11 00 039 Checking compression of all cylinders (N47 D20 O1)

Special tools required:

- 11 0 235
- 11 8 880

Necessary preliminary work:

- Remove all glow elements.

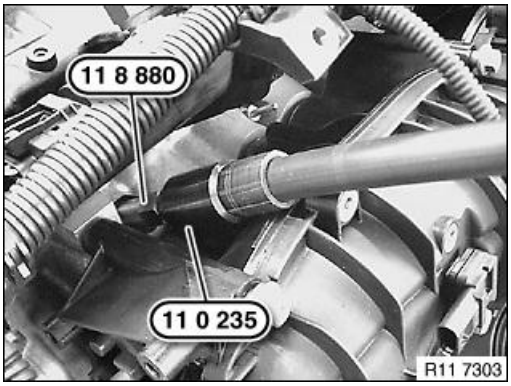
Warning!

On vehicles with manual gearbox:

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

Important!

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



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

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

Technical data.

Assemble engine.

Delete fault memory in the Digital Diesel Electronics.

Check function of Digital Diesel Electronics.

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11 00 039 Checking compression of all cylinders (N47, N47S)

Special tools required:

- 11 0 235
- 11 8 880

Necessary preliminary tasks:

- Remove all glow elements.

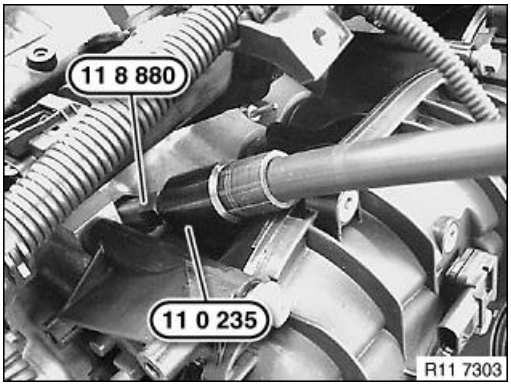
Warning!

On vehicles with manual gearbox:

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

Important!

To prevent the injection system from injecting, it is necessary to disconnect the injection system plug connections.



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

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

Assemble engine.

Clear DDE fault memory.

Check function of DDE.

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11 00 039 Checking the compression of all cylinders (N47D20 K/U/O/T 1)

Special tools required:

- 11 0 235
- 11 8 880

Necessary preliminary tasks:

- Remove all glow elements.

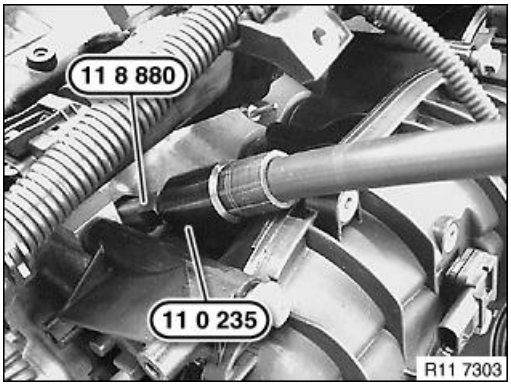
Warning!

On vehicles with manual gearbox:

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

Important!

To prevent the injection system from injecting, it is necessary to disconnect the injection system plug connections.



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

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

Technical data.

Assemble engine.

Delete fault memory in the Digital Diesel Electronics.

Check function of Digital Diesel Electronics.

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



Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

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



Protective measures/rules of conduct:

- Pour oil only into appropriately marked containers
- Do not pour oil into drinking vessels (drinks bottles, glasses, cups or mugs)
- Observe country-specific safety regulations



First aid measures:

- Do not induce vomiting.

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

  If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

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11 00 000 Differences among engine block versions (N47)

Engine generation = N47

Distinguishing features:

Longitudinal and transverse installation = **D**/C

Displacement = **2.0l**/1.6l

Power stage = T/**O**/U/K

T = Top power stage.

O = Upper power stage.

U= Lower power stage.

K = Smallest power stage.

Expansion stage = **1 (TU)** (first technical update)

Expansion stage = **2 (TU)** (second technical update)

	Power in kilowatts (KW)	Displacement in litres	Installation variants	Counterbalance shafts (AGW)	Transmission versions
N47 D20 T	160 KW	2 l	Longitudinal installation	with AGW	Manual gearbox/automatic
N47 D20 O1	135 KW	2 l	Longitudinal installation	with AGW	Manual gearbox/automatic
N47 D20 U1	105 KW	2 l	Longitudinal installation	with and without AGW	Manual gearbox/automatic
N47 D20 K1	85 KW	2 l	Longitudinal installation	with and without AGW	Manual gearbox/automatic
N47 D16 U1	82 KW	1.6 l	Longitudinal installation	without AGW	Manual gearbox/automatic
N47 C20 U1	105 KW	2 l	Transverse installation	without AGW	Manual gearbox/automatic
N47 C20 K1	85 KW	2 l	Transverse installation	without AGW	Manual gearbox/automatic
N47 C16 U1	82 KW	1.6 l	Transverse installation	without AGW	Manual gearbox/automatic
N47 C16 K1	66 KW	1.6 l	Transverse installation	without AGW	Manual gearbox

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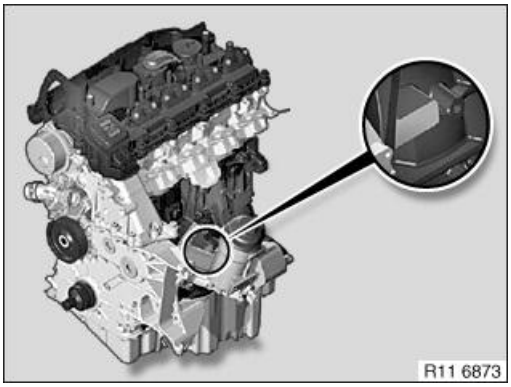
Engine identification

Engine number at the marked surface.

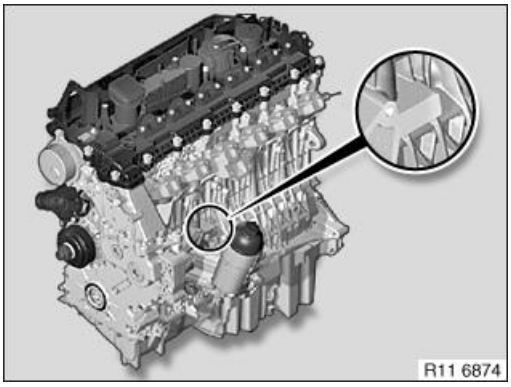
Replacement drives are already assigned a number containing the identification and engine number at the factory.

The old drive number must be imprinted for replacement crankcases.

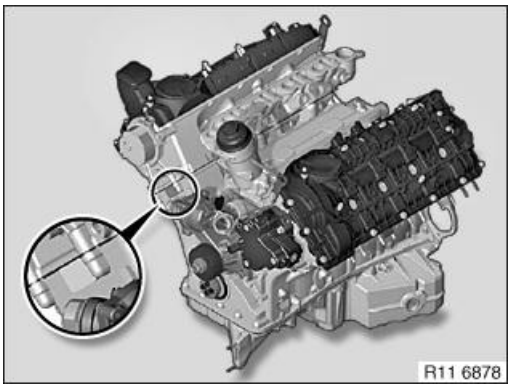
Magnesium crank cases feature a label, the engine number does not need to be embossed.



M47 / M47TU / M47T2

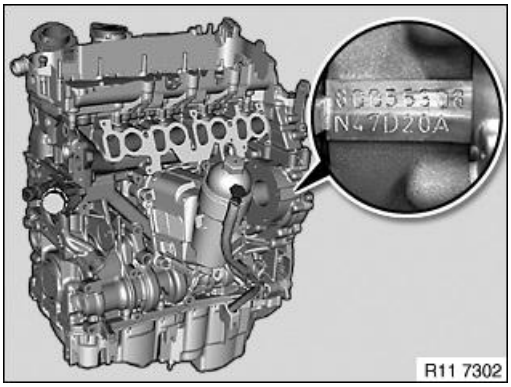


M57 / M57TU / M57T2

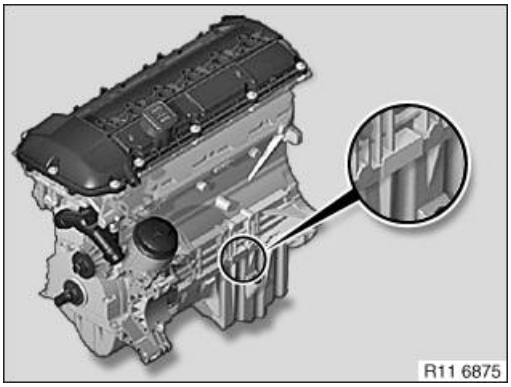


M67 / M67TU

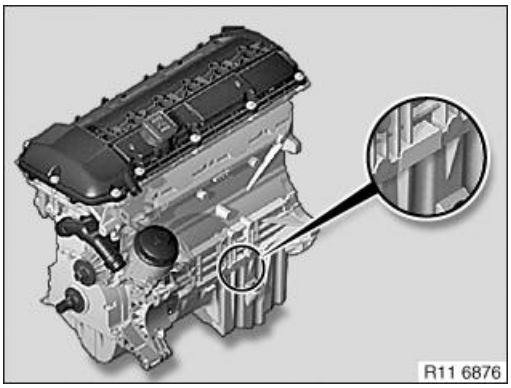
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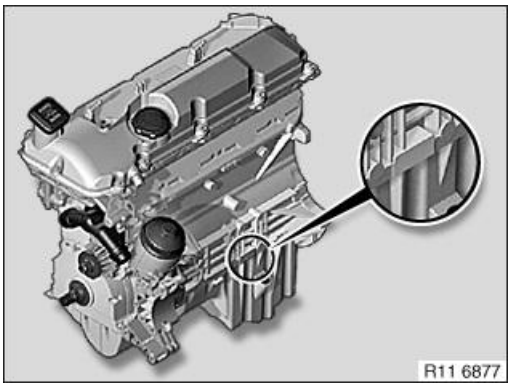
N47 / N47S / N47C / N47T / N57 / N57S / N57T



M52 / M52TU

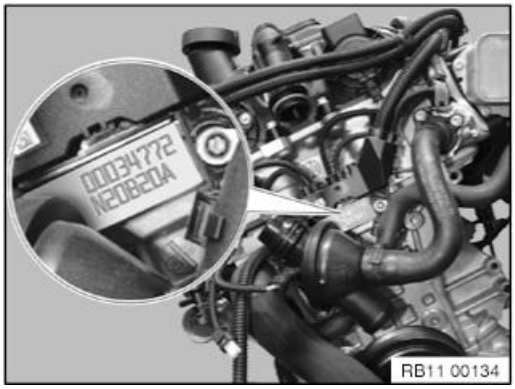


M54

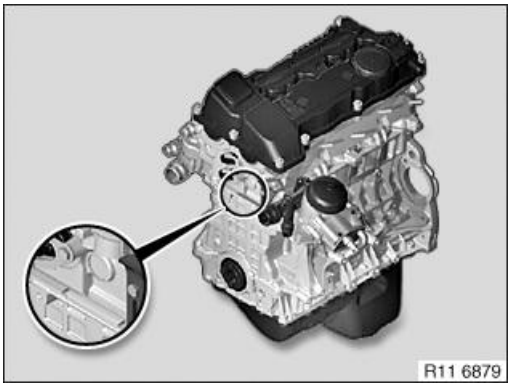


M56

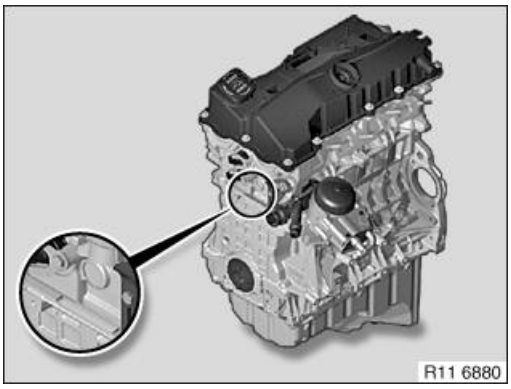
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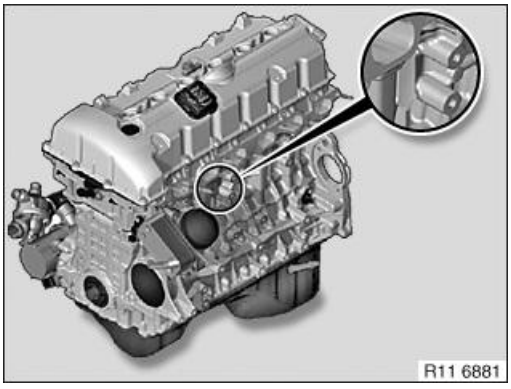
N20 / N26



N40 / N45 / N45T / N43

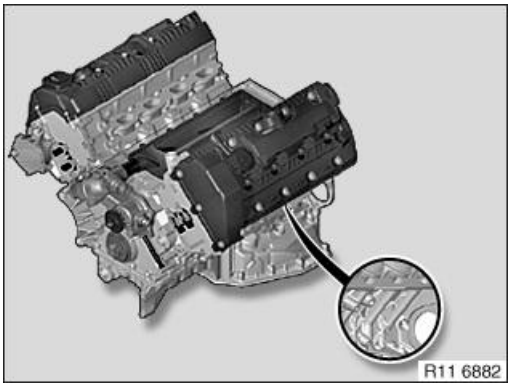


N42 / N46 / N46T

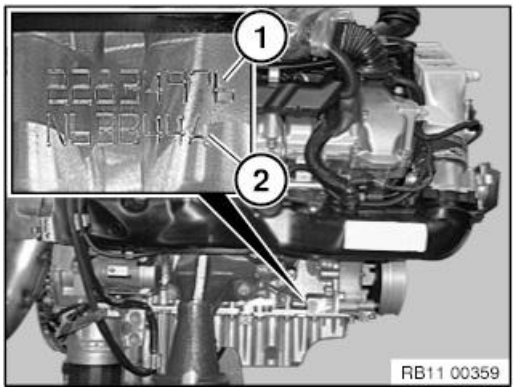


N51 / N52 / N52K / N52T / N53 / N54 / N55

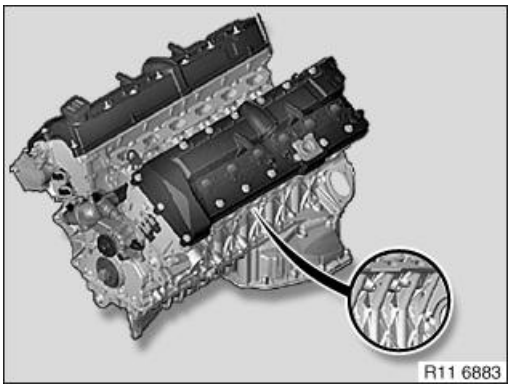
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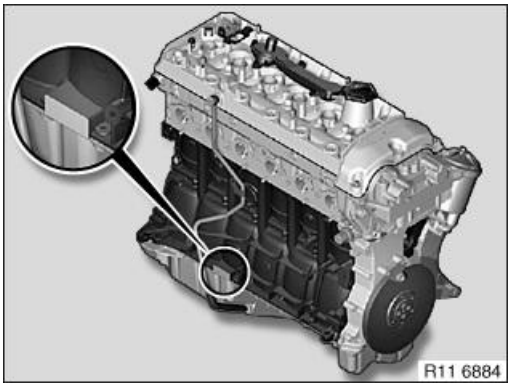
N62 / N62TU



Position (1) engine number.
PositionÂ (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.

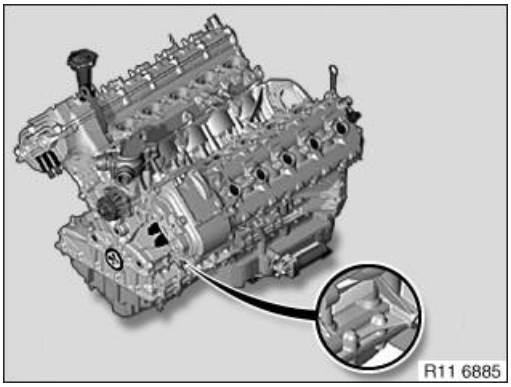


N73



S54

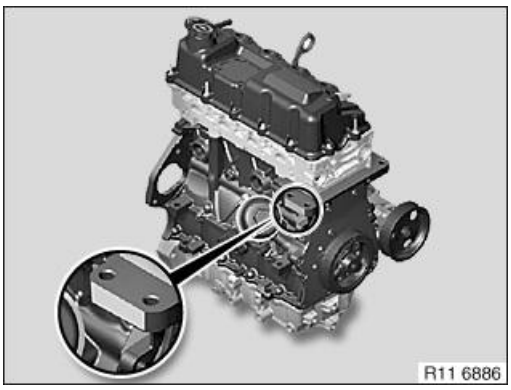
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S85 / S65



S55

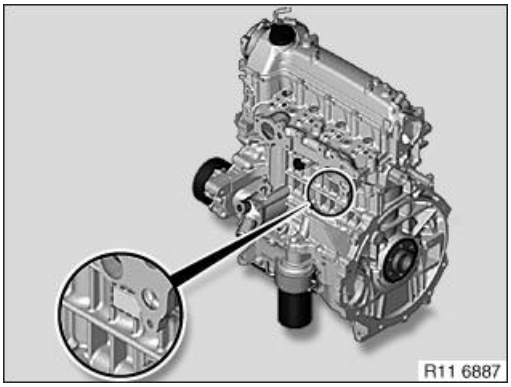


W10 / W11

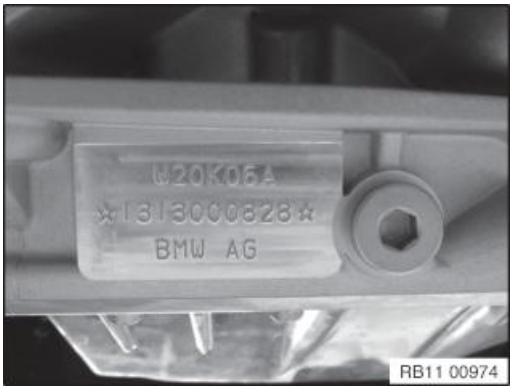


W16

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W17



W20

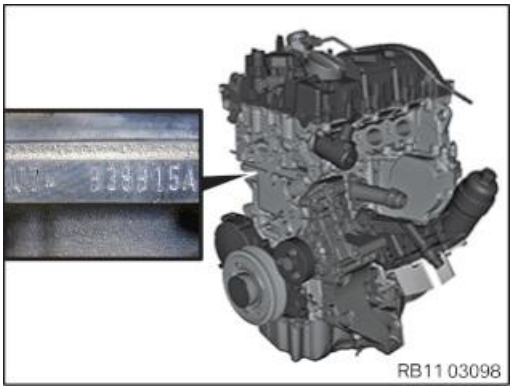


N12 / N13 / N14 / N16 / N18

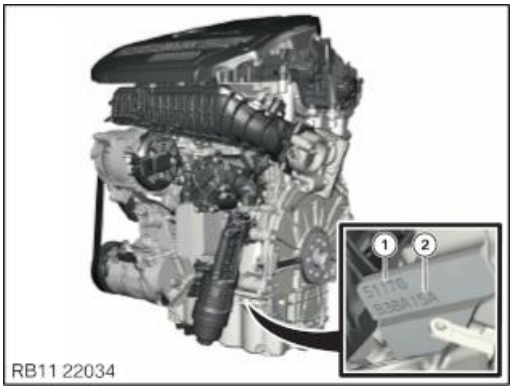


B37 / B38**A** / B47 / B48**A**
in the area of the oil sump

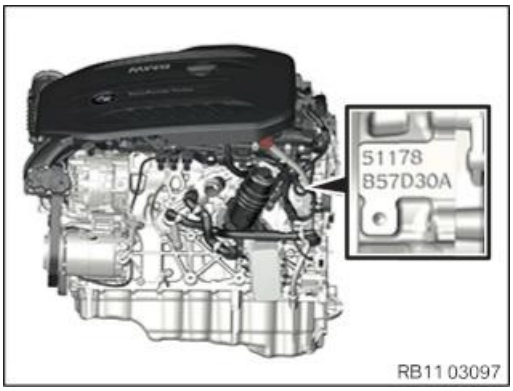
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B38**B** / B48**B**



B38



B57



B58

Assemble engine.

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11 00 ... Engine oil change (N47 D20 1)



Warning!

Risk of scalding!

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



Attention!

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

Observe the exact engine oil filling capacity.

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

Attention!

Risk of damage!

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

Cover alternator with suitable materials.



Recycling:

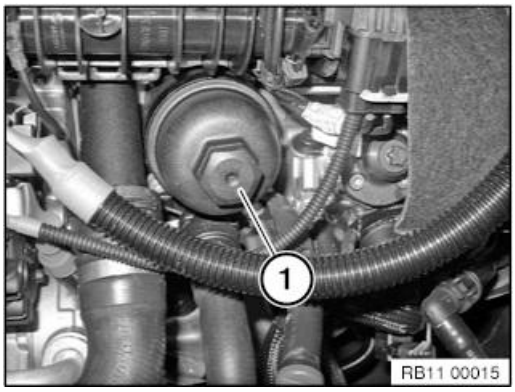
Catch and dispose of drained engine oil in a suitable collecting vessel.

Observe country-specific waste disposal regulations.



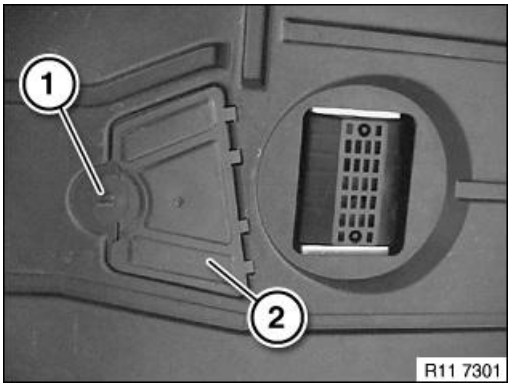
Necessary preliminary work:

- Remove acoustic cover



Release oil filter cover (1) with a suitable tool.*Note:*
Engine oil flows out of the oil filter housing and back into the oil sump.

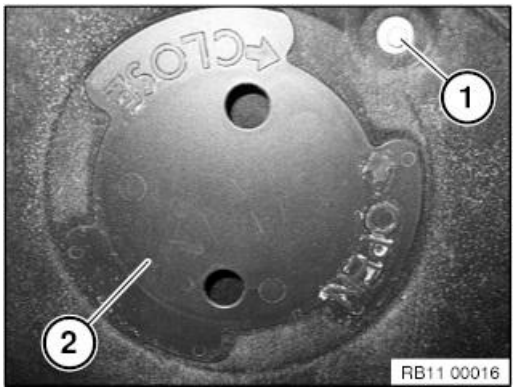
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E90, E91, E92, E93

Turn plastic screw (1).

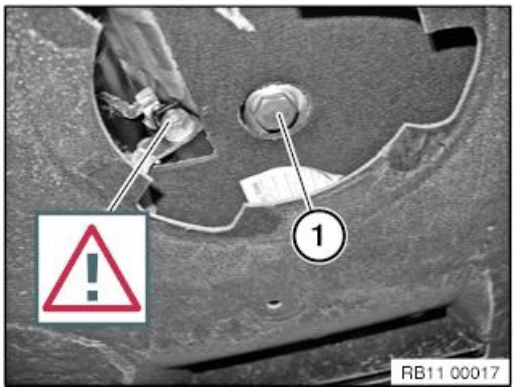
Release service opening (2).



F10, F11

Release screw (1).

Open and close service opening (2) in direction of arrow.



Attention!

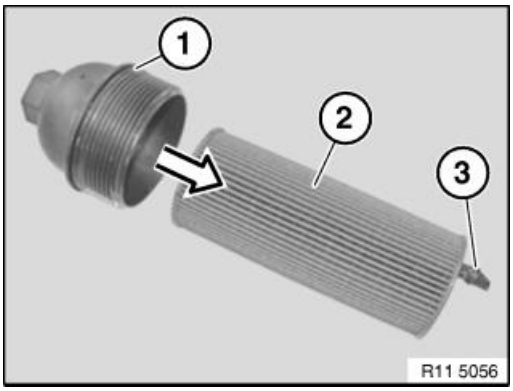
Risk of shorting at starter motor!

Open oil drain plug (1) of oil sump and drain engine oil.

Tightening torque 11 13 1AZ.

Installation note:

Replace sealing ring.



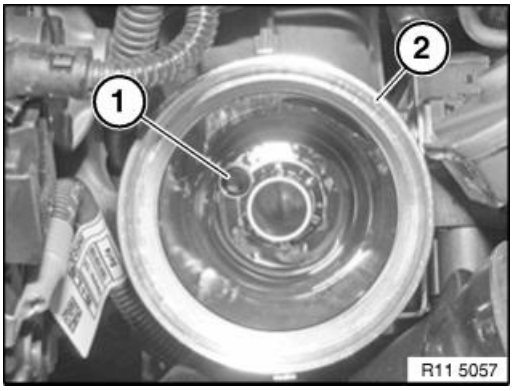
Pull out oil filter element (2) in direction of arrow.*Installation note:*

Replace oil filter element (2) and sealing ring (1).

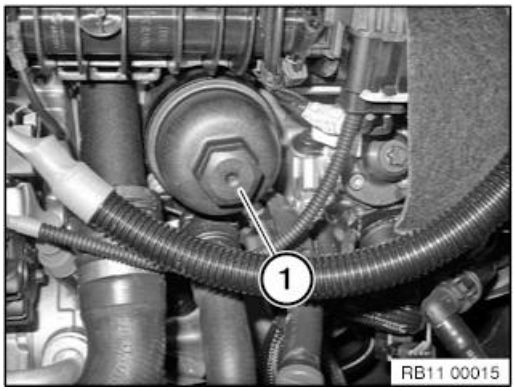
Note:

Moisten sealing ring (1) on oil filter cover and sealing ring (3) on oil filter element guide with engine oil.

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Note:
Observe the guide bore (1) for oil filter element in oil filter housing (2).



