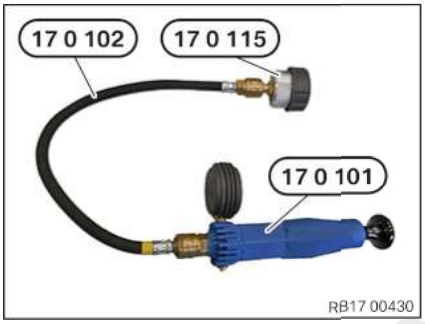
- Loosen sealing cap (1).



- Attach the special tool 0 494 418 (17 0 101) with special tools 0 494 419 (17 0 102) and 0 494 426 (17 0 109) from the set of special tools 0 494 417 (17 0 100).
- Build up excess pressure and wait for approximately 2 minutes.

Opening pressure of sealing cap / test pressure of high-temperature coolant circuit cooling system

Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure.	max. 0,1 bar
Test pressure for cooling system (gauge pressure)	1,5 bar



TECHNICAL INFORMATION

If the described test step is not completed successfully: repeat test step twice. Only replace the sealing cap after three tests with an incorrect opening pressure.

When driving at high ambient temperatures, the design may cause the pressure relief valve in the sealing cap to open slightly and air to escape together with dissolved coolant. This coolant vapour condenses on the surface of the coolant expansion tank and leaves traces of coolant when the vehicle has cooled down. These traces of coolant do not indicate whether the sealing cap is defective or not.

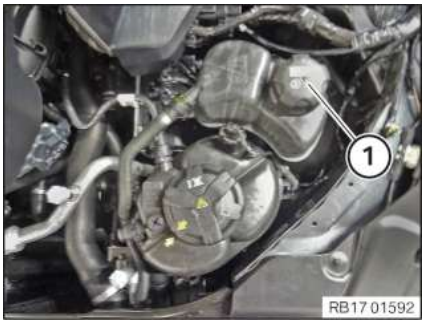
Escaping coolant vapours when the vehicle is at standstill may cause the pressure relief valve to stick to the sealing cap. This may cause an incorrect opening pressure.

- Screw on sealing cap (1) on special tool 0 495 889 (17 0 115) from the set of special tools 0 494 417 (17 0 100).
- Build up the pressure with special tools 0 494 418 (17 0 101) and 0 494 419 (17 0 102) from the set of special tools 0 494 417 (17 0 100).
- Observe on the pressure measuring device when the opening pressure has been reached.

Opening pressure of sealing cap / test pressure of high-temperature coolant circuit cooling system

Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure.	max. 0,1 bar
Test pressure for cooling system (gauge pressure)	1,5 bar

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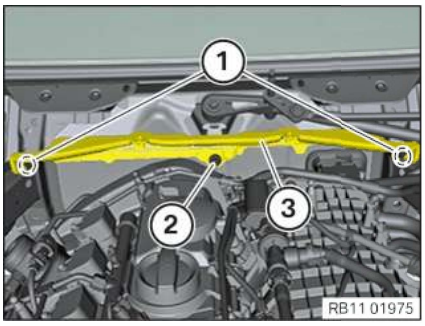


- Close sealing cap (1).

121 – Check engine oil level

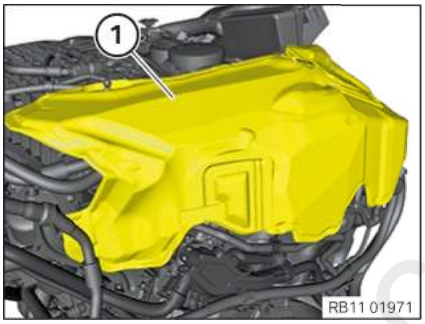
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.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

122 – Installing centre bulkhead lower section



- Position the centre bulkhead lower part (3).
- Tighten nut (2) and screws (1).

123 – Installing acoustic cover at rear

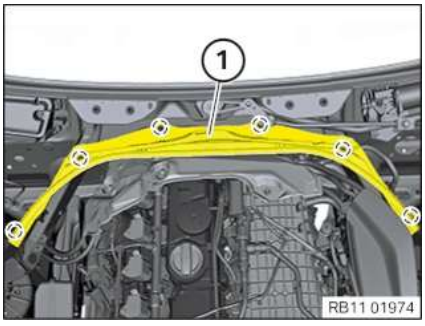


- Make sure the acoustic cover (1) is correctly positioned on the rear side of the engine.



- Install the acoustic cover (1) from the top and clip it in into the marked areas.

124 – Installing the centre bulkhead upper part

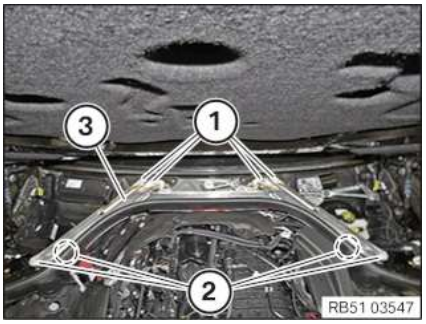


- Position the centre bulkhead upper part (1).
- Tighten the bolts in the marked areas.

Bulkhead upper part to bottom bulkhead

	Tightening torque	3 Nm

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- **If installed:** Install tension strut on spring strut dome.
- Install the tension strut (3) on the spring strut dome.
- Tighten the screws (1).

Tension strut on bulkhead

M10x25 screw		Tightening torque	56 Nm

- Renew screws (2).

  Parts: Bolts
- Tighten the screws (2).

Tension strut to spring strut dome

Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

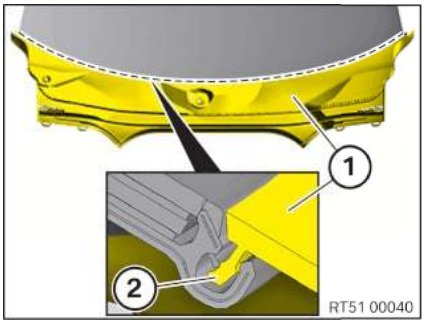
125 – Installing cowl panel cover

RISK OF DAMAGE

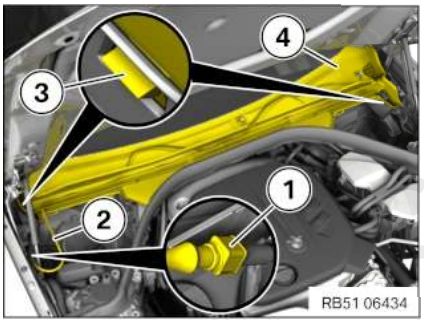
Damage caused by water ingress into the vehicle.

Water ingress into the vehicle may result in damage to components, malfunctions and corrosion.

- Ensure correct installation of the components.
- Only use undamaged components.

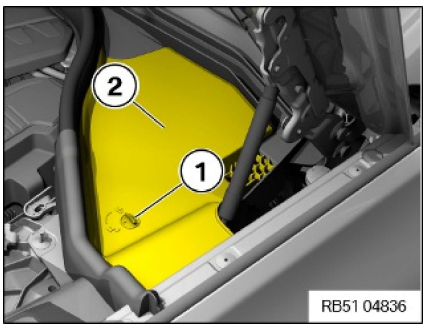


- Push the cowl panel cover (1) into the latch mechanism (2) beginning on the side.



- Clip cowl panel cover (4)in by means of the latch mechanisms (3).
- Position windscreen wash hose (2) and connect windscreen wash hose (1)quick lock.

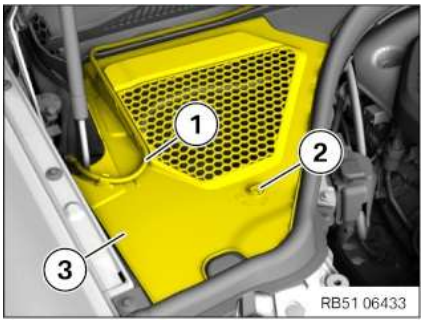
126 – Install the cover of the engine compartment on the rear left



- Position the engine compartment cover at the rear left (2) .
- Close lock (1).

127 – Install the rear right engine compartment cover

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- Position the cover of the engine compartment on the rear right (3).
- Close lock (2).
- Insert washer fluid hose (1) into the guides.

128 – Installing both wiper arms

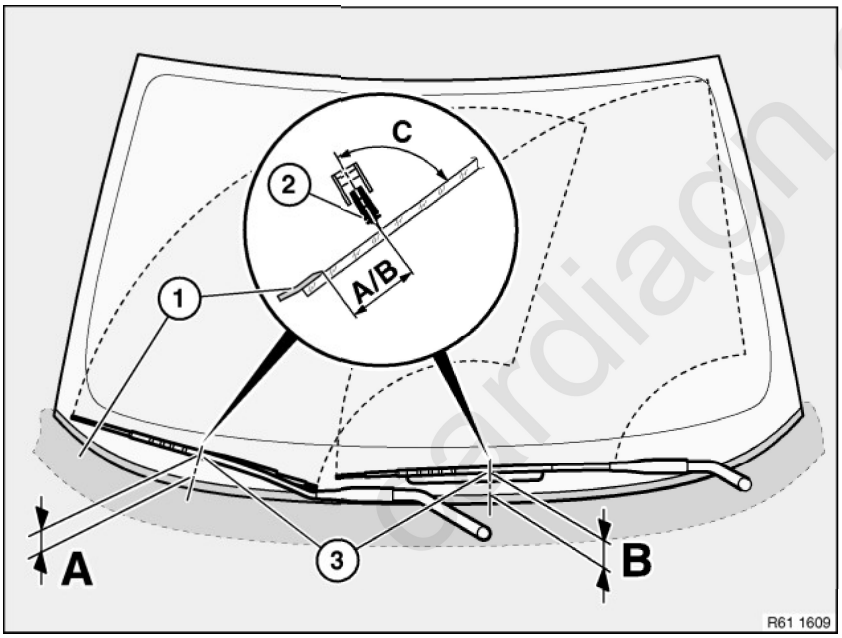
NOTICE

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

▸ **Install the wiper arm**

TECHNICAL INFORMATION

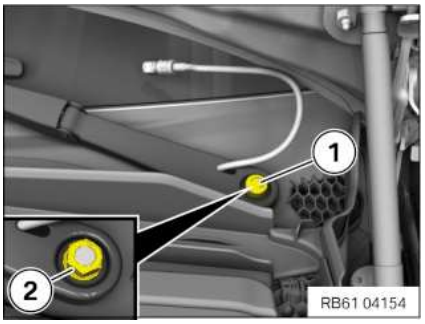
The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).

Distance from window pane edge to wiper blade

Wiper arm right (A)	57,5 ±5 mm
Wiper arm left (B)	63,3 ±4 mm

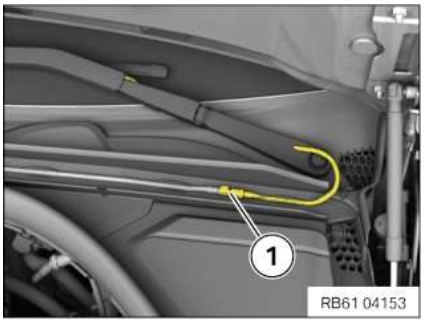


- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).



- Insert windscreen wash hose (1) into the cowl and connect at the separating point.

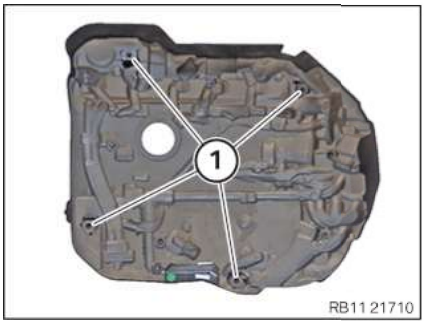
129 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

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

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



- Check the rubber mount (1) for correct fit in the acoustic cover.



- Install acoustic cover (1) and fix in the rubber mounts (marks).

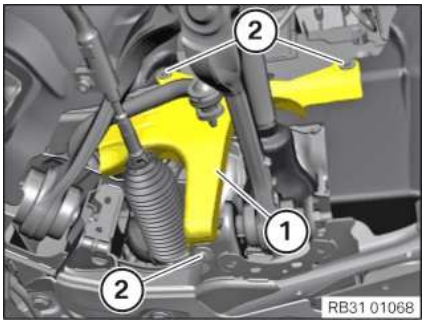
130 – Install the seal for the bonnet



- Press the rear bonnet seal (2) into the guide.
- Feed in cable (1) into the brackets.
- Check that the rear bonnet seal (2) and the cable (1) are seated correctly.

131 – Install the cover of the steering assembly

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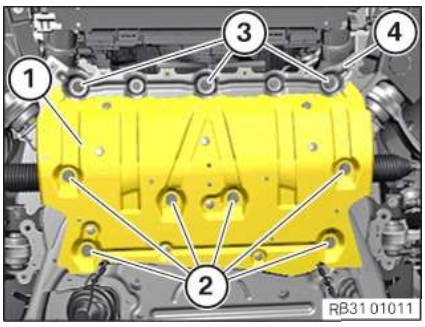


- Position the cover (1).
- Tighten the screws (2).

Cover, steering unit

Screw		Tightening torque	3 Nm

132 – Installing the stiffening plate

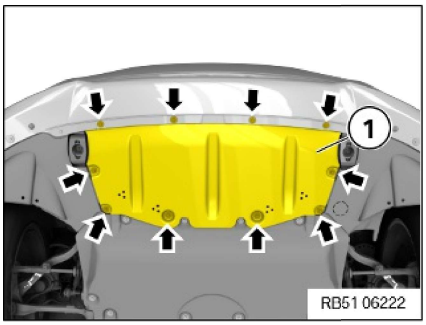


- Position stiffening plate (1).
- Screw screws (2) in.
- Position holder of underride protection (4).
- Screw screws (3) in.
- Tighten down screws (2) and (3).

Stiffening plate to front axle support

M10		Tightening torque	56 Nm

133 – Installing the front underbody protection



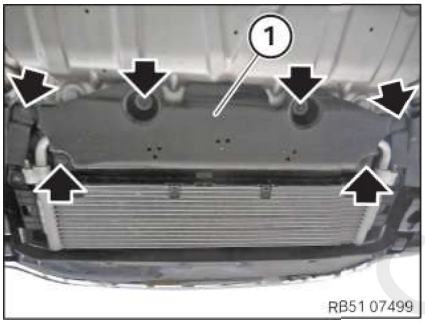
- **Version 1:**

  Feed in the front underbody protection (1) towards the front under the bumper panel and position.

  Tighten screws (arrows).

Underbody protection front

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



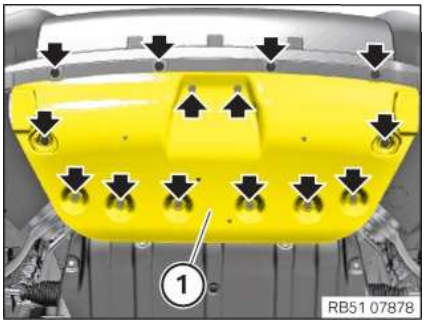
- **Version 2:**

  Feed in and position the front underbody protection (1).

  Tighten screws (arrows).

Underbody protection front

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



- **Version 3:**

  Feed in and install front underbody protection (1).

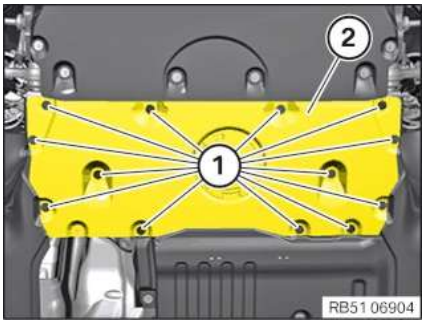
  Tighten screws (arrows).

Underbody protection front

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

134 – Installing the centre underbody protection

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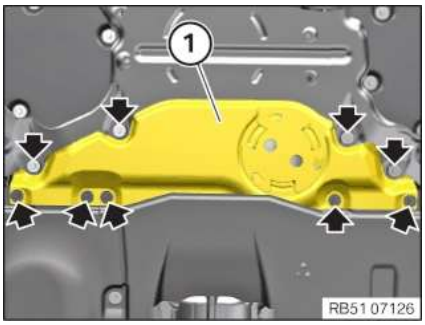
- **Version with rear-wheel drive:**

  Position central underbody protection (2).

  Tighten the screws (1).

Underbody protection

Hexagon screw		Tightening torque	3 Nm



- **Version with all-wheel drive:**

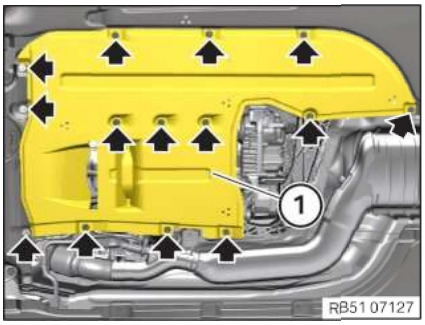
  Guide in and install the centre of underbody protection (1).

  Tighten screws (arrows).

Underbody protection

Hexagon screw		Tightening torque	3 Nm

135 – Installing underbody protection at rear



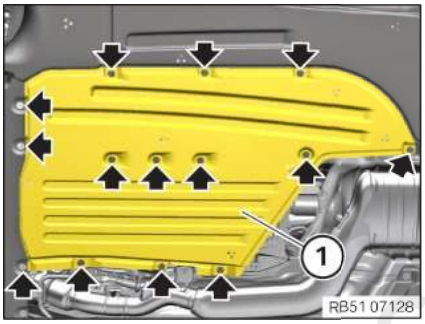
- **Version 1:**

  Insert and install the rear underbody protection (1).

  Tighten screws (arrows).

Underbody protection

Hexagon screw		Tightening torque	3 Nm



- **Version 2:**

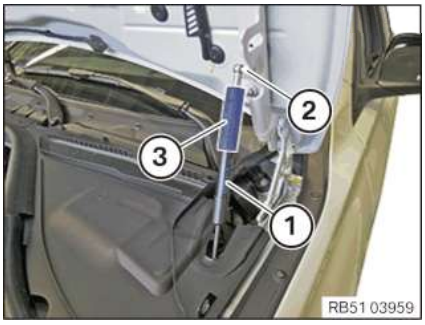
  Insert and install the rear underbody protection (1).

  Tighten screws (arrows).

Underbody protection

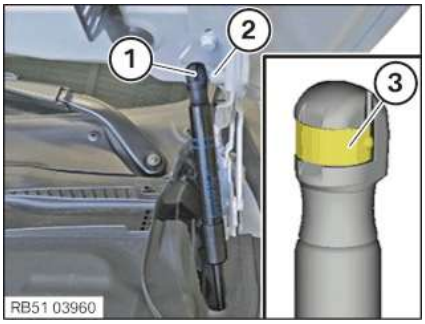
Hexagon screw		Tightening torque	3 Nm

136 – Take bonnet out of the service position



- Support the bonnet by hand.
- Remove the special tool (3) from the ball pin (2).
- Pull off the special tool (3) from the gas pressure spring (1).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.

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CAUTION

Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.

- Check the clamp (3) is fitted correctly.
- Connect ball socket (1) to ball pin (2).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.

Additional Information

Overview of Tightening Torques

Cover, front bottom on side — Used in step 4890

Hexagon screw for thermoplastic		Tightening torque	3 Nm

Basic carrier to cylinder head — Used in step 546979

M6		Tightening torque	8 Nm

Test gauge to basic carrier — Used in step 546979

M6		Tightening torque	8 Nm

Special tool to cylinder head — Used in step 63

M8		Tightening torque	21,5 Nm

Cylinder head to crankcase — Used in step 68

M11	Observe tightening sequence. Fit new cylinder head bolts.	1. Jointing torque 2. Angle of rotation 3. Angle of rotation	30 Nm 90 ° 180 °

Cylinder head bolt to timing case cover — Used in step 68

M8x40	Renew screws.	Tightening torque	19 Nm

Camshaft sensor wheel to intake camshaft — Used in step 68

M4 x35			4,5 Nm

Bearing journal to cylinder head — Used in step 68

Bearing journal	Renew the bearing journal!	Tightening torque	20 Nm

Sliding rail to cylinder head — Used in step 68

M6x16			8 Nm

Cover on rear cylinder head — Used in step 68

M6		Tightening torque	8 Nm

Cable routing to cylinder head, rear — Used in step 68

M6 x 20		Tightening torque	8 Nm

Oil feed line for exhaust turbocharger to crankcase — Used in step 68

M6 x 12	Replace sealing ring.	Tightening torque	8 Nm

Coolant return line holder bracket to crankcase — Used in step 68

M6X12		Tightening torque	8 Nm

Heat shield to cylinder head — Used in step 68

M8X12	Renew screws.	Tightening torque	19 Nm

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Heat shield to clamping strip — Used in step 68

M6X16	Renew screw.	Tightening torque	8 Nm

Coolant feed line to crankcase — Used in step 68

M6X12		Tightening torque	8 Nm

Exhaust turbocharger support to crankcase — Used in step 68

M8 x 20	Renew screws.		19 Nm

Exhaust turbocharger to support — Used in step 68

M8 x 25	Renew screw.		19 Nm

VANOS central valve to camshaft — Used in step 7576

M20 x 1.5		1. Jointing torque	10 Nm
		2. Jointing torque	30 Nm
		3. Jointing torque	50 Nm
		4. Angle of rotation	35 °

Chain tensioner to cylinder head — Used in step 78

Chain tensioner		Tightening torque	20 Nm
		Angle of rotation	40 °

Intake plenum to cylinder head — Used in step 80

M6		Tightening torque	10 Nm

Intake plenum to support — Used in step 80

M6X25		Tightening torque	8 Nm

Tank ventilation line to intake plenum — Used in step 80

Oval-head screw		Tightening torque	3 Nm

Charge air line to throttle valve — Used in step 80102

M6x30		Tightening torque	8 Nm

Control unit holder on spring strut dome — Used in step 82

Hexagon screw		Tightening torque	8 Nm

Coolant line to coolant pump/cylinder head — Used in step 85

M6x20		Tightening torque	8 Nm

Oil return line to turbocharger — Used in step 86

M6 x 12			8 Nm

Oil return line to crankcase — Used in step 86

M6 x 12			8 Nm

Catalytic converter to turbocharger — Used in step 87

V-band clamp	Replace V-band clamp.	Tightening torque	19 Nm

Catalytic converter to holder — Used in step 87

M8 nut	Renew nut.	Tightening torque	28 Nm

Rear silencer to body / bumper support — Used in step 88

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust system to rear axle carrier — Used in step 88

Nut M8	Renew nut.	Tightening torque	19 Nm

Front pipe / petrol particulate filter on transmission holder — Used in step 88

M8	Renew nut.	Tightening torque	19 Nm

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Exhaust system to catalytic converter			Used in step 88
Ribbon cable clamp	Renew flat band clip.	Tightening torque	26 Nm

V-clip to catalytic converter			Used in step 88
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Connecting support to tunnel			Used in step 89
M8x25 screw		Tightening torque	20 Nm
Screw		Tightening torque	3 Nm

Engine oil cooler to bumper support			Used in step 90
M6X25		Tightening torque	8 Nm

Cylinder head cover to cylinder head			Used in step 91
M6X30		Jointing torque	8 Nm

Cylinder head cover to cylinder head			Used in step 91
M6X30		Tightening torque	11 Nm

Auxiliary coolant pump holder to cylinder head			Used in step 91
M6		Tightening torque	7 Nm

Standard screw connection M6			Used in step 91
M6			8 Nm

Differential pressure sensor to holder			Used in step 91
TS6X18		Tightening torque	3,5 Nm

Holder, positive battery cable to cylinder head cover			Used in step 91
6X18		Tightening torque	6 Nm

High pressure pump to high pressure pump flange			Used in step 93
M6x25	*Renew screws.*	Jointing torque	12 Nm
		Tightening torque	90 °

Ground cable to rail			Used in step 9596
M6			5 Nm

High pressure line between rail and high pressure pump			Used in step 97
M14x1,5		Tightening torque	33 Nm

Fuel delivery line to high pressure pump			Used in step 98
M14		Tightening torque	31 Nm

Fuel line to cylinder head cover			Used in step 98
6x18		Tightening torque	6,5 Nm

Spark plugs			Used in step 99
M12x1.25		Tightening torque	23 Nm

Ignition coil			Used in step 100
Screw		Tightening torque	8 Nm

Engine ventilation line adapter with heating element to exhaust turbocharger			Used in step 101
M6x26 screw		Tightening torque	8 Nm

Electric coolant pump to holder			Used in step 102
M6		Tightening torque	8 Nm

Fan cowl with electric fan on radiator			Used in step 105
TS6x20		Tightening torque	6,5 Nm

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Top rear cross connection to bonnet catch support			Used in step 106
Flat-head screw M6x20		Tightening torque	11,8 Nm

Rear top cross connection to wheel arch carrier support			Used in step 106
M10x20 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Cross connection, top			Used in step 107
M8x20		Tightening torque	28 Nm

Cross connection, top			Used in step 107
M6x20		Tightening torque	11,8 Nm

Monitoring oxygen sensor to catalytic converter			Used in step 111
M18X1.5		Tightening torque	50 Nm

Front oxygen sensor to catalytic converter			Used in step 112
M18X1.5		Tightening torque	50 Nm

Clean air pipe to upper section of intake filter housing			Used in step 113
Clamp		Tightening torque	3 Nm

Bulkhead upper part to bottom bulkhead			Used in step 124
		Tightening torque	3 Nm

Tension strut on bulkhead			Used in step 124
M10x25 screw		Tightening torque	56 Nm

Tension strut to spring strut dome			Used in step 124
Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

Windscreen wiper arm			Used in step 128
Combination hexagon nut		Tightening torque	35 Nm

Cover, steering unit			Used in step 131
Screw		Tightening torque	3 Nm

Stiffening plate to front axle support			Used in step 132
M10		Tightening torque	56 Nm

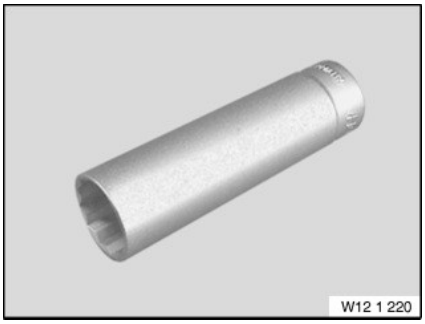
Underbody protection front			Used in step 133
Hexagon screw for thermoplastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Underbody protection			Used in step 134135
Hexagon screw		Tightening torque	3 Nm

Overview of Special Tools

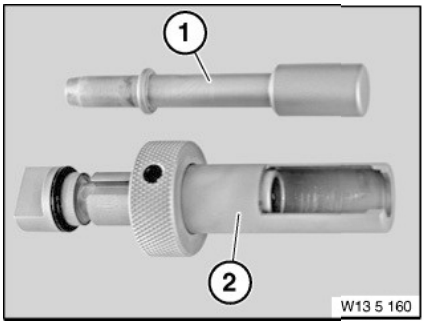
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0 495 560 (12 1 220) Socket



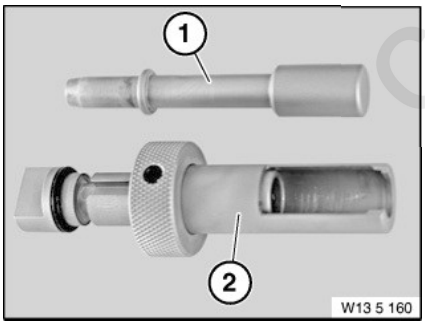
Common	Used in step 2699
Usage	For removing and installing the spark plugs (WAF 14 bihexal).
Included in the tool or work	
Storage location	C18
Replaced by	
In connection with	
SI-Number	01 20 06 (299)

0 496 567 (13 5 161) Fastener



Common	Used in step 28
Usage	(Cap (2 piece)) For sealing the quick connectors Deletion, only available via tool set
Included in the tool or work	0 496 565
Storage location	
Replaced by	
In connection with	
SI-Number	

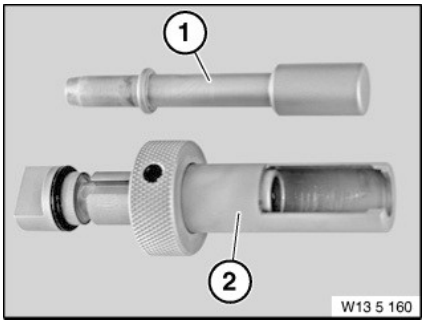
0 496 568 (13 5 162) Fastener



Common	Used in step 28
Usage	(Cap (2 x)) To close off the fuel lines. Discontinued, can only be ordered using complete tool
Included in the tool or work	0 496 565
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 496 565 (13 5 160) Fastener

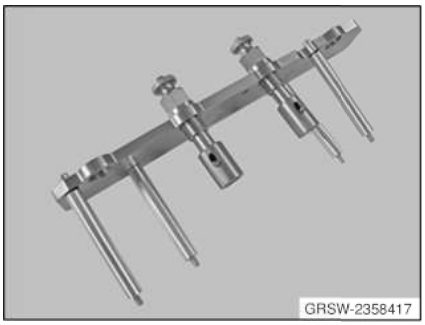


Common	Used in step 28
Usage	(Caps (2x)) To close off the fuel lines when removing and installing the engine.
Included in the tool or work	
Storage location	B26
Replaced by	
In connection with	
SI-Number	01 22 08 (498)

Consisting of

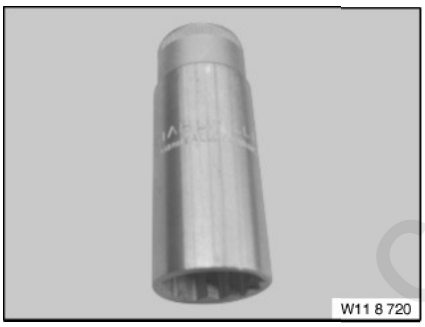
Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 567 (13 5 161)		**Fastener** (Cap (2 piece)) For sealing the quick connectors Deletion, only available via tool set	
2	0 496 568 (13 5 162)		**Fastener** (Cap (2 x)) To close off the fuel lines. Discontinued, can only be ordered using complete tool	

2 358 417 Device



Common	Used in step 3031
Usage	For removing and installing injectors. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A57
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

0 496 106 (11 8 720) Socket WAF 46



Common	Used in step 3031
Usage	(Long socket SW24) For removal and installation of oil pressure sensor. (Stahlwille or HAZET)
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 04 07 (352)

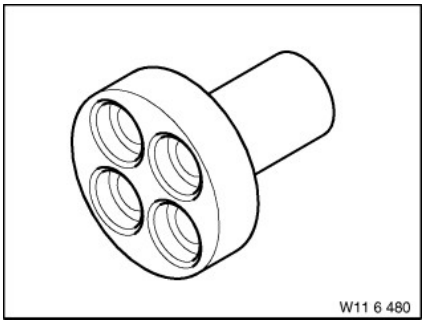
2 360 895 Pin wrench



Common	Used in step 3292
Usage	For removal and installation of the magnetic actuator. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

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0 493 380 (11 6 480) Connector



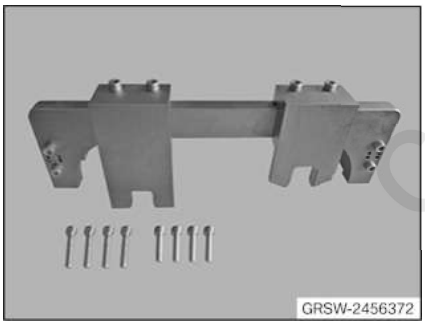
Common	Used in step 54777993
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud



Common	Used in step 547779
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

2 456 372 Gauge



Common	Used in step 5462697779
Usage	For securing camshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B57
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 358 122 Gauge



Common	Used in step 546279
Usage	For securing camshaft at TDC. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A57
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

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0 496 855 Ratchet handle



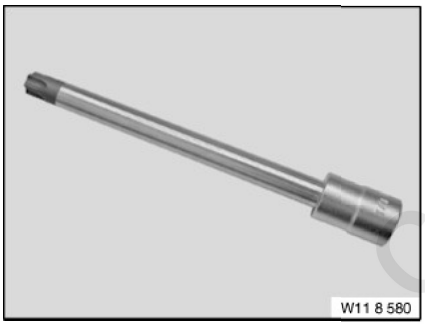
Common	Used in step 56577576
Usage	Insert reversible ratchet with nut for installation and disassembly of the VANOS- SW22. (only in longitudinal installation). Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A55
Replaced by	
In connection with	
SI-Number	01 34 15 (306)

2 450 487 Socket



Common	Used in step 56577576
Usage	For removing and installing the VANOS adjuster. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B55
Replaced by	
In connection with	0496855
SI-Number	01 07 17 (487)

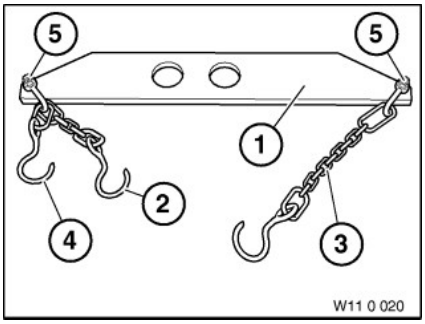
0 495 747 (11 8 580) Socket wrench



Common	Used in step 6368
Usage	(wrench socket Torx T60) For removing and installing cylinder head (outside diameter 13.5 mm).
Included in the tool or work	
Storage location	A19
Replaced by	
In connection with	
SI-Number	01 20 06 (299)

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0 490 567 (11 0 020) Lifting gear



Common Used in step 6368

Usage	For removing and installing the engines. 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
5	0 490 572 (11 0 029)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 568 (11 0 021)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 569 (11 0 022)		**Chain** (Chain) As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 570 (11 0 023)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
4	0 490 571 (11 0 024)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	

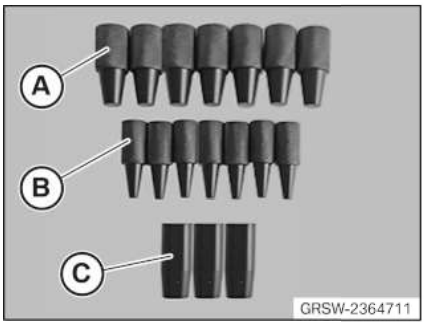
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2 220 718 Workshop crane



Common	Used in step 63
Usage	WSK 1000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	06 01 11 (701)

2 364 711 Plug



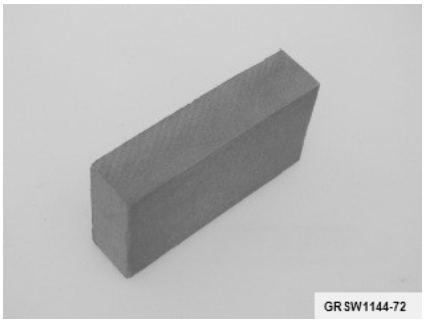
Common	Used in step 6566
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper



Common	Used in step 66
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

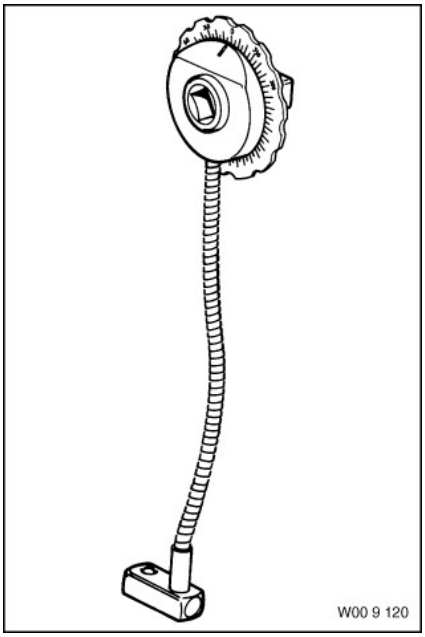
0 495 104 (11 4 472) Extractor



Common	Used in step 66
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

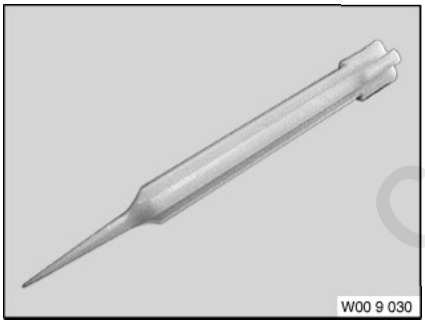
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0 490 504 (00 9 120) Torque angle measuring dial



Common	Used in step 68
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 496 714 (00 9 030) Wedge



Common	Used in step 68101102
Usage	For dismantling O-rings, gaskets and trim panels. This special tool replaces special tool 00 9 316.
Included in the tool or work	
Storage location	A50
Replaced by	
In connection with	
SI-Number	01 20 09 (581)

2 455 654 Tensioning tool



Common	Used in step 7477
Usage	To pretension the timing chain when adjusting the timings. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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2 452 959 Pliers



Common	Used in step 94
Usage	For disassembly of the PTFE sealing rings on the injector HDEV5 & HDEV6. Replaces 0495757 (SWZ number 13 0 191). Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A5
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 448 401 Fitting aid



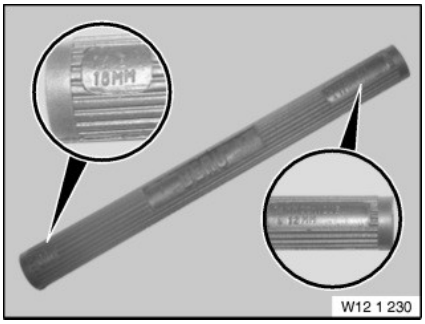
Common	Used in step 94
Usage	For installation of PTFE rings on injector. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C55
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 358 022 Gauge



Common	Used in step 9596
Usage	To position the injector during installation. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

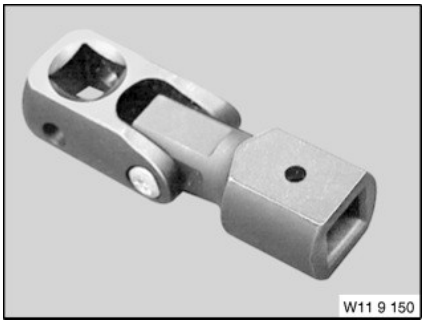
0 496 065 (12 1 230) Fitting aid



Common	Used in step 99
Usage	Fitting aid for spark plug installation. Original BERU ZMH 001 rubber hose 0 890 00 001.
Included in the tool or work	
Storage location	individual
Replaced by	
In connection with	
SI-Number	01 04 07 (352)

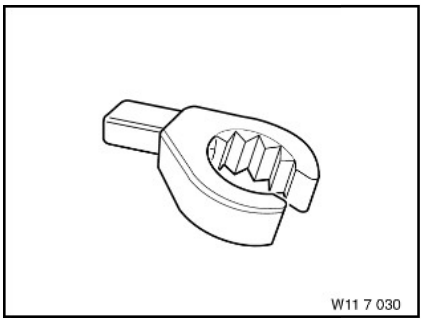
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0 493 751 (11 9 150) Extension



Common	Used in step 111
Usage	(Socket wrench extension) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	C41
Replaced by	
In connection with	
SI-Number	01 15 00 (609)

0 491 075 (11 7 030) Socket wrench insert

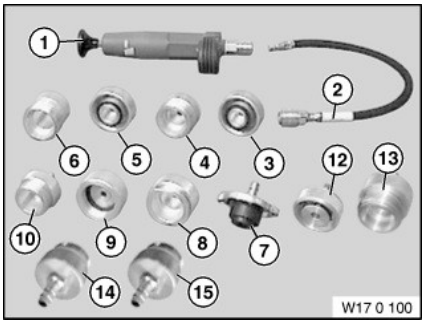


Common	Used in step 111
Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 95 (963)

0 494 417 (17 0 100) Tester

Used in step 114115119120

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Common

Usage	For checking engine cooling system on watertightness. For checking radiator cap.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 02 (884)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
5	0 494 422 (17 0 105)		**Adapter** For radiator cap (sawtooth thread)	
10	0 494 427 (17 0 111)		**Adapter** For radiator cap R53/W11, R50/W17 adapter replaced 17 0 052.	
1	0 494 418 (17 0 101)		**Pump**	
2	0 494 419 (17 0 102)		**Hose** (hose with quick-release coupling)	
3	0 494 420 (17 0 103)		**Adapter** For radiator cap (normal thread)	
4	0 494 421 (17 0 104)		**Adapter** For radiator cap (normal thread)	
6	0 494 423 (17 0 106)		**Adapter** For radiator cap (sawtooth thread)	
7	0 494 424 (17 0 107)		**Adapter** For radiator cap R50 / W10	
8	0 494 425 (17 0 108)		**Adapter** For radiator cap R50 / W10	
9	0 494 426 (17 0 109)		**Adapter** For radiator connection R53/W11, R50/W17 adapter corresponds to 17 0 051	
11	0 494 428 (17 0 112)		**Case**	
12	0 494 642 (17 0 113)		**Adapter** For radiator cap Model series: E60, E61, E63, E64 SI no.: 1 08 03 (988)	
13	0 494 643 (17 0 114)		**Adapter** For radiator cap Model series: E60, E61, E63, E64 SI no.: 1 08 03 (988)	
14	0 495 889 (17 0 115)		**Adapter** For radiator cap Model series: N12, N14	

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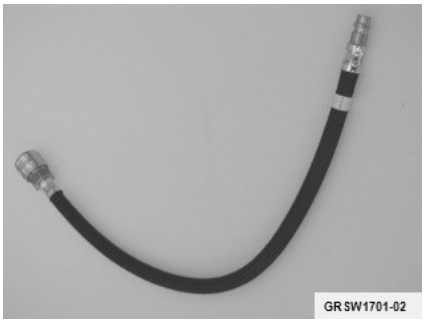
0 494 418 (17 0 101) Pump



Common Used in step 119120

Usage	
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 419 (17 0 102) Hose



Common	Used in step 119120
Usage	(hose with quick-release coupling)
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 642 (17 0 113) Adapter



Common	Used in step 119
Usage	For radiator cap Model series: E60, E61, E63, E64 SI no.: 1 08 03 (988)
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 643 (17 0 114) Adapter



Common	Used in step 119
Usage	For radiator cap Model series: E60, E61, E63, E64 SI no.: 1 08 03 (988)
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

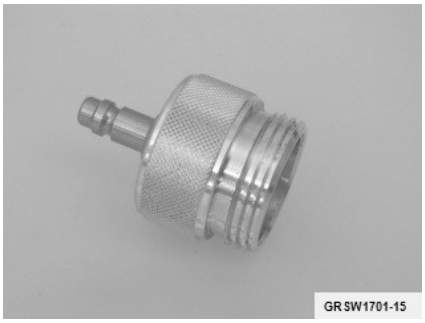
0 494 426 (17 0 109) Adapter



Common	Used in step 120
Usage	For radiator connection R53/W11, R50/W17 adapter corresponds to 17 0 051
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 889 (17 0 115) Adapter



Common		Used in step 120
Usage	For radiator cap Model series: N12, N14	
Included in the tool or work	0 494 417	
Storage location		
Replaced by		
In connection with		
SI-Number	01 26 06 (321)	

Overview Technical Data

Opening pressure of sealing cap / test pressure of high-temperature coolant circuit cooling system	Used in step 119120
Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure.	max. 0,1 bar
Test pressure for cooling system (gauge pressure)	1,5 bar

Distance from window pane edge to wiper blade	Used in step 128
Wiper arm right (A)	57,5 ±5 mm
Wiper arm left (B)	63,3 ±4 mm

Capacity of high-temperature coolant circuit G20/G29	Used in step 114
B58B30O1	10,5 l
Expendable materials: Technically suitable antifreeze and corrosion inhibitor	

Capacity of low-temperature coolant circuit G20/G29	Used in step 115
B58B30O1	4,5 l
Expendable materials: Technically suitable antifreeze and corrosion inhibitor	

Links

General repair instructions	Used in step
12 00 ... Instructions for removal and replacement of control units	3583
11 00 ... Overview of consumables (Electronic Parts Catalogue)	111112

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1116
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1116
61 20 900 Disconnecting and connecting battery earth lead	1116

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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1116
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
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61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 20 900 Disconnecting and connecting battery earth lead	1116
61 35 ... Notes on ESD protection (Electro Static Discharge)	22253234355284
13 53 ... Clean the cylinder heads in the area of injectors to prevent sand/dust contamination.	3031
61 35 ... Notes on ESD protection (Electro Static Discharge)	32
61 00 730 Encode/program control unit(s) (after vehicle test)	83
17 11 035 Removing and installing/replacing fan cowl with electric fan	93
17 00 ... Notes for working on cooling system.	114115

Operating materials	**Used in step**
Main group 17	114115

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11 12 001 Replace the cylinder head cover

WARNING

Hot surfaces.

Risk of burning!

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

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

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

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Damage to battery terminal, the safety battery terminal or the intelligent battery sensor (IBS).

Damaged battery terminals can lead to malfunctions or vehicle electrical system faults.

- Pull off battery terminal from battery pole by carefully moving to and fro. Do not pry off using a tool.

TECHNICAL INFORMATION

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

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

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- See additional information.

2 – Bring front compartment lid in the service position

Prerequisite

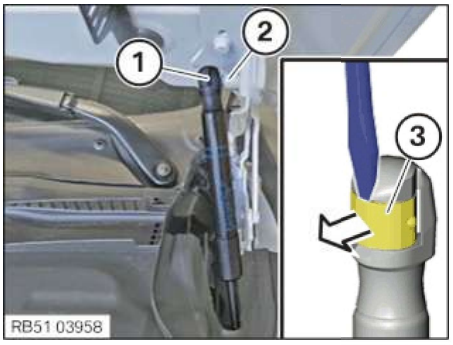
Engine compartment lid is open.

CAUTION

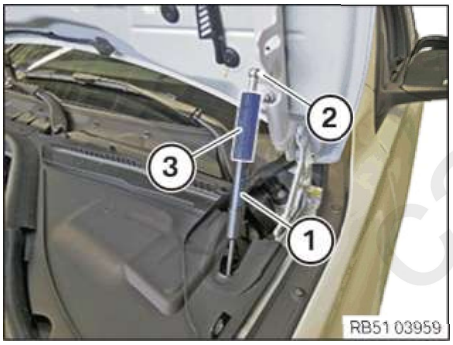
Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.



- Lift clamp (3) slightly using a screwdriver, in the direction of the arrow.
- Lift off ball socket (1) from ball pin (2).
- Repeat the operation on the other side of vehicle.



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Remove the bonnet support and open the bonnet further.
- Push special tool or (3) over gas pressure spring (1).
- Place special tool on the ball pin (2) and engage using force.
- Repeat the operation on the other side of vehicle.

3 – Remove the seal for the rear bonnet



- Feed the cable (1) out of the brackets toward the front.
- Remove the rear bonnet seal (2) from the guide toward the inside.

4 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

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

RISK OF DAMAGE

Damage to the acoustic cover.

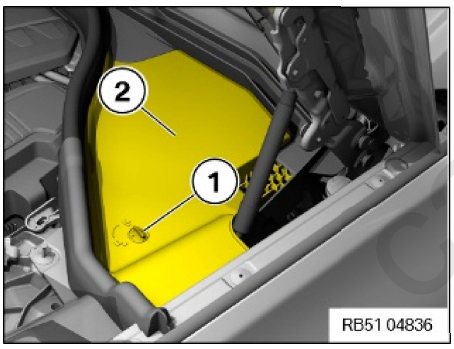
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

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



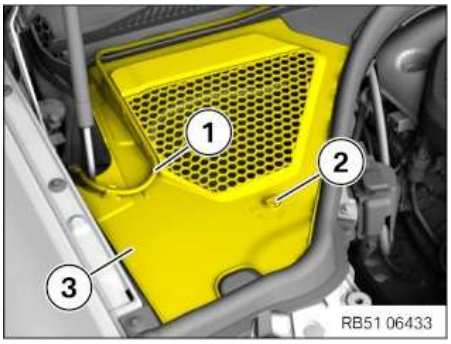
- Release the acoustic cover (1) towards the top from the rubber mounts (marks).

5 – Remove the cover of the engine compartment at the rear left



- Loosen the lock (1).
- Remove rear left cover of engine compartment (2).

6 – Remove the cover of the rear right engine compartment



- Release washer fluid hose (1) from the guides.
- Loosen the lock (2).
- Remove the cover of rear right engine compartment (3).

7 – Removing both wiper arms

NOTICE

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

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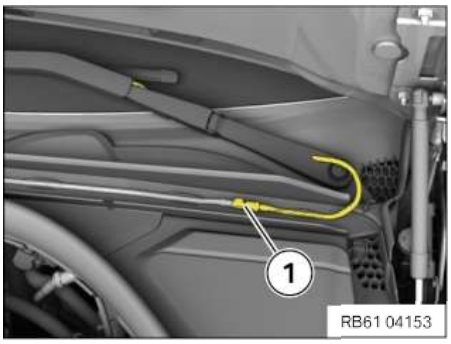
▸ **Remove the wiper arm**

RISK OF DAMAGE

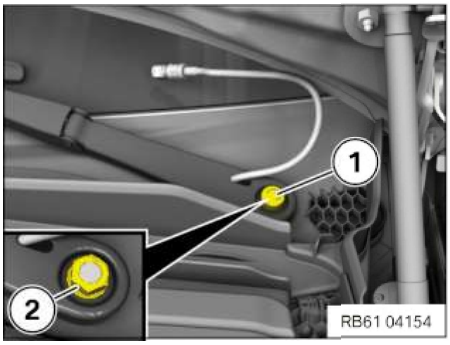
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

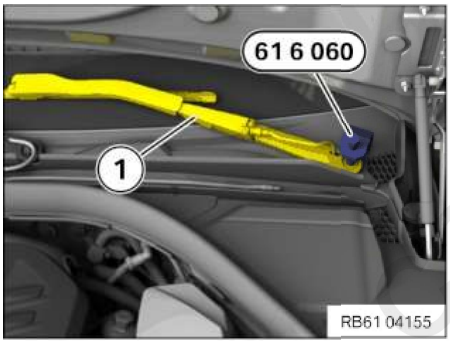
- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Disconnect the windscreen wash hose(1) at the separation point and remove from the cowl guide.

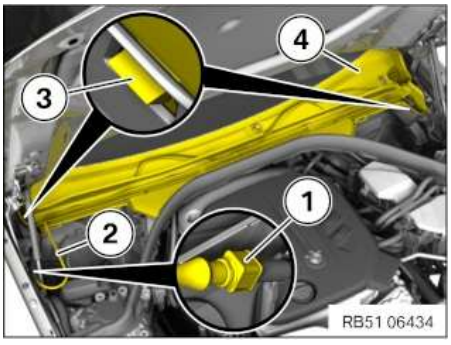


- Remove the protective cap (1).
- Loosen nut (2).



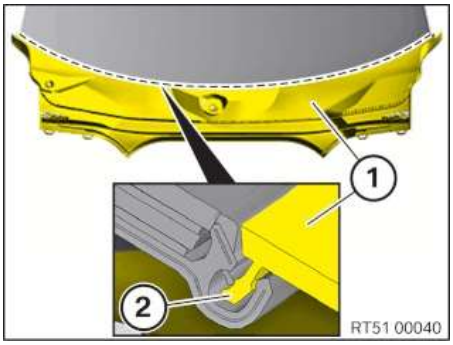
- Pull off the wiper arm (1) using special tool .

8 – Remove cowl panel cover



- Release snap fastener of the washer fluid hose (1) and put the washer fluid hose(2) to one side.
- Unclip clips (3) on the cowl panel cover (4).

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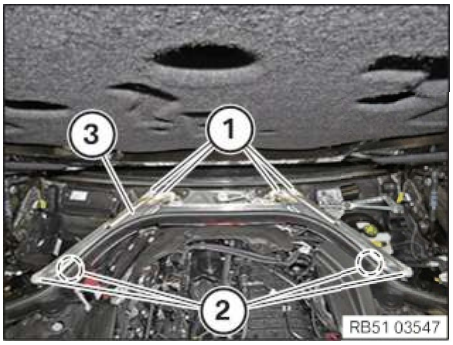


- Pull the cowl panel cover (1) upward out of the latch mechanism (2) beginning on the side.

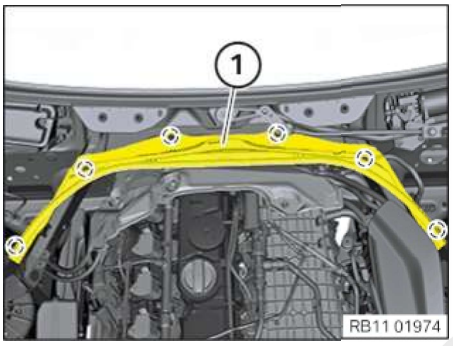
9 – Removing the centre bulkhead upper part

TECHNICAL INFORMATION

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



- **If installed:** Remove tension strut on spring strut dome.
- Loosen screws (1) and (2).
- Remove tension strut (3) in the spring strut dome upwards.



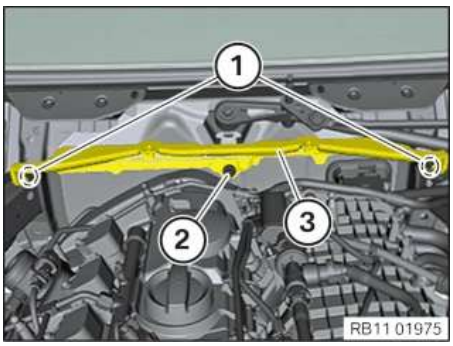
- Unscrew the bolts in the marked areas.
- Remove the centre bulkhead upper part (1).

10 – Removing acoustic cover at rear



- Unclip the acoustic cover (1) in the marked areas and remove it to the top.

11 – Removing the centre bulkhead lower section



- Loosen screws (1).
- Loosen nut (2).
- Remove the centre bulkhead lower part (3).