Secure oil filter cover (1) with a suitable tool.

Tightening torque 11 42 1AZ.

Note:
Pour in engine oil.

Start engine and run at idle until oil pressure indicator light goes out.

Switch off engine.

Check oil filter cover (1) and drain plug of the oil sump for leaks.

Assemble engine.

Checking oil level:

- Park vehicle on a horizontal surface
- Wait for five minutes and check the oil level by means of the oil dipstick with the engine being at operating temperature.
- Top up engine oil if necessary

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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 00 ... Engine oil service (N47)



Warning!

Risk of scalding!

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



Attention!

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

Observe the exact engine oil filling capacity.

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

Attention!

Risk of damage!

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

Cover alternator with suitable materials.



Recycling:

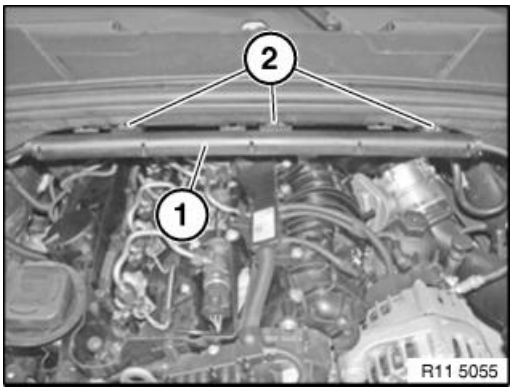
Catch and dispose of drained engine oil in a suitable collecting vessel.

Observe country-specific waste disposal regulations.



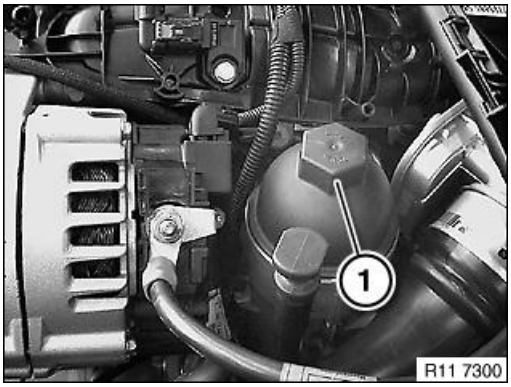
Necessary preliminary tasks:

- Remove acoustic cover

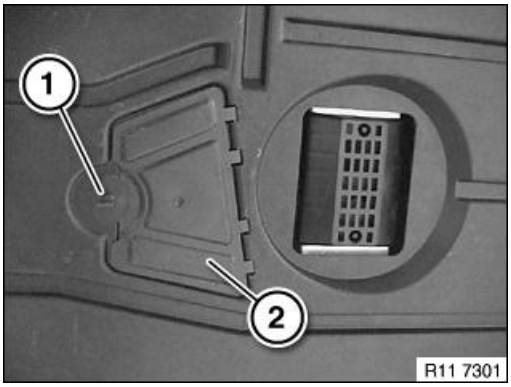


Unclip cable duct (1) in these positions (2) and put to one side.

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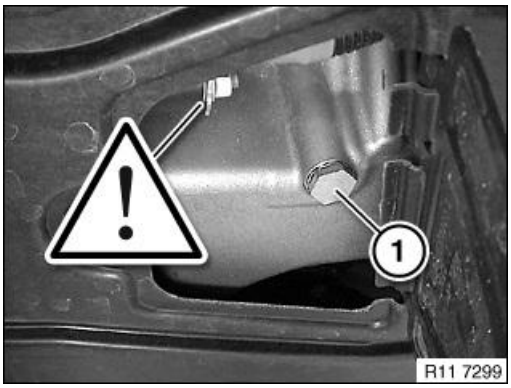


Release oil filter cover (1) with a suitable tool.*Note:*
Engine oil flows out of the oil filter housing and back into the oil sump.



Turn plastic screw (1).

Release service opening (2).

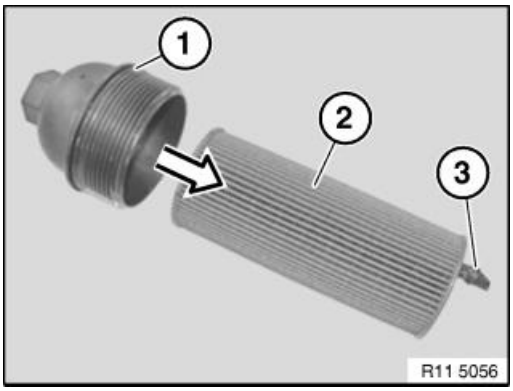


Attention!
Risk of shorting at starter motor!

Remove screw plug (1) from oil sump and drain engine oil.

Tightening torque 11 13 1AZ.

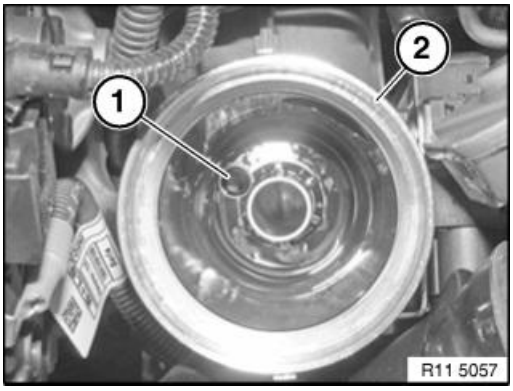
Installation note:
Replace sealing ring.



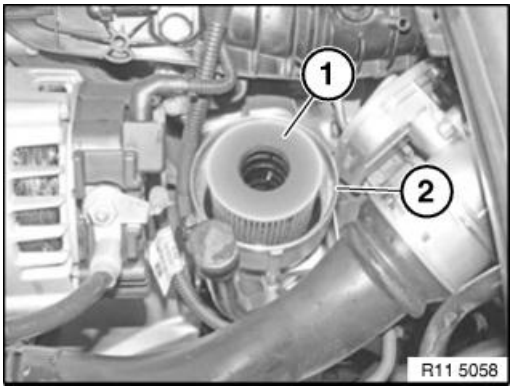
Pull out oil filter element (2) in direction of arrow.*Installation note:*
Replace oil filter element (2) and sealing ring (1).

Note:
Moisten sealing ring (1) on oil filter cover and sealing ring (3) on oil filter element guide with engine oil.

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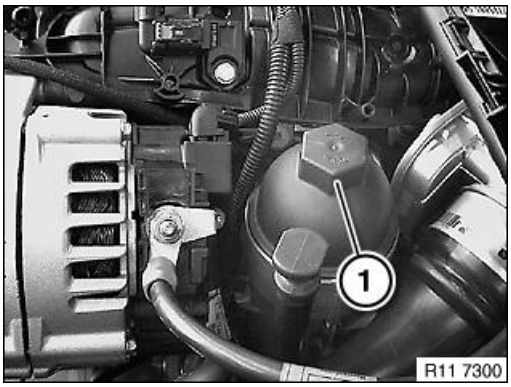
Note:
Guide bore (1) for oil filter element in oil filter housing (2).



Insert new oil filter element (1) in guide bore of oil filter housing (2).

Screw oil filter cover into oil filter housing (2) and tighten down.

Tightening torque 11 42 1AZ.



Secure oil filter cover (1) with a suitable tool.

Tightening torque 11 42 1AZ.

Note:
Pour in engine oil.

Start engine and run at idle until oil pressure indicator light goes out.

Switch off engine.

Check oil filter cover (1) and screw plug of the oil sump for leaks.

Assemble engine.

Checking engine oil level:

- Park vehicle on a horizontal surface
- Check engine oil level using the oil dipstick after the engine has been at operating for 5 minutes
- Top up engine oil if necessary

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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 00 091 Installing exchange engine (N47 / N47S)

Special tools required:

- 11 5 320
- 11 8 740
- 11 8 741
- 11 9 260

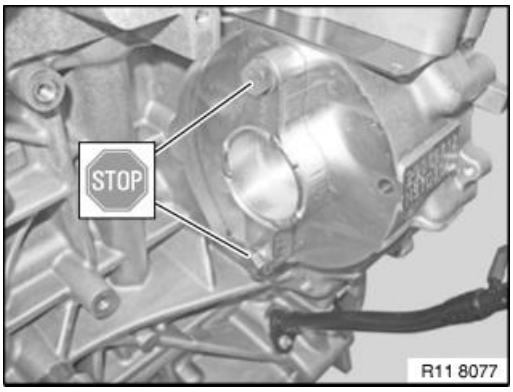
Important!

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

Risk of damage to timing chain drive.

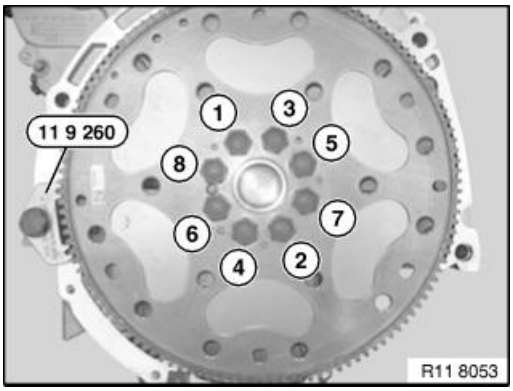
Necessary preliminary work:

- Remove engine.
- Mount engine on assembly stand.
- Convert all assemblies.



Important!

Do not remove transportation retainer without special tool 11 8 740 .



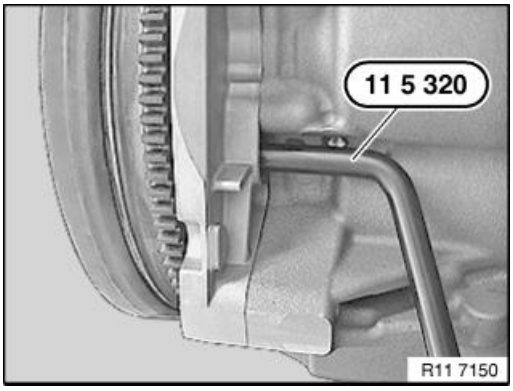
Install flywheel.

Screw in bolts (1 to 8).

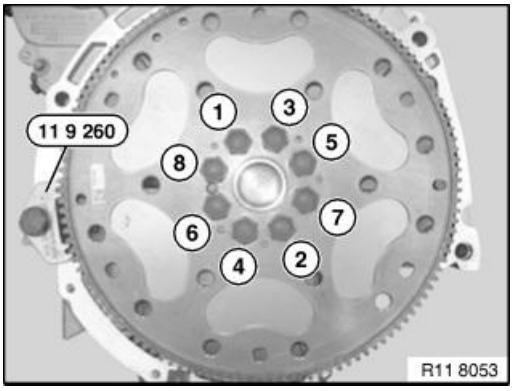
Installation note:
Replace screws.

Note:
Graphic shows automatic flywheel.

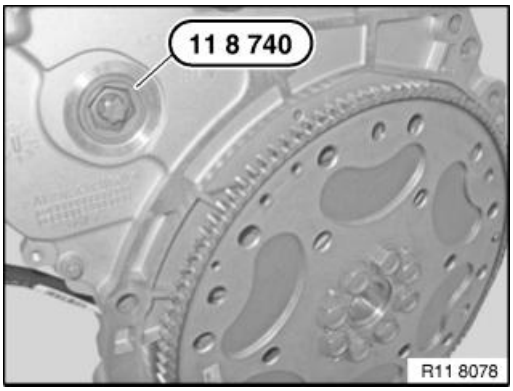
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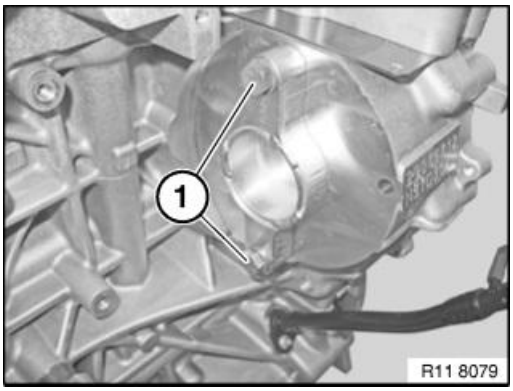
Secure engine in TDC setting with special tool 11 5 320 .



Fit special tool11 9 260 .
Tighten bolts in sequence (1 to 8).
Tightening torque: 11 22 1AZ.

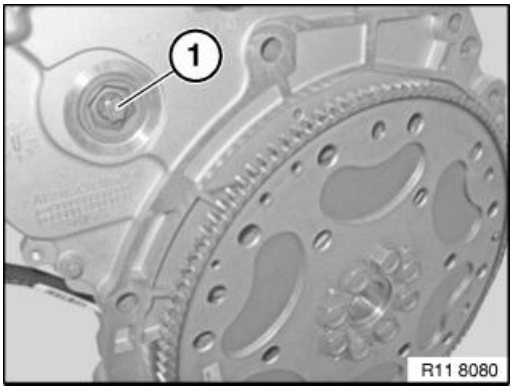


Screw in special tool 11 8 740 .



Release screws (1).

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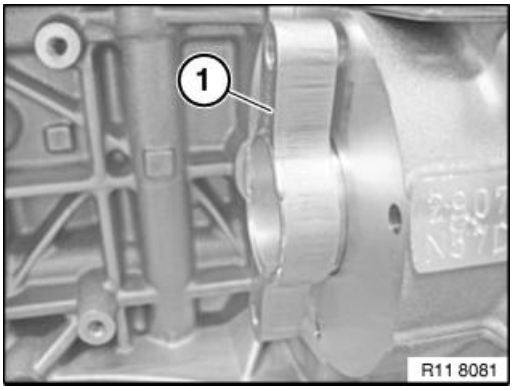


Important!

Special tool 11 8 741 remains in timing case housing.

Central bolt (1) remains in camshaft sprocket.

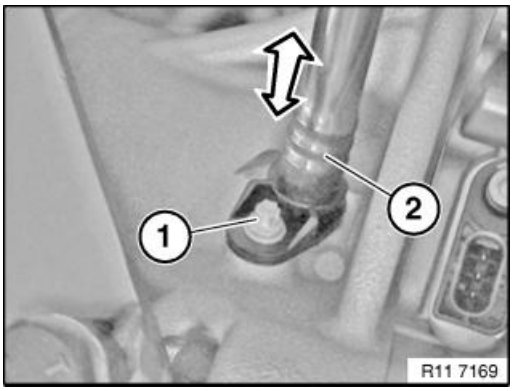
Remove central bolt (1).*Note:*
Central bolt (1) is supported on special tool 11 8 740 until transportation retainer is pressed out towards rear.



Remove transportation retainer (1).

Install high pressure pump.

Transportation retainer (1) must be sent back to BMW (obligatory return).



Release screw (1).

Tightening torque: 11 00 1AZ.

Remove vacuum line (2) in direction of arrow.

Installation note:
Replace O-ring on vacuum line.

Assemble engine.

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11 00 091 Installing replacement engine (N47T)

Special tools required:

- 11 5 320
- 11 8 740
- 11 9 260

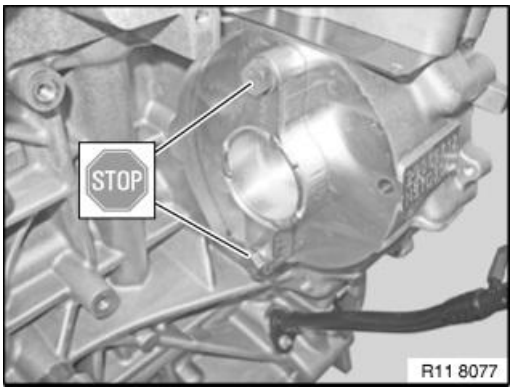
Important!

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

Risk of damage to timing chain drive.

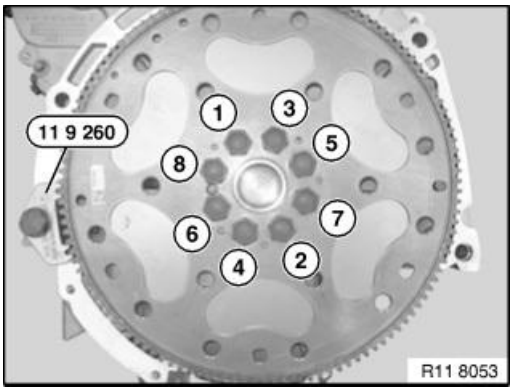
Necessary preliminary work:

- Remove engine.
- Mount engine on assembly stand.
- Convert all assemblies.



Important!

Do not remove transportation retainer without special tool 11 8 740 .



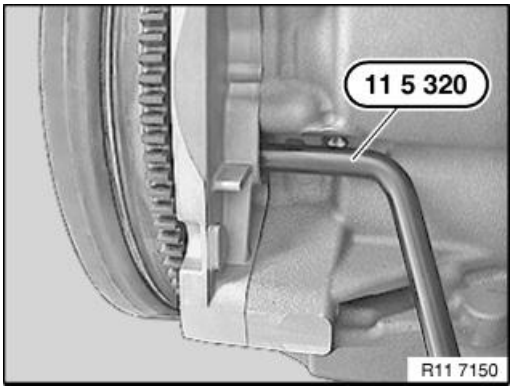
Install flywheel.

Screw in bolts (1 to 8).

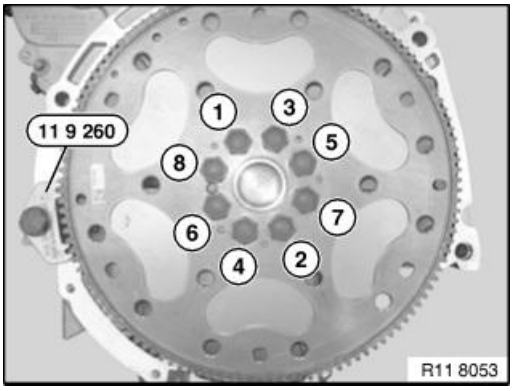
Installation note:
Replace screws.

Note:
Picture shows automatic flywheel.

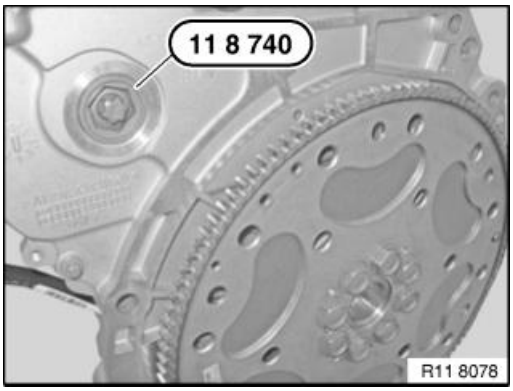
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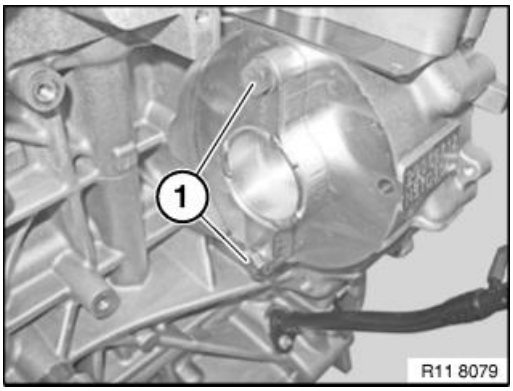
Secure engine in TDC setting with special tool 11 5 320 .



Fit special tool11 9 260 .
Tighten bolts in sequence (1 to 8).
Tightening torque: 11 22 1AZ.

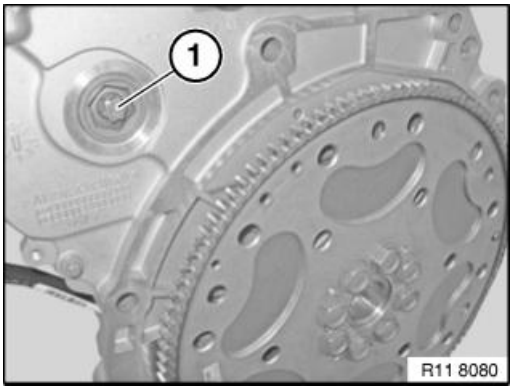


Screw in special tool 11 8 740



Unscrew screws (1).

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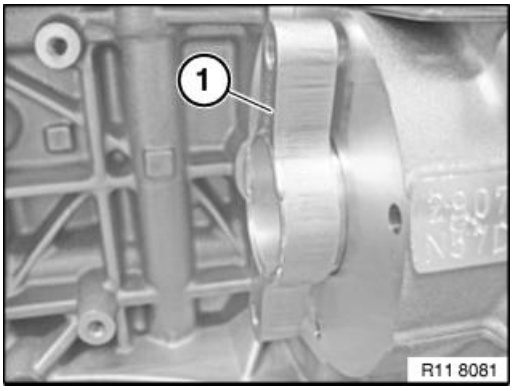


Important!

Special tool 11 8 741 remains in timing case housing.

Central bolt (1) remains in camshaft sprocket.

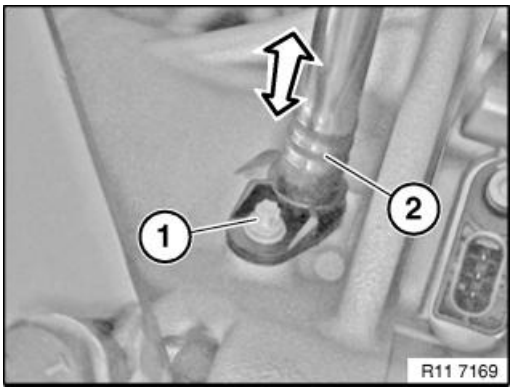
Remove central bolt (1).*Note:*
Central bolt (1) is supported on special tool 11 8 740 until transportation retainer is pressed out towards rear.



Remove transportation retainer (1).

Install high pressure pump.

Transportation retainer (1) must be sent back to BMW (obligatory return).



Release screw (1).

Tightening torque:11 00 1AZ.

Remove vacuum line (2) in direction of arrow.

Installation note:
Replace O-ring on vacuum line.

Assemble engine.

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Mounting engine on assembly stand (N47 D20 O1)

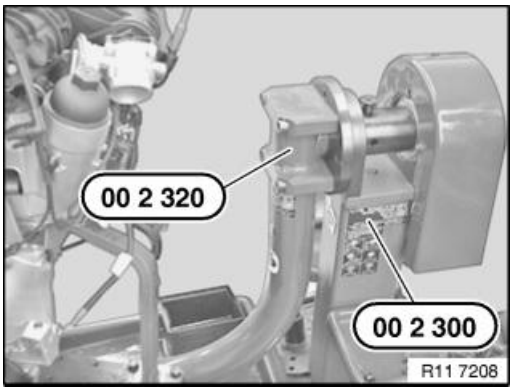
Special tools required:

- 00 2 300
- 00 2 320
- 11 8 770

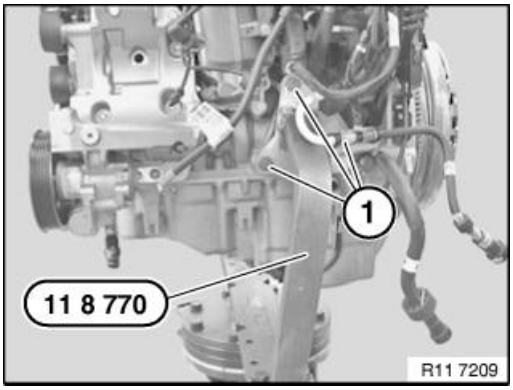
Important!
Observe manufacturer's specifications.

Necessary preliminary tasks:

- Remove engine.
- Remove engine support arm on left and right.

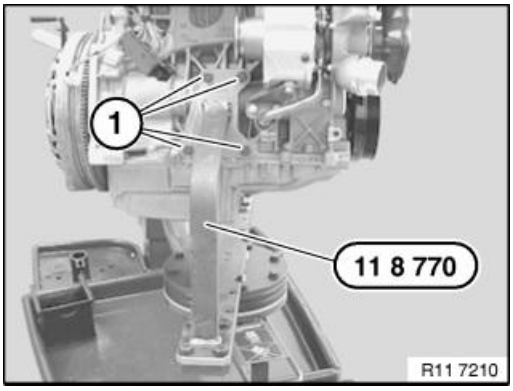


Prepare special tool 00 2 300 together with the special tool 00 2 320 .



Secure special tool 11 8 770 on left to support on engine support arm with screws (1).

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Secure special tool 11 8 770 on right to support on engine support arm with screws (1).

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Mounting engine on assembly stand (N47, N47S)

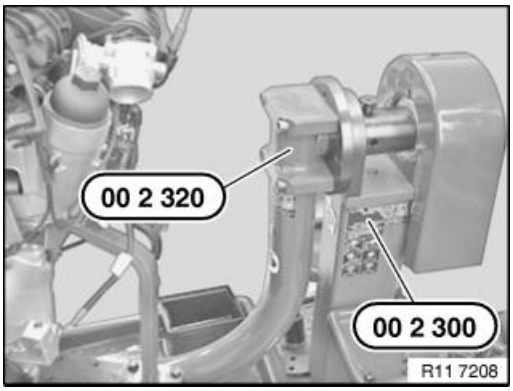
Special tools required:

- 00 2 300
- 00 2 320
- 11 8 770

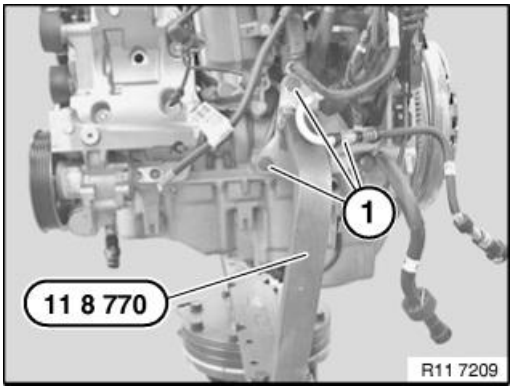
Important!
Pay attention to manufacturer's information

Necessary preliminary tasks:

- Remove engine.
- Remove engine support arm on left and right.