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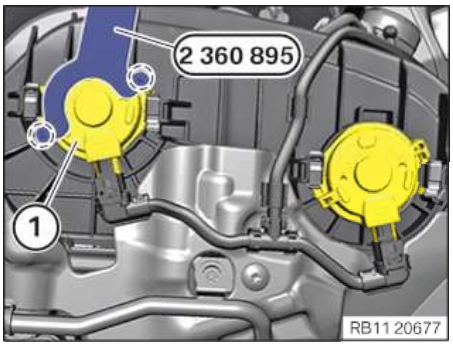
12 – Removing both actuators

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

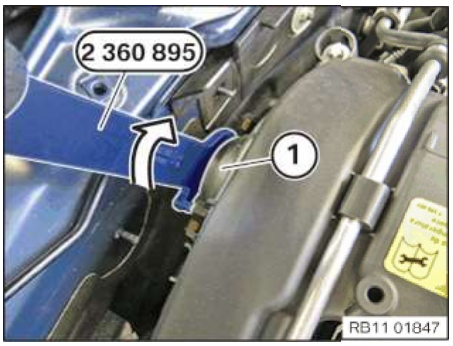
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the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



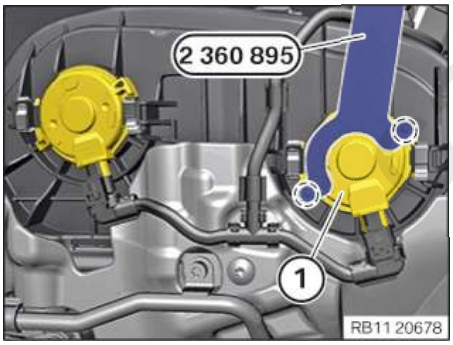
NOTICE

The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the intake side.



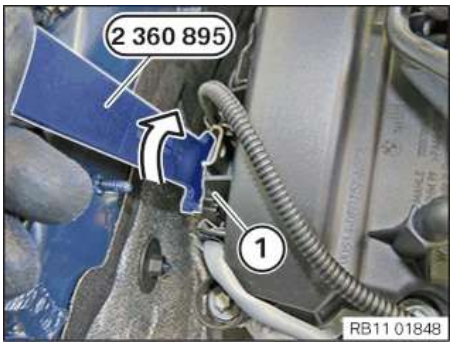
- Turn the actuator (1) on the intake side with the special tool 2 360 895 by about 50° in the direction of arrow and release it.



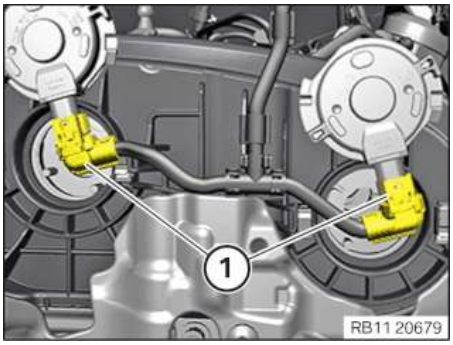
NOTICE

The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the exhaust side.



- Turn the actuator (1) on the exhaust side with the special tool 2 360 895 by about 50° in the direction of arrow and release it.

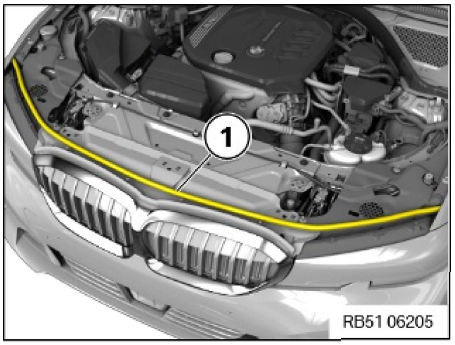


NOTICE

The figure shows the rear side of the engine.

- Unlock and disconnect both connectors (1).
- Feed out and remove both actuators.

13 – Remove the seal for the bonnet in front



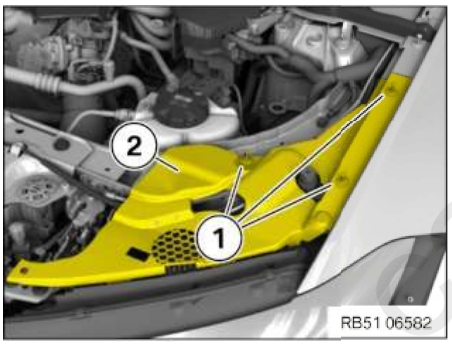
- Pull off front bonnet seal (1) upwards.

14 – Partially remove the top left and right cover in the engine compartment

NOTICE

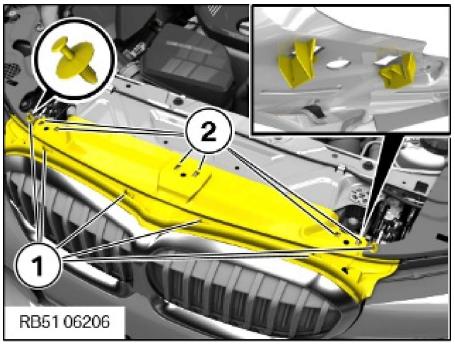
Description is for left component only. Procedure on the right side is identical.

▸ **Removing the cover in the engine compartment on top partially**



- Loosen the expanding rivet (1).
- Remove the cover in the engine compartment on top (2) partially.

15 – Removing the centre engine compartment cover

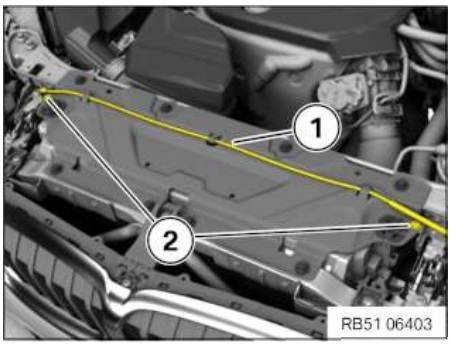


- Detach all expanding rivets (1).
- Release the cover of the centre engine compartment with the latch mechanisms (2) .
- Feed the cover for the centre engine compartment out to the rear.

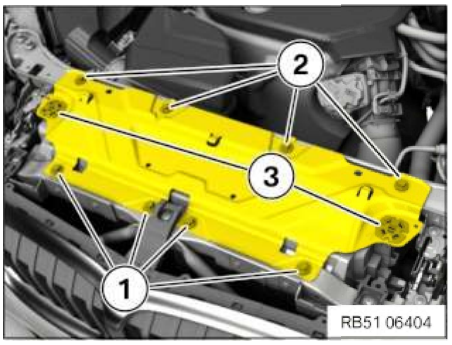
16 – Removing the top cross connection



- Release the housing for the coupling of the Bowden cables (1) from the body.

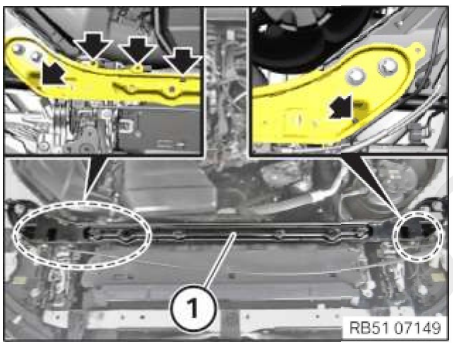


- Detach Bowden cable (1) at the top cross connection.
- Loosen screws (2).

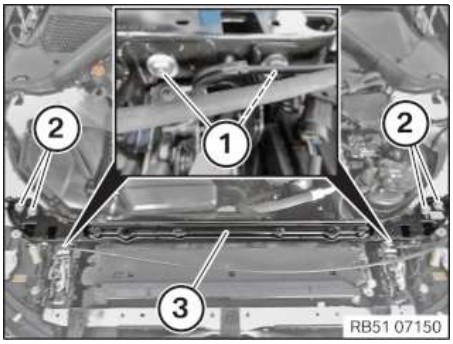


- Loosen screws (1) and (2).
- Remove the top cross connection with the holders(3) towards the top.

17 – Remove the rear top cross connection



- Release the clips (arrows) in the marked areas from the top rear cross connection (1).



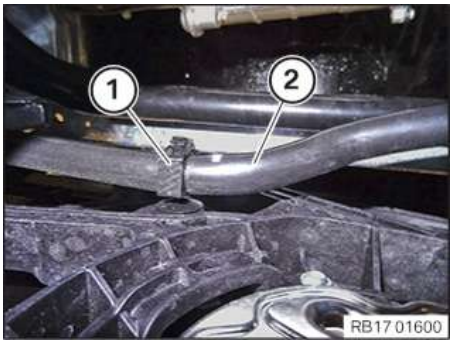
- Loosen screws (1).
- Loosen screws (2).
- Guide out and remove top rear cross connection (3).

18 – Remove fan cowl.

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TECHNICAL INFORMATION

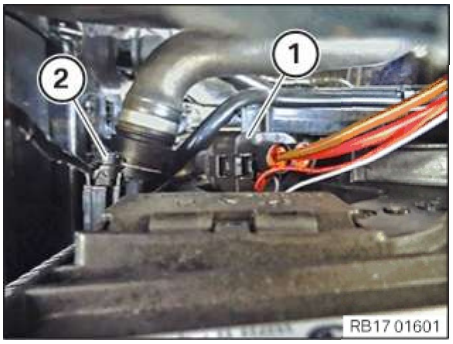
- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!



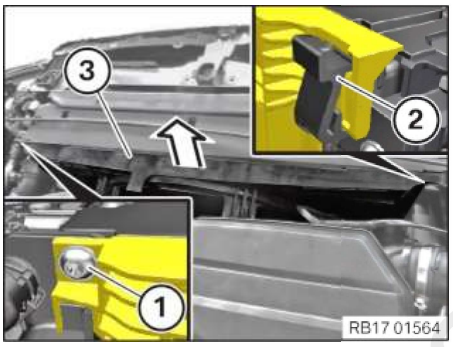
- **If installed:** Release transmission oil line (2).

  Unlock the holder (1).

  Thread out transmission oil line (2) and set aside.



- Unlock plug connection (1) and disconnect.
- Unlock plug connection (2) and disconnect.



- Loosen screw (1).
- Unlock lock (2).
- Guide out and remove fan cowl (3) **carefully** in the direction of the arrow.

19 – Remove all ignition coils.

NOTICE

The description is for one component only. The procedure is identical for all further components.

▸ **Removing the ignition coil**

WARNING

Hot surfaces.

Risk of burning!

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

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RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

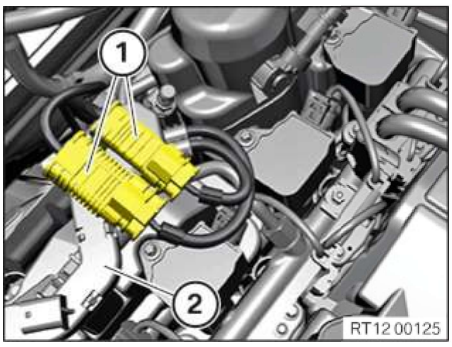
- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

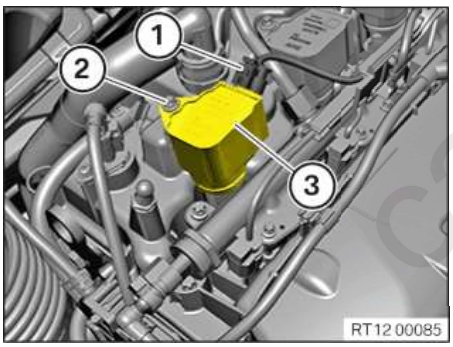
Electrostatic discharge.

Damage to or destruction of electrical components.

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



- Disconnect the connector (1) of the front oxygen sensor and the monitoring oxygen sensor from the cable channel (2) and set aside.



- Unlock plug connection (1) and disconnect.
- Loosen screw (2).
- Remove ignition coil (3).

20 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

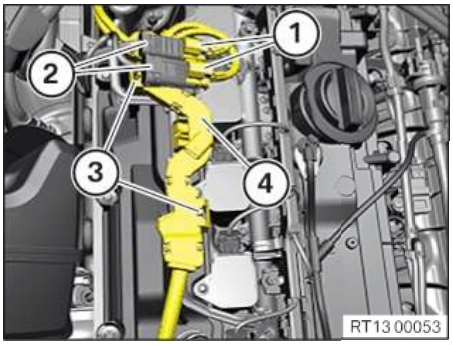
On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

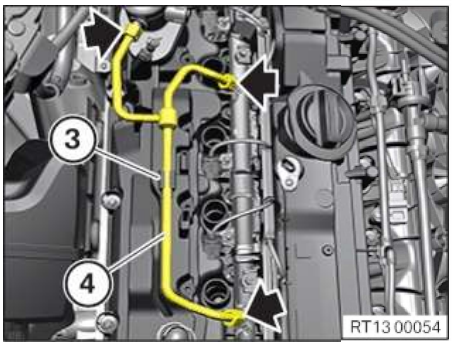
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

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



- Unlock and disconnect the plug connections (1) and (2).
- Unlock the locks (3).
- Guide out the wiring harness section of the engine wiring harness (4) and set it aside.



- Position a lint-free rag under the union nuts.
- Unscrew union nuts (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Thread out the high pressure line (4) from the bracket (3) and remove it.
- Feed out and dispose of the lint-free cleaning clothes .

21 – Remove fuel delivery line

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

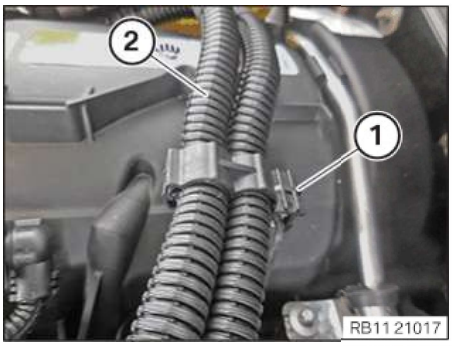
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

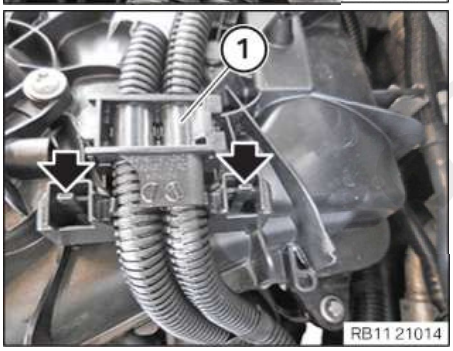
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

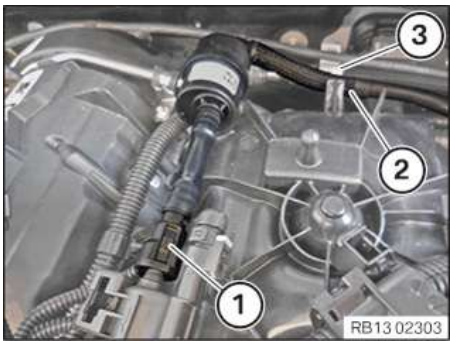
Reset special tool in early to avoid bending pressure lines.



- Loosen clamp (1).
- Guide out wiring harness section (2) for the injectors and ignition coils and place it aside.

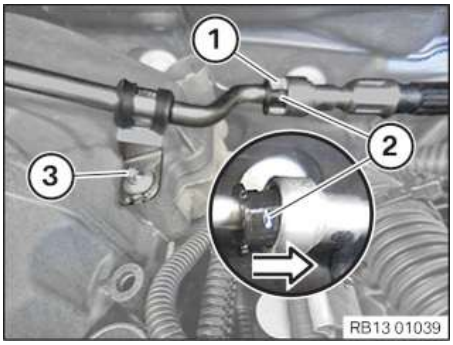


- Unlock the locks (arrows).
- Guide out wiring harness section (1) for the injectors and ignition coils and place it aside.

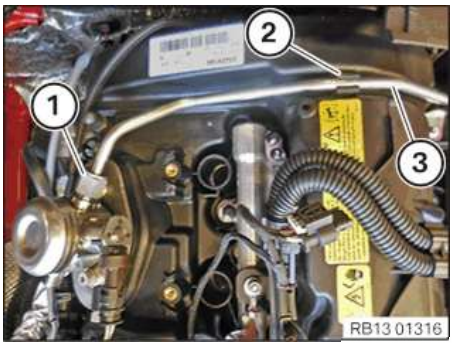


- Unlock and loosen lock (1).
- Guide tank ventilation line (2) out of clamp (3) and place it aside.

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- Unlock and loosen clamp (1).
- Unlock and remove the snap fastener (2) in the direction of the arrow.
- Catch and dispose of escaping fuel.
- Seal the fuel lines with special tools 0 496 567 (13 5 161) and 0 496 568 (13 5 162) from the set of special tools 0 496 565 (13 5 160).
- Loosen screw (3).



- Slacken the union nut (1) on the high pressure pump.
- Catch and dispose of escaping fuel.
- Seal all openings with the special tool .
- Guide the fuel feed line (3) out and remove.
- Make sure that the rubber damper (2) is not lost.

22 – Remove high pressure pump

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

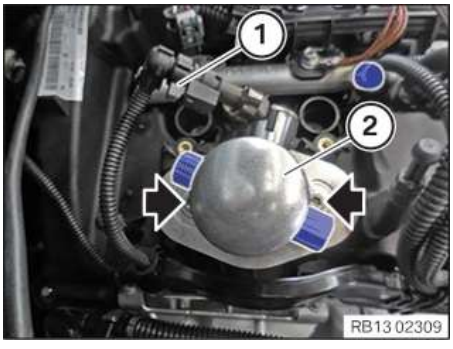
TECHNICAL INFORMATION

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

TECHNICAL INFORMATION

The high pressure pump can be pre-tensioned by camshaft cams. If when loosening the screws, the high pressure pump is forced out, the engine will have to be turned to bring the camshafts to a different position.

Before installing the high pressure pump, the cam of the high pressure pump drive must be turned to BDC. To do this, twist the engine if necessary in the direction of engine rotation to the central bolt of the crankshaft. Otherwise, it will not be possible to install the high-pressure pump.



- Unlock plug connection (1) and disconnect.
- Unscrew the bolts (arrows) **in alternating order**.
- Have a rag ready and catch any engine oil that may emerge.
- Feed out high pressure pump (2) and remove.

23 – Removing rail with injectors of cylinders 1 to 3

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

Damage to the injector tips and Teflon ring.

Improper handling of the injector tips and Teflon ring can lead to malfunctioning of the injector.

- Avoid mechanical contact with injector tip.
- When exchanging Teflon ring, hands and work surface must be clean and free of oil. Do not use any lubricating agents.
- Do not use fingernails to slide Teflon ring on.

RISK OF DAMAGE

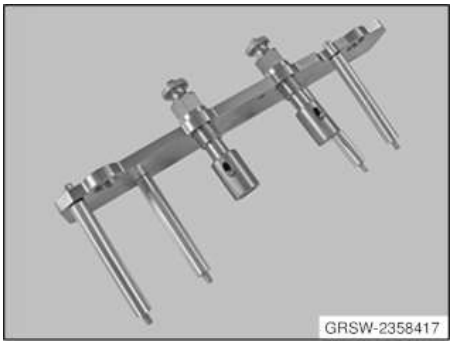
Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

- Twist the injectors with a maximum torsional movement of 13 Nm.



- Prepare special tool .

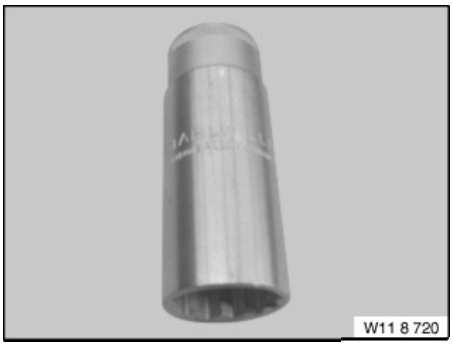


- Prepare special tool 2 358 417.

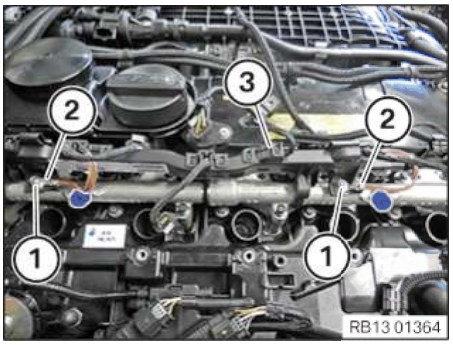
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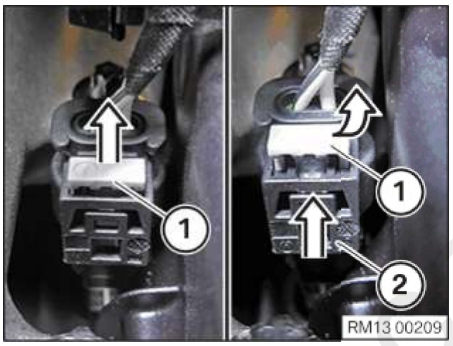
- Prepare special tool .



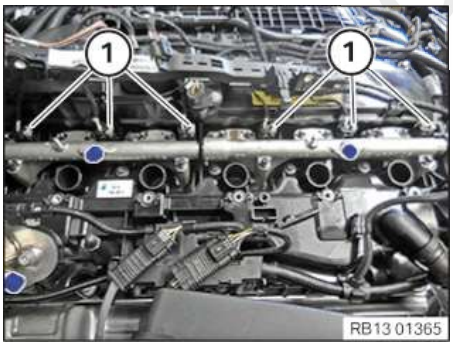
- Prepare special tool 0 496 106 (11 8 720).



- Loosen nut (1).
- Feed out ground cable (2) and set it aside.
- Feed out cable channel (3) and set it aside.

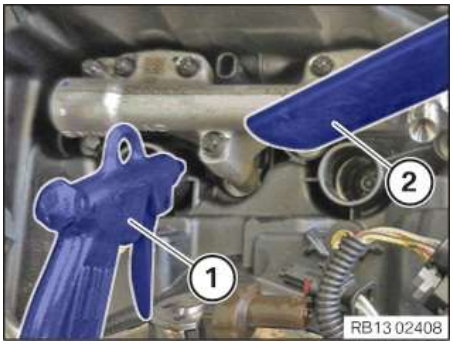


- Unlock lock (1) in direction of arrow from the top.
- Press lock (1) together and release.
- Pull out the connector (2) from the injectors.



- Unlock and release all connectors (1) of the injectors.

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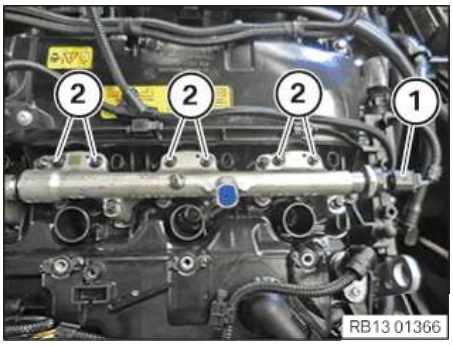


TECHNICAL INFORMATION

In case of dusty / sandy operating conditions of the vehicle, the injector shafts must be cleaned before removal.

For additional information see: 13 53 ... Cleaning the cylinder head in the area of the injectors in case of sandy / dusty contamination

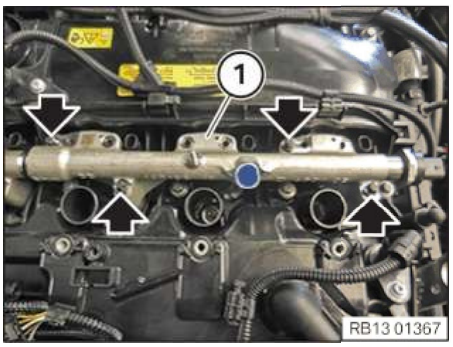
- Before releasing the high pressure lines: Blow out the injector shafts with an air gun(1) with less pressure.
- Simultaneously, draw off the dirt particles with an **explosion proof** vacuum cleaner (2).



- Unlock and loosen connector (1).
- Release screws (M5x30) (2).
- Remove screws (2).

  Do not reuse the bolts (2).

  Parts: Screws (M5x30)
- Catch and dispose of escaping fuel with suitable materials.

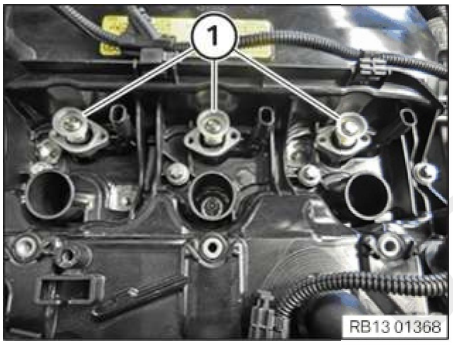


- Unscrew the screws (M6x30) (arrows).

  The screws may not be reused!
- Renew screws.

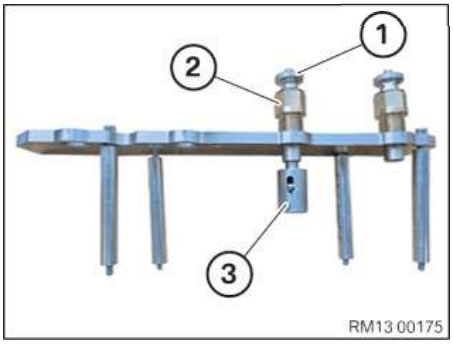
  Parts: Screws (M6x30)
- Remove rail (1) in upward direction.

  The injectors remain in the cylinder head.



- Remove the gaskets (1).

  The seals (1) are only required during the initial assembly at the plant and will not be installed again.



RISK OF DAMAGE

Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

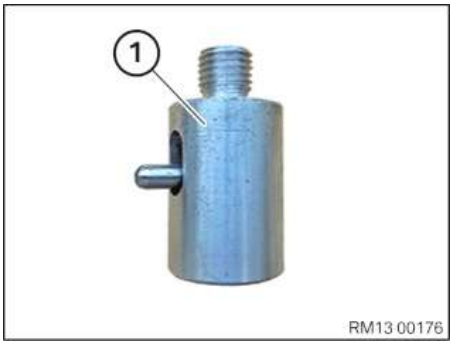
- Twist the injectors with a maximum torsional movement of 13 Nm.
- In the event that the specified value for the tensile force is exceeded: Replace injectors.
- Use the special tool 2 358 417to remove the injectors.

  The special tool 2 358 417 is used to ensure that the tensile force is not exceeded.

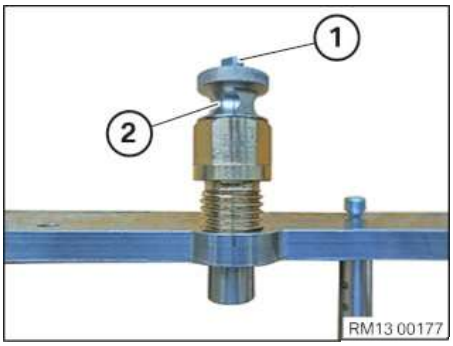
  Special tool 2 358 417 consists of:

  - **(1)** Threaded sleeves
  - **(2)** Pull-out thread (left-hand thread)
  - **(3)** Mounting for the injectors

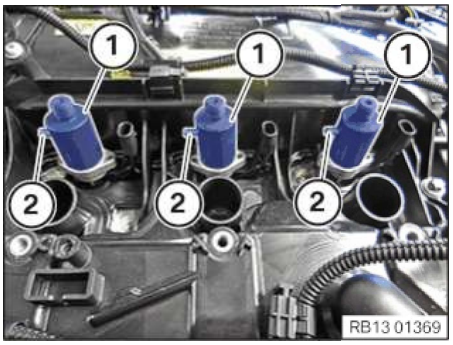
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- Unscrew the fixture for the injectors (1) from the special tool 2 358 417.