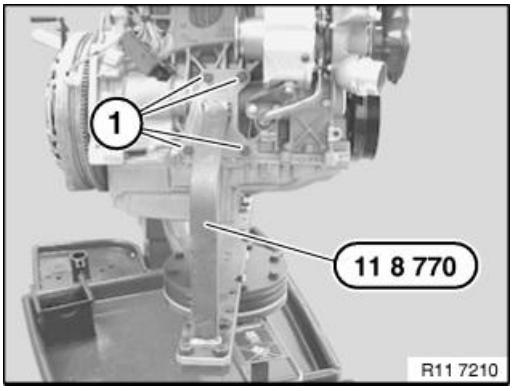


Prepare special tool 00 2 300 with special tool 00 2 320 .



Secure special tool 11 8 770 on left to support on engine support arm with screws (1).

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Secure special tool 11 8 770 on right to support on engine support arm with screws (1).

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

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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**

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	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 00 050 Remove and install engine (N47 D20 01) E90, E91, E92, E93

Special tools required:

- 11 0 020

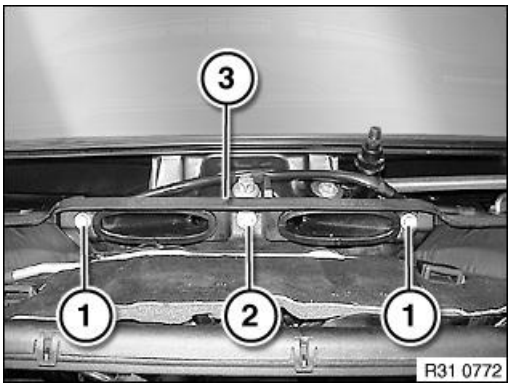
Necessary preliminary tasks:

- Follow instructions for disconnecting and connecting battery
- Disconnect battery earth lead.
- Move engine compartment lid into service position.
- Remove intake silencer housing.
- Remove radiator.
- Disconnect all coolant hoses including heater hose from engine.
- Remove left pressure pipe.
- Remove right pressure pipe.
- Remove alternator.
- Release A/C compressor and place to one side.
- If necessary, release power steering pump and place to one side.
- Remove cowl panel cover.
- Release engine wiring harness from electronics box.
- Remove diesel particulate filter.
- Remove transmission.

Recycling:

Catch and dispose of escaping fuel with auxiliary materials.

Observe country-specific waste disposal regulations.



Release screws (1,2).

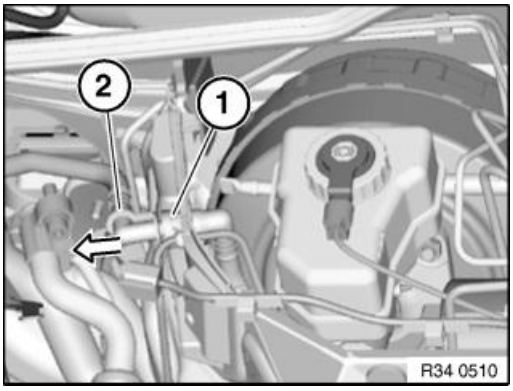
Remove heater end panel (3).

Installation note:

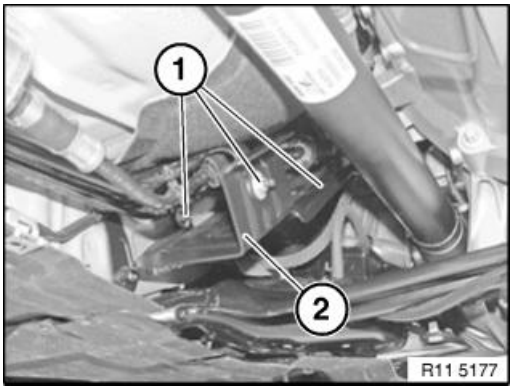
Make sure heater end panel is correctly seated.

M6x20 bolt must be fitted in middle.

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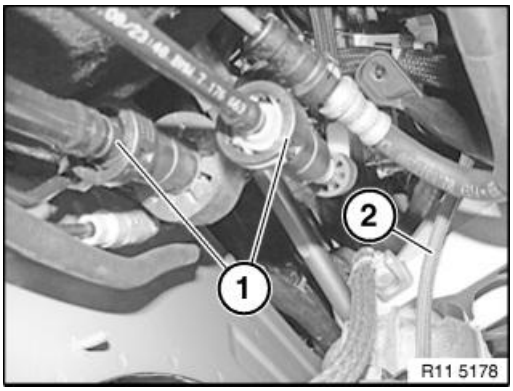
Unlock quick-release fastener (1) and pull out vacuum line (2).



Release screws (1).

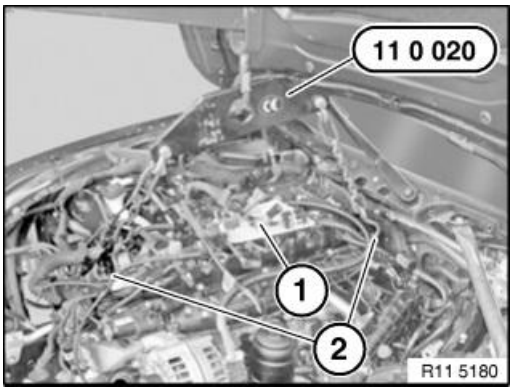
Remove the protective plate (2).

Note:
The figure shows all-wheel drive vehicle.



Unlock and disconnect the fuel delivery line and return line (1).

Detach vacuum hose (2) for engine mount.



Secure engine wiring harness (1) on engine against falling out.

Fit special tool 11 0 020 on engine.

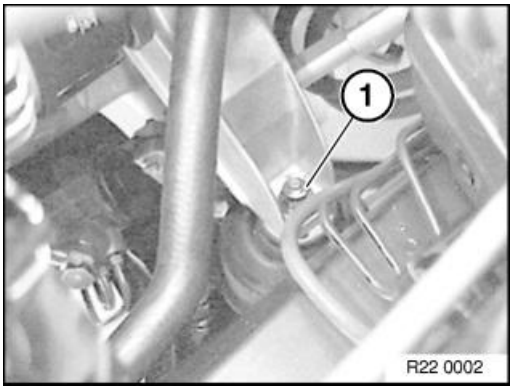
Important!

Pay attention to chain of special tool 11 0 020 . **Risk of damage.**

Only raise engine at the lifting lugs (2) provided for this purpose.

Note:
The figure shows F01.

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Release nut (1) on left and right engine mounts.

Installation note:
Replace nuts.

Release ground strap on left engine support arm.

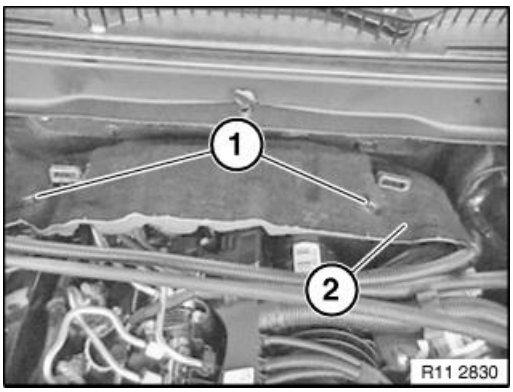
Assemble engine.

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11 00 Remove/install/replace rear acoustic cover (N47)

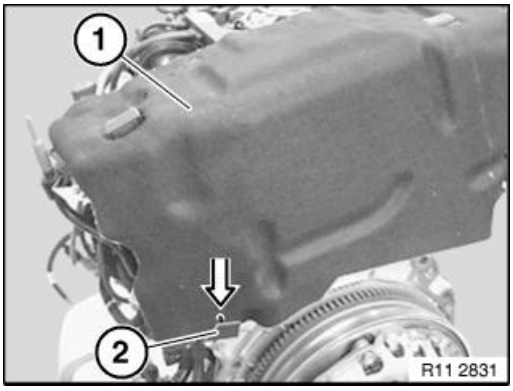
Necessary preliminary tasks:

- Remove front acoustic cover.
- Remove microfilter housing.
- Remove suspension cross-brace.



Remove expanding rivet (1).

Lift off acoustic cover (2)



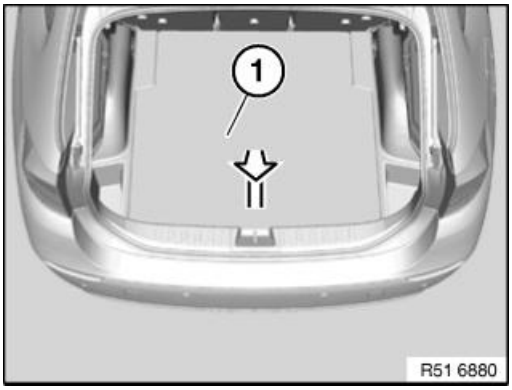
Installation note:
When installing the acoustic cover (1), make sure it is correctly seated in the holder (2).

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11 00 050 Removing and installing engine

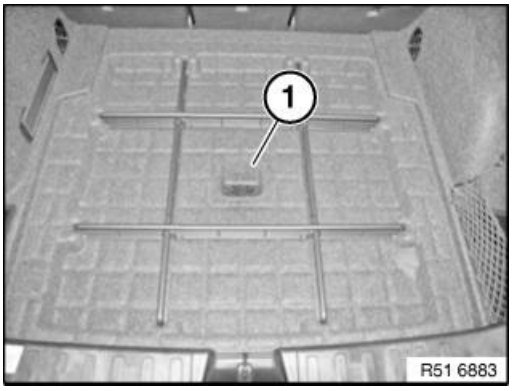
PRELIMINARY WORK

1 – Removing the luggage compartment floor trim panel



- Lift the luggage compartment floor trim panel (1) at the rear and remove it in the direction of the arrow.

2 – Removing the spare wheel well trim panel



- Remove the trim panel of the luggage compartment well (1) towards the top.

3 – Disconnecting the battery earth lead

Prerequisite

Ignition is switched off.

TECHNICAL INFORMATION

Observe the notes on handling the vehicle battery.

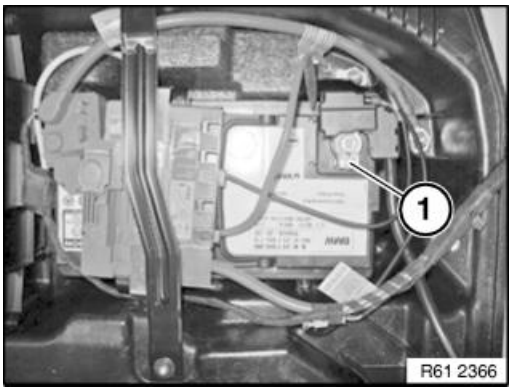
For additional information see:

61 00 ... Safety information on handling the vehicle battery

61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery

61 12 ... Notes on the intelligent battery sensor (IBS)

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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.

- Slacken nut (1).
- Pull off the intelligent battery sensor (IBS) towards the top and put to one side.

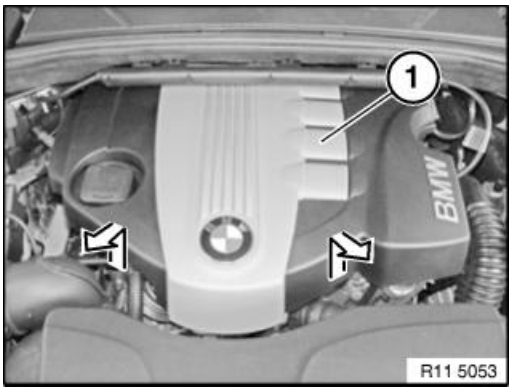
4 – Remove acoustic cover at top.

RISK OF DAMAGE

Damage to the acoustic cover.

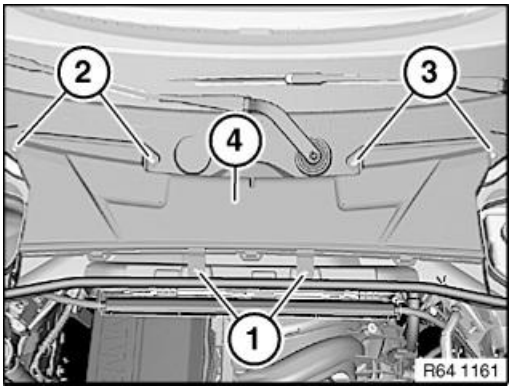
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- 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.



- Detach the acoustic cover top (1) upwards from rubber mounts and remove it in the direction of travel.

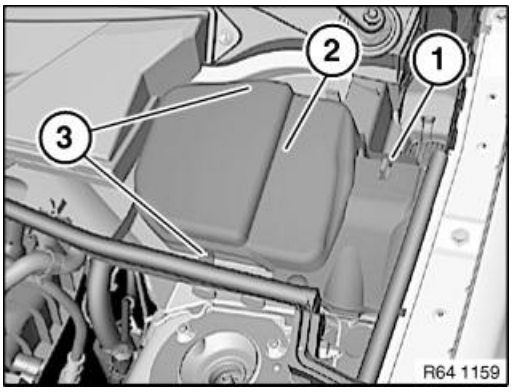
5 – Remove the top section of the microfilter housing



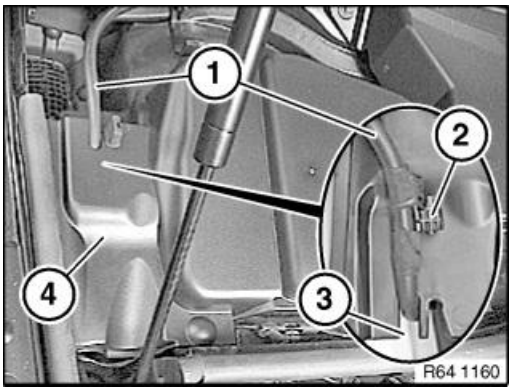
- Loosen screws (1), (2) and (3).
- Remove the upper section of the microfilter housing (4).

6 – Remove the lower section of the microfilter housing

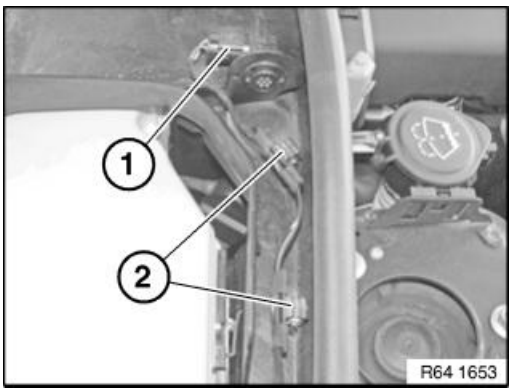
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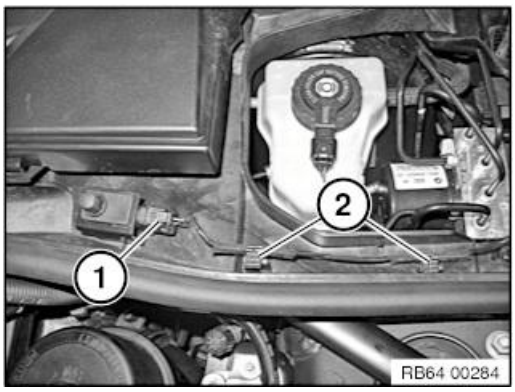
- Release the retaining tab (1).
- Loosen the latch mechanisms (3).
- Remove the cover (2) on the left.



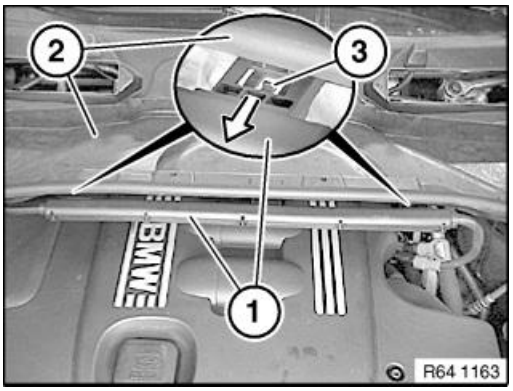
- The procedure for the removal of the right cover (4) is identical to the removal of the left cover.
- Loosen the hose support (2) and remove the hose (1) from the cover on the right (4).
- Detach the hose (1) from the recess (3).



- Unlock plug connection (1) and disconnect.
- Unclip the cable from the guides (2).

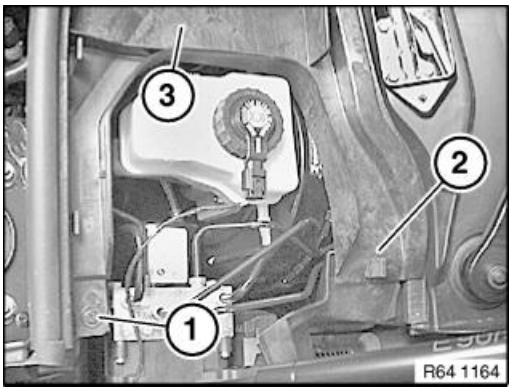


- Unlock plug connection (1) and disconnect.
- Unclip the cable from the guides (2).

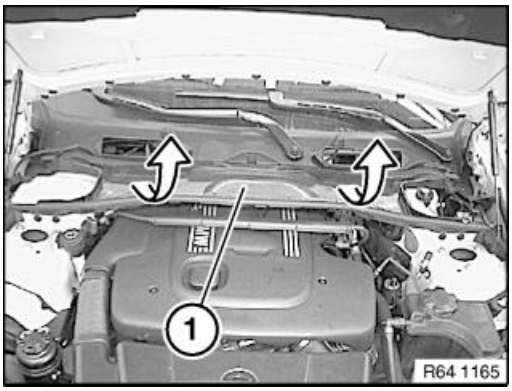


- Press the retaining lugs (3).
- Detach the cable strip (1) from the lower section of the microfilter housing (2) in the direction of the arrow.

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- Detach the retaining tab (2) on both sides.
- Unscrew the bolt (1) on the lower section of the microfilter housing (3) on both sides.

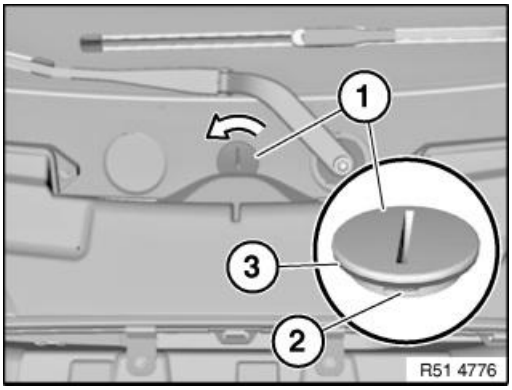


- Guide out the lower section of the microfilter housing (1) and remove it in the direction of the arrow.

7 – Remove tension strut from left and right spring strut dome

TECHNICAL INFORMATION

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

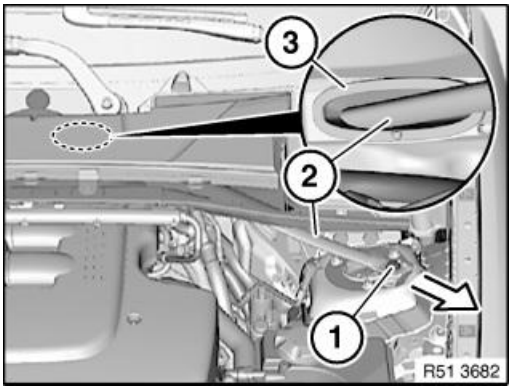


- Carefully remove the cover (1) as follows and loosen the underlying screw.

  For a cover (1)**with** notch: turn cover(1) approx. 45° anticlockwise.

  For a cover (1)**without** notch: Unclip the cover.

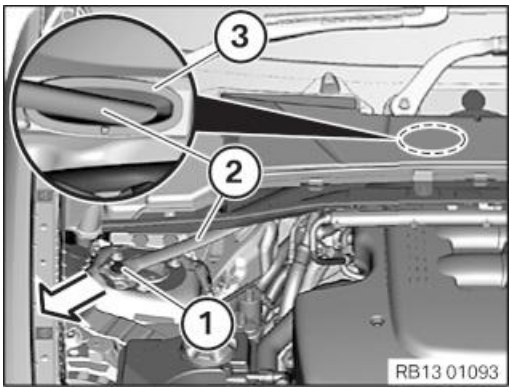
  The cover (1) must not be damaged.



- Loosen screw (1).
- Hold the grommet (3) down and **do not pull it out of the bulkhead**.

  If the grommet is pulled out, it can only be installed with major efforts.
- Pull the left tension strut (2) out in the direction of the arrow.

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- Loosen screw (1).
- Hold the grommet (3) down and **do not pull it out of the bulkhead**.

  If the grommet is pulled out, it can only be installed with major efforts.
- Pull the right tension strut (2) out in the direction of the arrow.

8 – Remove both wiper arms.

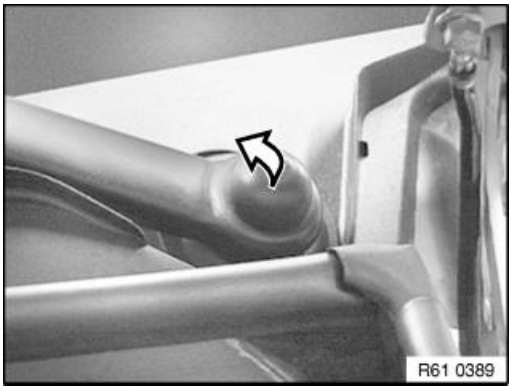
NOTICE

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

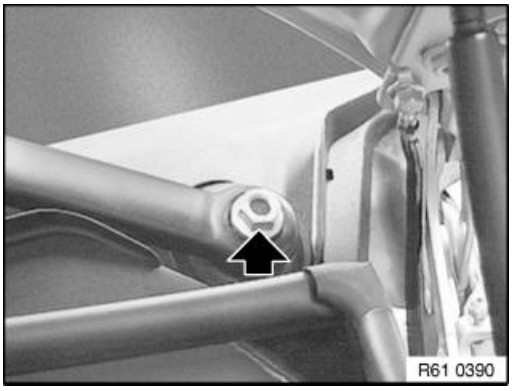
▶ **Remove wiper arm**

Prerequisite

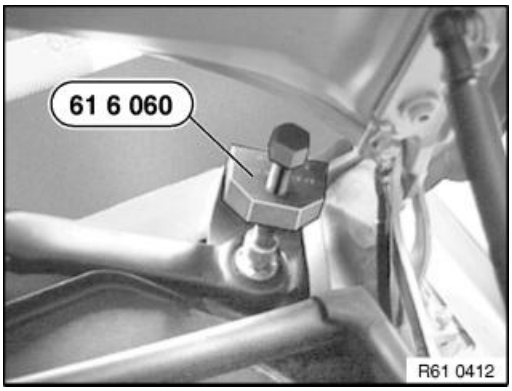
Engine compartment lid is open.



- Remove the protective cap in the direction of the arrow.



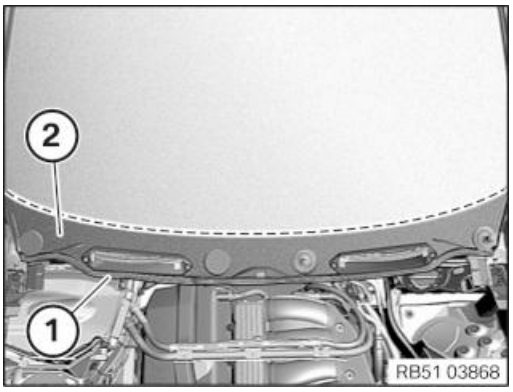
- Unscrew the nut (arrow).



- Pull off and remove the wiper arm with the help of the special tool **0 493 441 (61 6 060)**.

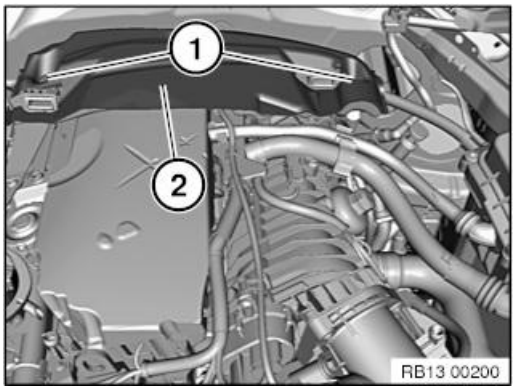
9 – Remove cowl panel cover

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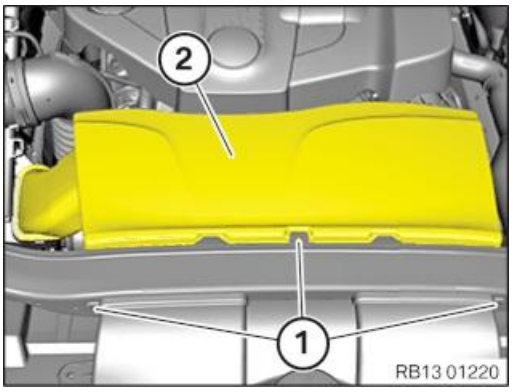
- Loosen the edge protection (1).
- Remove the cowl panel cover (2).

10 – Removing acoustic cover at rear

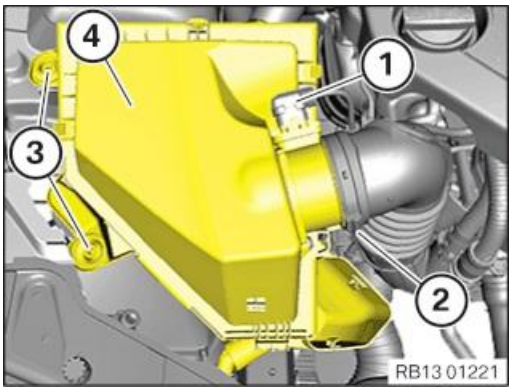


- Loosen the expanding rivet (1).
- Toward the top, feed out and remove rear acoustic cover (2).

11 – Removing intake silencer housing



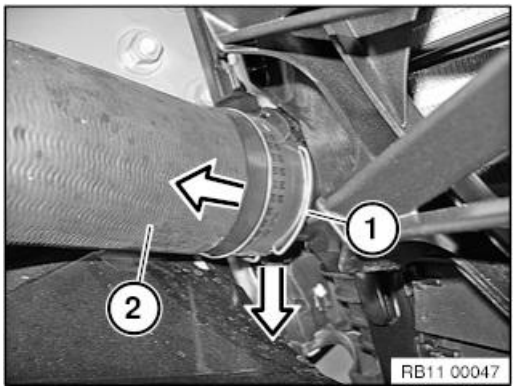
- Loosen screws (1).
- Remove intake port (2).



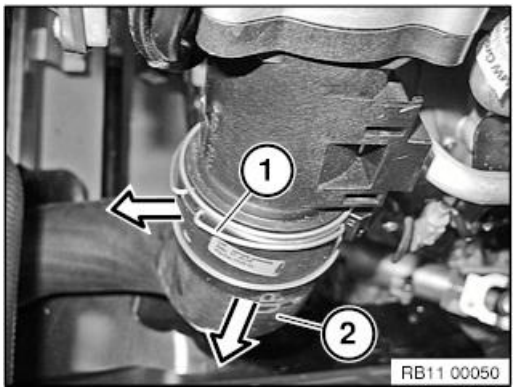
- Unlock connector (1) on hot film air mass meter and pull off.
- Unfasten clamp (2).
- Loosen screws (3).
- Remove intake filter housing (4).

12 – Remove pressure pipe at throttle valve assembly

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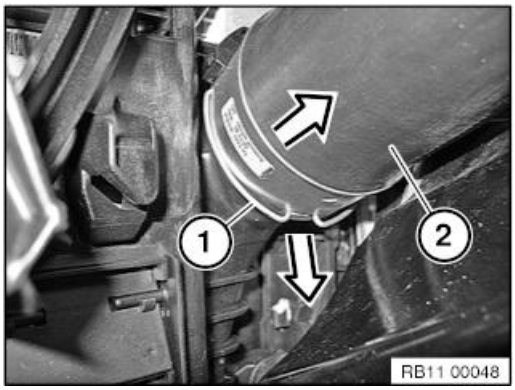


- Unlock the lock (1).
- Pull off pressure pipe (2) from charge air cooler.

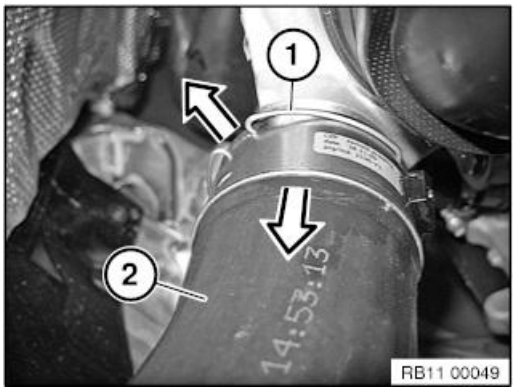


- Unlock the lock (1).
- Pull off pressure pipe (2) from throttle body.

13 – Remove pressure pipe between exhaust turbocharger and charge air cooler



- Unlock the lock (1).
- Pull off pressure pipe (2) from charge air cooler.



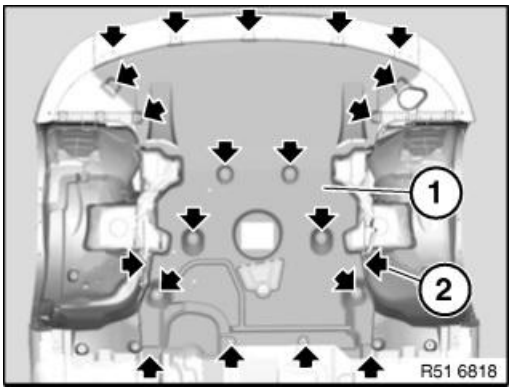
- Unlock the lock (1).
- Pull off pressure pipe (2) from exhaust turbocharger.

14 – Removing the front underbody protection

NOTICE

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

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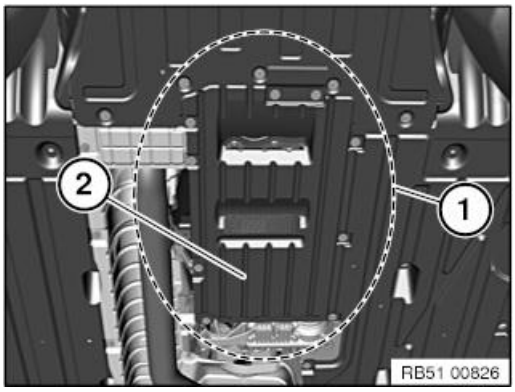


- Remove the screws (arrows) (2).
- Remove the front underbody protection (1).

15 – Removing rear underbody protection

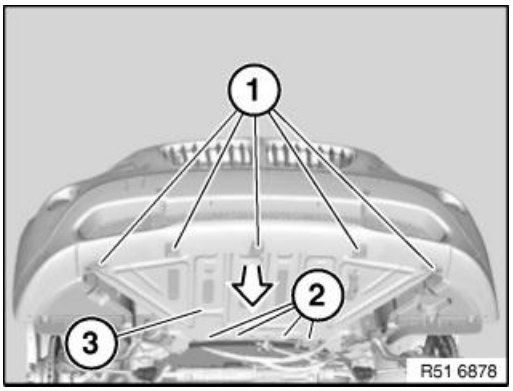
NOTICE

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



- Loosen screws in the area (1).
- Remove the rear underbody protection (2).

16 – Remove pedestrian protection



- Loosen screws (1).
- Loosen screws (2).
- Remove the pedestrian warning (3) at an angle towards the bottom rear.

- **When replacing the pedestrian warning:**

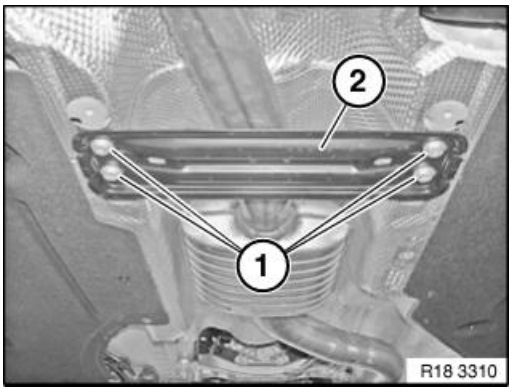
  Remount sheet metal nuts.

17 – Removing the reinforcement

- **For equipment specification without panorama glass roof:**

▸ **Remove reinforcement plate**

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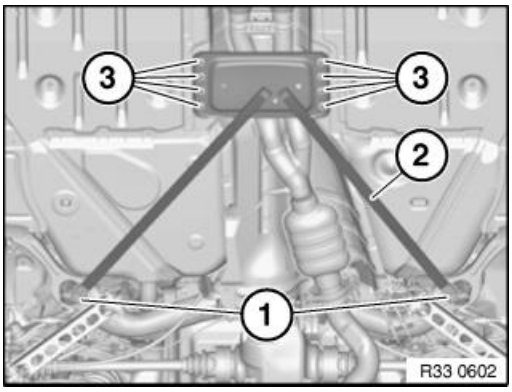
- Loosen the screws (1) and remove the reinforcement plate (2).

- **For equipment specification with panorama glass roof:**

▸ **Remove trailing link**

TECHNICAL INFORMATION

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



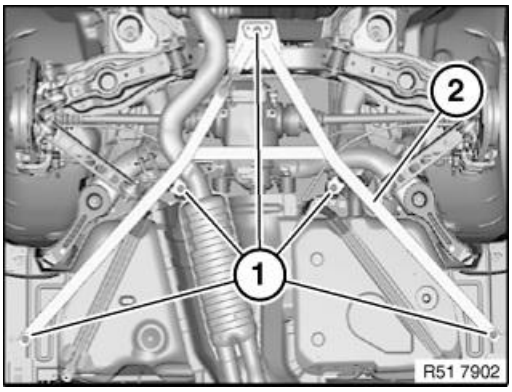
- Loosen screws (1).
- Loosen screws (3).
- Remove the tension struts (2).

- **For equipment specification with panorama glass roof:**

▸ **Removing the tension strut of the rear axle**

TECHNICAL INFORMATION

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



- Loosen the screws (1) and remove the tension strut (2).

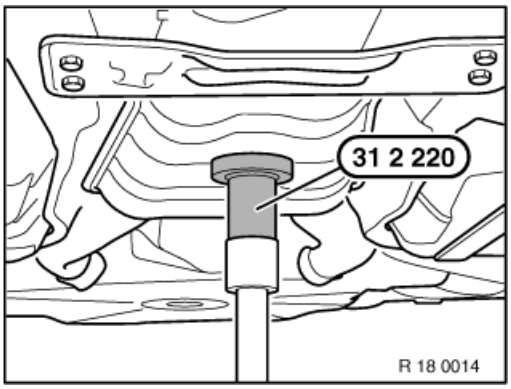
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WARNING

Hot surfaces.

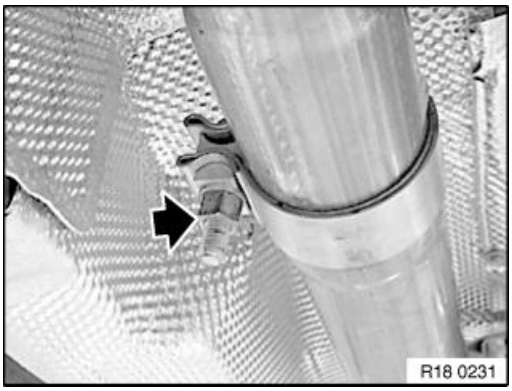
Risk of burning!

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

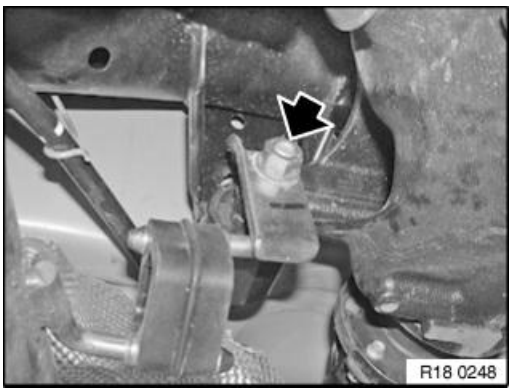


- Support the exhaust system using the special tool **0 491 932 (31 2 220)** and secure against dropping.

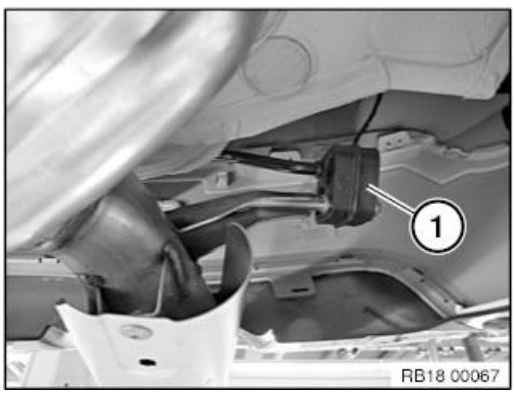
  The exhaust system may weigh up to 40 kg.



- Unscrew the nut (arrow).

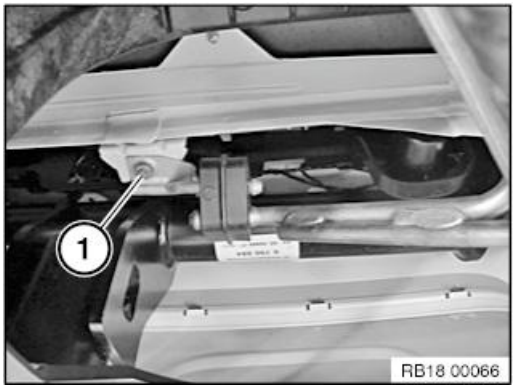


- Unscrew the nut (arrow).



- Pull off the rubber mount (1) from the rear silencer.

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- Loosen screw (1).

- Remove exhaust system.

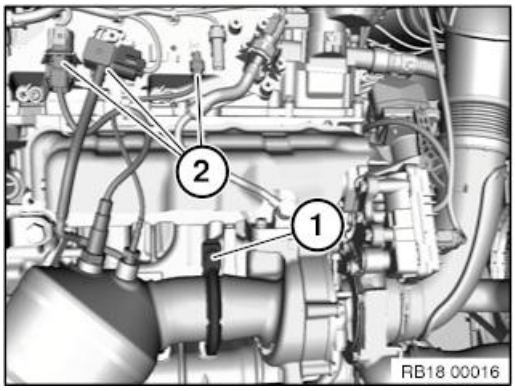
19 – Removing the diesel particulate filter

WARNING

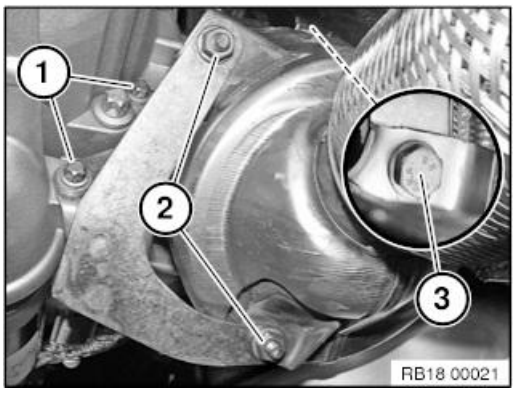
Hot surfaces.

Risk of burning!

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



- Unfasten clamp (1).
- Loosen the plug connections (2) from the brackets.
- Unlock and disconnect plug connections (2).



- Loosen screws (1).
- Loosen nuts (2).
- Loosen the screw (3) above the diesel particulate filter.
- Remove diesel particle filter in downward direction.

20 – Remove heat shields

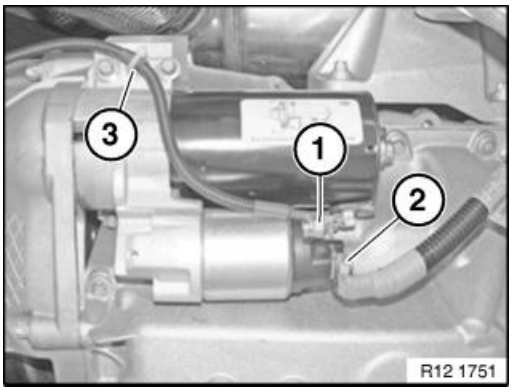
- Remove the heat shields around the propeller shaft.

21 – Removing starter motor

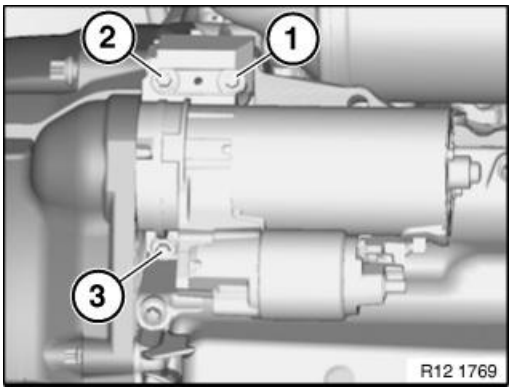
Prerequisite

Battery earth lead is disconnected.

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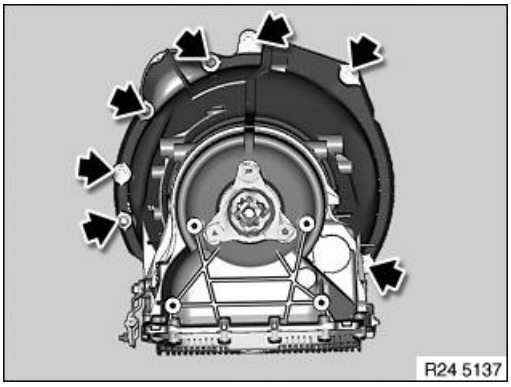


- Loosen the nut (1) and remove the cable.
- Loosen the nut (2) and remove the positive battery cable.
- Loosen the cable on the clamp (3) from the starter motor.



- Loosen screw (1).
- Loosen screw (2).
- Loosen screw (3).
- Remove starter motor.

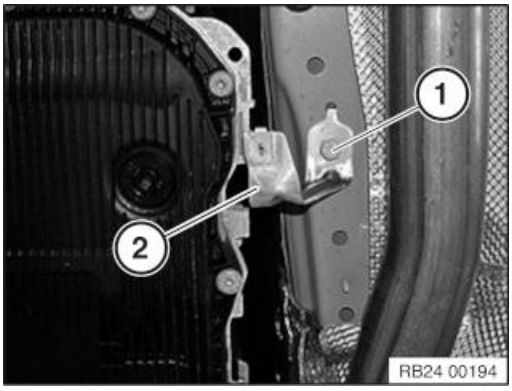
22 – Remove automatic transmission



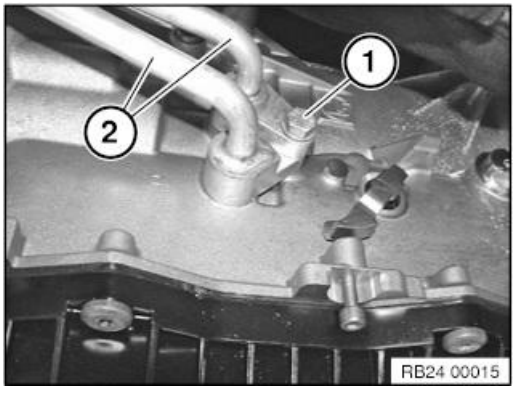
TECHNICAL INFORMATION

To prevent damage to the engine and transmission, check the thread before removal. If the threads are corroded, you must remove rust and clean them before removal.

- Check the threads (arrows) for corrosion, if necessary, remove rust and clean them.

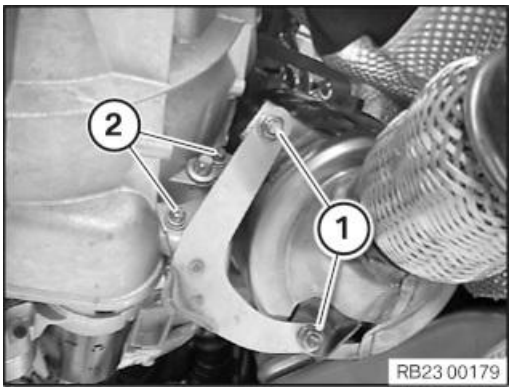


- Loosen the screw (1) and remove the holder (2).

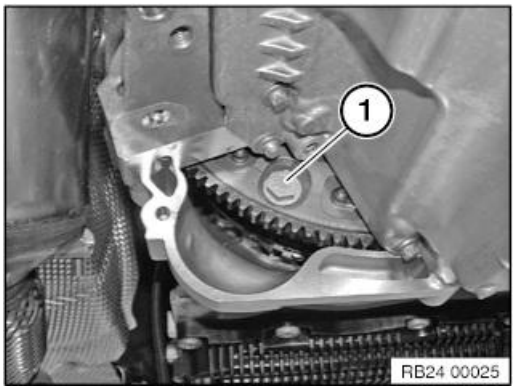


- Loosen screw (1).
- Remove the hydraulic lines (2).

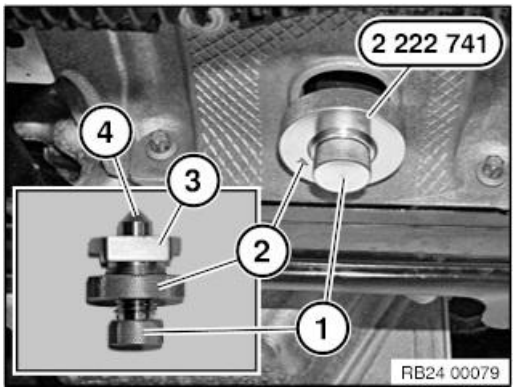
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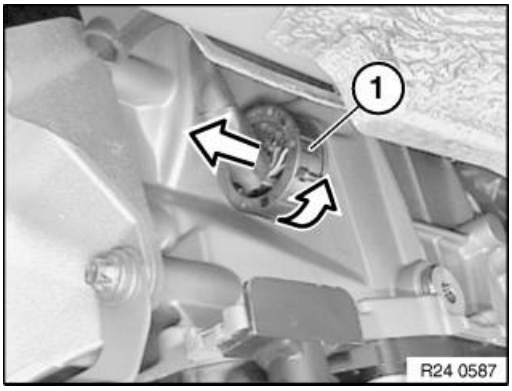
- If necessary, loosen the screws (1) and (2) and remove the holder.



- Crank the engine using special tool **0 493 380 (11 6 480)** on the vibration damper in the direction of rotation until the screw (1) becomes visible in the recess.
- Loosen all four screws of the torque converter using special tool **0 491 667 (24 1 110)**.



- Unscrew the screw (1) of special tool **2 222 741**.
- Insert special tool **2 222 741** including the shaped element (3) into the recess.
- Tighten the nut (2) hand-tight, but do not fully tighten it.
- Completely screw in the screw (1).
- Make sure that the bolt (4) is located between the torque converter and the engine.
- Push the special tool **2 222 741** towards the rear until it is fully in contact with the torque converter.
- Tighten nut (2).



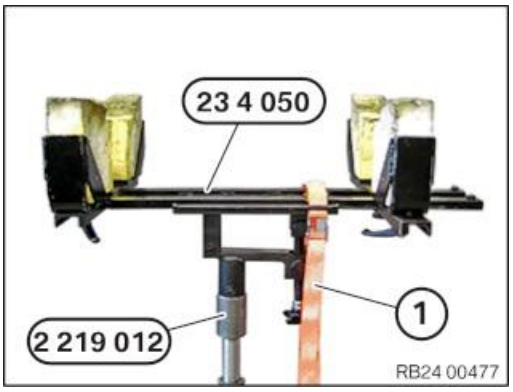
TECHNICAL INFORMATION

Notes on mechatronics are a fundamental requirement for these repair instructions and must be complied with at all times.

For more information see: 24 34 ... Notes on mechatronics (GA8HP45Z,GA8HP70Z,GA8HP90Z)

- Twist the connector (1) anticlockwise and pull it off in the direction of the arrow.
- Loosen the cable from the bracket.
- Insert special tool **0 494 213 (24 2 390)** into the connector (1).

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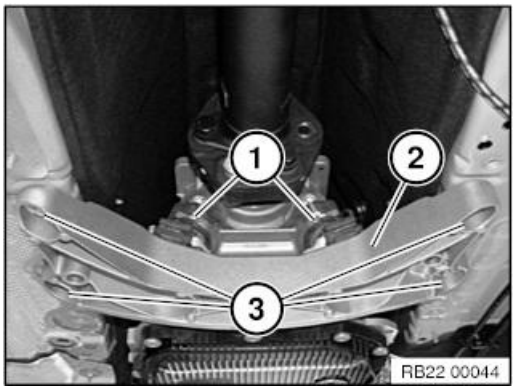


TECHNICAL INFORMATION

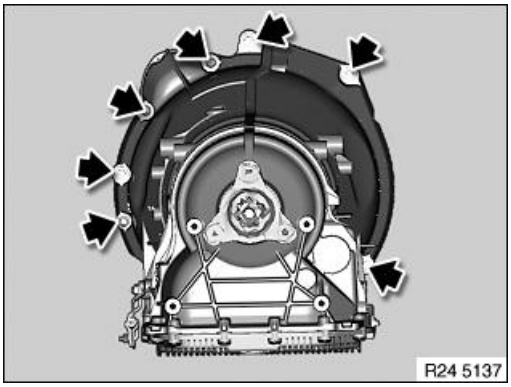
Notes on universal transmission support are a fundamental requirement for these repair instructions and must be complied with at all times.

For additional information see: 24 ... Universal transmission support

- Connect special tool fixture **0 495 498 (23 4 050)** to special tool universal jack **2 219 012**.
- Support the transmission using special tool fixture **0 495 498 (23 4 050)** and special tool universal jack **2 219 012**.
- Secure the transmission with the tensioning strap (1).



- Leave the screws (1) mounted because the transmission cross member (2) must not be removed from the automatic transmission.
- Loosen screws (3).



- Remove screws (arrows).
- Remove and lower the transmission.

23 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

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

TECHNICAL INFORMATION

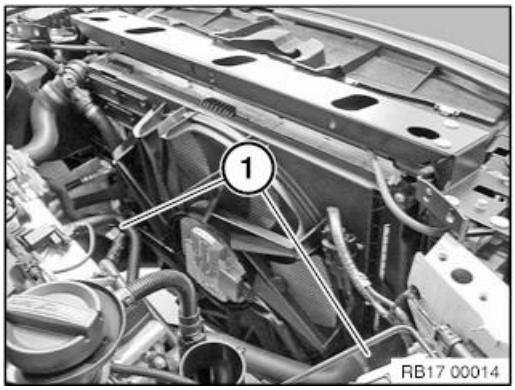
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Notes on work at the cooling system form the basis of these repair instructions and must be complied with at all times.

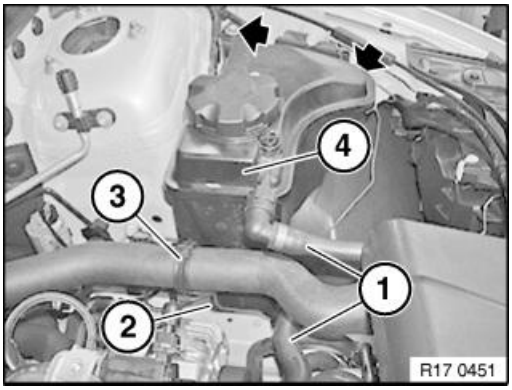
For additional information see: 17 00 ... Instructions for repair work on cooling system

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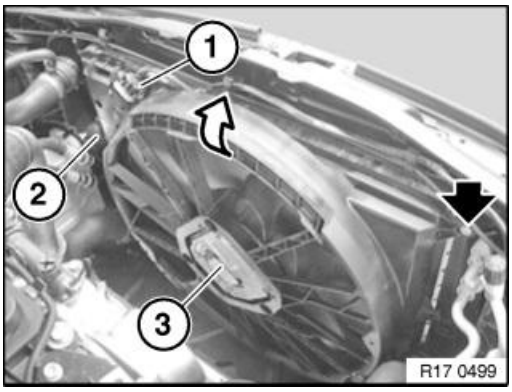
- Release sealing cap on the coolant expansion tank.
- Unlock and pull off coolant hoses (1) from radiator.
- Drain, catch and dispose of coolant.