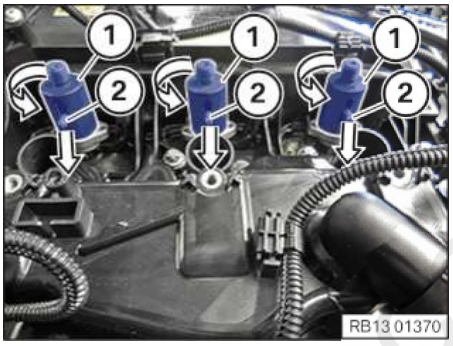


- Press the lock (1) in and remove threaded sleeve (2) from the special tool 2 358 417.

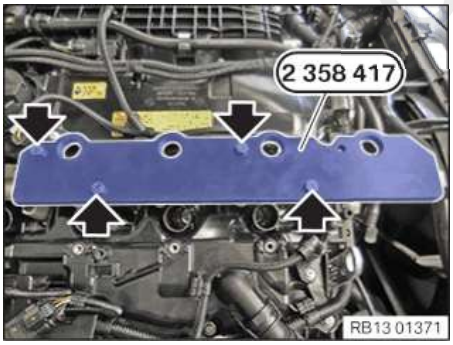


- Install all fixtures (1) for the injectors.

  The fixture (1) is not locked if the lever (2) is on the top.



- Turn fixtures (1) by 90° and lock the lever (2) downwards.



RISK OF DAMAGE

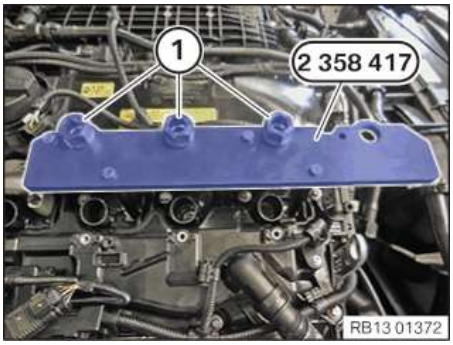
Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

- Do not use the puller plate as a support.

- Attach special tool 2 358 417 to cylinder head.
- Hand-tighten the bolts (arrows).

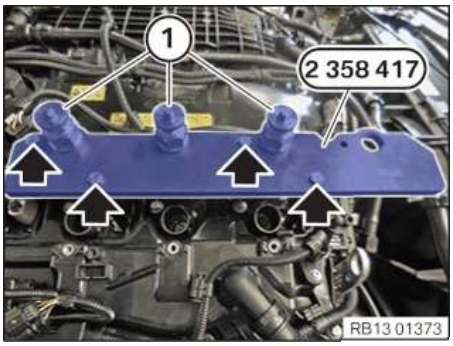
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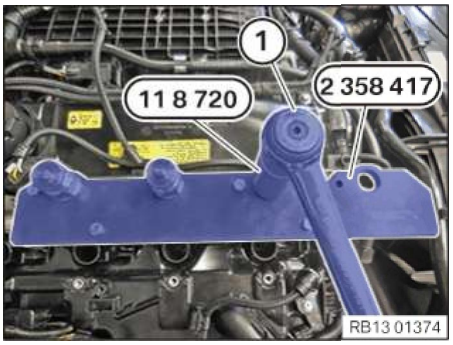
TECHNICAL INFORMATION

The extraction thread is a left-hand thread.

- Screw in pull-out thread (1) on the special tool 2 358 417fully.



- Insert threaded sleeves (1) again and screw threaded sleeves completely onto the fixtures for injectors.
- Then tighten screws (arrows) on special tool 2 358 417 to 5 Nm.

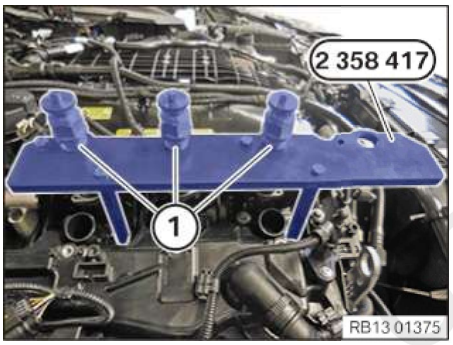


- Adjust torque wrench to 13 Nm **clockwise** .
- Turn torque wrench (1) in **clockwise** direction with special tool 0 496 106 (11 8 720)until the injector is pulled out.

TECHNICAL INFORMATION

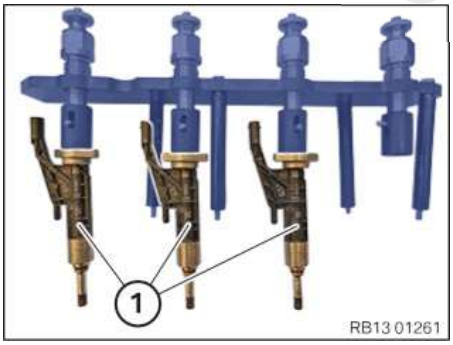
If the torque wrench makes a cracking noise when the injector is pulled out, **the injector must be renewed.**

- Disassemble all injectors individually.

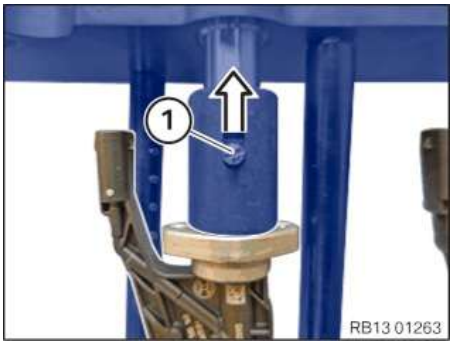


- Before removing the special tool 2 358 417 with the injectors, check if all the injectors were completely pulled out of the cylinder head.

  This can be recognised on the completely visible threads of the sleeves (1).
- Loosen screws on special tool 2 358 417.



- Carefully remove the special tool 2 358 417with injectors (1) from the cylinder head vertically upwards.
- Place the combination of the special tool 2 358 417 and the injectors (1) flat on a clean table.

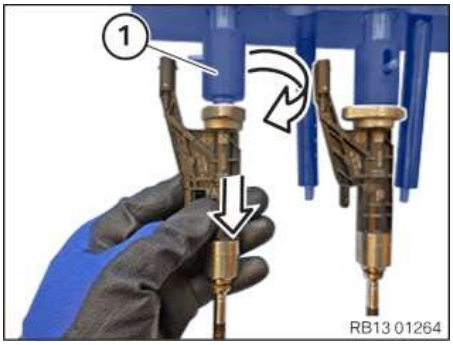


NOTICE

The description is for one component only. The procedure is identical for all further components.

- Unlock the fixture lock (1) from the top.

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- Turn the unlocked fixture (1) by 90°.
- Release and remove the injector downwards.

24 – Removing rail with injectors of cylinders 4 to 6

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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

RISK OF DAMAGE

Damage to the ignition coil.

The silicone hose of the ignition coil must not be contaminated by fuel as this can lead to failure of the ignition coil.

- Cover ignition coils using suitable covers when working on the fuel system, if necessary remove them.
- Do not oil or grease the silicone tube of the spark plug connector. The silicone tube is coated with talc to reduce the pulling forces.

RISK OF DAMAGE

Damage to the injector tips and Teflon ring.

Improper handling of the injector tips and Teflon ring can lead to malfunctioning of the injector.

- Avoid mechanical contact with injector tip.
- When exchanging Teflon ring, hands and work surface must be clean and free of oil. Do not use any lubricating agents.
- Do not use fingernails to slide Teflon ring on.

RISK OF DAMAGE

Damage to injectors.

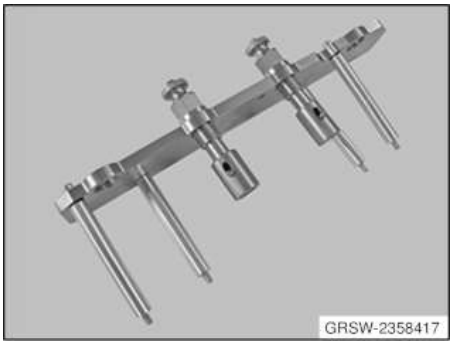
Excessive force may damage the injector and this means having to renew the injector.

- Twist the injectors with a maximum torsional movement of 13 Nm.



- Prepare special tool .

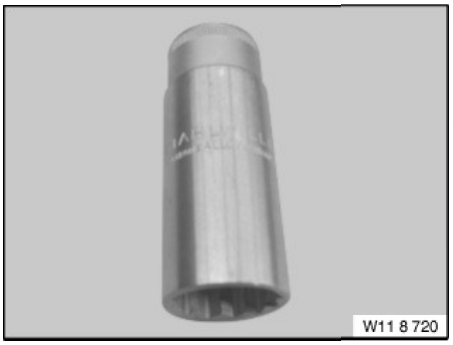
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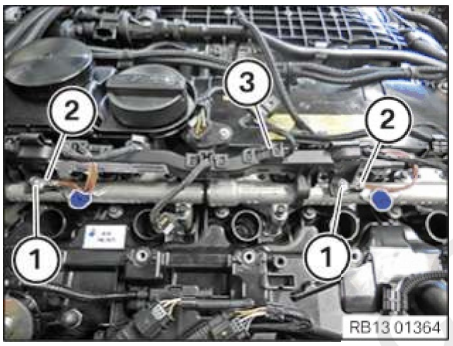
- Prepare special tool 2 358 417.



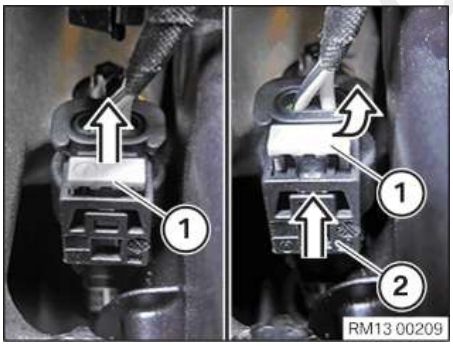
- Prepare special tool .



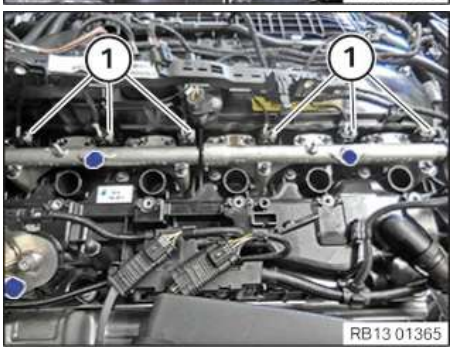
- Prepare special tool 0 496 106 (11 8 720).



- Release nuts (1) .
- Feed out ground cable (2) and set aside.
- Feed out cable channel (3) and set it aside.

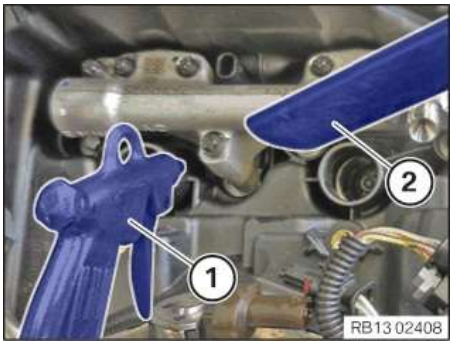


- Unlock lock (1) in direction of arrow upwards.
- Press lock (1) together and release.
- Disconnect the connector (2) from the injectors in the direction of the arrow.



- Unlock and release all connectors (1) of the injectors.

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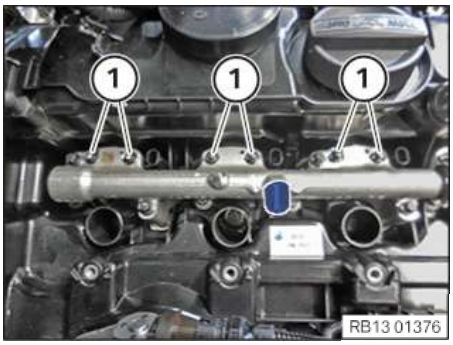


TECHNICAL INFORMATION

In case of dusty / sandy operating conditions of the vehicle, the injector shafts must be cleaned before removal.

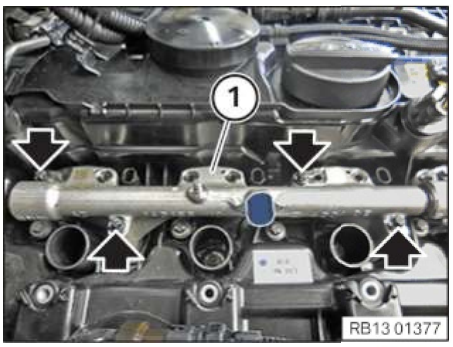
For additional information see: 13 53 ... Cleaning the cylinder head in the area of the injectors in case of sandy / dusty contamination

- Before releasing the high pressure lines: Blow out the injector shaft with an air gun (1) with less pressure.
- Simultaneously, draw the dirt particles off **using an** explosion proof (2) vacuum cleaner.



- Release screws (M5x30) (1).
- Remove screws (M5x30) (1) .

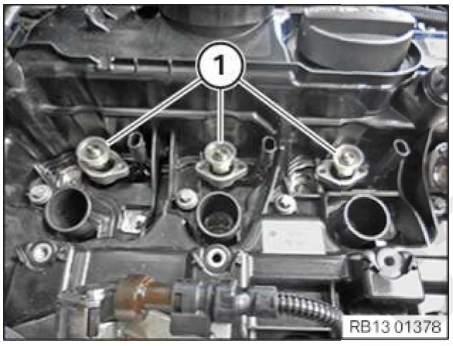
  Do **not** reuse screws (M5x30) (1).
- Catch and dispose of escaping fuel with suitable materials.



- Release screws (M6x30) (arrow).
- Remove screws (M6x30) (arrows).

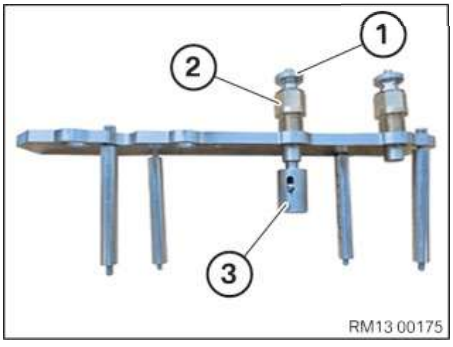
  Do **not** reuse the screws (M6x30).
- Remove rail (1) upwards.

  The injectors remain in the cylinder head.



- Remove seals (1) .

  The seals (1) are required during first assembly within the plant only and will not be installed again.



RISK OF DAMAGE

Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

- Twist the injectors with a maximum torsional movement of 13 Nm.

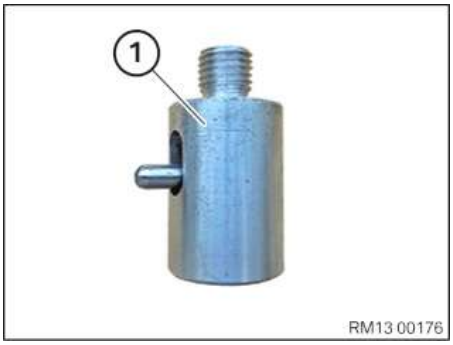
- In the event that the specified value for the tensile force is exceeded: Replace injectors.
- Use the special tool 2 358 417 to remove the injectors.

  The special tool 2 358 417 is used to ensure that the tensile force is not exceeded.

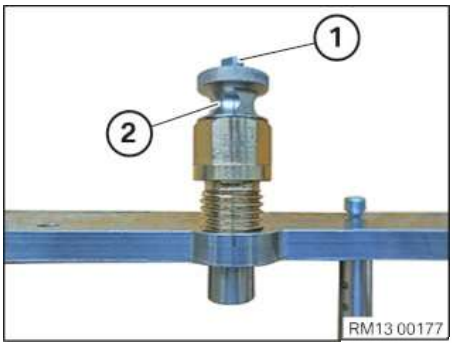
  The special tool 2 358 417 consists of:

  - (1) Threaded sleeves
  - (2) Pull-out thread (left-hand thread)
  - (3) Mounting for the injectors

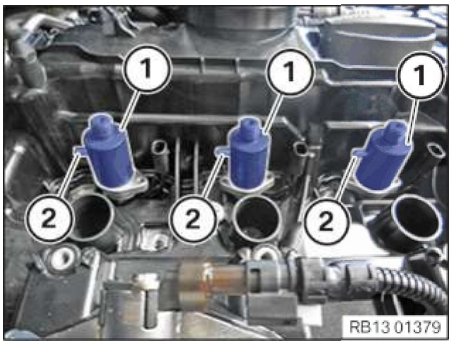
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- Unscrew the fixture for injectors (1) from special tool 2 358 417.

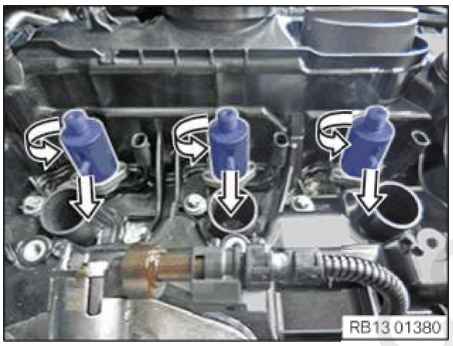


- Press lock (1) in and remove the threaded sleeve (2) from the special tool 2 358 417.



- Install all fixtures (1) for the injectors.

  The fixture (1) is not locked, if the lever is (2) on top.



- Turn fixtures (1) by 90° and lock the lever (2) downwards.



RISK OF DAMAGE

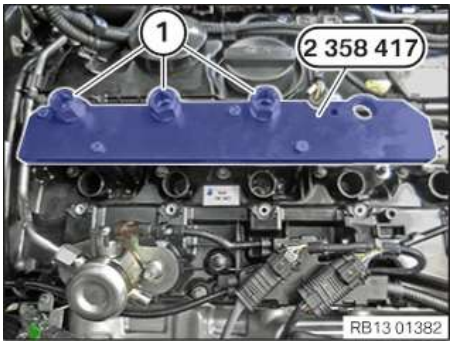
Damage to injectors.

Excessive force may damage the injector and this means having to renew the injector.

- Do not use the puller plate as a support.

- Attach special tool 2 358 417 to cylinder head.
- Hand-tighten the bolts (arrows).

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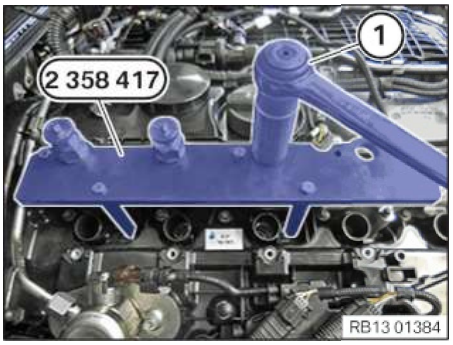
TECHNICAL INFORMATION

The extraction thread is a left-hand thread.

- Screw in pull-out thread (1) on the special tool 2 358 417 fully.



- Insert the threaded sleeves (1) again and screw threaded sleeves completely onto the fixtures for the injectors.
- Then tighten screws (arrows) on special tool 2 358 417 to 5 Nm.

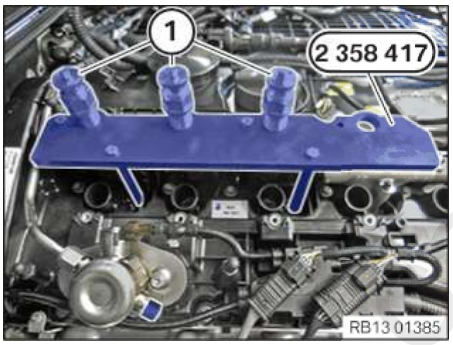


- Adjust torque wrench to 13 Nm **in clockwise** direction.
- Turn the torque wrench (1) with the special tool 0 496 106 (11 8 720) **clockwise**, until the injector is pulled out.

TECHNICAL INFORMATION

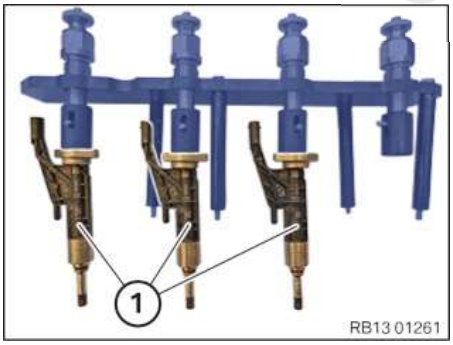
If the torque wrench makes a cracking noise when the injector is pulled out, **the injector must be renewed.**

- Disassemble all injectors individually.

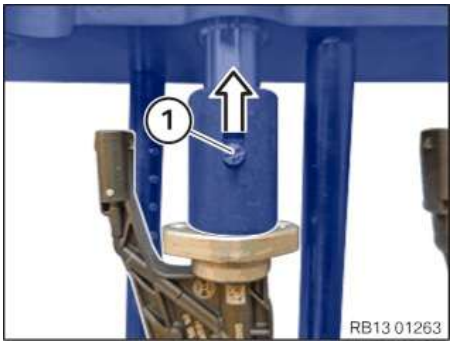


- Before removing the special tool 2 358 417 with the injectors, check if all the injectors were completely pulled out of the cylinder head.

  This can be recognised on the completely visible thread starts of the threaded sleeves (1).
- Loosen screws on special tool 2 358 417.



- Carefully remove the special tool 2 358 417 with the injectors (1) vertically straight up from the cylinder head.
- Place the combination of the special tool 2 358 417 and the injectors (1) flat onto a clean table.

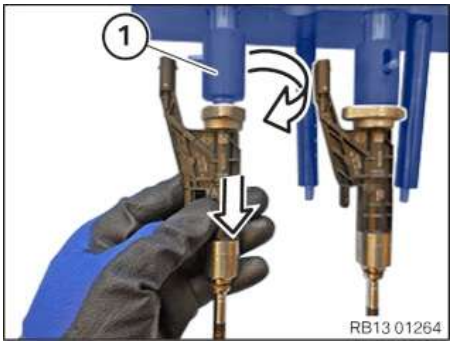


NOTICE

The description is for one component only. The procedure is identical for all further components.

- Unlock the fixture lock (1) from the top.

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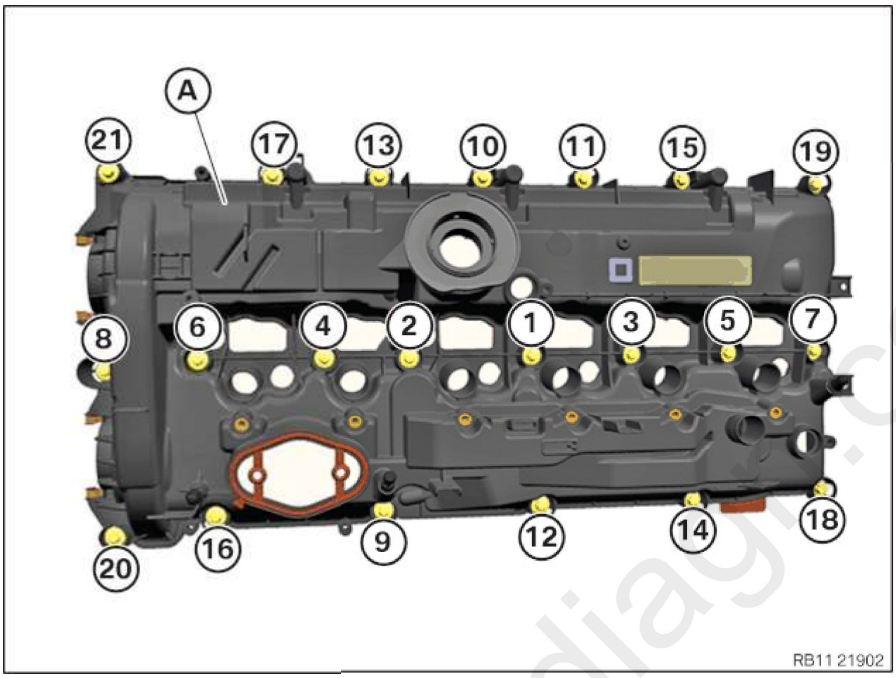


- Turn the unlocked fixture(1) by 90°.
- Release and remove the injector downwards.

MAIN WORK

25 – Removing the cylinder head cover

Overview: Bolts of the cylinder head cover



1 - 21 Bolts of the cylinder head cover

A Cylinder head cover

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

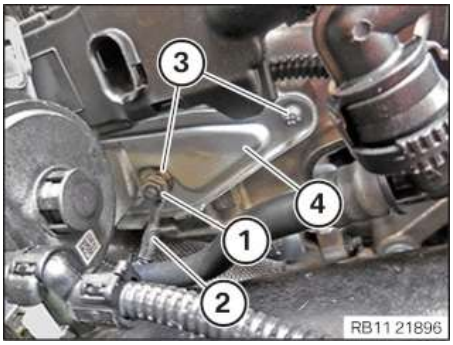
Sheared wires can cause a short circuit.

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

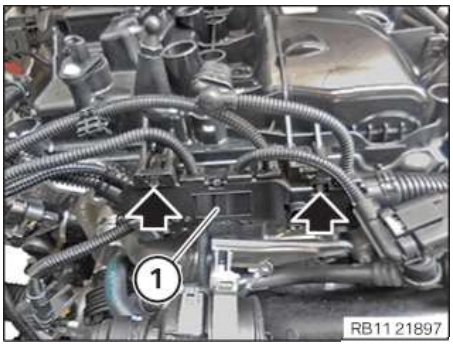


- Unlock the locks (1).
- Feed the engine ventilation line (2) out and set it aside.

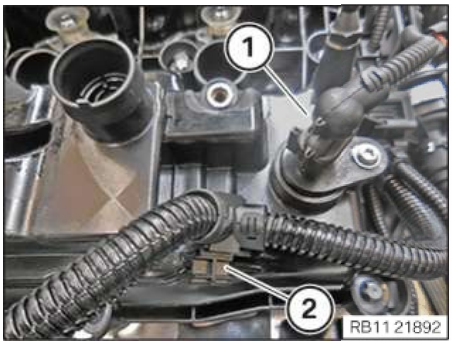
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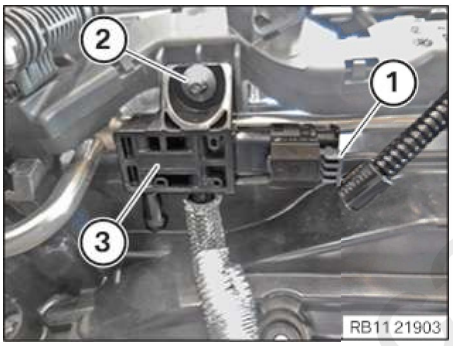
- Loosen nut (1).
- Feed out ground cable (2) and set it aside.
- Loosen screws (3).
- Thread out holder (4) and set aside.



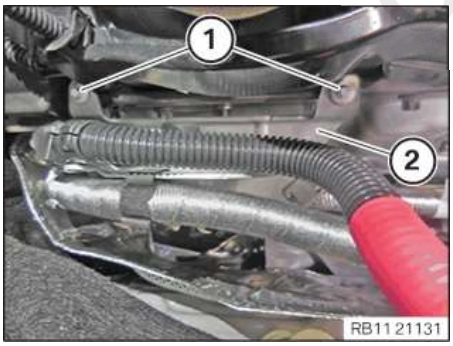
- Unlock and detach the locks (arrows).
- Guide out the wiring harness section (1) for the sensor system **2** and place to one side.



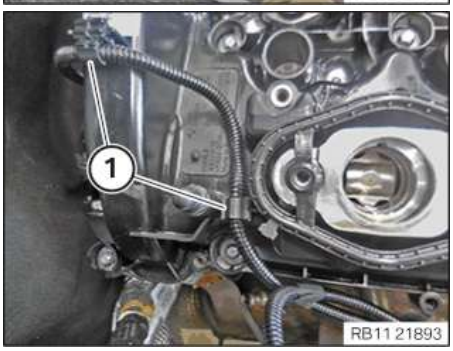
- Unlock and detach connector (1) on exhaust camshaft sensor .
- Loosen clamp (2).



- **If installed:**
- Unlock and loosen connector (1).
- Loosen screw (2).
- Remove the differential pressure sensor (3) and put it to one side.

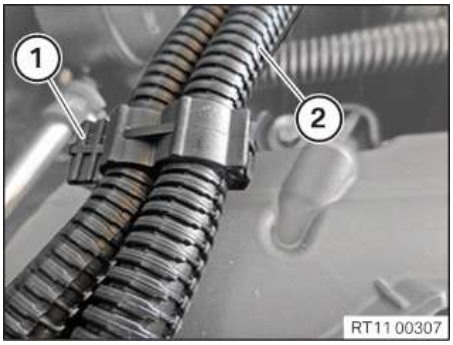


- Loosen screws (1).
- Feed out the bracket (2) of the positive battery cable and set it aside.

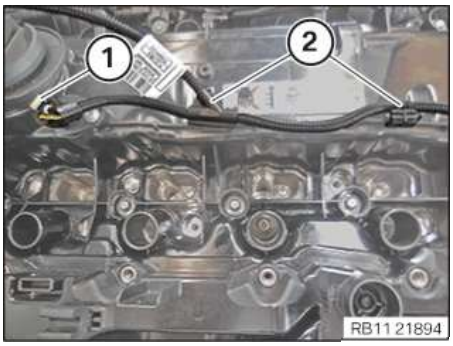


- Loosen clamps (1).

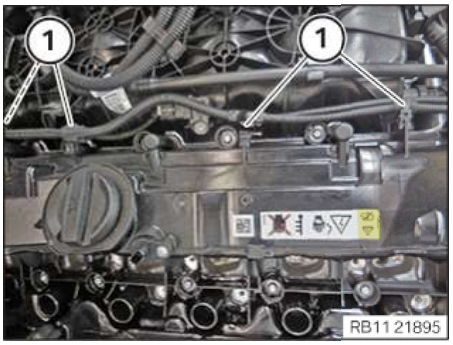
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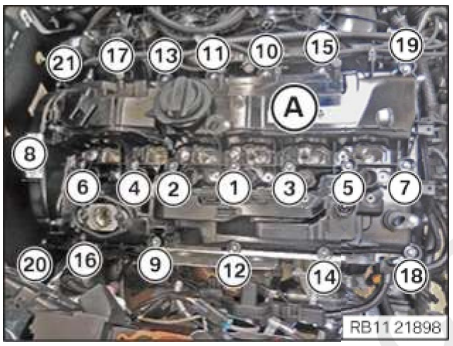
- Loosen clamp (1).
- Thread out the wiring harness section (2) for the injectors and ignition coils and set it aside.



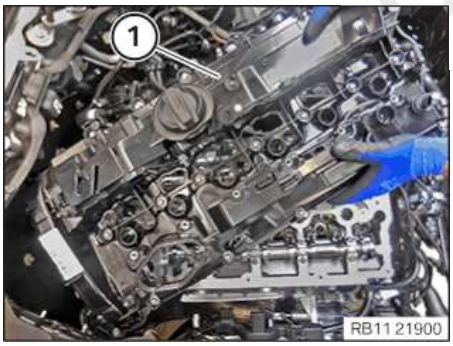
- Unlock and detach connector (1) on the intake camshaft sensor.
- Loosen clamps (2).



- Loosen clamps (1).



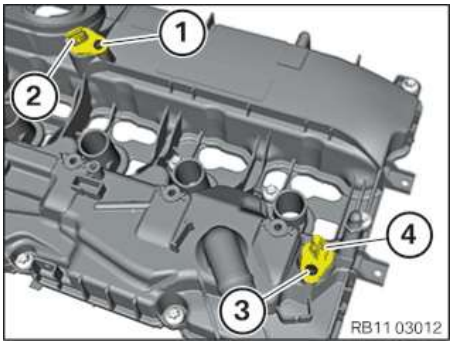
- Release all screws on the cylinder head cover (A) in the sequence (21) to (1).



- Guide the cylinder head cover (1) out and remove it.

26 – Remounting the camshaft sensors of the intake camshaft and of the exhaust camshaft

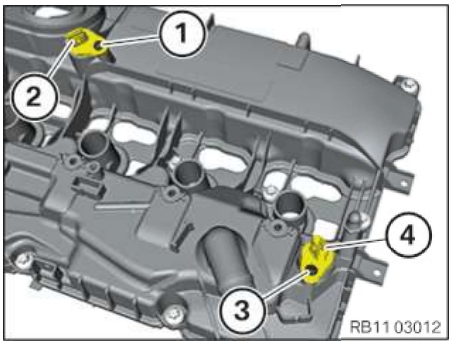
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- Loosen screw (1).
- Thread out and remove the camshaft sensor (2) of the intake camshaft.
- Loosen screw (3).
- Guide the camshaft sensor (4) of the exhaust camshaft out and remove.



- Check sealing ring (1) for damage, renew if necessary.



- Thread in and install the camshaft sensor (2) of the intake camshaft.
- Tighten down screw (1).

Camshaft sensor to cylinder head cover

TS5x20		Tightening torque	4 Nm

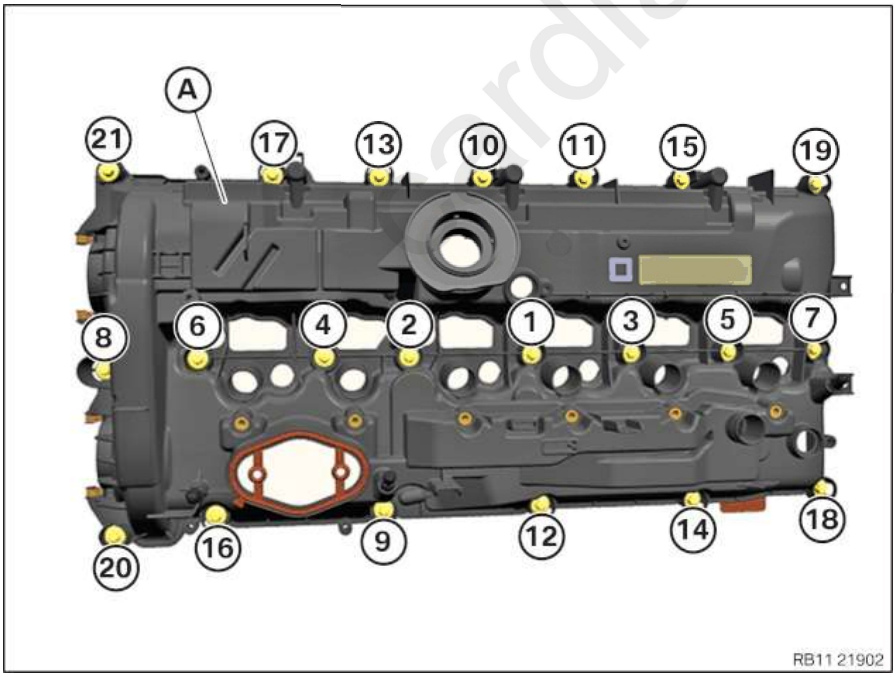
- Guide the camshaft sensor (4) of the exhaust camshaft in and install.
- Tighten down screw (3).

Camshaft sensor to cylinder head cover

TS5x20		Tightening torque	4 Nm

27 – Installing cylinder head cover

Overview: Bolts of the cylinder head cover



1 - 21 Bolts of the cylinder head cover

A Cylinder head cover

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RISK OF DAMAGE

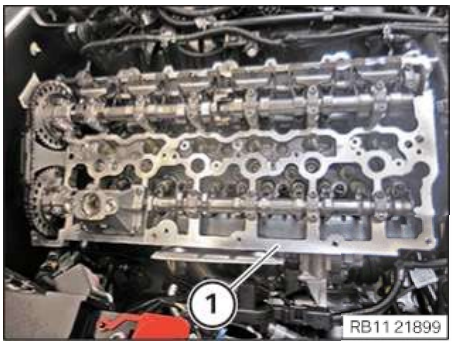
Improper routing of cables and wiring harnesses.

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

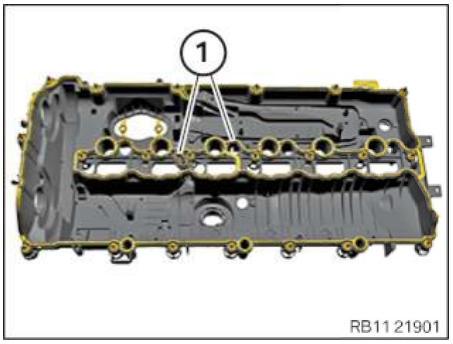
- Route all cables without abrasions, do not trap and crush.

TECHNICAL INFORMATION

Latch mechanisms, guides and mounting elements must not be damaged or missing.

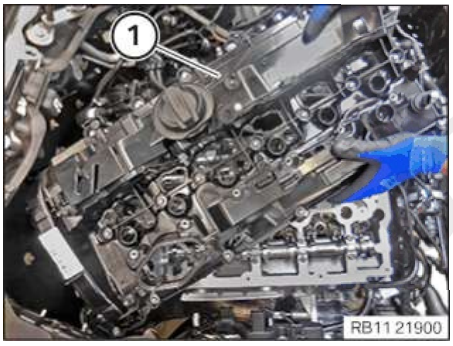


- Contact surface (1) must be free from oil and grease.



- Replace the seals (1).

  Parts: Seals



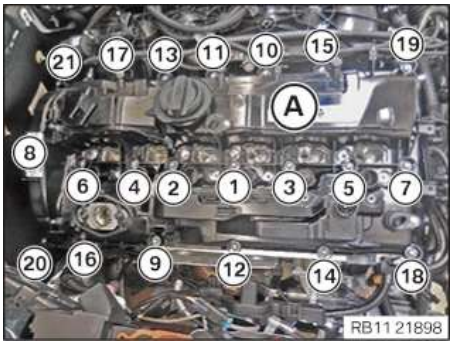
- Insert and install cylinder head cover (1).



- Ensure that the cylinder head cover (1) is installed in the **marked** area correctly on the high pressure pump bracket(2).

  The cylinder head cover (1) must not touch the high pressure pump bracket (2) in the **marked** area.

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- Position the cylinder head cover (A).
- Make sure that the cylinder head cover (A) does not touch the high pressure pump bracket!
- Tighten all bolts in sequence (1) to (21).

Cylinder head cover to cylinder head

M6X30		Jointing torque	8 Nm

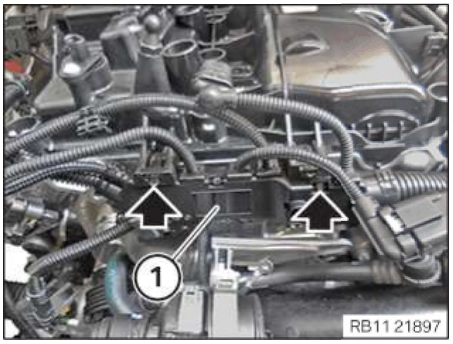
- Tighten all screws in a sequence from (1) to (21).

Cylinder head cover to cylinder head

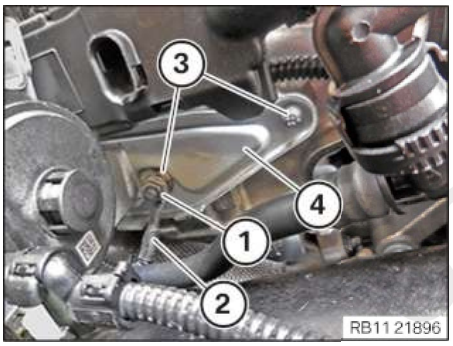
M6X30		Tightening torque	11 Nm



- Insert and install the engine ventilation line (2).
- Ensure that the locks (1) engage audibly.



- Feed in and install wiring harness section (1) for sensor system **2**.
- Make sure that you can hear the locks (arrows) engage.



- Insert and position the holders (4).
- Tighten the screws (3).

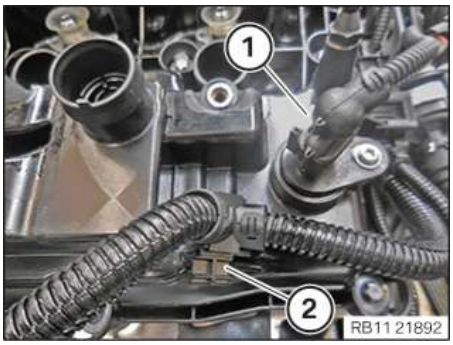
Auxiliary coolant pump holder to cylinder head

M6		Tightening torque	7 Nm

- Thread in ground cable (2) and install.
- Tighten nut (1).

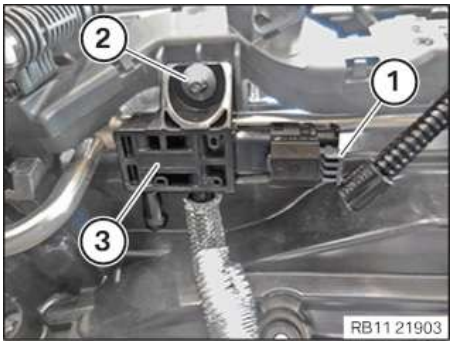
Standard screw connection M6

M6			8 Nm



- Connect and lock the connector (1) on the exhaust camshaft sensor .
- Ensure that connector (1) on the exhaust camshaft sensor engages audibly.
- Secure clamps (2).

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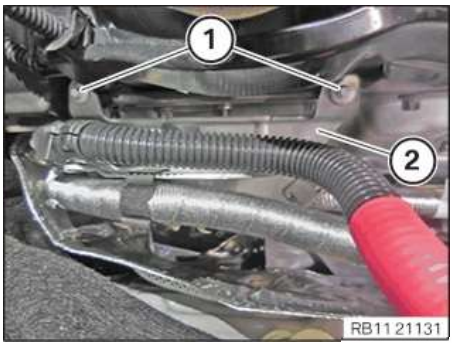


- **If installed:**
- Feed in and install the differential pressure sensor (3).
- Tighten down screw (2).

Differential pressure sensor to holder

TS6X18		Tightening torque	3,5 Nm

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



CAUTION

Improper routing of the positive battery cable.

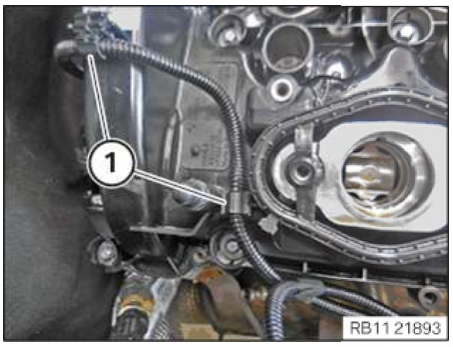
Risk of short circuits!

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

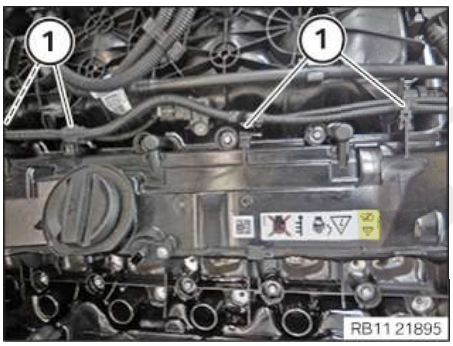
- Guide in and install holder (2) of the positive battery cable.
- Tighten the screws (1).

Holder, positive battery cable to cylinder head cover

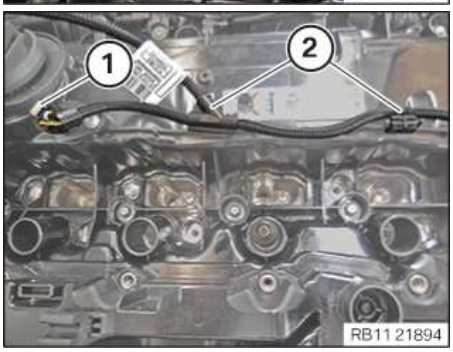
6X18		Tightening torque	6 Nm



- Secure clamps (1).



- Secure clamps (1).

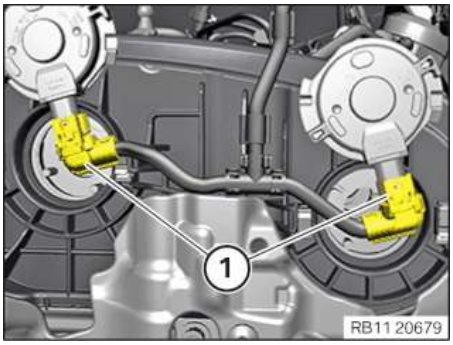


- Connect connector (1) to the intake camshaft sensor and lock it.
- Make sure the connector (1) engages audibly.
- Secure clamps (2).

POSTPROCESSES

28 – Installing both actuators

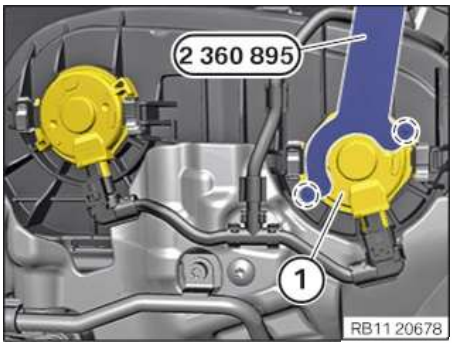
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NOTICE

The figure shows the rear side of the engine.

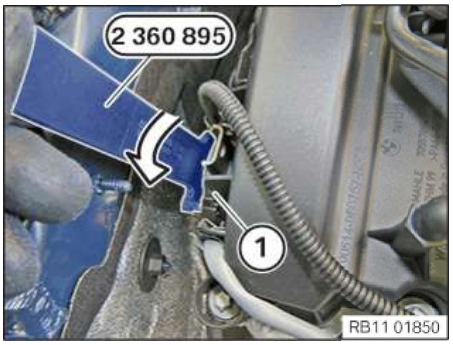
- Position both actuators.
- Connect and lock both connectors (1).
- Make sure the connectors (1) engage audibly.



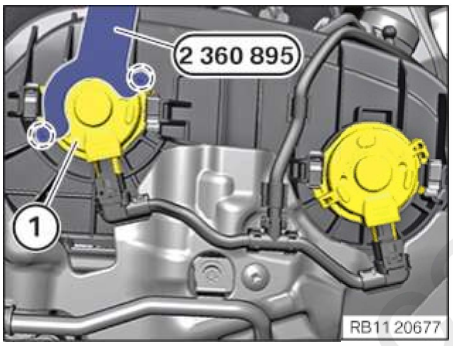
NOTICE

The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the exhaust side.



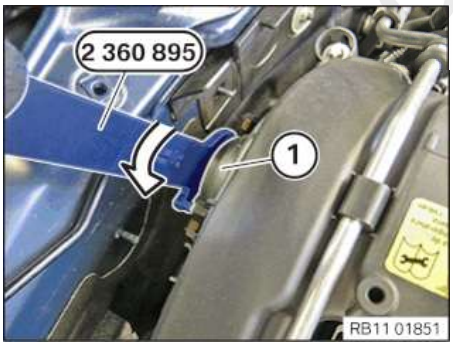
- Position the actuator (1) of the exhaust side and turn it in the direction of arrow with the special tool 2 360 895 until the limit stops touch the clamps.



NOTICE

The figure shows the rear side of the engine.

- Position special tool 2 360 895 correctly on the actuator (1) of the intake side.



- Position the actuator (1) of the intake side and turn it in the direction of arrow with the special tool 2 360 895 until the limit stops touch the clamps.

29 – Prepare the injectors for installation

RISK OF DAMAGE

Damage to the injector tips and Teflon ring.

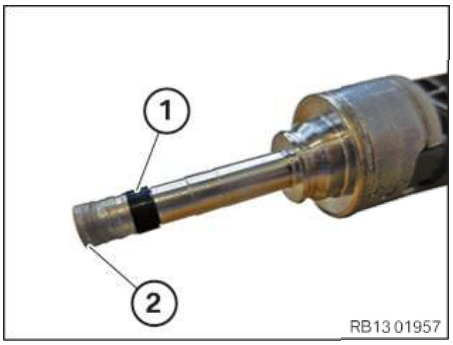
Improper handling of the injector tips and Teflon ring can lead to malfunctioning of the injector.

- Avoid mechanical contact with injector tip.
- When exchanging Teflon ring, hands and work surface must be clean and free of oil. Do not use any lubricating agents.
- Do not use fingernails to slide Teflon ring on.

TECHNICAL INFORMATION

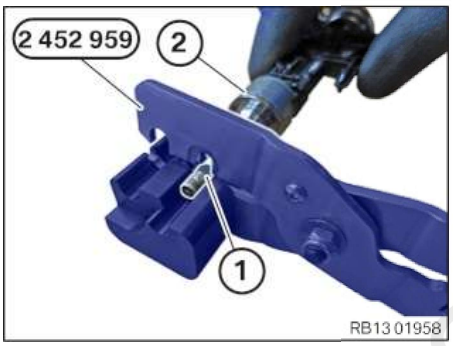
Before re-installing the injector, the Teflon ring must be renewed. Once a Teflon ring has been installed, it may not be re-used. New injectors are supplied with a new Teflon ring.

After the installation of a new Teflon ring on the injectors, the injector must be installed in the cylinder head within 10 minutes or protected with protective caps; otherwise, the Teflon ring will swell.



- Before installing the injectors: Renew the Teflon rings (1).

  Parts: Teflon rings
- Avoid mechanical contact with injector tip (2).



- Remove Teflon ring (1) by using special tool 2 452 959 from injector (2).
- If necessary, use a lint-free cloth to clean the cylindrical part of the injector tip. Do not use ultrasonic sound or other auxiliary materials.
- Do **not** clean the injector tip.

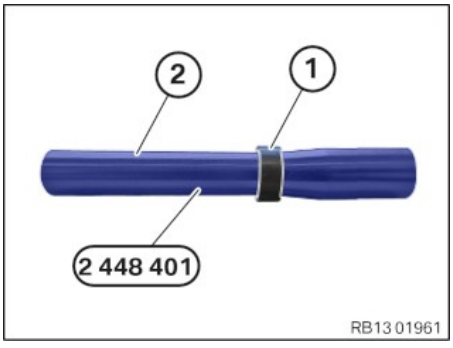


- For the installation of the new Teflon rings: Use the set of special tools 2 448 401:

  (1) Installation cone

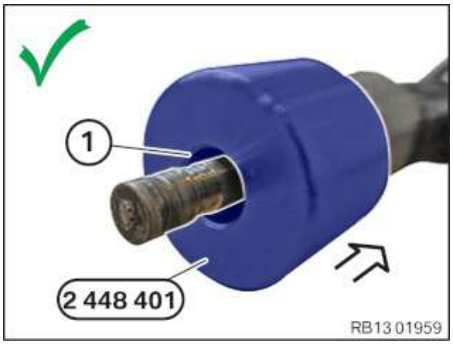
  (2) Sliding sleeve

  (3) Assembly sleeve



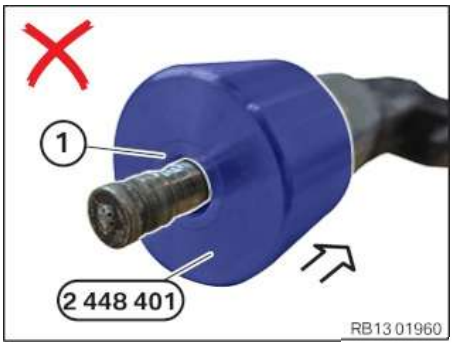
- Slide the new Teflon ring (1) onto the installation cone (2) from the set of special tools 2 448 401.

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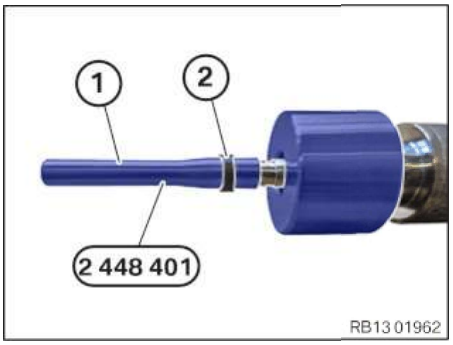
- Make sure the installation position of the assembly sleeve (1) from the set of special tools 2 448 401 is correct:

  The larger diameter of the assembly sleeve (1) must point to the injector tip.

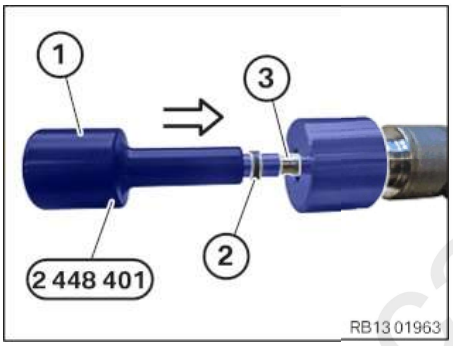


- Make sure the installation position of the assembly sleeve (1) from the set of special tools 2 448 401 is correct:

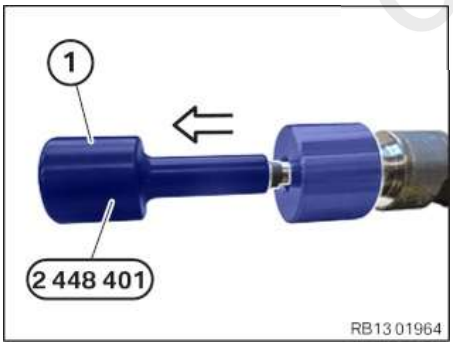
  The assembly sleeve (1) is **not** mounted correctly when the smaller diameter points to the injector tip.



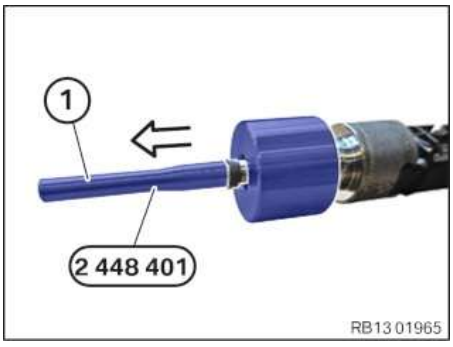
- Mount the Teflon ring (2) with the installation cone (1) from the set of special tools 2 448 401 on the injector tip .



- Use the sliding sleeve (1) from the set of special tools 2 448 401 to push the Teflon ring (2) into the groove (3) on the injector in the direction of the arrow.