24 – Remove coolant expansion tank



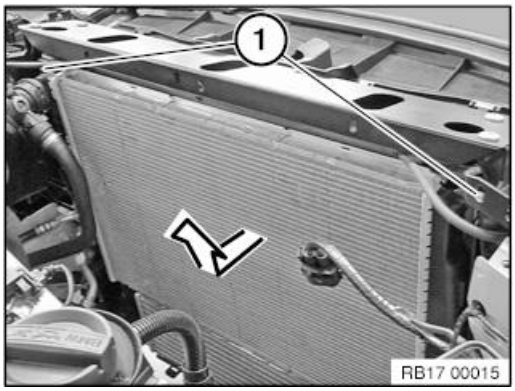
- Unlock and pull off the coolant hoses (1).
- Unlock and disconnect the connector (2) of the coolant level sensor.
- If necessary, unlock the holder (3).
- Remove the coolant expansion tank (4) towards the top.

25 – Removing the fan cowl with electric fan



- Unlock connector (1).
- Release screw (arrow).
- Unlock the latch mechanism (2) and remove the fan cowl (3) towards the top.

26 – Removing the radiator

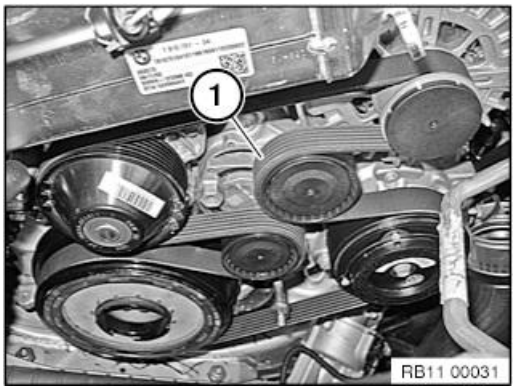


- Loosen screws (1).
- If necessary, unlock and pull off the coolant hoses.
- Feed out radiator towards rear and remove by pulling upwards.

27 – Removing the drive belt for alternator

Check

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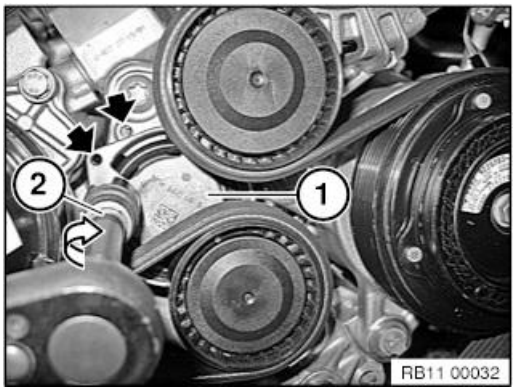
- Check drive belt for alternator (1) for coolant residue and oil residue.

Result

» Drive belt for alternator (1) is contaminated with coolant or oil.

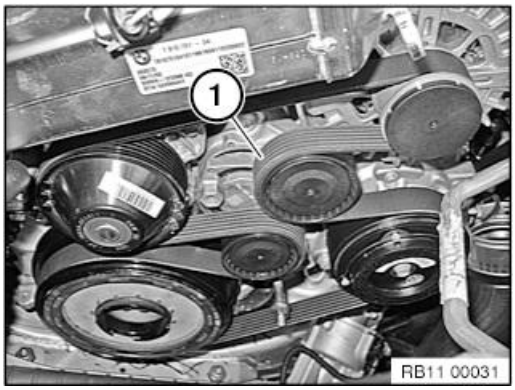
Measure

- Renew drive belt for alternator (1).



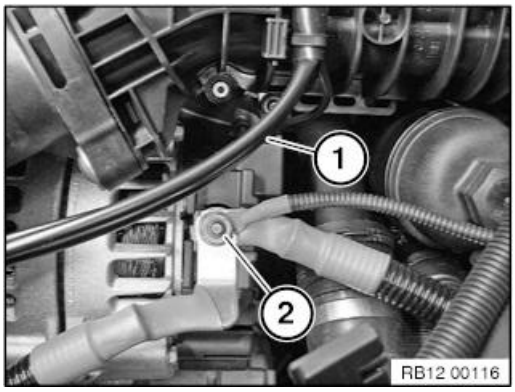
- Increase the preload on the belt tensioner (1) using a tool (2) until special tool **0 490 973 (11 3 340)** can be inserted into the belt tensioner (1).

  Both bore holes of the belt tensioner must line up.



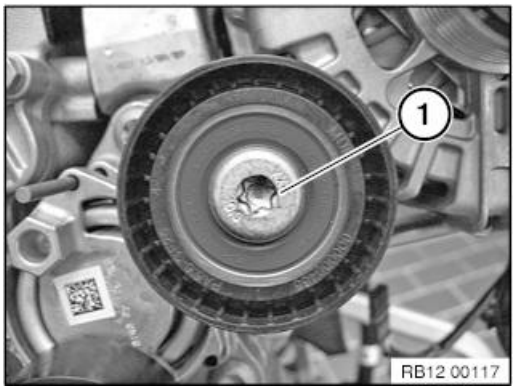
- Remove the drive belt for alternator (1).

28 – Removing the alternator

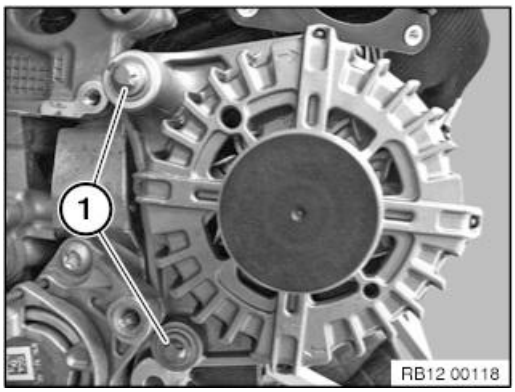


- Unlock and disconnect connector (1).
- Loosen the nut (2) and remove the positive battery cable from the alternator.

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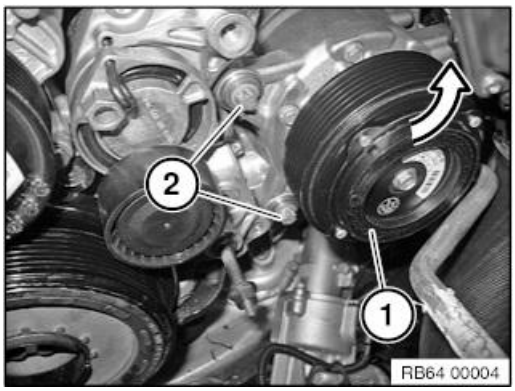


- Remove the cover from the deflecting element.
- Loosen the screw (1) and remove the deflecting element.



- Loosen screws (1).
- Remove the alternator towards the top.

29 – Releasing air conditioning compressor



- Unlock and disconnect the connector on the air conditioning compressor.
- Loosen the screws (2) on the air conditioning compressor (1).
- Remove the air conditioning compressor (1) and allow it to hang to the side of the refrigerant lines.

30 – Loosening the engine wiring harness from the electronics box

Prerequisite

Ignition is switched off.

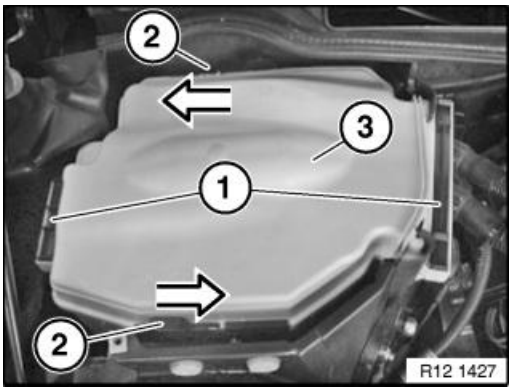
RISK OF DAMAGE

Electrostatic discharge.

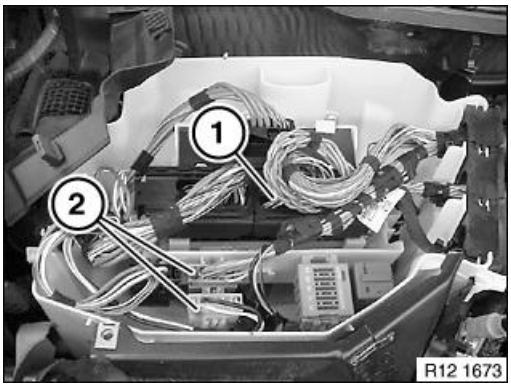
Damage to or destruction of electrical components.

- 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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- Unlock the locks (1) and push them upwards by approximately 10 mm.
- Unlock the locks (2).
- Remove the lid of the electronics box (3).



- Unlock and disconnect all connectors (1) and (2) from the electronics box.
- Loosen all cables from the electronics box and put to one side.

31 – Loosening the engine wiring harness from the electronics box

Prerequisite

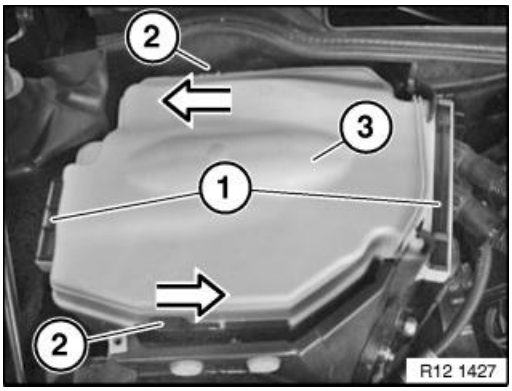
Ignition is switched off.

RISK OF DAMAGE

Electrostatic discharge.

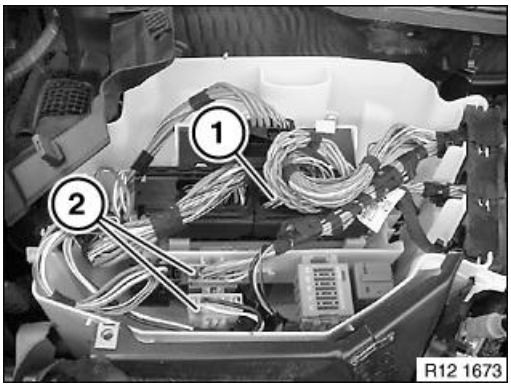
Damage to or destruction of electrical components.

- 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.



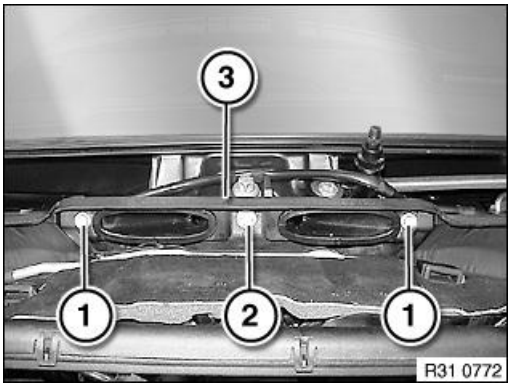
- Unlock the locks (1) and push them upwards by approximately 10 mm.
- Unlock the locks (2).
- Remove the lid of the electronics box (3).

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- Unlock and disconnect all connectors (1) and (2) from the electronics box.
- Loosen all cables from the electronics box and put to one side.

32 – Removing the heater end panel



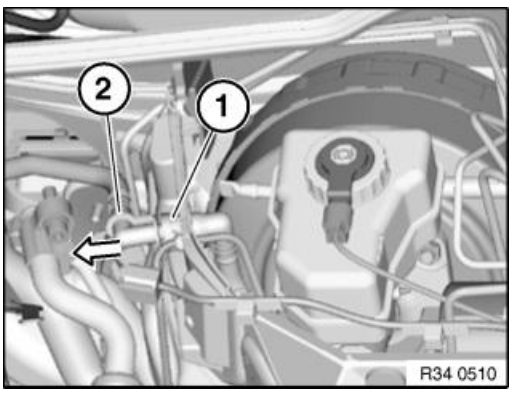
- Loosen screws (1) and (2).
- Remove the heater end panel (3).

MAIN WORK

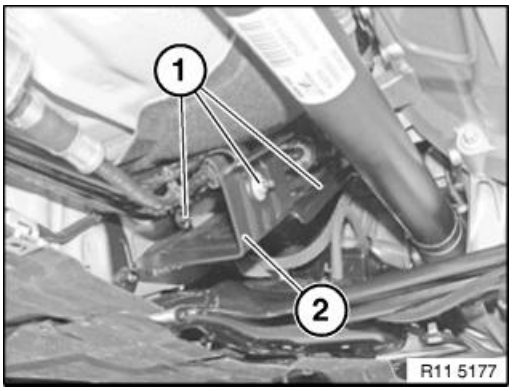
33 – Removing engine

NOTICE

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

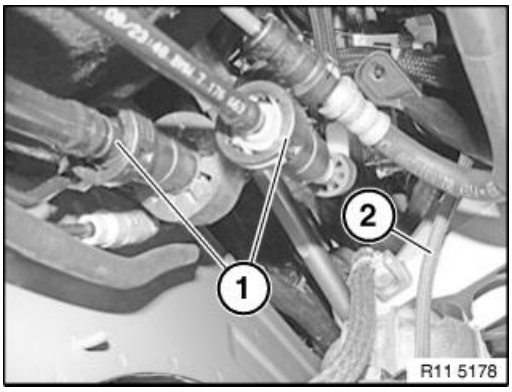


- Disconnect snap fastener (1) of the vacuum line (2).



- Loosen the screws (1) and remove the protective plate (2).

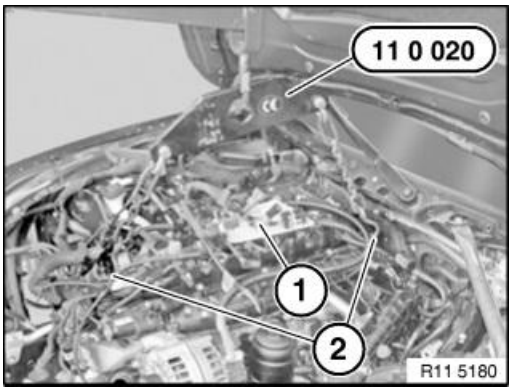
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TECHNICAL INFORMATION

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

- Unlock and disconnect fuel lines (1).
- Pull off vacuum hose (2) for the engine mount.



- Secure engine wiring harness (1) against falling down.

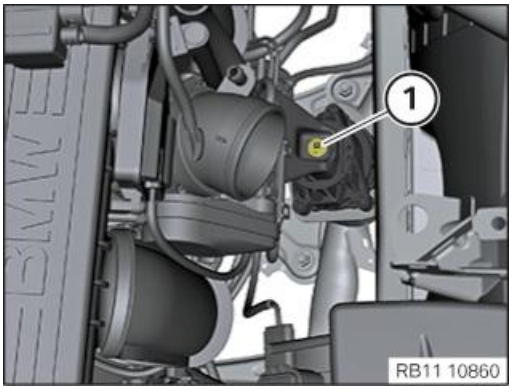
CAUTION

Components connected to the engine joint or cross member.

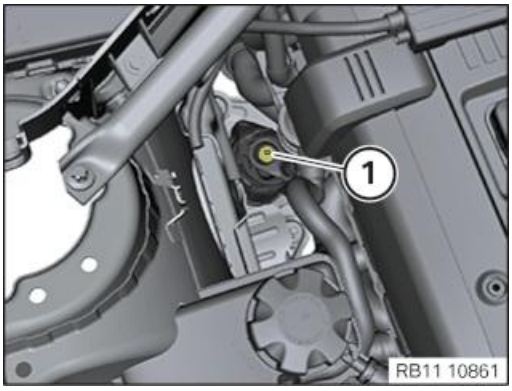
Danger of injury!

- 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.

- Secure special tool **2 220 718** with special tool **0 490 567 (11 0 020)** to the lifting eyes of the engine.
- Slightly lift special tool **2 220 718** and apply preload.



- Loosen the screw (1) on the left engine mount.
- Loosen ground strap on the left engine mount.



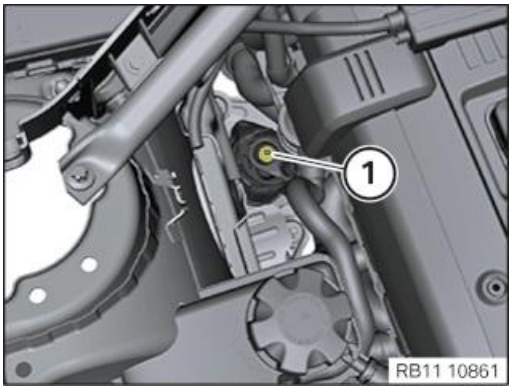
- Loosen the screw (1) on the right engine mount.
- Pull engine out upward.

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NOTICE

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

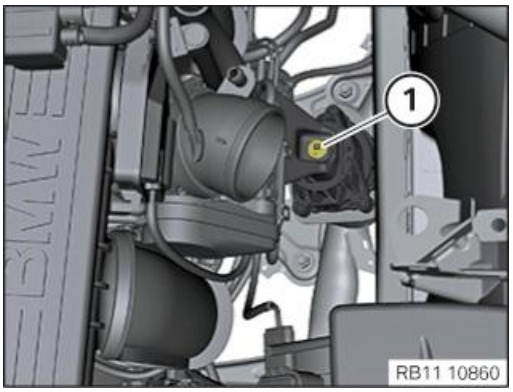
- Carefully lower the engine into the engine compartment.



- Tighten screw (1) from engine mount at right.

Left/right engine mount to engine support arm

M10		56 Nm
M12		68 Nm

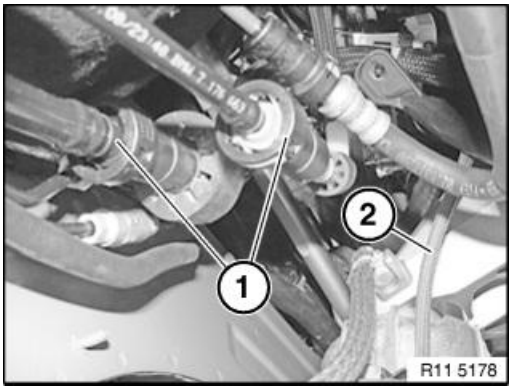


- Tighten screw (1) from engine mount at left.

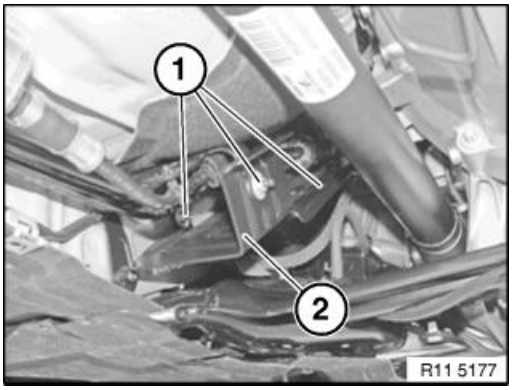
Left/right engine mount to engine support arm

M10		56 Nm
M12		68 Nm

- Secure the ground strap to the left-hand engine mount.
- Remove all special tools.

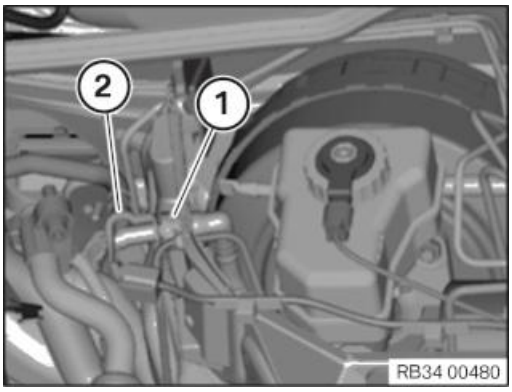


- Connect the fuel lines (1).
- Connect the vacuum hose (2) to the engine mount.



- Attach the protective plate (2) and tighten the screws (1).

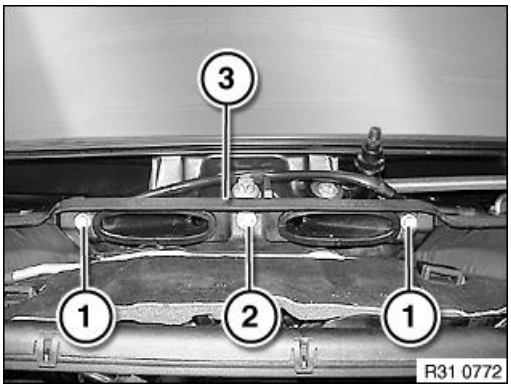
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- Connect the snap fastener (1) of the vacuum line (2).

POSTPROCESSES

35 – Installing the heater end panel



- Install the heater end panel (3).
- Tighten down screws (1) and (2).

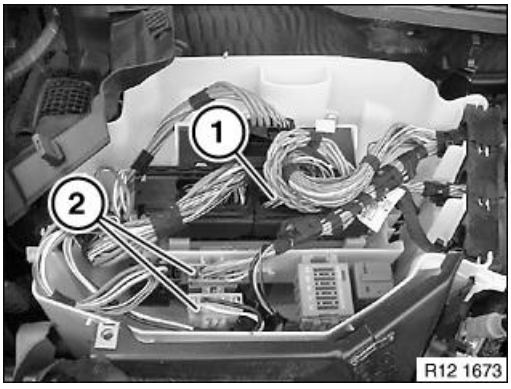
36 – Installing the engine wiring harness in the electronics box

RISK OF DAMAGE

Electrostatic discharge.

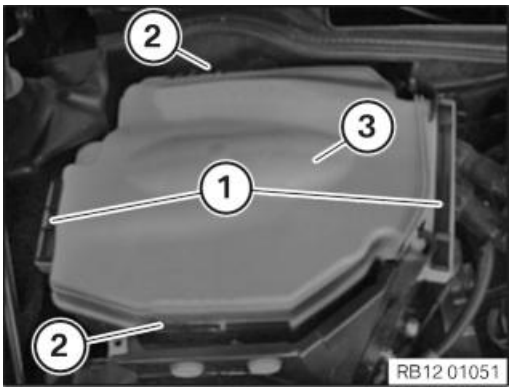
Damage to or destruction of electrical components.

- 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.



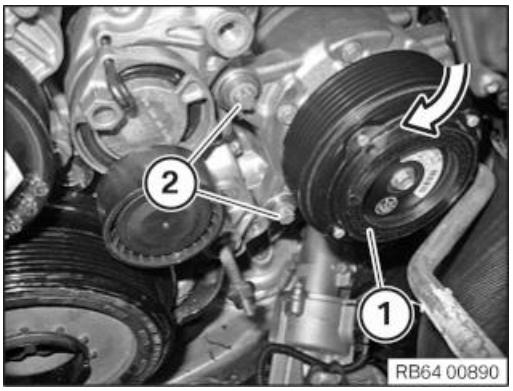
- Insert all cables into the electronics box.
- Connect all connectors (1) and (2) in the electronics box.

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- Put on lid of the electronics box (3).
- Lock the locks (2).
- Lock closures (1).

37 – Installing air conditioning compressor



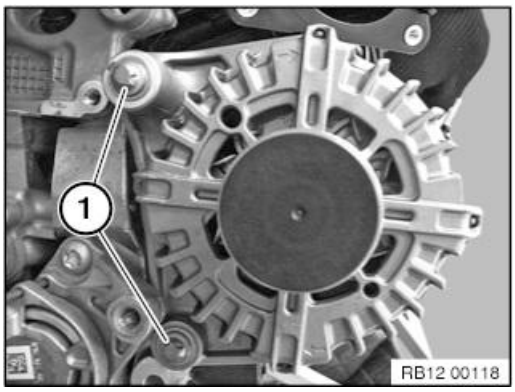
- Position air conditioning compressor (1) on the engine.
- Tighten screws (2) on the air conditioning compressor (1).

Air conditioning compressor on crankcase

M8			19 Nm
M10			38 Nm

- Connect connector on air conditioning compressor.

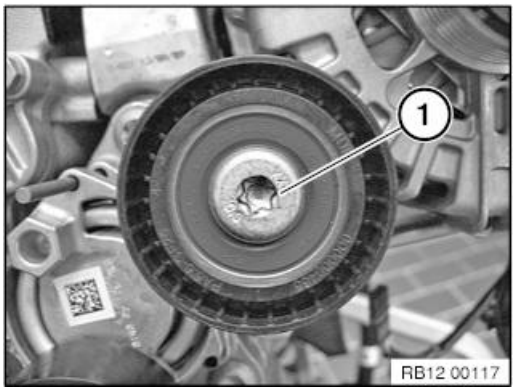
38 – Installing the alternator



- Install alternator.
- Tighten the screws (1).

Alternator to component carrier

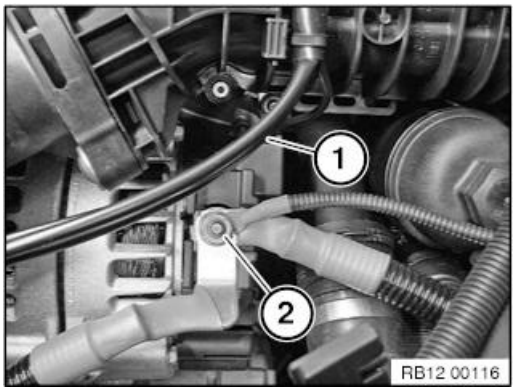
	38 Nm



- Attach cover to the deflecting element.
- Attach deflecting element to the belt tensioner and tighten the screw (1).

Deflecting element to belt tensioner

	55 Nm



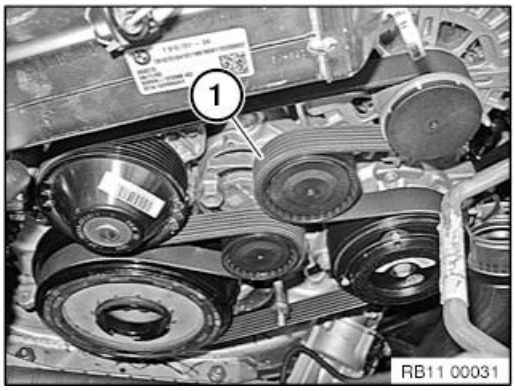
- Connect connector (1).
- Connect positive battery cable to alternator and tighten nut (2).