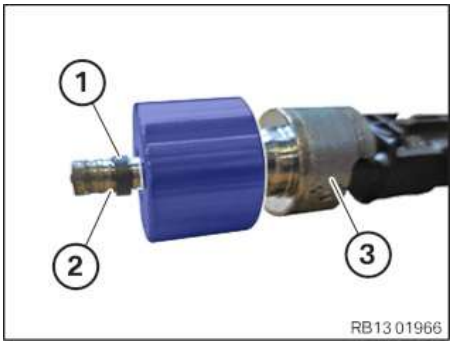


- Thread out the sliding sleeve (1) from the set of special tools 2 448 401 in the direction of the arrow and remove.

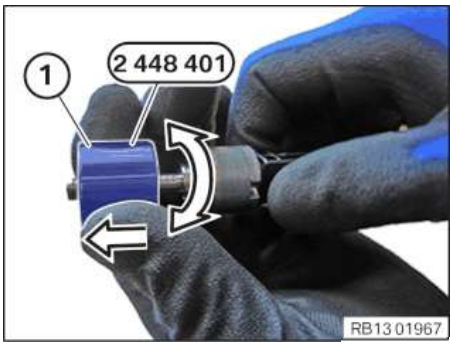


- Thread out the installation cone (1) from the set of special tools 2 448 401 in the direction of the arrow and remove.

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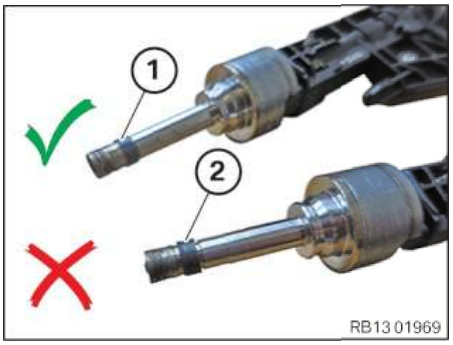


- Make sure that the expanded Teflon ring (1) is properly inserted in the groove (2) of the injector (3) and can be moved easily with your fingers.



- Calibrate the expanded Teflon ring with the assembly sleeve (1) from the set of special tools 2 448 401 to the installation dimension in the direction of the arrow.
- Perform **rotational movements** in increments of 180° synchronous to the **pull-off movement**. Perform the movements slowly and **not** jerky.

  This calibrates the Teflon ring (1) to the installation dimension.
- Thread out and remove the assembly sleeve (1).

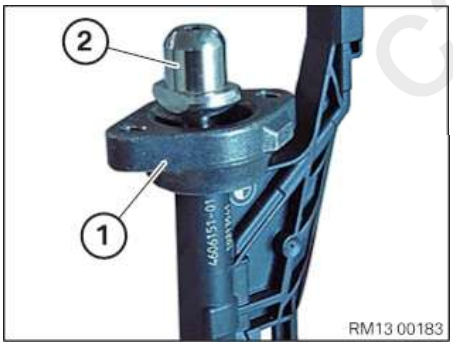


- Check the correct installation dimension of the Teflon ring (1):
  - (1) indicates a correct installation dimension of the Teflon ring.
  - (2) indicates an incorrect installation dimension of the Teflon ring.

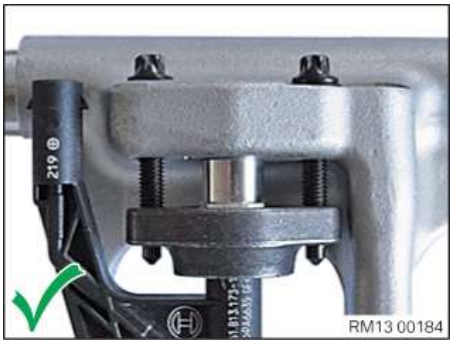
30 – Installing the high-pressure rail with injectors of the cylinders 4 to 6

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.



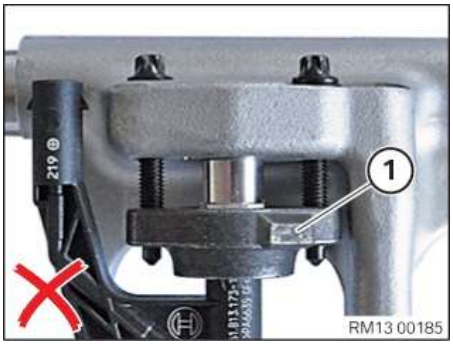
- Mount the holder (1) above the bayonet fitting (2) on the injector.
- **If the holder**(1) **has a cast lug**: Make sure that the holder is installed in the correct position.



- If applicable, note the position of the cast lug:

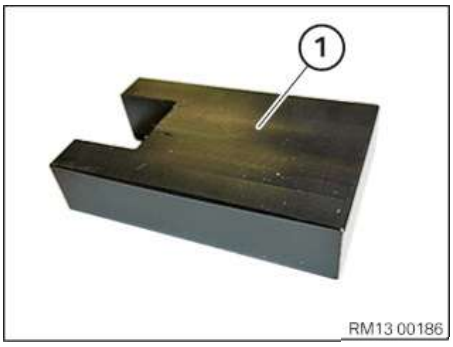
  The holder is mounted **correctly** when the cast lug is located at the rear.

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- If applicable, note the position of the cast lug:

  The holder is mounted **incorrectly** when the cast lug (1) is in front.



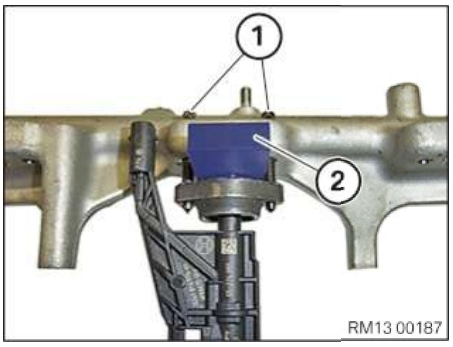
RISK OF DAMAGE

Damage to injectors.

Weld seams on the injector may tear due to incorrect distances between the rail and injector so that the injector must be renewed.

- Insertion of the distance gauge is compulsory.
- Replace distance gauge, if a thickness of 8.5 mm is no longer given in the distance gauge.

- Use the special tool (distance gauge) 2 358 022 (1).



- Replace (M5x30) screws.

  Parts: Screws (M5x30)
- Mount the injectors with the holders and the bolts (M5x30) (1) on the rail.
- Keep the rail on a clean table in such a way that the openings on the rail for the injectors point upwards.

  The electrical injector connections must point to the fuel pressure sensor.
- Slide the special tool (distance gauge) 2 358 022 (2) between the holders and the rail onto the injector head.
- Make sure that the special tool (distance gauge) 2 358 022 (2) rests flat on the retaining bridge.
- Hand-tighten both screws (M5x30) (1) evenly until the special tool (distance gauge) 2 358 022 (2) rests flat against the rail and the holder.



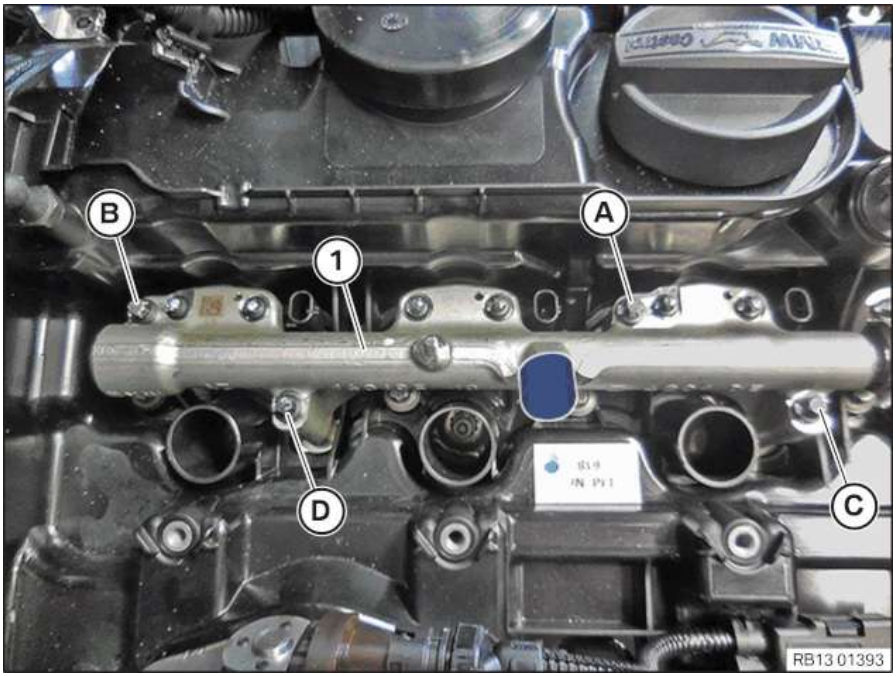
- Remove the special tool (distance gauge) 2 358 022 (1).
- Repeat this operation for all injectors.



- Check injectors for loose fit at the rail.
- Align the electrical injector connections parallel to the rail.

  The injectors must move freely.

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- Renew screws (A) to (D).

  Parts: Bolts
- Attach the rail (1) with the injectors to the cylinder head from the top.
- Make sure the injector tips catch the corresponding holes in the cylinder head.
- Make sure the guides on the injector are properly inserted into the guide bores in the cylinder head.
- Press the rail (1) down until a resistance can be felt; join and hand-tighten the bolts (M6x30) (A) and (B).
- Set the torque wrench to 2 Nm.
- Tighten the screws (A) and (B) in alternating order by **180°** each with the torque wrench until the rail is positioned flush on the cylinder head.

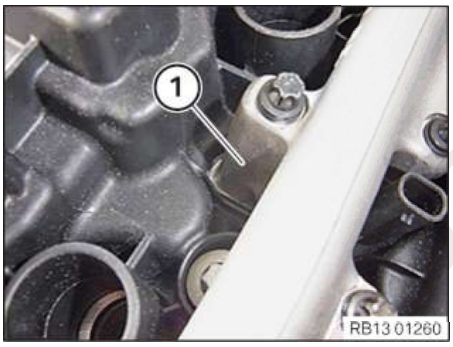
  The figure shows the rail resting flat against the cylinder head.
- Insert bolts (C) and (D).

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

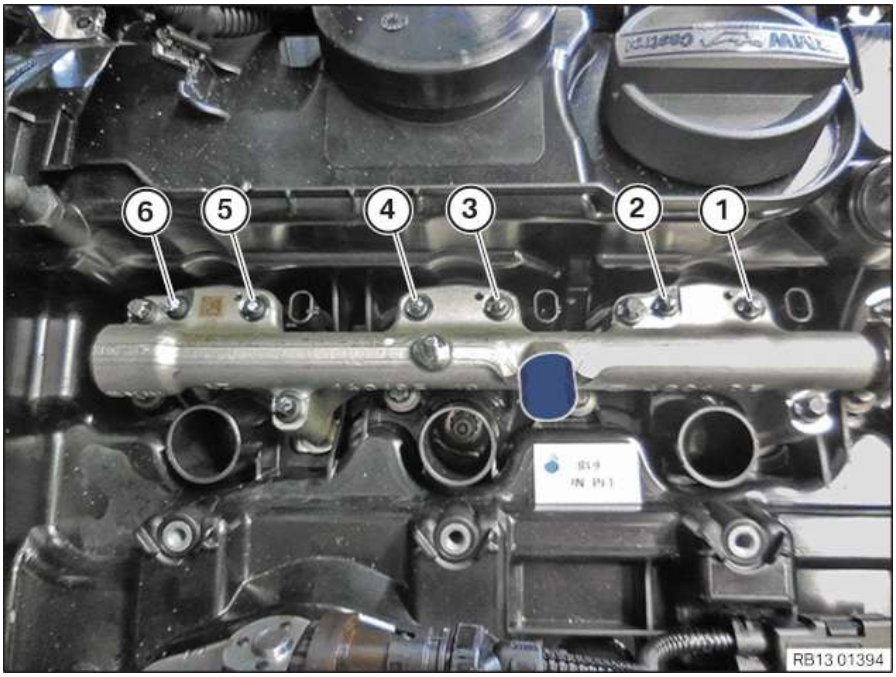
Non-observance of these requirements may result in leaks and damage.

- Tighten bolt (A) to 5 Nm.
- Tighten bolt (D) to 5 Nm.
- Tighten bolt (B) to 5 Nm.
- Tighten bolt (C) to 5 Nm.



- Make sure that the rail (1) rests flat against the cylinder head.

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- Attach a socket to an extension.

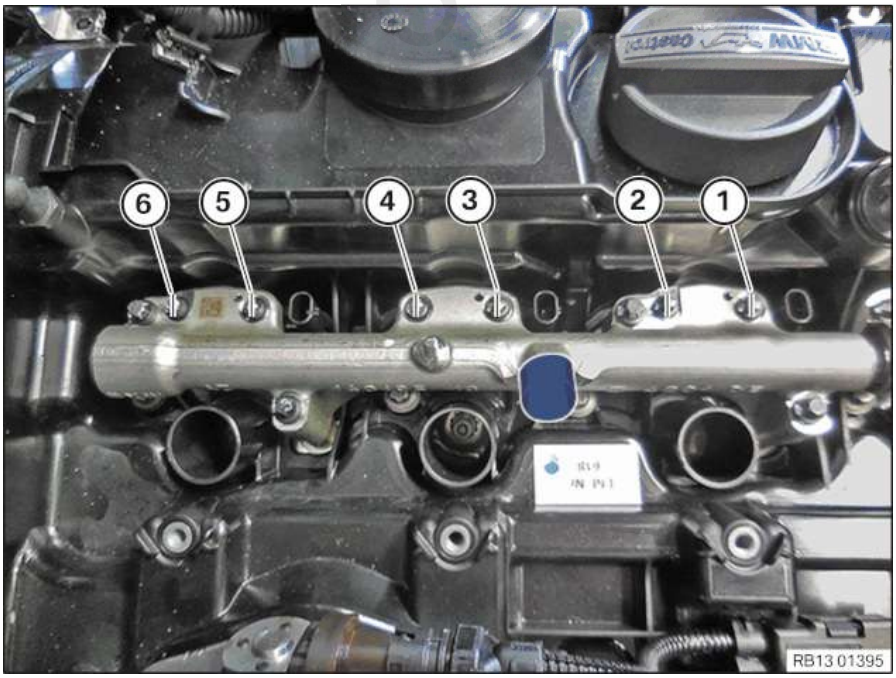
  Do not use a reversible ratchet or torque wrench.
- Tighten the bolts (M5x30) in pairs ((1) with (2), (3) with (4), (5) with (6)) in alternating order **90° hand-tight**.
- Set the torque wrench to 5 Nm.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- **Screw the (M5x30) bolts according to the following plan:**
  - **Fuel injector 4:**
  - Tighten screw (1) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (2) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (1) and (2) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 5:**
  - Tighten screw (3) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (4) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (3) and (4) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 6**:
  - Tighten screw (5) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (6) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (5) and (6) until both bolts reach a torque of 5 Nm.



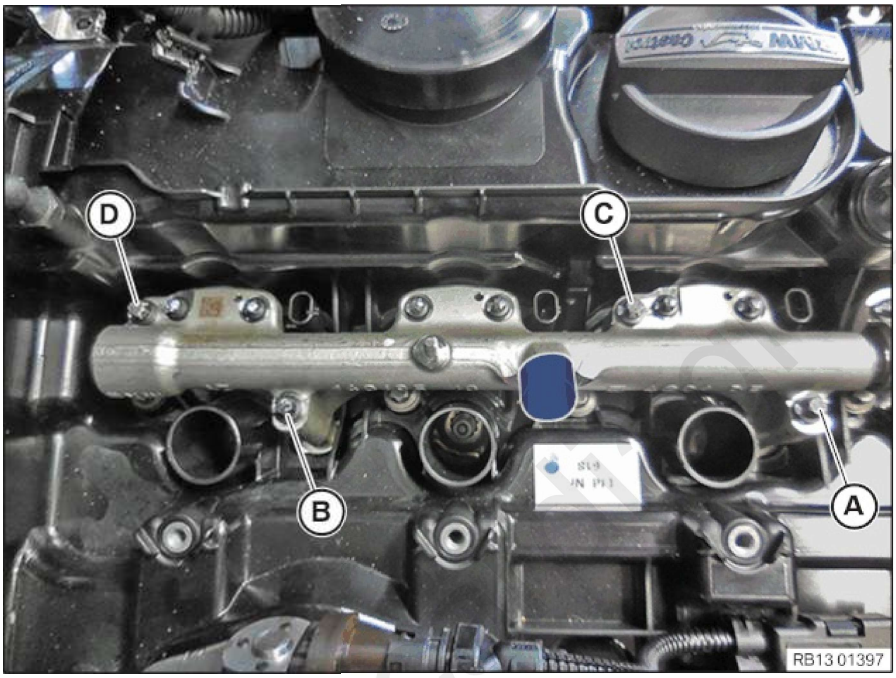
- Mark all bolts (1) to (6) with a vertical line (see figure).
- **Tighten screws using an angle of rotation.**
  - Tighten the screw (1) with an angle of rotation of 90° ±15°.
  - Tighten the screw (2) with an angle of rotation of 90° ±15°.
  - Tighten the screw (3) with an angle of rotation of 90° ±15°.
  - Tighten the screw (4) with an angle of rotation of 90° ±15°.
  - Tighten the screw (5) with an angle of rotation of 90° ±15°.
  - Tighten the screw (6) with an angle of rotation of 90° ±15°.

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- Check if all bolts (1) to (6) have been tightened with a 90° ±15° angle of rotation.

  All marks (lines) must be horizontal (see figure).



- Unscrew the bolts (M6x70) (A) to (D).

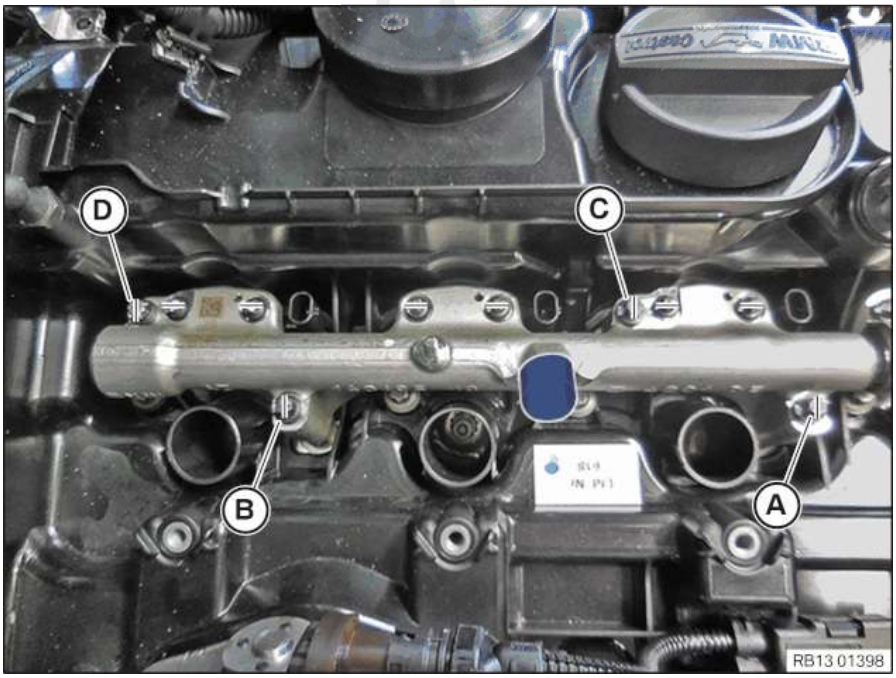
  It is imperative that the bolts are unscrewed.

TECHNICAL INFORMATION

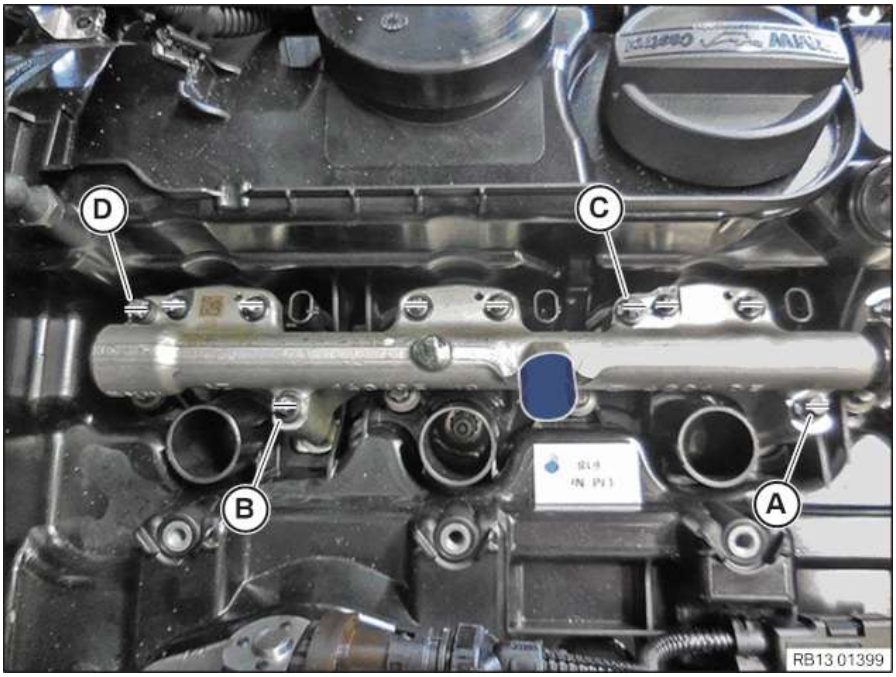
When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten bolt (A) to 5 Nm.
- Tighten bolt (D) to 5 Nm.
- Tighten bolt (B) to 5 Nm.
- Tighten bolt (C) to 5 Nm.

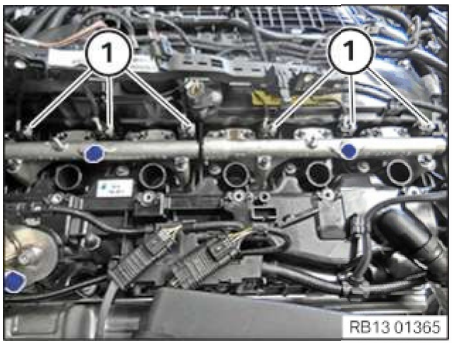


- Mark all bolts (A) to (D) with a vertical line (see figure).
- Tighten bolts (M6x70) (A) to (D) to a 90° angle of rotation.



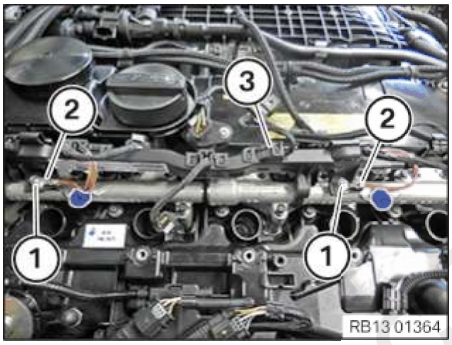
- Check if all bolts (A) to (D) have been tightened with a 90° angle of rotation.

  All marks (lines) must be horizontal (see figure).



- Connect and lock all connectors (1) to the injectors.

  All connectors (1) must engage audibly.



- Thread in cable channel (3) and install.
- Thread in ground cable (2) and install.
- Tighten nuts (1).

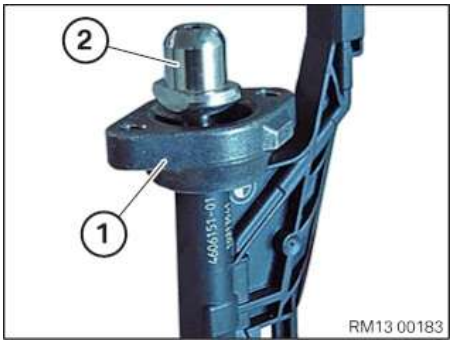
Ground cable to rail

M6			5 Nm

31 – Installing rail with injectors of cylinders 1 to 3

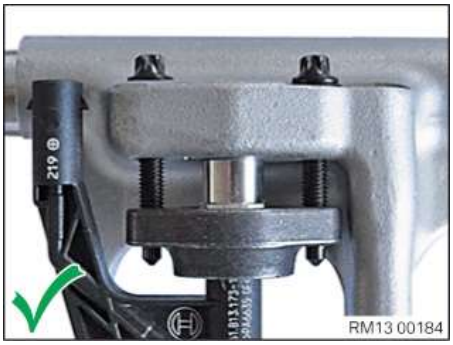
TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.



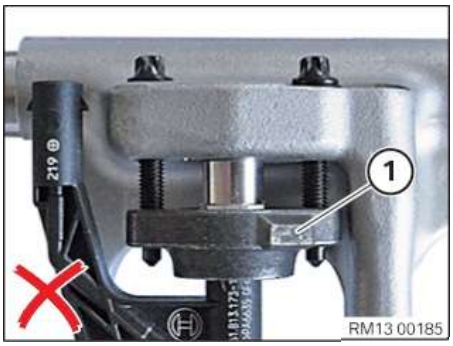
- Mount the holder (1) above the bayonet fitting (2) on the injector.
- **If there is a cast lug on the holder** (1) **:** Make sure that the holder is installed in the correct position.

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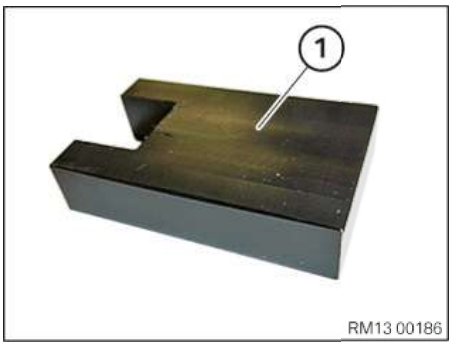
- Observe position of cast lug:

  The holder is mounted **correctly** when the cast lug is located at the rear.



- Observe position of cast lug:

  The holder is mounted **incorrectly** when the cast lug (1) is in front.



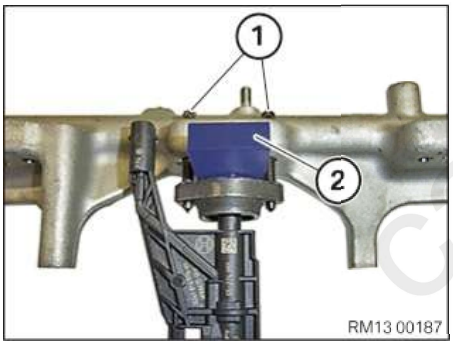
RISK OF DAMAGE

Damage to injectors.

Weld seams on the injector may tear due to incorrect distances between the rail and injector so that the injector must be renewed.

- Insertion of the distance gauge is compulsory.
- Replace distance gauge, if a thickness of 8.5 mm is no longer given in the distance gauge.

- Use special tool 2 358 022(1) .



- Replace (M5x30) screws.

  Parts: Screws (M5x30)
- Mount the injectors with the holders and the bolts (M5x30) (1) on the rail.
- Keep the rail on a clean table in such a way that the openings on the rail for the injectors point upwards.

  The electrical injector connections must point to the fuel pressure sensor.
- Slide special tool 2 358 022 (2) between the holders and the rail onto the injector head.
- Make sure the special tool 2 358 022 (2) rests flat on the retaining bridge.
- Hand-tighten both screws (M5x30) (1) *uniformly until the special* tool 2 358 022 (2) rests flat against the rail and the holder.



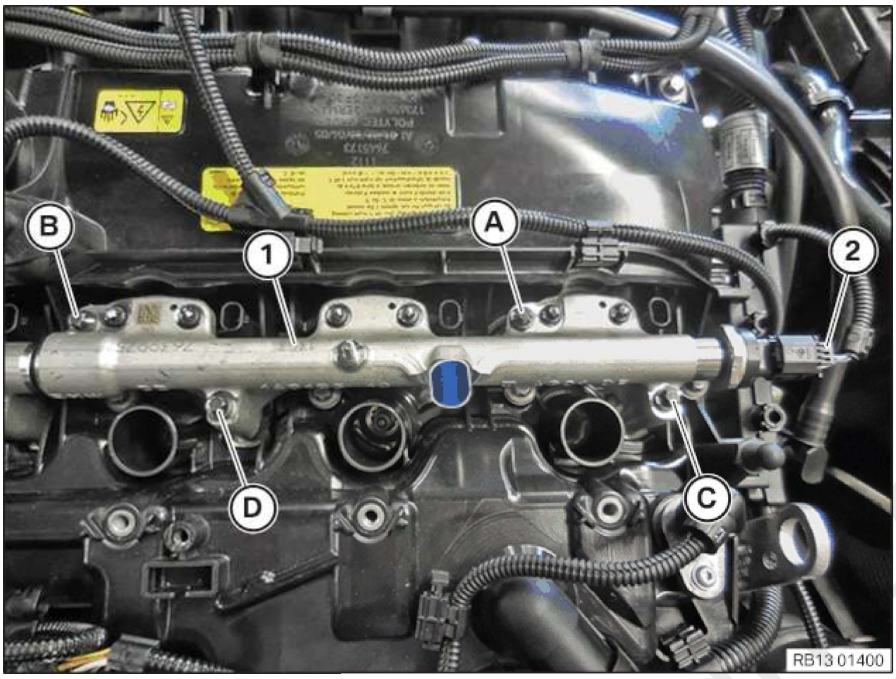
- Remove special tool 2 358 022(1) .
- Repeat this operation for all injectors.

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- Check injectors for loose fit at the rail.
- Align the electrical injector connections parallel to the rail.

  The injectors must move freely.



- Renew screws (A) to (D).

  Parts: Bolts
- Attach the rail (1) with the injectors to the cylinder head from the top.
- Make sure the injector tips catch the corresponding holes for the injectors in the cylinder head.
- Make sure the guides on the injector are properly inserted into the guide bores in the cylinder head.
- Press rail (1) down until a resistance can be felt; join and hand-tighten screws (M6x30) (A) and (B).
- Tighten screws (A) and (B) alternately by **180°** each with the torque wrench until the rail is positioned on the cylinder head.

  The figure shows the rail resting flat against the cylinder head.
- Insert screws (C) and (D).

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

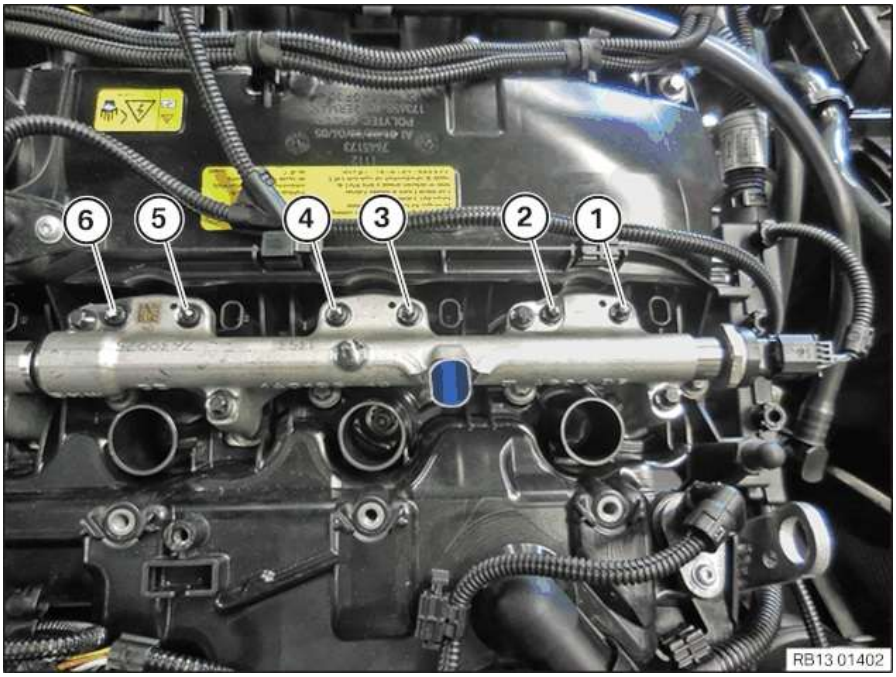
- Tighten screw (A) to 5 Nm.
- Tighten screw (D) to 5 Nm.
- Tighten screw (B) to 5 Nm.
- Tighten screw (C) to 5 Nm.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.



- Make sure that the rail (1) rests flat against the cylinder head.

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- Attach a socket to an extension.

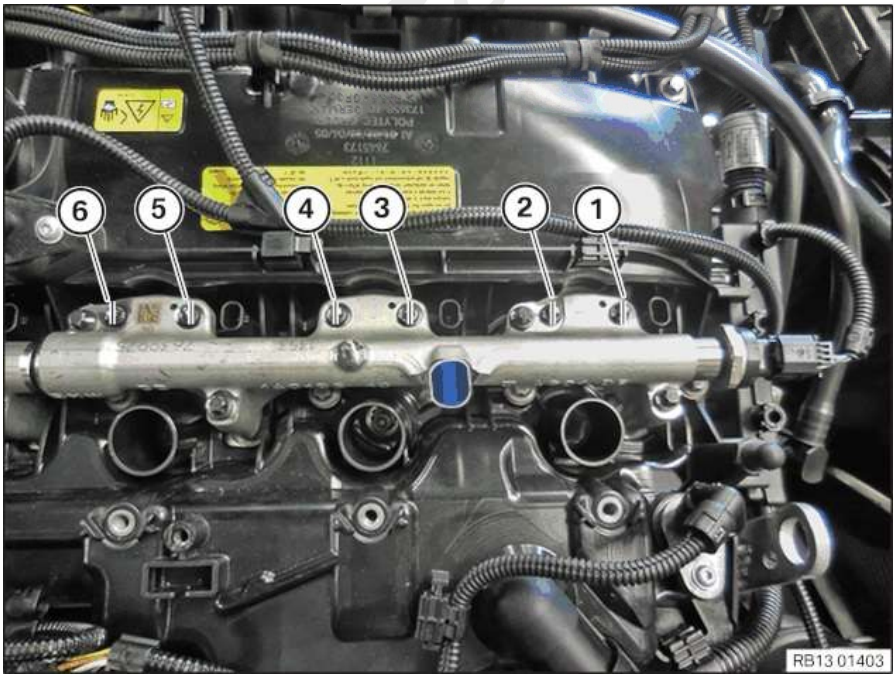
  Do not use a reversible ratchet or torque wrench.
- Hand-tighten screws (M5x30) in pairs ((1) with (2), (3) with (4), (5) with (6)) alternately by **90°**.
- Set torque wrench to 5 Nm.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

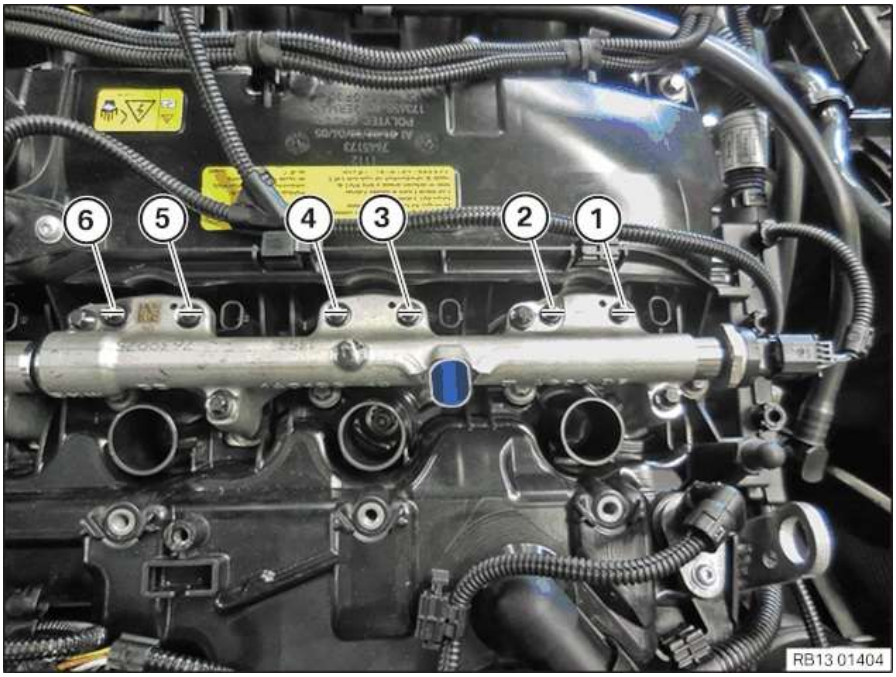
Non-observance of these requirements may result in leaks and damage.

- **Screw the (M5x30) bolts according to the following plan:**
  - **Fuel injector 1:**
  - Tighten screw (1) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (2) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (1) and (2) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 2:**
  - Tighten screw (3) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (4) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (3) and (4) until both bolts reach a torque of 5 Nm.
  - **Fuel injector 3**:
  - Tighten screw (5) at an angle of rotation of 90° ±15° with the torque wrench.
  - Tighten screw (6) at an angle of rotation of 90° ±15° with the torque wrench.
  - Repeat the operations for bolts (5) and (6) until both bolts reach a torque of 5 Nm.



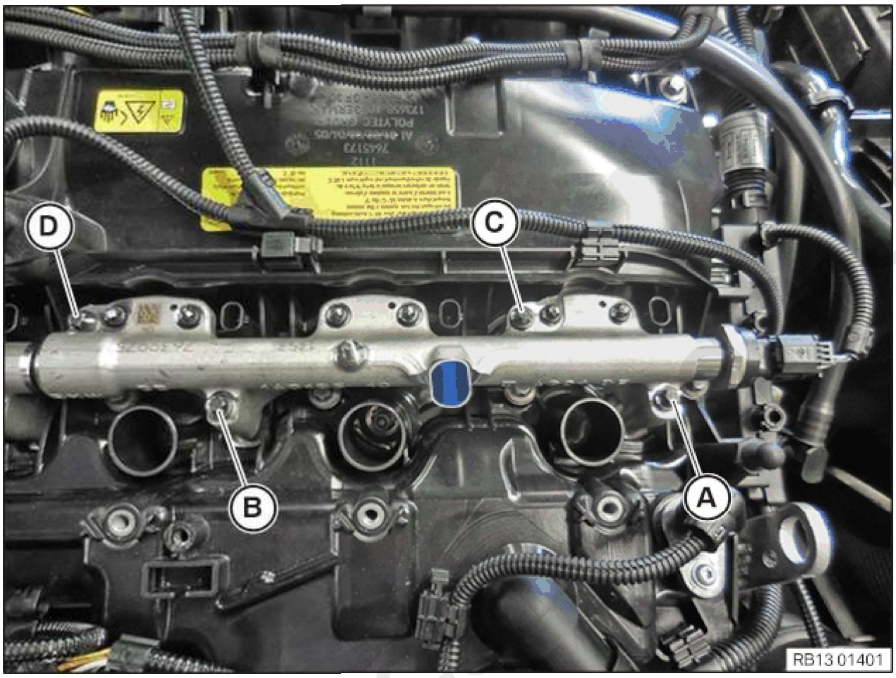
- Mark all bolts (1) to (6) with a line (see figure).
- **Tighten screws using an angle of rotation.**
  - Tighten the screw (1) with an angle of rotation of 90° ±15°.
  - Tighten the screw (2) with an angle of rotation of 90° ±15°.
  - Tighten the screw (3) with an angle of rotation of 90° ±15°.
  - Tighten the screw (4) with an angle of rotation of 90° ±15°.
  - Tighten the screw (5) with an angle of rotation of 90° ±15°.
  - Tighten the screw (6) with an angle of rotation of 90° ±15°.

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- Check if all bolts (1) to (6) have been tightened with a 90° ±15° angle of rotation.

  All markings (lines) must be horizontal (see Figure).



- Release screws (M6x70) (A) to (D) **without fail**.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten screw (A) to 5 Nm.
- Tighten screw (D) to 5 Nm.
- Tighten screw (B) to 5 Nm.
- Tighten screw (C) to 5 Nm.

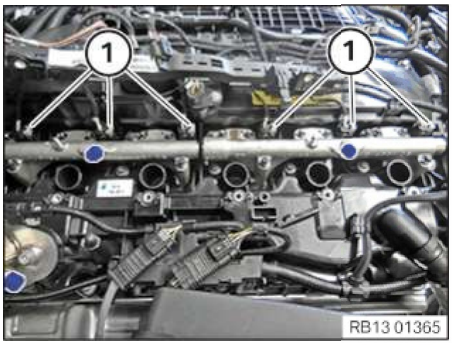


- Mark all the bolts (A) to (D) with a vertical line (see Figure).
- Tighten bolts (M6x70) (A) to (D) with an angle of rotation of 90°.



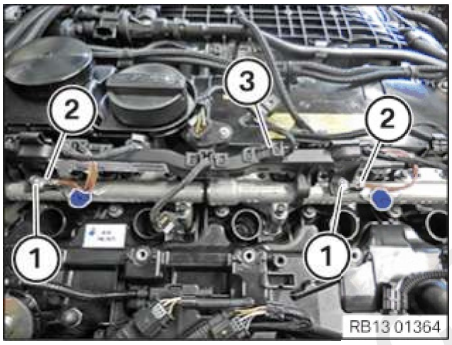
- Check whether all screws (A) to (D) have been tightened with an angle of rotation of 90°.

  All marks (lines) must be horizontal (see figure).



- Connect and lock all the connectors (1) to the injectors.

  All connectors (1) must engage audibly.



- Thread the cable channel (3) in and install.
- Thread in ground cable (2) and install.
- Tighten nuts (1).

Ground cable to rail

M6			5 Nm

32 – Install high pressure pump

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

TECHNICAL INFORMATION

Only G05 and G07

In vehicles with active anti-roll bar (ARS) the fan cowl must be removed in order to spin the engine.

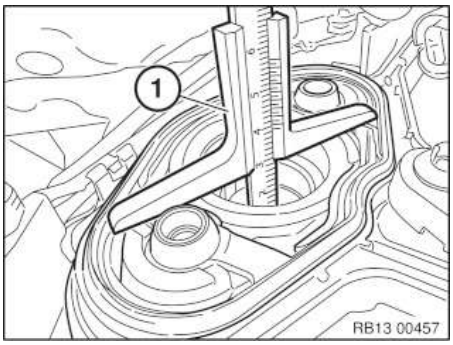
For additional information see: 17 11 035 Removing and installing/replacing the fan cowl including electric fan

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TECHNICAL INFORMATION

The high pressure pump can be pre-tensioned by camshaft cams. If when loosening the screws, the high pressure pump is forced out, the engine will have to be turned to bring the camshafts to a different position.

Before installing the high pressure pump, the cam of the high pressure pump drive must be turned to BDC. To do this, twist the engine if necessary in the direction of engine rotation to the central bolt of the crankshaft. Otherwise, it will not be possible to install the high-pressure pump.



- Place the depth gauge (1) flat onto the high pressure pump flange.
- Turn the engine at the central bolt in the direction of engine rotation until the BDC position of the camshaft is reached.

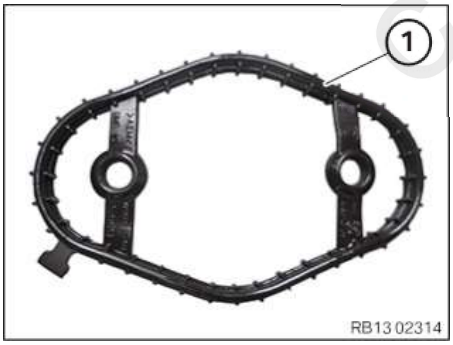
  The depth gauge (1) is in the deepest position.



- Rotate the engine with the special tool 0 493 380 (11 6 480) in the **direction of the arrow** until the cam of the high pressure pump drive is at the **BDC position** .



- Guide out and remove gasket (1).



- Renew the gasket (1).

  Parts: Gasket



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Check the threads (1) on the high pressure pump flange for sealing compound residue: Remove sealing compound residue as needed.
- Clean the thread (1) with a thread cutter **M6**.
- Make sure that no contamination enters the engine.
- Cover opening at the high pressure pump flange with suitable materials.

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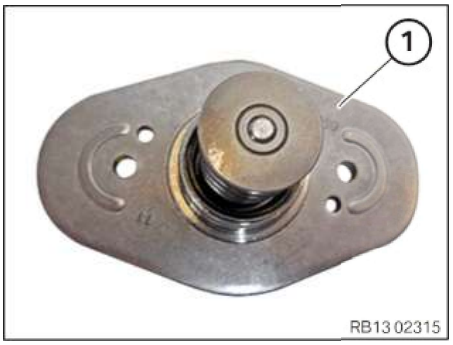
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Clean sealing surface (1).



- Insert and install the gasket (1).
- Make sure the seal (1) has been correctly positioned in the **highlighted** area.



RISK OF DAMAGE

Damage to the surface.

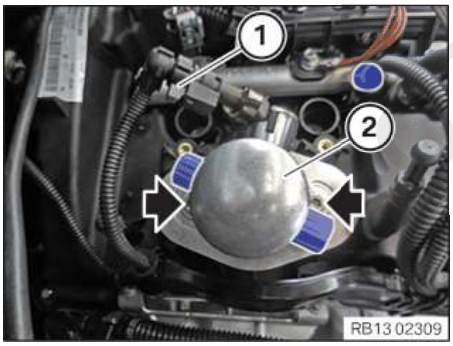
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Clean sealing surface (1).



- Feed in and install high pressure pump (2).
- Renew the bolts (arrows).

  Parts: Bolts
- Position screws (arrows) of the high pressure pump (2) and tighten **in alternating order** in **90°** increments.

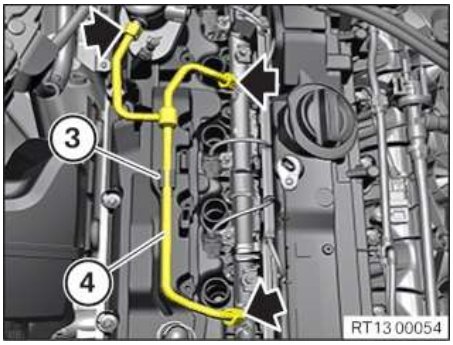
  Compliance with this specification is imperative to make sure that the piston will not break due to twisting.

High pressure pump to high pressure pump flange

M6x25	*Renew screws.*	Jointing torque	12 Nm
		Tightening torque	90 °

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

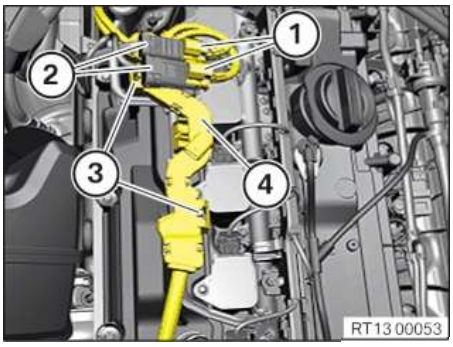
33 – Installing high pressure line between rail and high pressure pump



- Insert the high pressure line (4) into the holder (3) and install.
- Tighten union nuts (arrows) with the special tool .

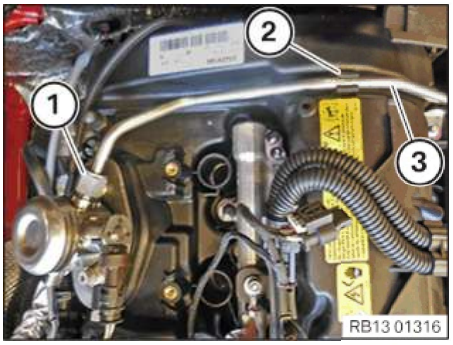
High pressure line between rail and high pressure pump

M14x1,5		Tightening torque	33 Nm



- Insert and install the wiring harness section of the engine wiring harness (4).
  The locks (3) must engage audibly.
- Connect connectors (1) and (2) and lock.
  The connectors (1) and (2) must audibly engage.

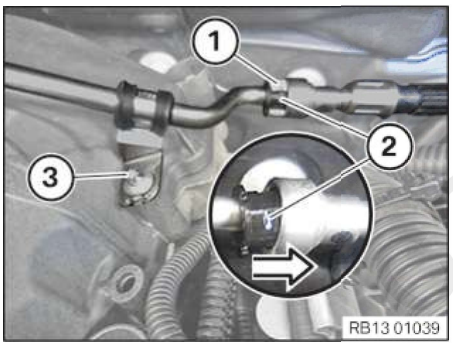
34 – Installing fuel delivery line



- Guide the fuel delivery line (3) in and install.
- Install rubber damper (2).
- Check the rubber damper (2) for the correct fit.
- Tighten the union nut (1) hand-tight.
- Tighten union nut (1).

Fuel delivery line to high pressure pump

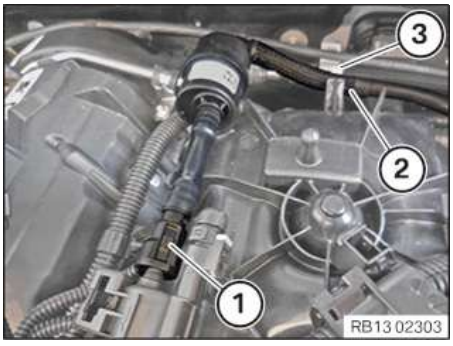
M14		Tightening torque	31 Nm



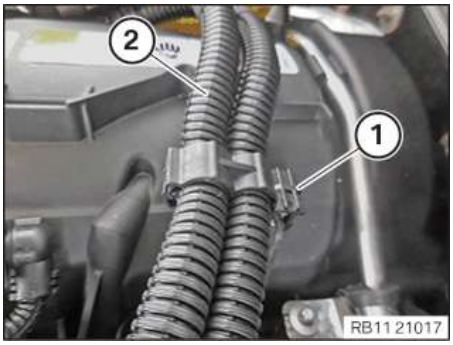
- Slide in and lock the fuel feed line in the direction of the arrow in the snap fastener (2).
  The fuel feed line must be audibly engage in the snap fastener (2).
- Secure clamps (1).
- Tighten down screw (3).

Fuel line to cylinder head cover

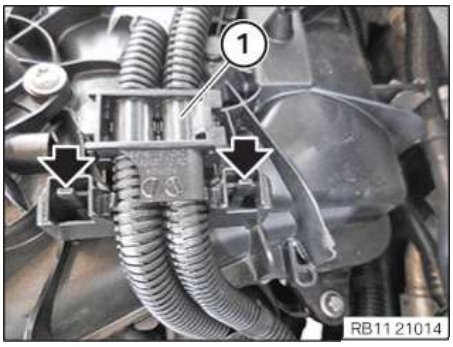
6x18		Tightening torque	6,5 Nm



- Insert and install the tank ventilation line (2).
- Lock (1) must engage audibly.
- Secure the tank ventilation line (2) to the clamp (3).



- Insert and install wiring harness section (2) for injectors and ignition coils.
- Secure clamps (1).



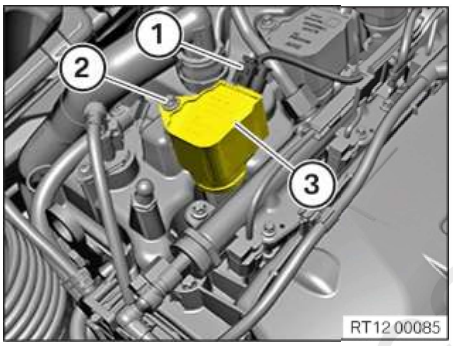
- Insert and install wiring harness section (1) for injectors and ignition coils.
- The locks (arrows) must engage audibly.

35 – Install all ignition coils

NOTICE

The description is for one component only. The procedure is identical for all further components.

▶ **Install ignition coil.**



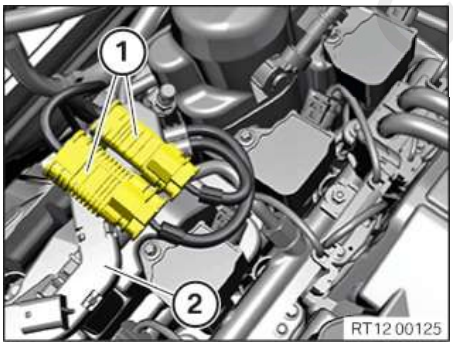
- Install ignition coil (3).
- Tighten down screw (2).

Ignition coil

Screw	Tightening torque	8 Nm

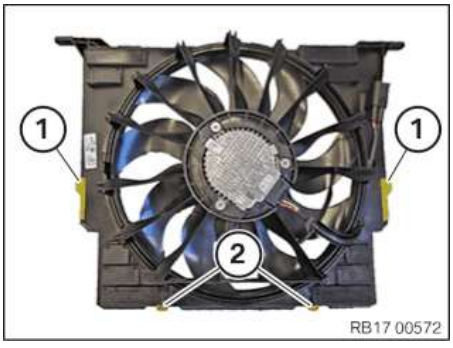
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.



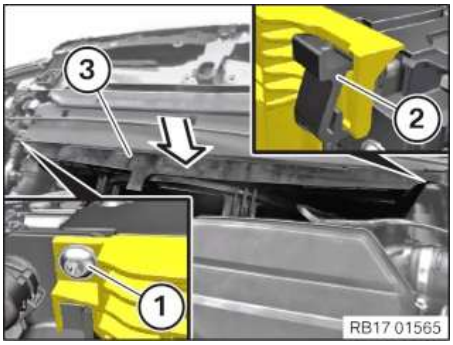
- Connect the connector (1) of the front oxygen sensor and the monitoring oxygen sensor on the cable shaft (2).

36 – Install fan cowl



- Feed guides (1) into the radiator.
- Feed guides (2) into the charge air cooler.

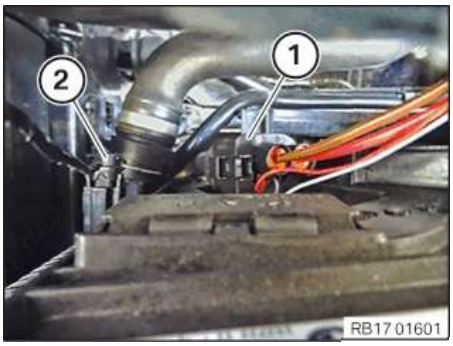
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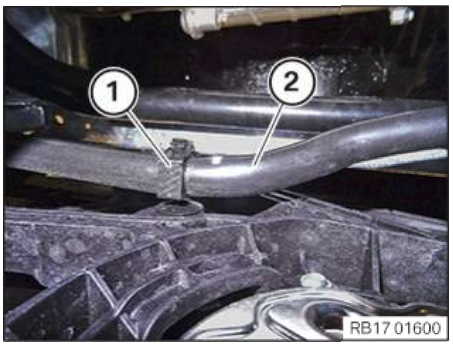
- Guide in and install fan cowl (3) **carefully** in the direction of the arrow.
- Ensure that the lock (2)engages audibly.
- Tighten down screw (1).