Positive battery cable to alternator

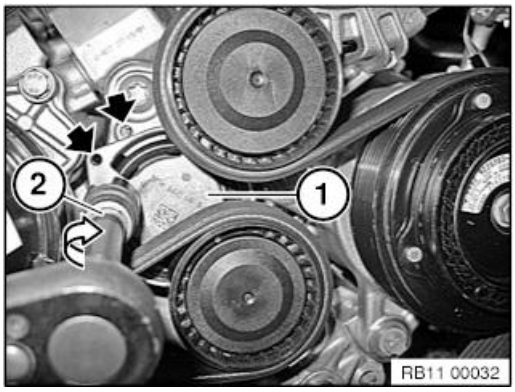
Nut		M5	13 Nm
		M8	19 Nm

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39 – Installing the drive belt for alternator

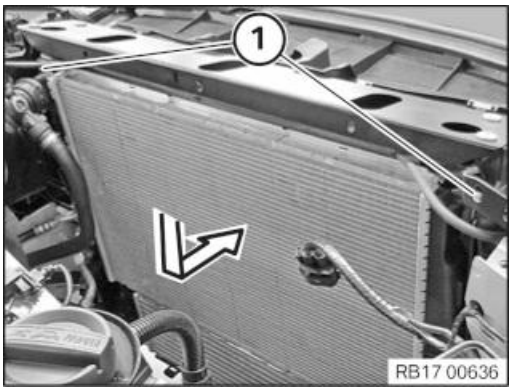


- Position the drive belt for alternator (1) on the rollers of the belt drive.



- Increase the preload on the belt tensioner (1) using a tool (2) until special tool **0 490 973 (11 3 340)** can be easily removed from the belt tensioner (1).
- Slowly relieve the tension on the belt tensioner (1) using a tool (2).

40 – Install radiator



- Insert the radiator from the top and towards the front.
- If necessary, insert and lock the coolant hose.
- Tighten the screws (1).

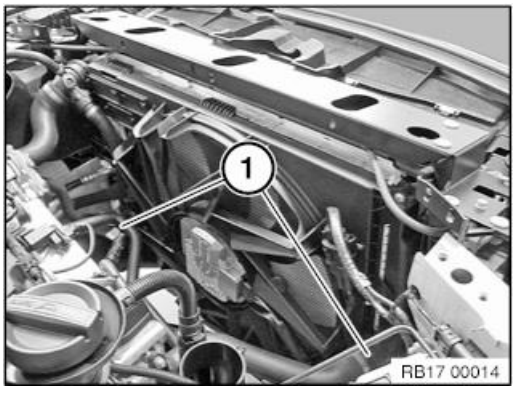
Radiator on module carrier

	4 Nm

41 – Connecting the coolant hoses

TECHNICAL INFORMATION

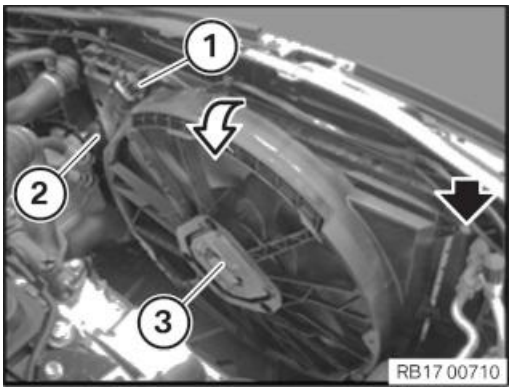
Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect and engage the coolant hoses (1) to the radiator.

42 – Installing fan cowl with electric fan

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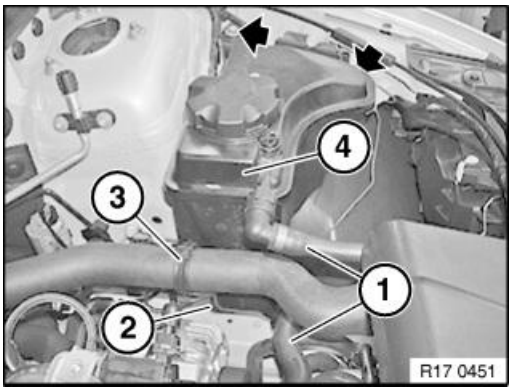
- Insert the fan cowl (3) from the top and engage with the latch mechanism (2).
- Tighten screw (arrow).

Fan cowl on radiator

	4 Nm

- Connect connectors (1) and lock.

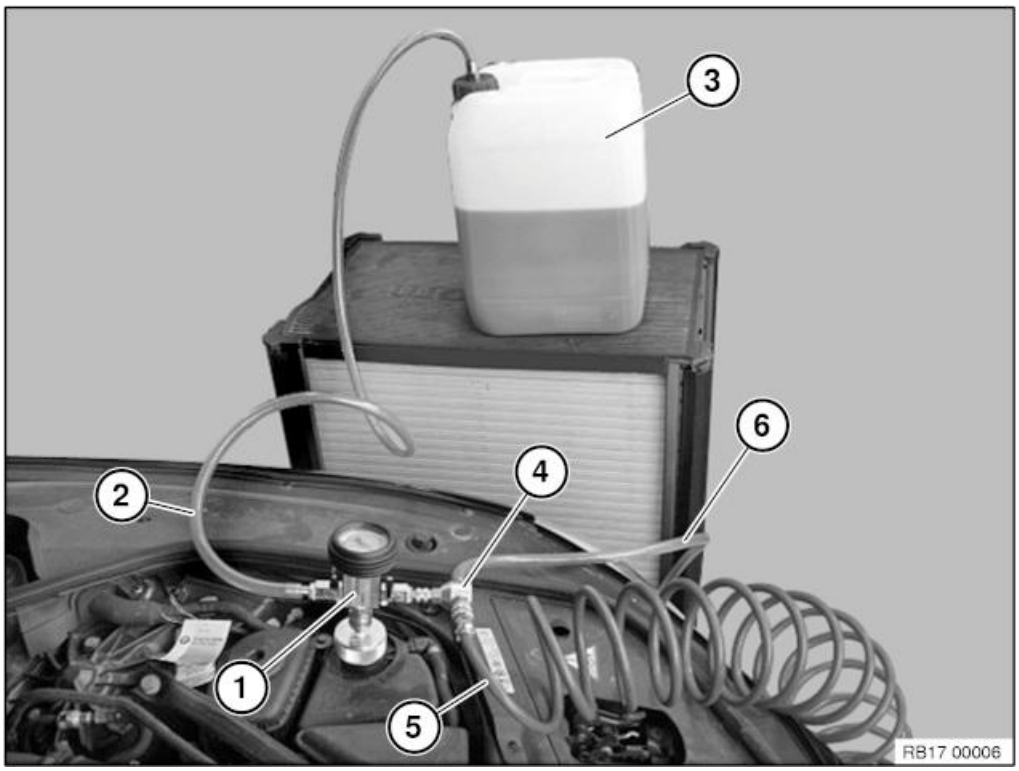
43 – Installing coolant expansion tank



- Install the coolant expansion tank (4). In this process, insert the centring pin of the coolant expansion tank (4) into the rubber grommet.
- If necessary, lock the holder (3).
- Connect the connector (2) of the coolant level sensor.
- Connect the coolant hoses (1).

44 – Bleed and fill the cooling system with the vacuum filler device

Vacuum filler device



Vacuum filler device - exemplary schematic diagram

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 6 bar)

6 Out-going hose (lead out-going hose into a collecting vessel)

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Prerequisite

The coolant expansion tank is empty. Compressed air connection with pressure of 6 bar is available.

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

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

Check

- Check all coolant hoses for damage.

Result

» Coolant hose are damaged or porous.

Measure

- Renew coolant hoses.
- Position the fluid tank of the vacuum filler device at the same height as the coolant expansion tank.

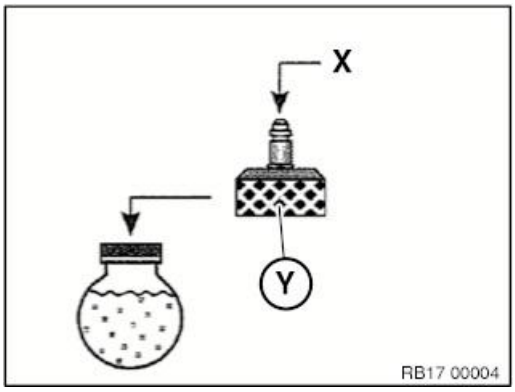
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

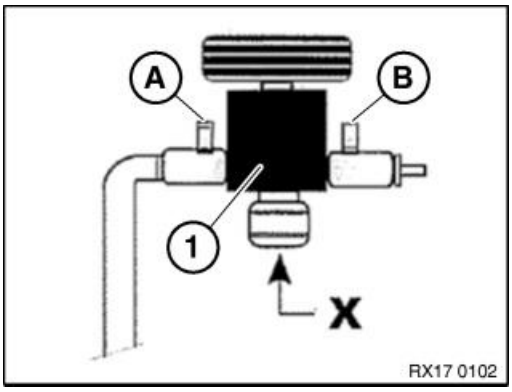
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Cover alternator watertight.
- The fluid tank of the vacuum filler device must be filled with 1 l to 2 l more than the required capacity of coolant for the vehicle.
- Set heating to maximum temperature.

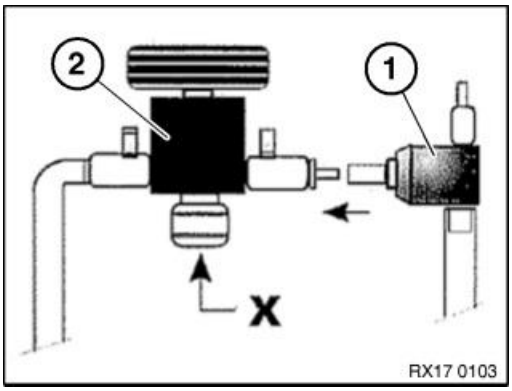


- Connect special tool **0 494 417 (17 0 100)** (Y) to the coolant expansion tank.
- Connect vacuum filler device to connection (X) of the adapter.

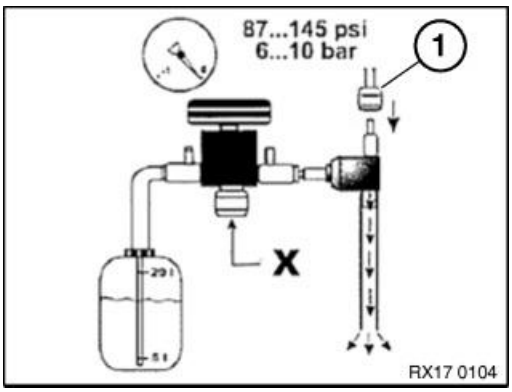
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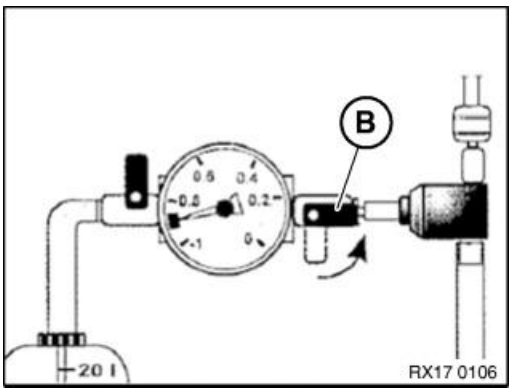
- Close shutoff valves (A) and (B) of the vacuum filler device (1).
  (X)is the connection on the coolant expansion tank.



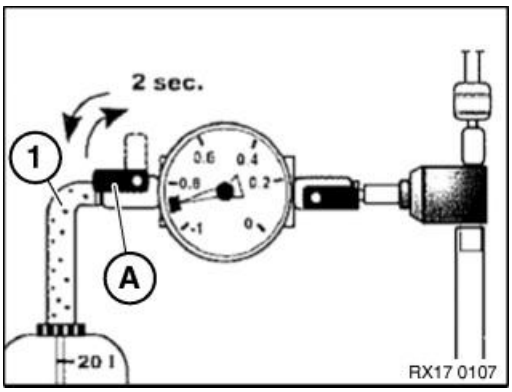
- Connect Venturi nozzle (1) to the vacuum filler device (2).
  (X)is the connection on the coolant expansion tank.



- Connect compressed air hose (1).
  (X)is the connection on the coolant expansion tank.



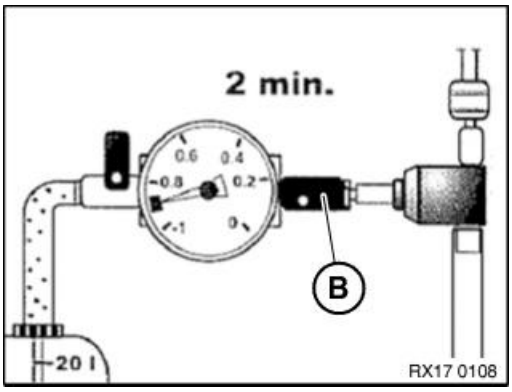
- Open shutoff valve (B).
  The Venturi nozzle generates a flow noise.



- Open shutoff valve (A) until the filling hose (1) is full without bubbles.
- Close shutoff valve (A) again.

» The filling hose (1) has now been bled.

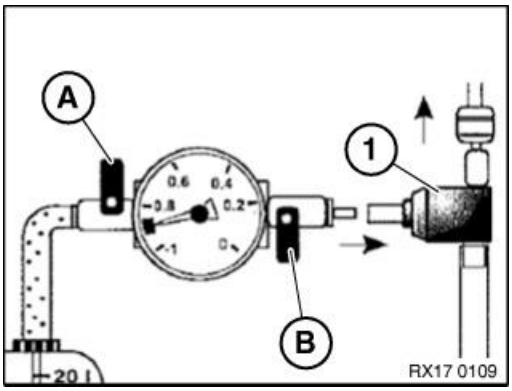
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TECHNICAL INFORMATION

The coolant hoses contract during vacuum build-up.

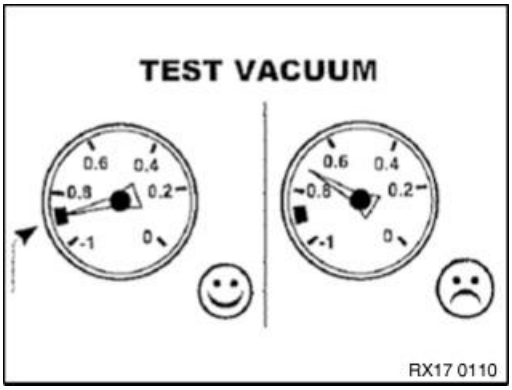
- After a vacuum of -0.7 bar to -0.95 bar has been reached in the coolant circuit (duration approximately 2 minutes), close the shutoff valve (B).



- Check whether the shutoff valves (A) and (B) are closed.
- Disconnect the Venturi nozzle (1).

Check

- Make sure the vacuum in the coolant circuit can be maintained for at least 30 seconds.



Result

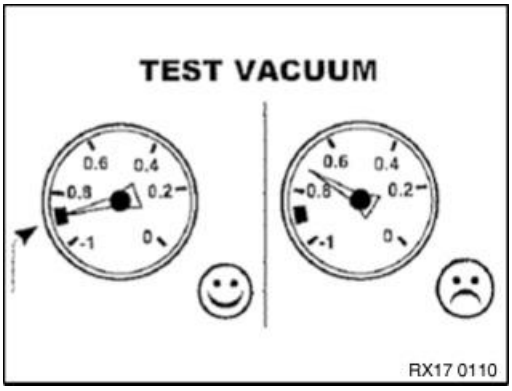
» Vacuum drops.

Measure

- Look for leak, repair cooling system, start filling procedure from the beginning.

Check

- The vacuum in the coolant circuit must be maintained for at least 30 seconds.



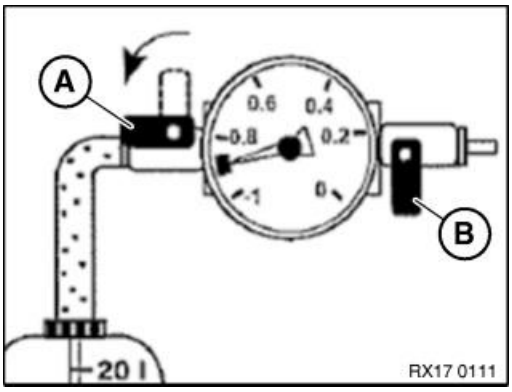
Result

» Vacuum remains constant.

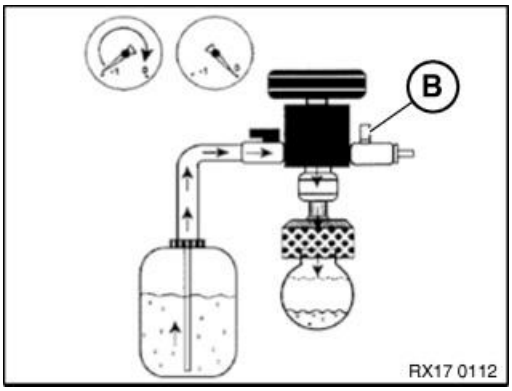
Measure

- Continue with the filling procedure.

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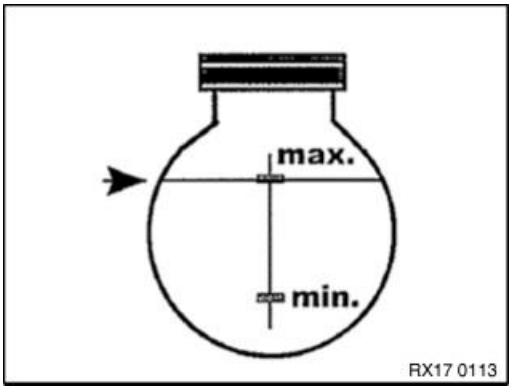


- Keep shutoff valve (B) closed during the filling process.
- To fill the cooling system, open the shutoff valve (A) to the fluid tank of the vacuum filler device.



- 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. Open the shutoff valve (B).

- Remove vacuum filler device and special tool **0 494 642 (17 0 113)** from the coolant expansion tank.



- Adjust the coolant level in the coolant expansion tank to the maximum mark.

45 – Check cooling system for leaks

WARNING

Hot fluids.

Risk of scalding!

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

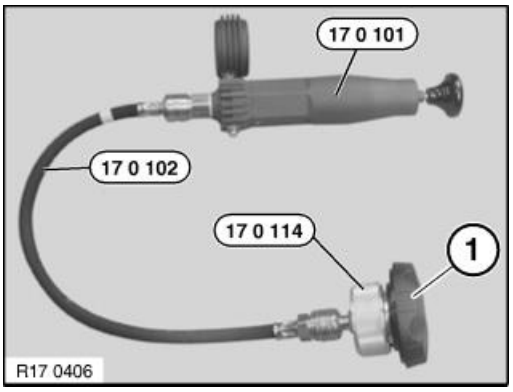
TECHNICAL INFORMATION

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

TECHNICAL INFORMATION

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

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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 the matching adapter from the set of special tools **0 494 417 (17 0 100)** (e.g. adapter **0 494 643 (17 0 114)**).
- Build up pressure using the hand pump from the special tools **0 494 418 (17 0 101)**. Observe on the pressure gauge when the opening pressure has been reached.

Check

- Generate pressure.

  Compare measured values with setpoint values.

Opening pressure of coolant sealing cover

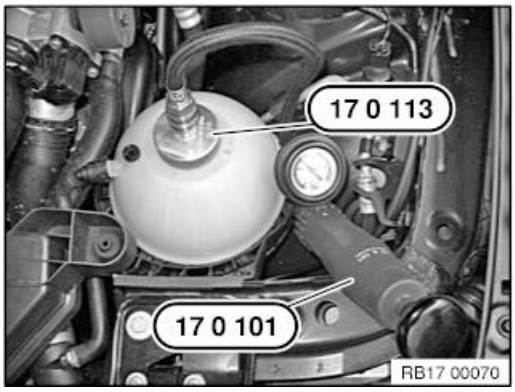
Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure	max. 0,1 bar

Result

» Measured values do not correspond with setpoint values.

Measure

- Exchange sealing cap.



- Release sealing cap on the coolant expansion tank.
- Place special tool **0 494 418 (17 0 101)** and the matching adapter from the set of special tools **0 494 417 (17 0 100)** on the coolant expansion tank (e.g. adapter **0 494 642 (17 0 113)**).

Check

- Build up excess pressure and wait approx. 2 minutes.

Cooling system test pressure

Test pressure for cooling system (gauge pressure)	1,5 bar
Pressure drop	max. 0,1 bar

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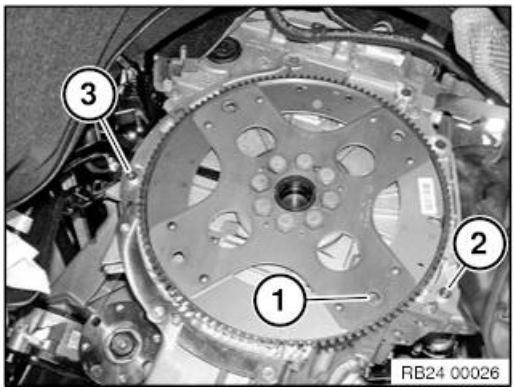
Result

» Measured values do not correspond with setpoint values.

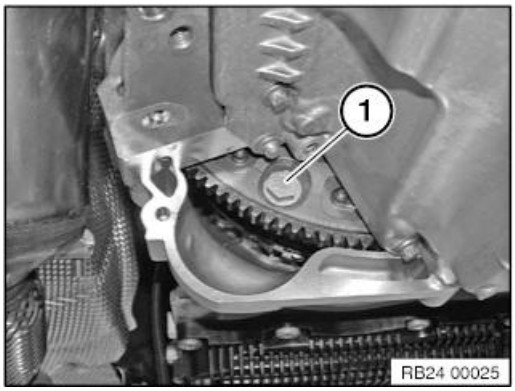
Measure

- Search cooling system for leakage.

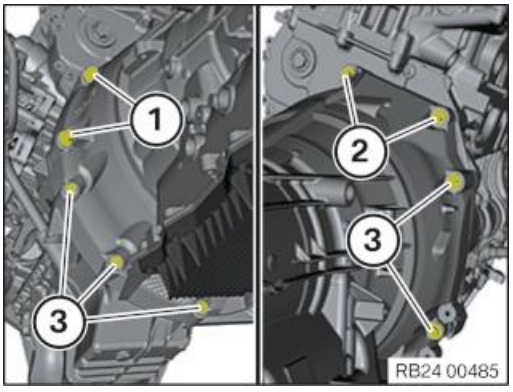
46 – Install automatic transmission



- Turn the drive plate so that the bore hole (1) becomes accessible through the recess on the transmission oil sump.
- Check that the fitting sleeves (2) and (3) are positioned correctly and are not damaged; renew if necessary.
- Turn the torque converter so that the bore hole of the torque converter and the bore hole of the drive plate (1) line up.



- Clean any adhesive residue on the threads of the screw connections (1) of the torque converter.

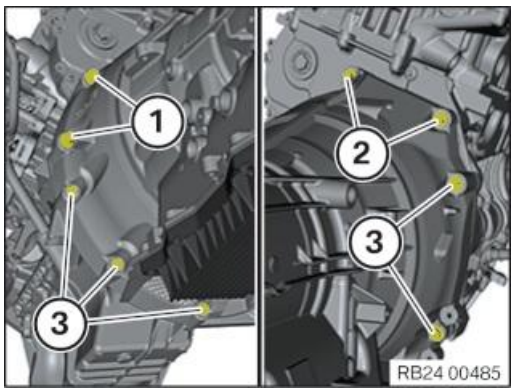


- Lift and flange-mount the transmission.
- Renew screws (1) to (3).

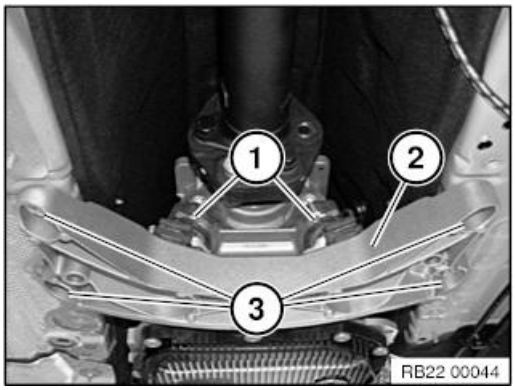
  Parts: Bolts
- Tighten the screws (1) to (3).

Transmission to engine

Screw (3) M12x100			66 Nm
Bolt (2) M12x75			66 Nm
Bolt (1) M8x50			19 Nm



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- Renew screws (3).

  Parts: Bolts

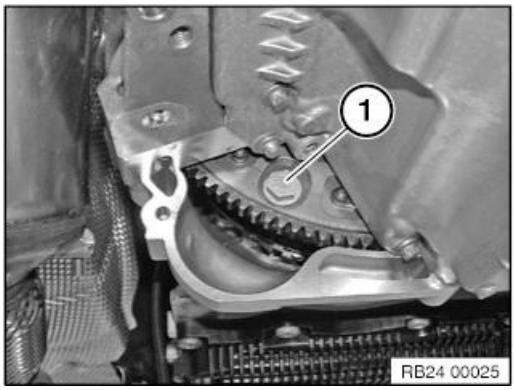
- Position transmission cross member (2) on vehicle underbody and tighten the screws (3).

Holder on the transmission

	19 Nm

- Make sure that the screws (1) were not loosened.

- Remove all special tools.



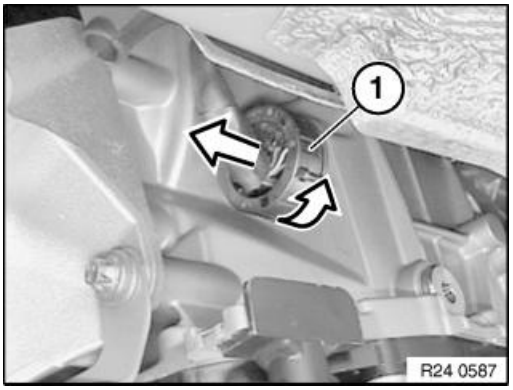
- Renew screws (1).

  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 four screws (1).
- Tighten all four screws (1) with special tool **0 491 667 (24 1 110)**.

Torque converter on the drive plate

M10	Renew screws.	56 Nm

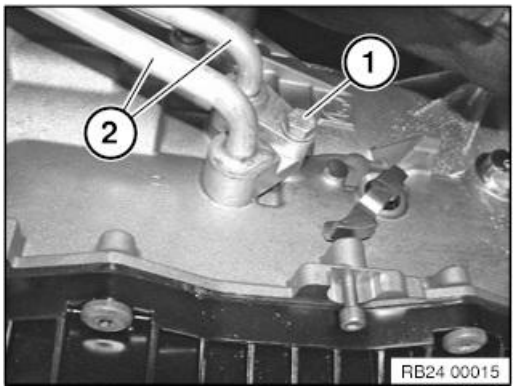


TECHNICAL INFORMATION

Notes on mechatronics are a fundamental requirement for these repair instructions and must be complied with at all times.

For more information see: 24 34 ... Notes on mechatronics (GA8HP45Z,GA8HP70Z,GA8HP90Z)

- Remove special tool **0 494 213 (24 2 390)**.
- Insert the connector (1) in contrary to the direction of the arrow and lock it by twisting it clockwise.
- Insert the cable into the bracket.



- Renew sealing rings.

  Parts: Sealing ring

- Position the hydraulic lines (2) on the transmission.
- Renew the screw (1).

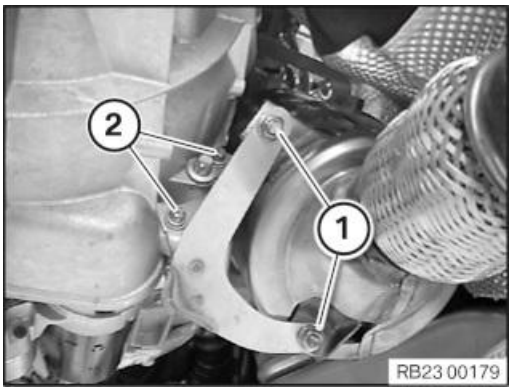
  Parts: Screw

- Tighten down screw (1).

Transmission oil cooler line to transmission

M8		8 Nm

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- Renew the screws (1) and (2) if necessary.
- If applicable, attach holder and tighten screws (2).

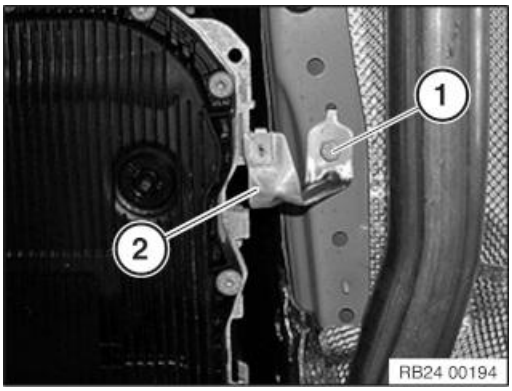
Holder on the transmission

	19 Nm

- If applicable, tighten screws (1).

Holder on the diesel particulate filter

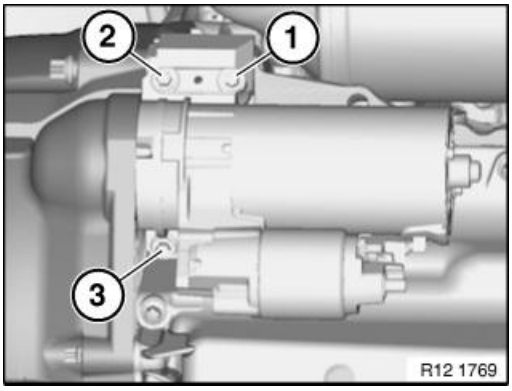
	21 Nm



- Attach the holder (2) and tighten the screw (1).

47 – Installing starter motor

- Check starter pinion and ring gear for damage. Replace starter motor if necessary.



- Position starter motor on oil sump.

TECHNICAL INFORMATION

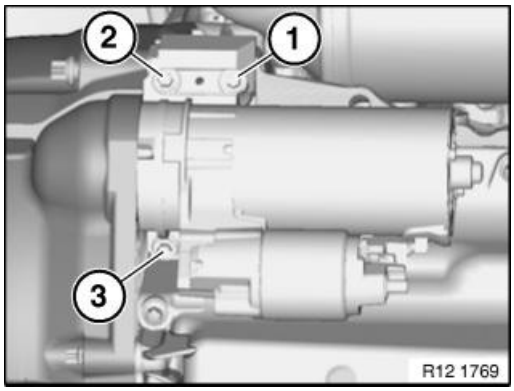
When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

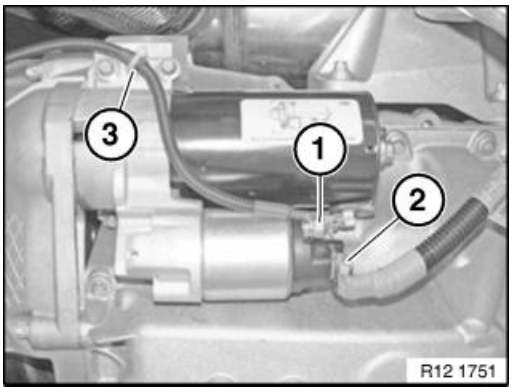
- Tighten the screws (1), (2) and (3).

Starter motor

M8x60	*Tighten screws in the following sequence (1), (2), (3).*	19 Nm



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- Attach cable to clamp (3) on starter motor.
- Attach positive battery cable and tighten nut (2).

Battery positive lead to starter

M8		13,4 Nm

- Attach cable and tighten nut (1).

Wiring harness to starter (terminal 50)

M6		7 Nm

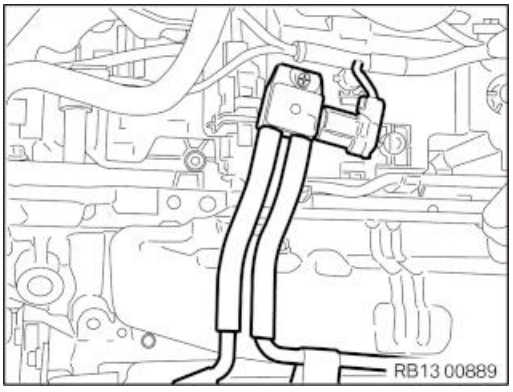
- **Only during starter motor replacement or on vehicles with automatic engine start-stop function (MSA):**

  Reset start counter using BMW diagnosis system.

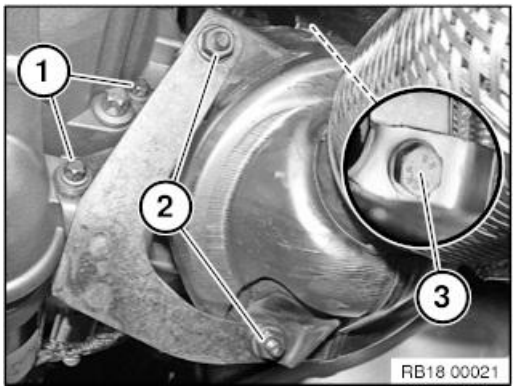
48 – Install the heat shields

- Install the heat shields around the propeller shaft.

49 – Installing the diesel particulate filter



- Renew the pressure hoses between the diesel particulate filter and the exhaust gas pressure sensor.



- Position the diesel particulate filter on the engine.
- Tighten the screw (3) above the diesel particulate filter.

Brace, top, to diesel particulate filter

M8x20		21 Nm

- Tighten nut (2).

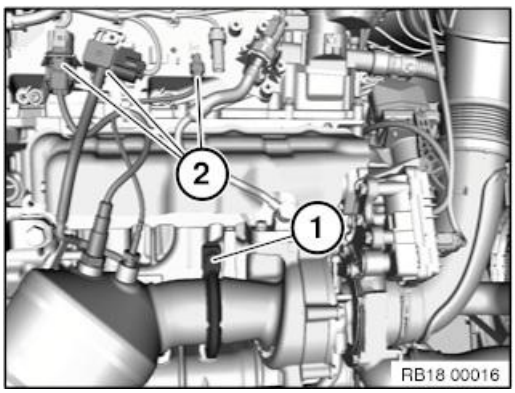
Diesel particulate filter to support

M8		21 Nm

- Tighten the screws (1).

Holder on the transmission

		19 Nm



- Renew the clamp (1) and the gasket.
- Tighten clamp (1).

Exhaust system to turbocharger

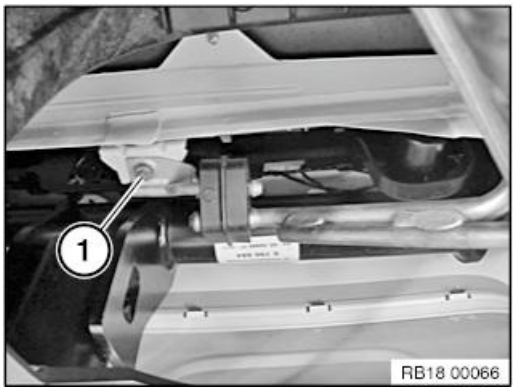
M8	Renew flat band clip.	15 Nm

- Connect plug connections (2).
- Clip in the plug connections (2) at the brackets.

50 – Installing the exhaust system (diesel particulate filter installed)

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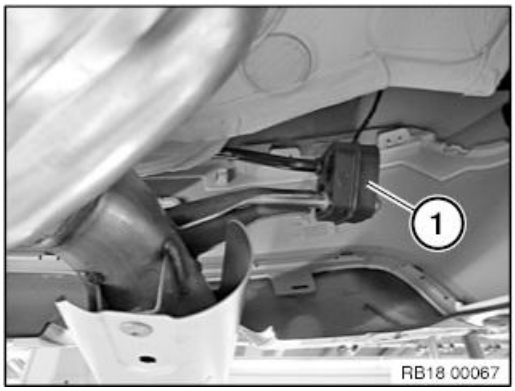
- Align the exhaust system with the vehicle underbody and attach to the front of the diesel particulate filter.



- Tighten down screw (1).

Rear silencer to body

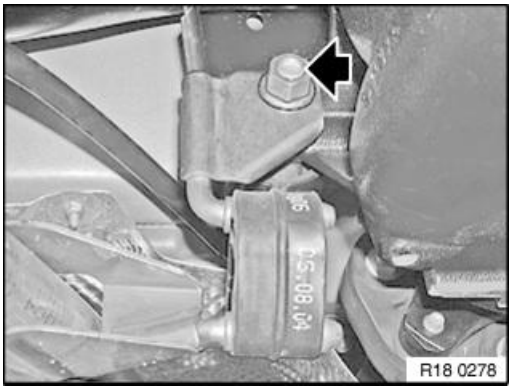
M8		21 Nm



TECHNICAL INFORMATION

Latch mechanisms, guides and mounting elements must not be damaged or missing.

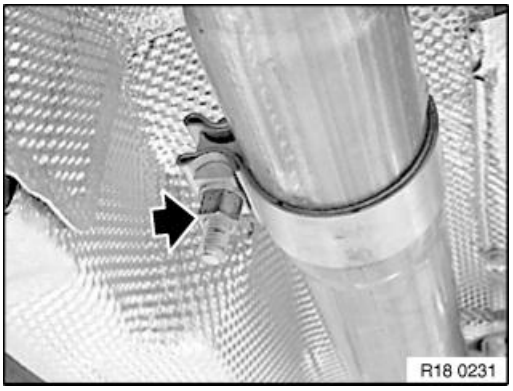
- Check the rubber mount (1) for damage and renew if necessary.
- Connect rubber mount (1) to the rear silencer.



- Tighten the nut (arrow).

Exhaust system bracket

M12x20		30 Nm



- Renew flat band clip.
- Tighten the nut (arrow).

Diesel particulate filter / primary catalytic converter to exhaust system

M8	Renew flat band clip.	26 Nm
M10	Renew flat band clip.	43 Nm

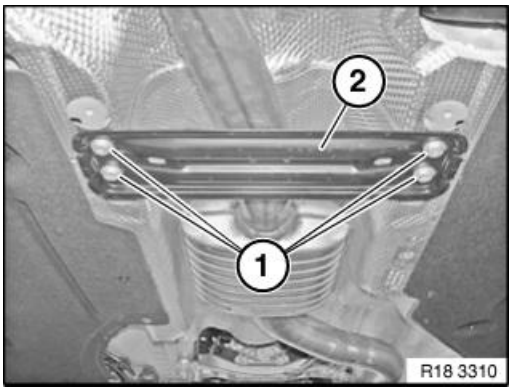
- Check exhaust system for leak tightness.

51 – Installing the reinforcement

- **For equipment specification without panorama glass roof:**

▸ **Installing the reinforcement plate**

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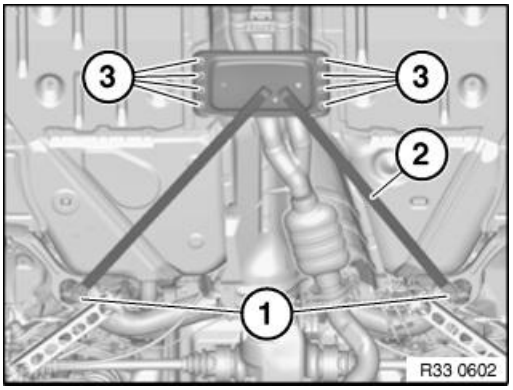
- Install the reinforcement plate (2) and tighten the screws (1).

Reinforcement plate to body

	19 Nm

- **For equipment specification with panorama glass roof:**

▸ **Install the tension strut**



- Install the tension struts (2).
- Tighten down screws (3).

Tension strut to body

M8		24 Nm

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

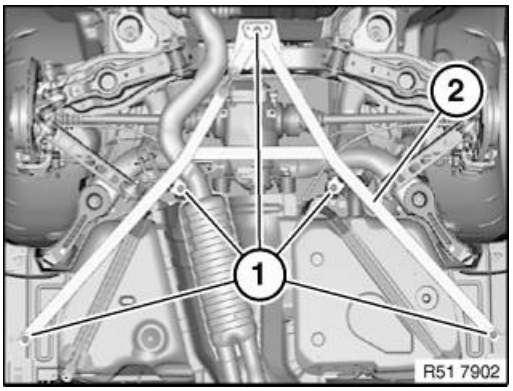
Tension strut to compression strut

Renew screws.

M12		Jointing torque	100 Nm
		Angle of rotation	90 °

- **For equipment specification with panorama glass roof:**

▸ **Installing the tension strut of the rear axle**

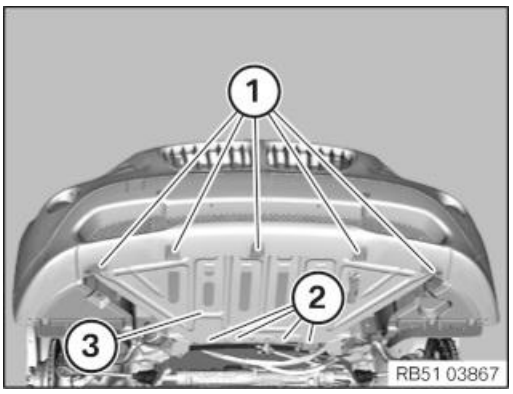


- Install the tension strut (2) and tighten the screws (1).

Trailing link to rear axle

M10		50 Nm

52 – Installing the pedestrian warning



- Install and correctly attach the pedestrian warning (3).
- Tighten down screws (1) and (2).

Pedestrian protection to front axle support

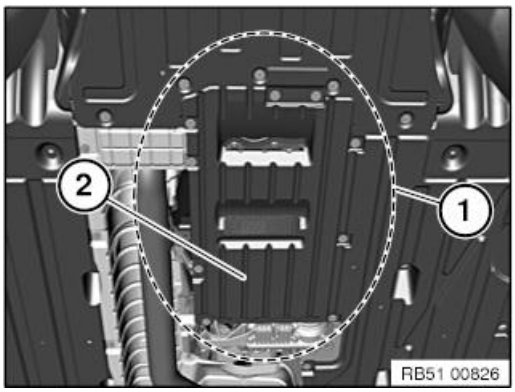
	25 Nm

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53 – Installing underbody protection at rear

NOTICE

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

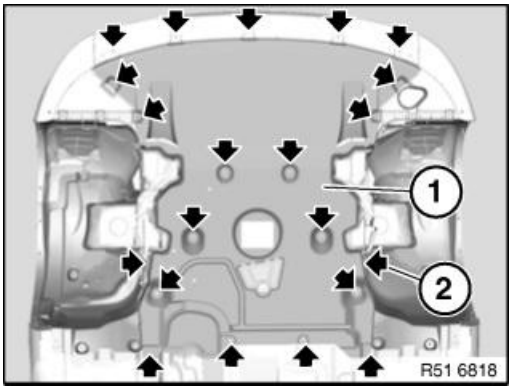


- Attach the rear underbody protection (2).
- Tighten the screws in this area (1).

Underbody panelling on body

Screw not metric			3 Nm
Screw M6			8.8 Nm
Nut			2.5 Nm

54 – Installing the front underbody protection

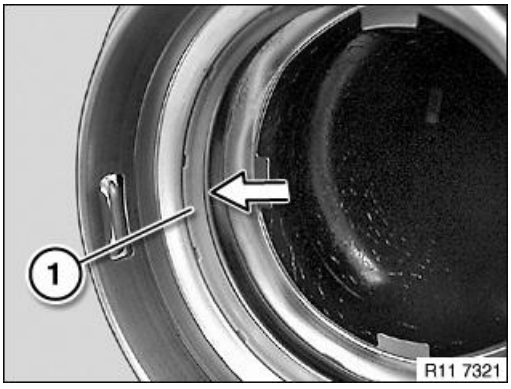


- Position the front underbody protection (1).
- Tighten the screws (arrows) (2).

Underbody panelling on body

Screw not metric			3 Nm
Screw M6			8.8 Nm
Nut			2.5 Nm

55 – Install pressure pipe between exhaust turbocharger and charge air cooler



RISK OF DAMAGE

Damage to the exhaust turbocharger.

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

- Replace the gaskets and pressure pipe if necessary.

- Check gasket (1) on the pressure pipe above for damage. Replace the gasket (1) if necessary.



RISK OF DAMAGE

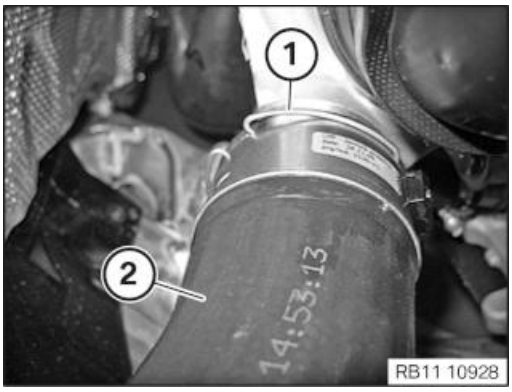
Damage to the exhaust turbocharger.

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

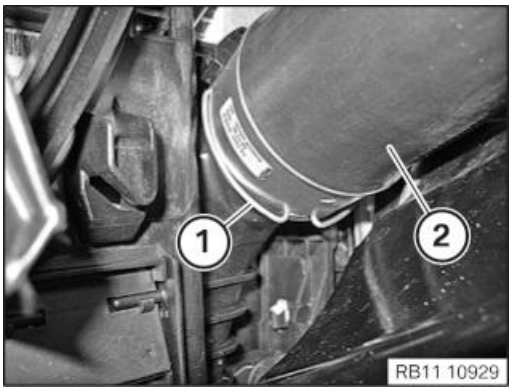
- Replace the gaskets and pressure pipe if necessary.

- Check gasket on the pressure pipe below, for damage. Replace the gasket as required.

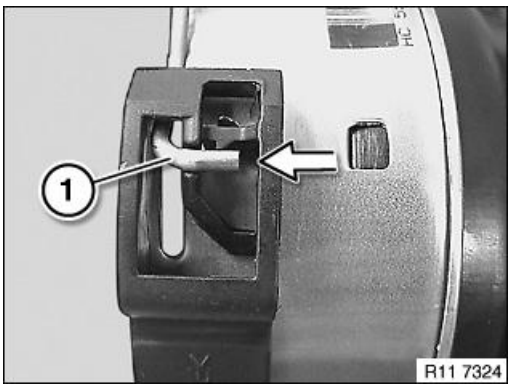
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- Unlock the lock (1).
- Connect and lock the pressure pipe (2) to the exhaust turbocharger.

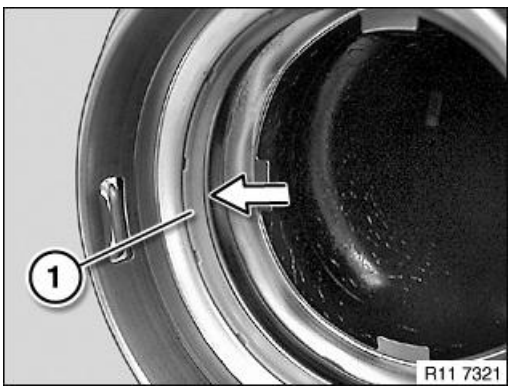


- Unlock the lock (1).
- Connect and lock the pressure pipe (2) to the charge air cooler.



- Check intake system for tightness.
- Make sure that the pressure pipe has been fully connected and all locks (1) engage correctly in the bracket.

56 – Installing pressure pipe on throttle body



RISK OF DAMAGE

Damage to the exhaust turbocharger.

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

- Replace the gaskets and pressure pipe if necessary.

- Check gasket (1) on the pressure pipe above for damage. Replace the gasket (1) if necessary.



RISK OF DAMAGE

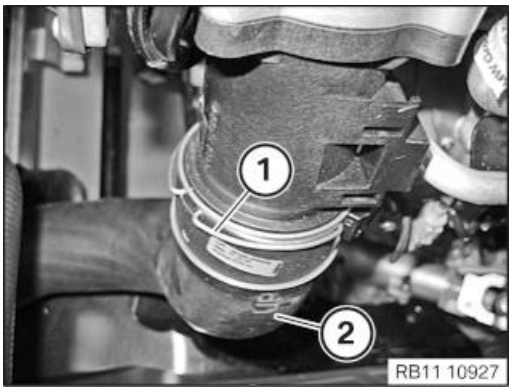
Damage to the exhaust turbocharger.

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

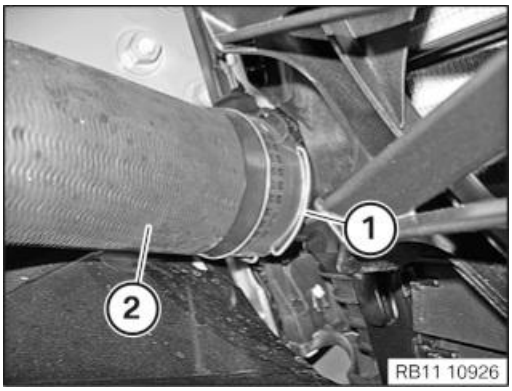
- Replace the gaskets and pressure pipe if necessary.

- Check gasket on the pressure pipe below, for damage. Replace the gasket as required.

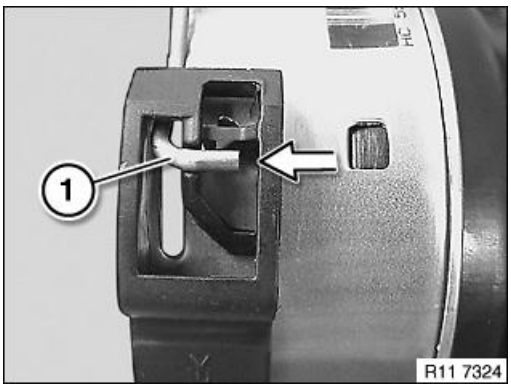
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- Unlock the lock (1).
- Connect pressure pipe (2) to the throttle body and lock.

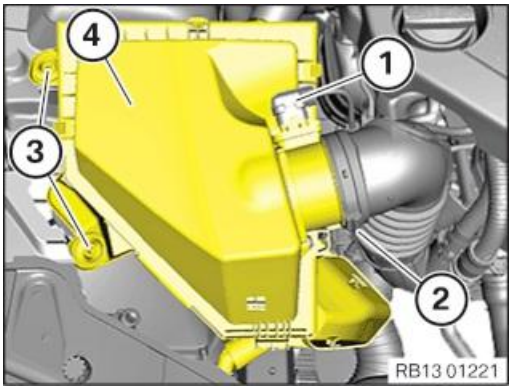


- Unlock the lock (1).
- Connect and lock the pressure pipe (2) to the charge air cooler.



- Check intake system for tightness.
- Make sure that the pressure pipe has been fully connected and all locks (1) engage correctly in the bracket.

57 – Installing intake silencer housing



- Position intake silencer housing (4).
- Connect the clean air pipe with the intake filter housing and tighten the clamp (2).

Clean air pipe to intake silencer housing

Clamp			2.5 Nm

- Tighten down screws (3).

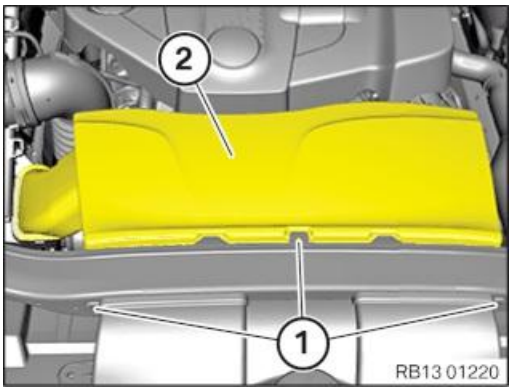
Intake silencer housing to the body

M6			8 Nm

- Connect the connector (1) to the hot film air mass meter.

  The connector (1) must engage audibly.