Fan cowl with electric fan on radiator

TS6x20		Tightening torque	6,5 Nm

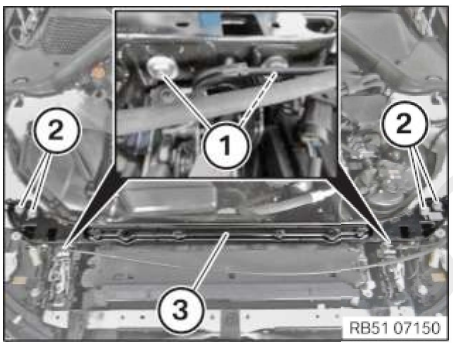


- Connect connectors (2) and lock.
  The connector (2) must engage audibly.
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.



- **If installed:** Secure the transmission oil line (2).
  Insert and install the transmission oil line (2).
  Lock holder (1).

37 – Install the rear top cross connection



- Guide in and position the top rear cross connection (3).
- Tighten the screws (1).

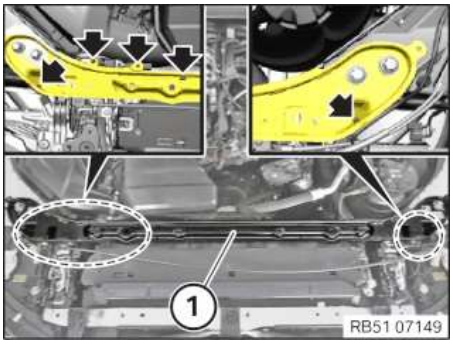
Top rear cross connection to bonnet catch support

Flat-head screw M6x20		Tightening torque	11,8 Nm

- Renew screws (2).
  Parts: Bolts
- Tighten the screws (2).

Rear top cross connection to wheel arch carrier support

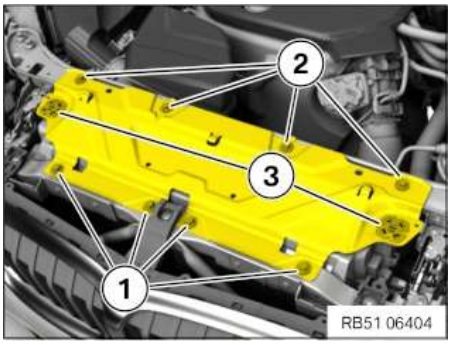
M10x20 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °



- Secure the clips (arrows) in the marked areas to the top rear cross connection (1).

38 – Installing the top cross connection

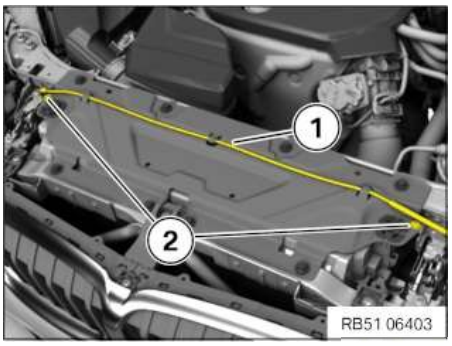
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- Set and position upper cross connection with holders (3) from above.
- Tighten down screws (1) and (2).

Cross connection, top

M8x20		Tightening torque	28 Nm



- Tighten down screws (2).

Cross connection, top

M6x20		Tightening torque	11,8 Nm

- Attach Bowden cable (1) on the upper cross connection.



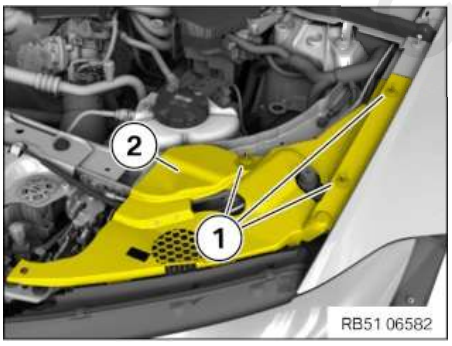
- Clip in the housing for the coupling of the Bowden cables (1).

39 – Install the cover in the engine compartment at top left and right partially

NOTICE

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

▸ **Installing the cover in the engine compartment on top partially**

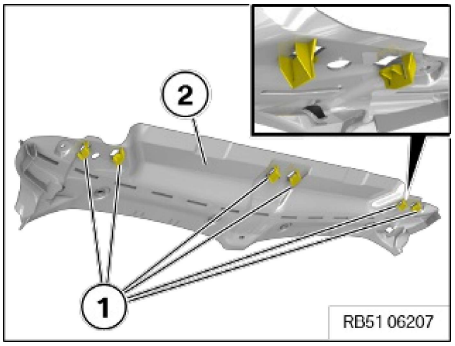


- Install the cover in the engine compartment on top (2).
- Secure expanding rivet (1).

40 – Installing cover for engine compartment centre

Check

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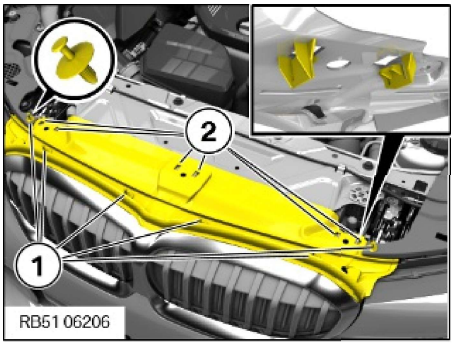
- Check latch mechanisms (1) of cover for engine compartment centre (2) for damage.

Result

» The latch mechanism (1) is damaged.

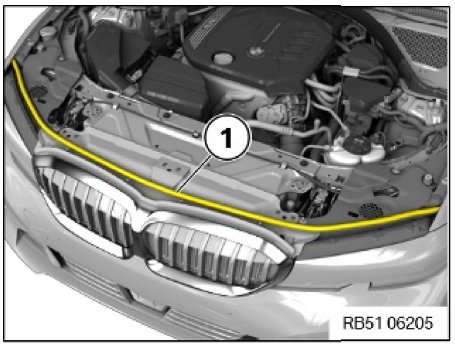
Measure

- Renew cover for engine compartment centre (2).



- Guide in the cover for the engine compartment centre from the rear and position it.
- Clip in the cover for the engine compartment centre with latch mechanisms (2).
- Mount all expanding rivets (1).

41 – Install the seal for the front bonnet



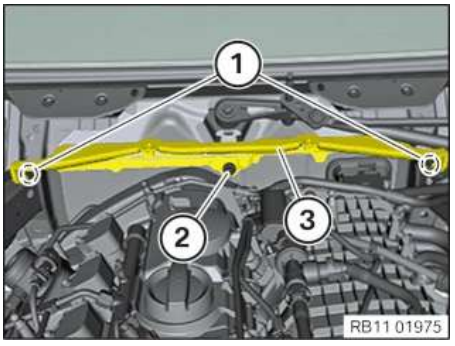
- Position the bonnet seal(1) and connect it on the mounting on the bumper and on the headlights.

42 – Disconnecting all battery earth leads



- See additional information.

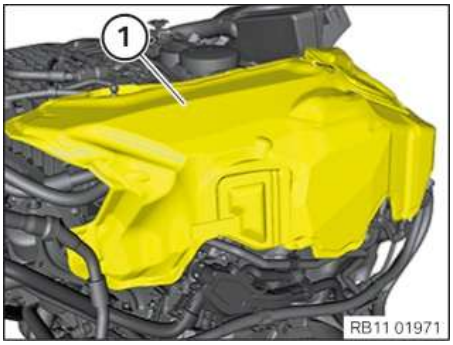
43 – Installing centre bulkhead lower section



- Position the centre bulkhead lower part (3).
- Tighten nut (2) and screws (1).

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44 – Installing acoustic cover at rear

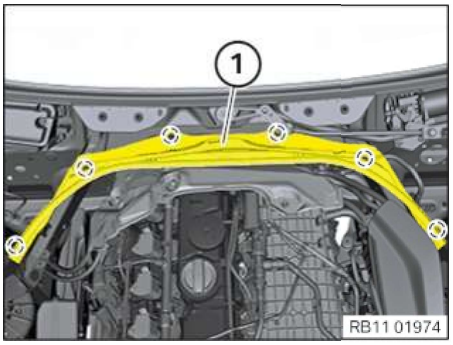


- Make sure the acoustic cover (1) is correctly positioned on the rear side of the engine.



- Install the acoustic cover (1) from the top and clip it in into the marked areas.

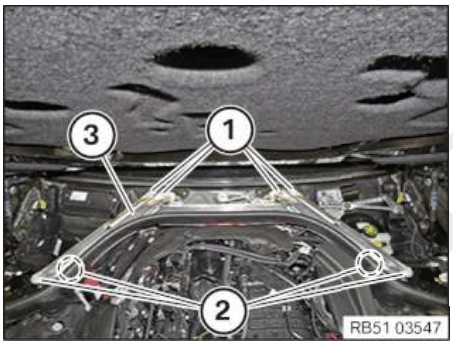
45 – Installing the centre bulkhead upper part



- Position the centre bulkhead upper part (1).
- Tighten the bolts in the marked areas.

Bulkhead upper part to bottom bulkhead

		Tightening torque	3 Nm



- **If installed:** Install tension strut on spring strut dome.
- Install the tension strut (3) on the spring strut dome.
- Tighten the screws (1).

Tension strut on bulkhead

M10x25 screw		Tightening torque	56 Nm

- Renew screws (2).

  Parts: Bolts
- Tighten the screws (2).

Tension strut to spring strut dome

Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

46 – Installing cowl panel cover

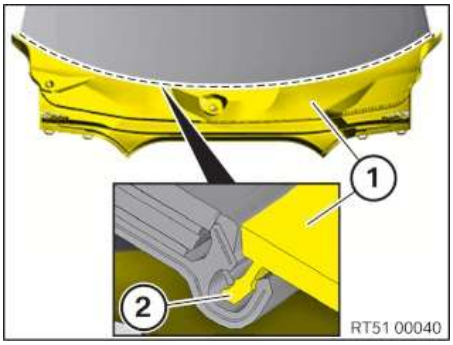
RISK OF DAMAGE

Damage caused by water ingress into the vehicle.

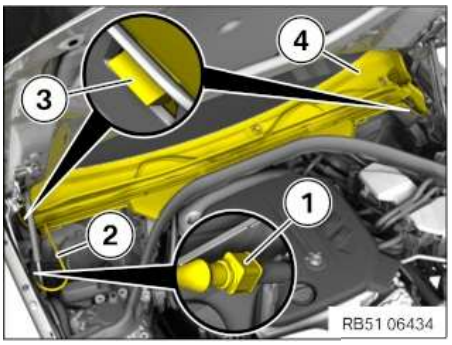
Water ingress into the vehicle may result in damage to components, malfunctions and corrosion.

- Ensure correct installation of the components.
- Only use undamaged components.

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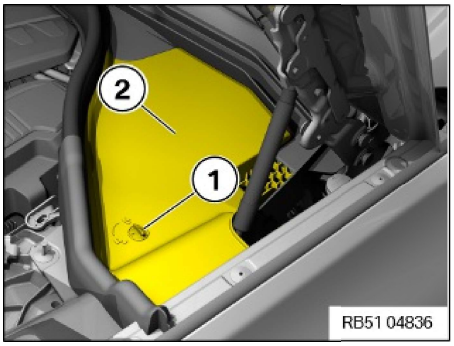


- Push the cowl panel cover (1) into the latch mechanism (2) beginning on the side.



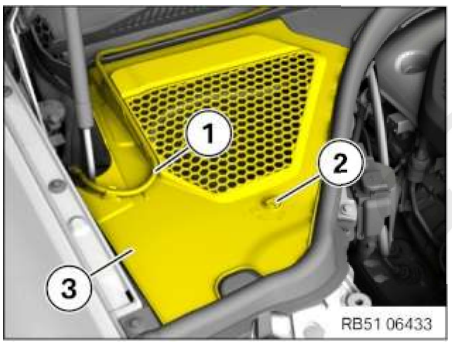
- Clip cowl panel cover (4)in by means of the latch mechanisms (3).
- Position windscreen wash hose (2) and connect windscreen wash hose (1)quick lock.

47 – Install the cover of the engine compartment on the rear left



- Position the engine compartment cover at the rear left (2) .
- Close lock (1).

48 – Install the rear right engine compartment cover



- Position the cover of the engine compartment on the rear right (3).
- Close lock (2).
- Insert washer fluid hose (1) into the guides.

49 – Installing both wiper arms

NOTICE

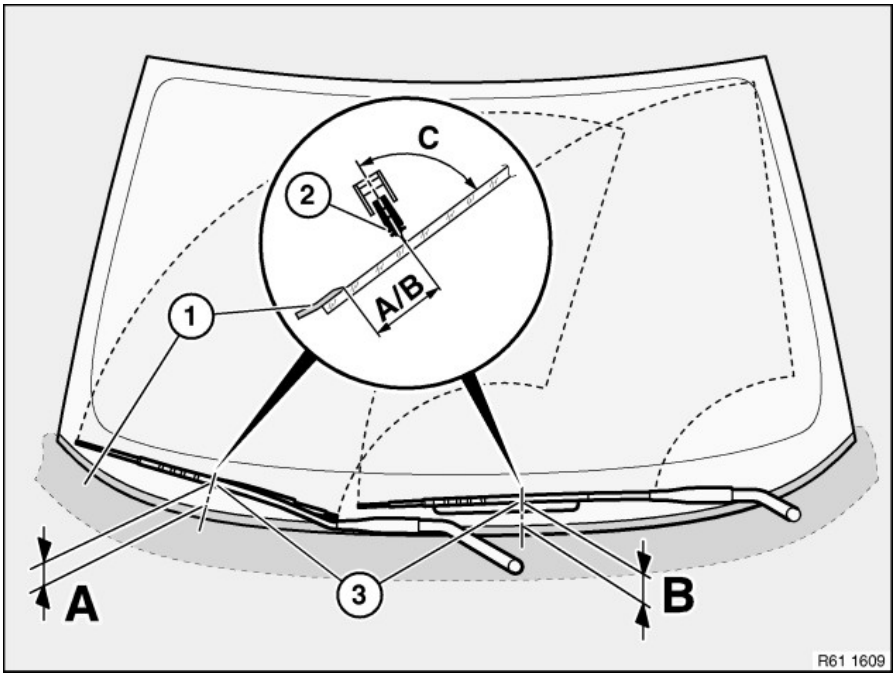
Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.

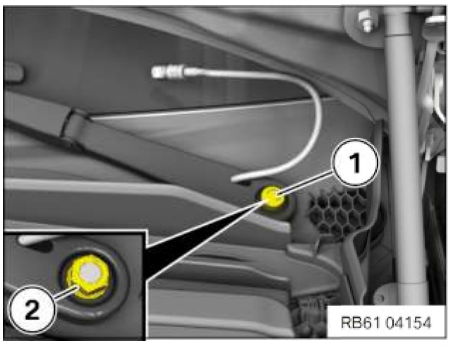
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- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).

Distance from window pane edge to wiper blade

Wiper arm right (A)	57,5 ± 5 mm
Wiper arm left (B)	63,3 ± 4 mm

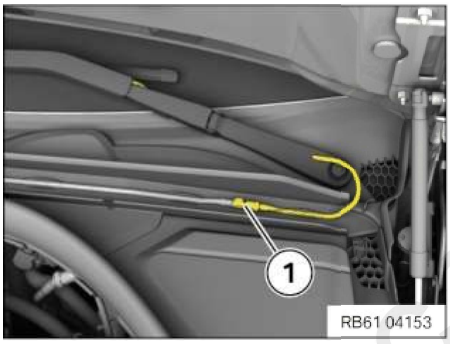


- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).



- Insert windscreen wash hose (1) into the cowl and connect at the separating point.

50 – Install acoustic cover

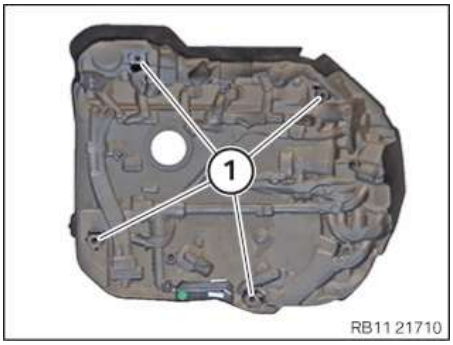
RISK OF DAMAGE

Damage to the acoustic cover.

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

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

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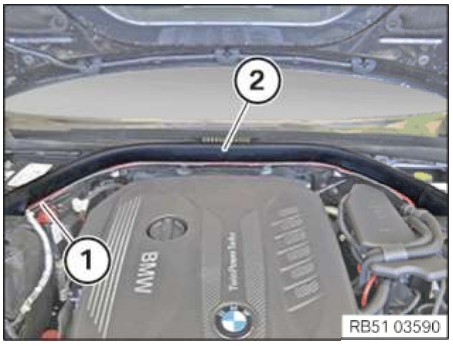


- Check the rubber mount (1) for correct fit in the acoustic cover.



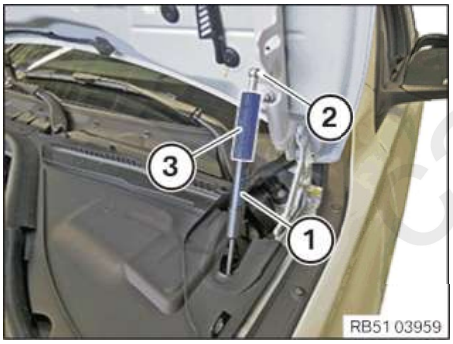
- Install acoustic cover (1) and fix in the rubber mounts (marks).

51 – Install the seal for the bonnet

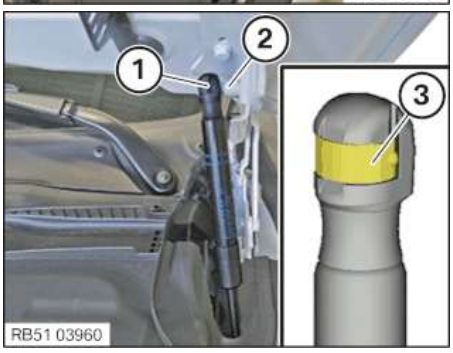


- Press the rear bonnet seal (2) into the guide.
- Feed in cable (1) into the brackets.
- Check that the rear bonnet seal (2) and the cable (1) are seated correctly.

52 – Take bonnet out of the service position



- Support the bonnet by hand.
- Remove the special tool (3) from the ball pin (2).
- Pull off the special tool (3) from the gas pressure spring (1).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.



CAUTION

Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.

- Check the clamp (3) is fitted correctly.
- Connect ball socket (1) to ball pin (2).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.

Additional Information

Overview of Tightening Torques

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Camshaft sensor to cylinder head cover			Used in step 26
TS5x20		Tightening torque	4 Nm

Cylinder head cover to cylinder head			Used in step 27
M6X30		Jointing torque	8 Nm

Cylinder head cover to cylinder head			Used in step 27
M6X30		Tightening torque	11 Nm

Auxiliary coolant pump holder to cylinder head			Used in step 27
M6		Tightening torque	7 Nm

Standard screw connection M6			Used in step 27
M6			8 Nm

Differential pressure sensor to holder			Used in step 27
TS6X18		Tightening torque	3,5 Nm

Holder, positive battery cable to cylinder head cover			Used in step 27
6X18		Tightening torque	6 Nm

Ground cable to rail			Used in step 3031
M6			5 Nm

High pressure pump to high pressure pump flange			Used in step 32
M6x25	*Renew screws.*	Jointing torque	12 Nm
		Tightening torque	90 °

High pressure line between rail and high pressure pump			Used in step 33
M14x1,5		Tightening torque	33 Nm

Fuel delivery line to high pressure pump			Used in step 34
M14		Tightening torque	31 Nm

Fuel line to cylinder head cover			Used in step 34
6x18		Tightening torque	6,5 Nm

Ignition coil			Used in step 35
Screw		Tightening torque	8 Nm

Fan cowl with electric fan on radiator			Used in step 36
TS6x20		Tightening torque	6,5 Nm

Top rear cross connection to bonnet catch support			Used in step 37
Flat-head screw M6x20		Tightening torque	11,8 Nm

Rear top cross connection to wheel arch carrier support			Used in step 37
M10x20 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Cross connection, top			Used in step 38
M8x20		Tightening torque	28 Nm

Cross connection, top			Used in step 38
M6x20		Tightening torque	11,8 Nm

Bulkhead upper part to bottom bulkhead			Used in step 45
		Tightening torque	3 Nm

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Tension strut on bulkhead			Used in step 45
M10x25 screw		Tightening torque	56 Nm

Tension strut to spring strut dome			Used in step 45
Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

Windscreen wiper arm			Used in step 49
Combination hexagon nut		Tightening torque	35 Nm

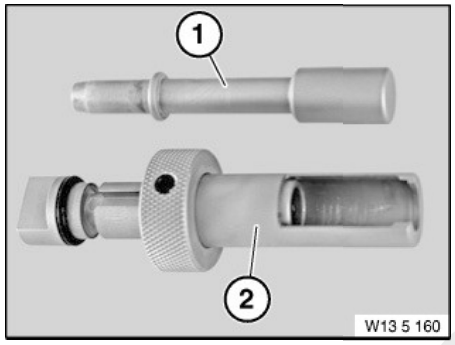
Overview of Special Tools

2 360 895 Pin wrench



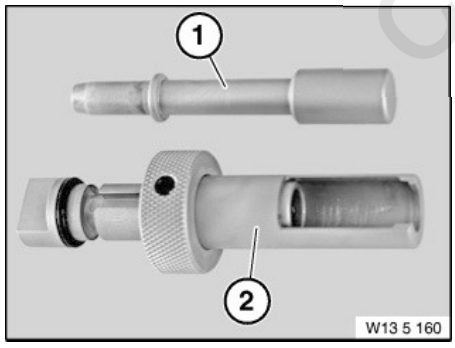
Common	Used in step 1228
Usage	For removal and installation of the magnetic actuator. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

0 496 567 (13 5 161) Fastener



Common	Used in step 21
Usage	(Cap (2 piece)) For sealing the quick connectors Deletion, only available via tool set
Included in the tool or work	0 496 565
Storage location	
Replaced by	
In connection with	
SI-Number	

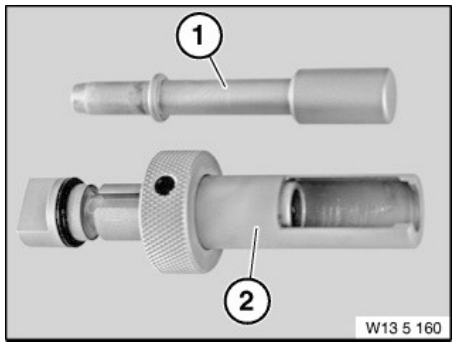
0 496 568 (13 5 162) Fastener



Common	Used in step 21
Usage	(Cap (2 x)) To close off the fuel lines. Discontinued, can only be ordered using complete tool
Included in the tool or work	0 496 565
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 496 565 (13 5 160) Fastener



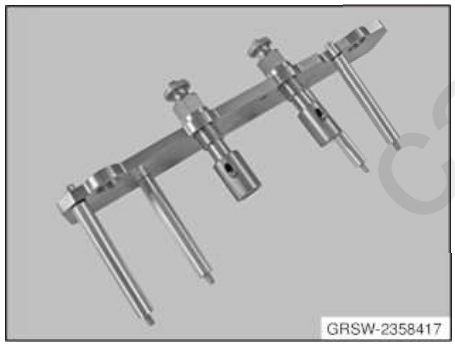
Common Used in step 21

Usage	(Caps (2x)) To close off the fuel lines when removing and installing the engine.
Included in the tool or work	
Storage location	B26
Replaced by	
In connection with	
SI-Number	01 22 08 (498)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 567 (13 5 161)		**Fastener** (Cap (2 piece)) For sealing the quick connectors Deletion, only available via tool set	
2	0 496 568 (13 5 162)		**Fastener** (Cap (2 x)) To close off the fuel lines. Discontinued, can only be ordered using complete tool	

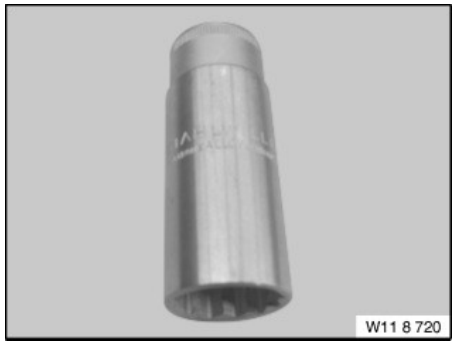
2 358 417 Device



Common Used in step 2324

Usage	For removing and installing injectors. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A57
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

0 496 106 (11 8 720) Socket WAF 46



Common Used in step 2324

Usage	(Long socket SW24) For removal and installation of oil pressure sensor. (Stahlwille or HAZET)
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 04 07 (352)

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2 452 959 Pliers



Common	Used in step 29
Usage	For disassembly of the PTFE sealing rings on the injector HDEV5 & HDEV6. Replaces 0495757 (SWZ number 13 0 191). Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A5
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 448 401 Fitting aid



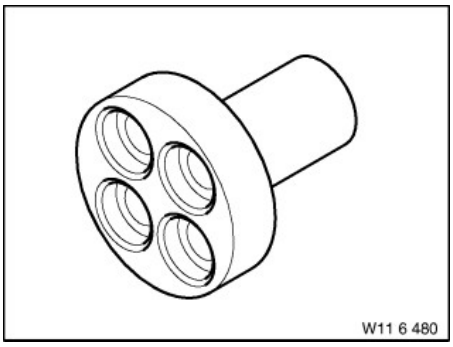
Common	Used in step 29
Usage	For installation of PTFE rings on injector. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C55
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 358 022 Gauge



Common	Used in step 3031
Usage	To position the injector during installation. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 13 14 (098)

0 493 380 (11 6 480) Connector



Common	Used in step 32
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

Overview Technical Data

Distance from window pane edge to wiper blade — Used in step 49

Wiper arm right (A)	57,5 ± 5 mm
Wiper arm left (B)	63,3 ± 4 mm

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Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	142
61 20 900 Disconnecting and connecting battery earth lead	142
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61 20 900 Disconnecting and connecting battery earth lead	142
61 20 900 Disconnecting and connecting battery earth lead	142
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	142
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	142
61 20 900 Disconnecting and connecting battery earth lead	142
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	142
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	142
61 20 900 Disconnecting and connecting battery earth lead	142
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61 20 900 Disconnecting and connecting battery earth lead	142
61 20 900 Disconnecting and connecting battery earth lead	142
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61 20 900 Disconnecting and connecting battery earth lead	142
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	142
61 20 900 Disconnecting and connecting battery earth lead	142
61 20 900 Disconnecting and connecting battery earth lead	142
61 20 900 Disconnecting and connecting battery earth lead	142
61 20 900 Disconnecting and connecting battery earth lead	142
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61 35 ... Notes on ESD protection (Electro Static Discharge)	12
61 35 ... Notes on ESD protection (Electro Static Discharge)	1219
13 53 ... Clean the cylinder heads in the area of injectors to prevent sand/dust contamination.	2324
17 11 035 Removing and installing/replacing fan cowl with electric fan	32

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