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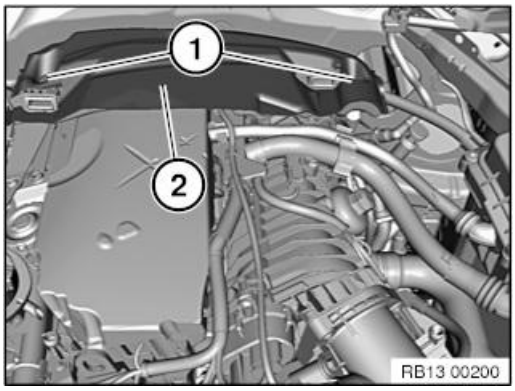


- Install the intake port (2).
- Tighten the screws (1).

Intake port to front panel

Screw with Torx socket, for plastic			1.5 Nm

58 – Installing acoustic cover at rear



- Guide in and install acoustic cover at rear (2).
- Secure acoustic cover with the expanding rivets (1).

59 – Attaching cowl panel cover

Check

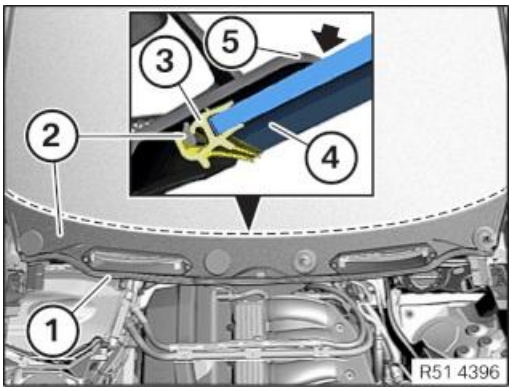
- Check the sealing lip of the cowl panel cover for damage.

Result

» Sealing lip faulty.

Measure

- Renew the complete cowl panel cover.



- Press on the supporting strip (3) onto the windscreen (4).
- Check whether the supporting strip (3) is sufficiently bonded to the windscreen (4). If necessary, replace the supporting strip (3).
- Install the cowl panel cover (2) and clip into the supporting strip (3).

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.

- Make sure that the sealing lip (5) is contact with the windscreen (4) across its entire length.

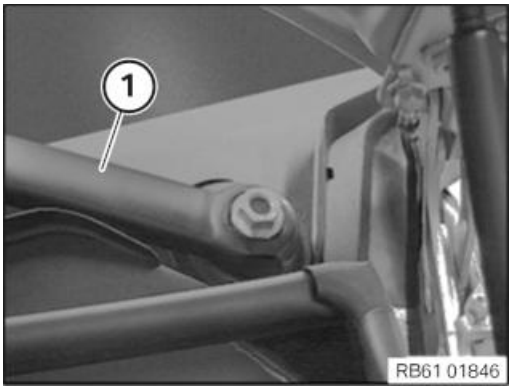
60 – Install both wiper arms

NOTICE

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

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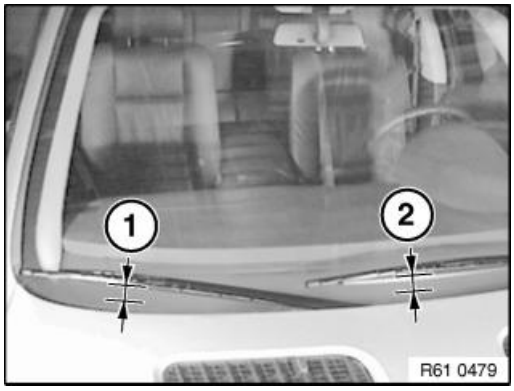
▸ **Installing the wiper arm**

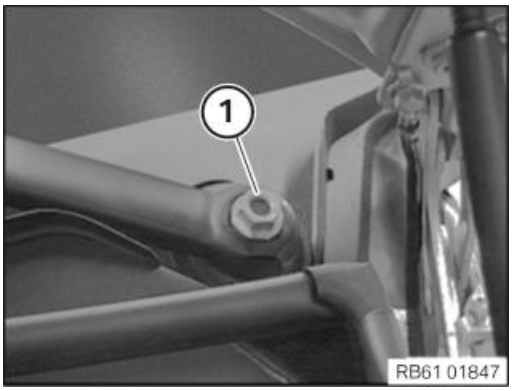


- Attach the wiper arm (1) and ensure that the wiper arm (1) is positioned correctly.

Windscreen wiper arm

Left wiper arm (2)	44 mm ... 50 mm
Right wiper arm (1)	51 mm ... 57 mm





- Tighten nut (1).

Windscreen wiper arm

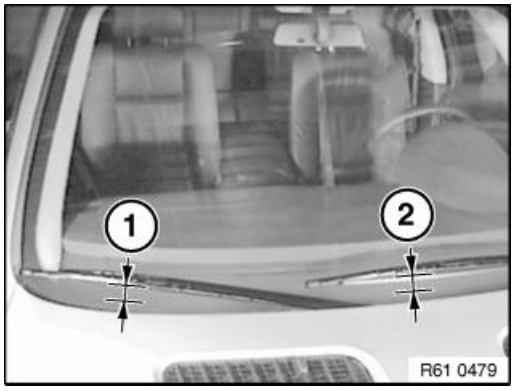
	35 Nm

Check

- Operate the wipers.
- Measure the distance between the wiper blade and cowl panel cover.

Windscreen wiper arm

Left wiper arm (2)	44 mm ... 50 mm
Right wiper arm (1)	51 mm ... 57 mm



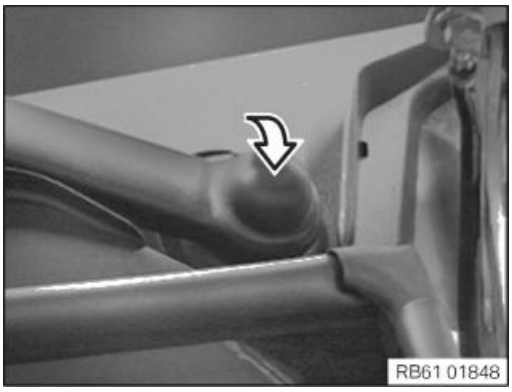
Result

» The distance between the wiper blade and cowl panel cover is incorrect: The wiper arm has not been positioned correctly.

Measure

- Remove the wiper arm and install it correctly.

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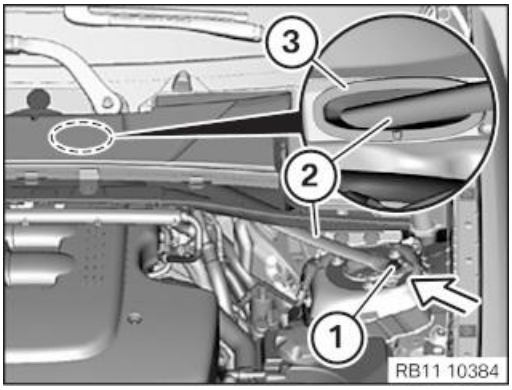


- Mount the protective cap (1).

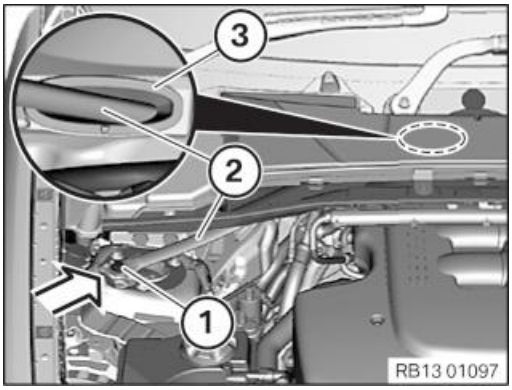
61 – Install tension strut on left and right spring strut dome

TECHNICAL INFORMATION

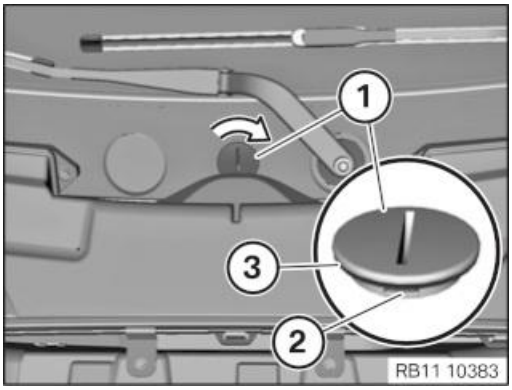
Driving without the strut brace/front end or tension strut is not permitted.



- Carefully insert the left-hand tension strut (2) into the grommet (3) in the direction of the arrow.
- Tighten down screw (1).
- Tighten the screw below the cowl panel.



- Carefully insert the right-hand tension strut (2) into the grommet (3) in the direction of the arrow.
- Tighten down screw (1).

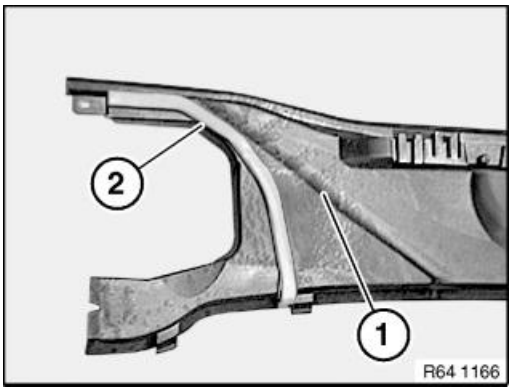


- Tighten the screw below the cover (1).
- For the cover with notch: Turn the cover (1) clockwise by approximately 45°.
- For the cover without notch: Clip in the cover .
- If the cover (1) is damaged: Replace the cover (1).

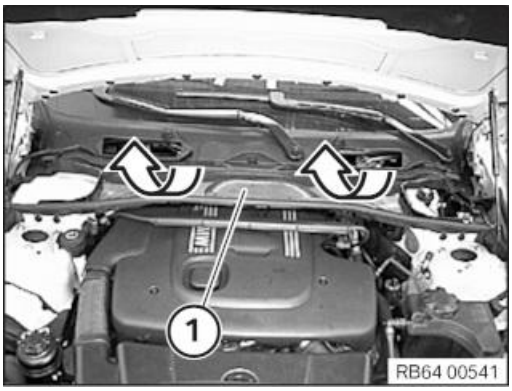
  The latch mechanism (2) and gasket (3) of the cover (1) must not be damaged. Even minor damage to the cover (1) may cause water ingress.

62 – Install the lower section of the microfilter housing

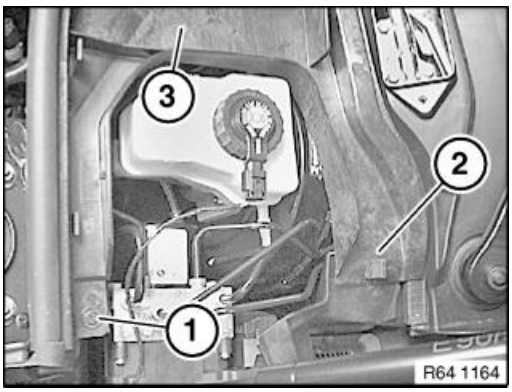
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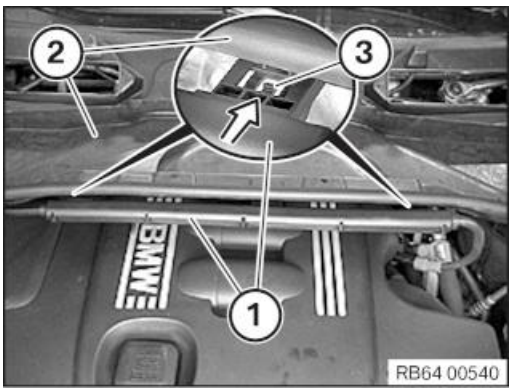
- Check the seal (2) on the lower section of the microfilter housing (1) for damage and replace missing or faulty seals as needed.



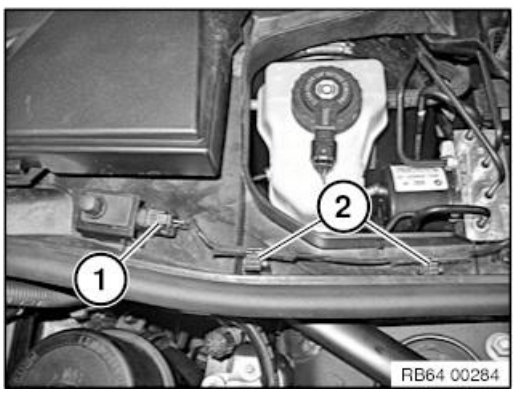
- Insert the lower section of the microfilter housing (1) in the direction of the arrow.
- Make sure the lower section of the microfilter housing (1) is fitted correctly.



- Fasten the lower section of the microfilter housing (3) on both sides with the screw (1).
- Fasten the retaining tab (2) on both sides.

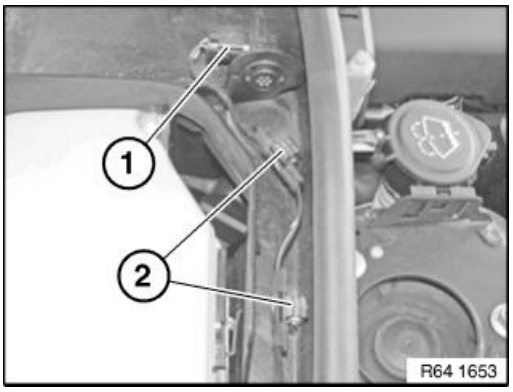


- Check all retaining lugs for damage; renew missing or faulty retaining lugs if necessary.
- Insert the cable strip (1) in the direction of the arrow into the lower section of the microfilter housing (2) until the retaining lugs (3) engage.
- Make sure cable strip is correctly seated.

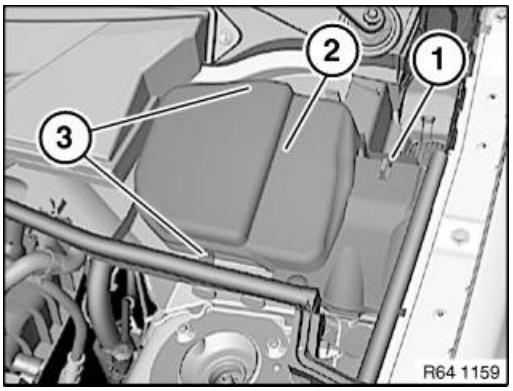


- Clip the cable into the guides (2).
- Close plug connection (1).

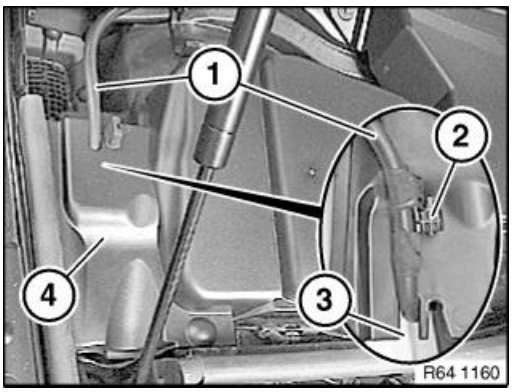
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- Clip the cable into the guides (2).
- Close plug connection (1).

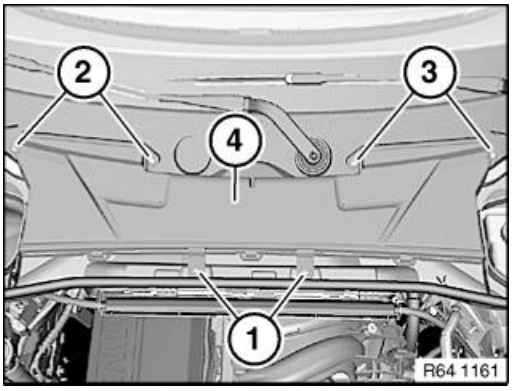


- Install the cover (2) on the left.
- Make sure left cover (2) is correctly seated.
- Engage the latch mechanisms (3).
- Secure the retaining tab (1).



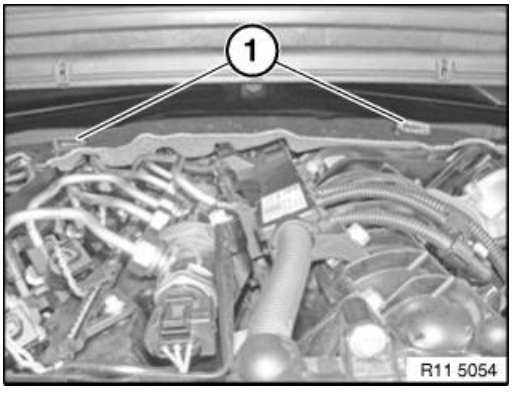
- The procedure for the installation of the right cover (4) is identical to the installation of the left cover.
- Make sure the hose (1) is correctly fitted in the recess (3).
- Fasten the hose (1) with the hose support (2) on the right cover (4).

63 – Install the upper section of the microfilter housing



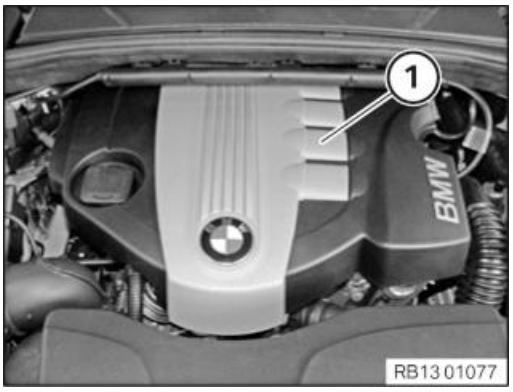
- Position the upper section of the microfilter housing (4).
- Make sure the upper section of the microfilter housing (4) is correctly positioned.
- Tighten the screws (1), (2) and (3).

64 – Installing the top acoustic cover



- Push the top acoustic cover into both guides (1).

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RISK OF DAMAGE

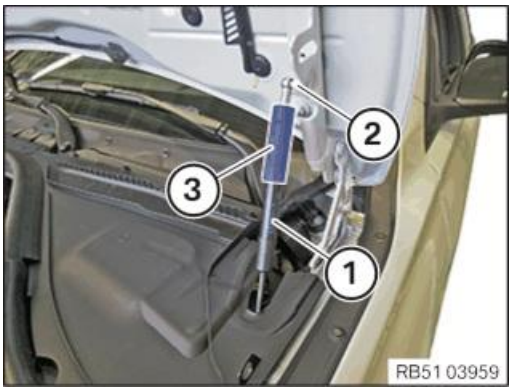
Damage to the acoustic cover.

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

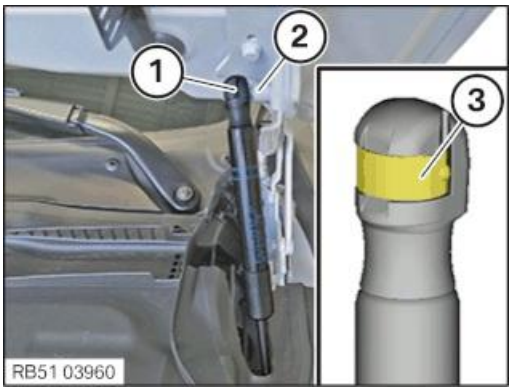
- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Secure the top acoustic cover (1) to the rubber mounts.

65 – 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

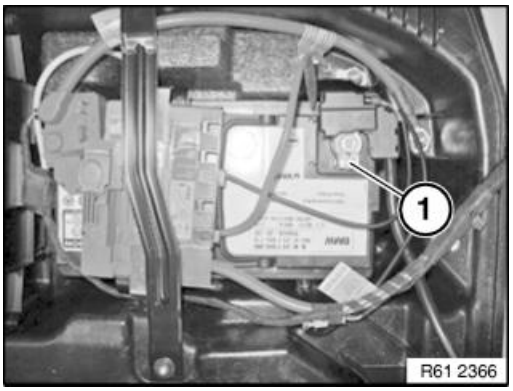
Shutting bonnet or tailgate.

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.

66 – Connecting the battery earth lead



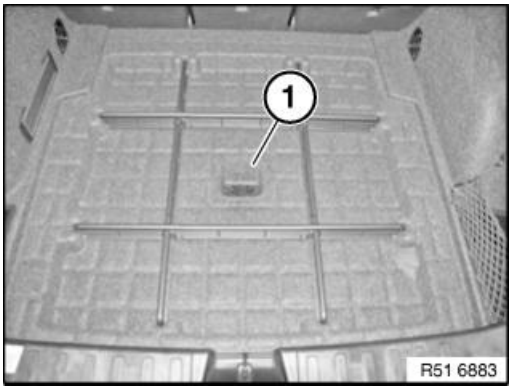
- Position the intelligent battery sensor (IBS) on the vehicle battery.
- Tighten nut (1).

Battery earth lead to battery

M6			5 Nm

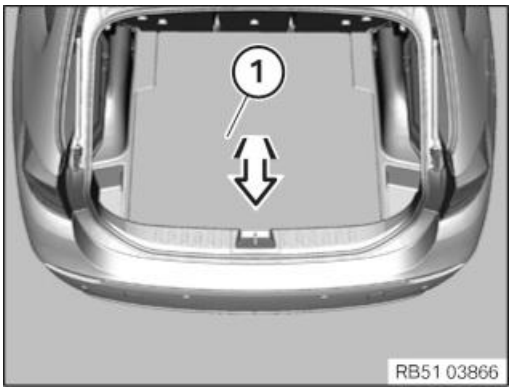
67 – Installing the spare wheel well trim panel

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- Install the trim panel of the luggage compartment well (1).

68 – Installing the luggage compartment floor trim panel



- Insert the luggage compartment floor trim panel (1) in the direction of the arrow.

69 – Charging battery

TECHNICAL INFORMATION

Observe the notes on handling the vehicle battery.

For additional information see:

61 00 ... Safety information on handling the vehicle battery

61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery

61 12 ... Notes on the intelligent battery sensor (IBS)

▸ **Charging lead-acid batteries and AGM batteries**

- Connect to a charger approved by BMW.
- If the battery is charged while it is still installed: always connect the charger to the jump start terminal point in the engine compartment.
- Fully charge the battery.

  The battery is fully loaded once the charge current drops below a certain value:

Battery temperature	Charge current
15° C - 25° C	<2.5 A
< 15°C	<1.5 A

- Disconnect the charger after having completed charging.

▸ **Charging the lithium ion battery**

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TECHNICAL INFORMATION

Comply with notes on handling lithium ion batteries.
For more information see:
08 08 14 (094) Charging parameters for lithium ion batteries
61 12 ... Notes regarding intelligent battery electronics (lithium ion battery)

- Adapt the charging voltage on the charger to the lithium ion batteries.

  Too high charging voltage can lead to opening of the electronic disconnect switch.
- Connect to a charger approved by BMW.
- Fully charge the battery.
- Disconnect the charger after having completed charging.

70 – Check/add transmission oil level (GA8HP45Z, GA8HP50Z, GA8HP70Z, GA8HP75Z, GAHP90Z)

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.

TECHNICAL INFORMATION

To set the correct oil level, it is mandatory that the service function "Transmission control unit: Oil-level adjustment" is carried out with the diagnosis system.

- Start the oil-level adjustment with the help of diagnosis system only when the transmission oil temperature lies between 30°C and 40°C.

  The oil-level adjustment with the diagnosis system can only be successfully terminated if the transmission oil temperature is between 40°C and 50°C.
- Connect the diagnosis system to the vehicle.
- Call up the service function: Transmission control unit: Oil-level adjustment.
- Follow the instructions in the diagnosis system and run an oil-level adjustment.
- **If applicable, top up the oil level in the automatic transmission:**

▸ **Top up automatic transmission fluid**

CAUTION

Materials harmful to health.

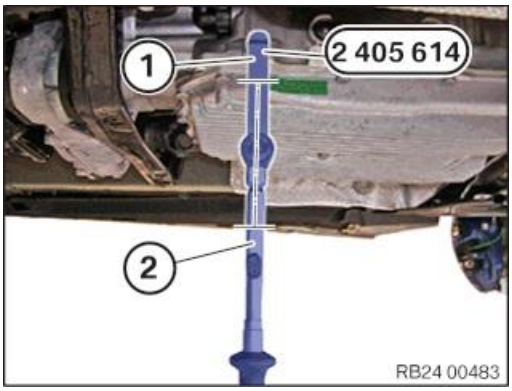
Contact with fluids harmful to health!

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

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- Stand vehicle on a level surface and secure against rolling off.
- Loosen the oil filler plug (1) using the special tool **2 405 614**.
- Top up automatic transmission fluid according to the instructions in the diagnosis system.

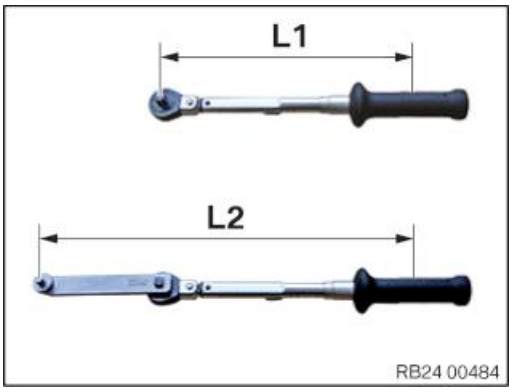


- Renew the oil filler plug and the sealing ring.

  Parts: Oil filler plug, sealing ring
- Position the oil filler plug by hand.
- Align special tool **2 405 614** (1) and the torque wrench (2) in a line.
- Tighten the oil filler plug to the **calculated torque to be set**.

  The calculation of the torque to be set is as follows:

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TECHNICAL INFORMATION

If an extension is used on the torque wrench, then the torque to be set and the specified tightening torque differ. The torque to be set on the torque wrench must be calculated before tightening.

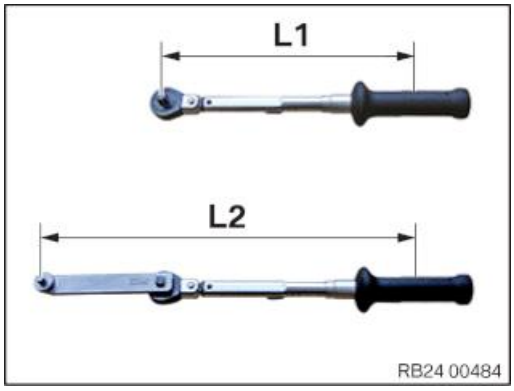
- Recalculate the torque prior to tightening when using special tool **2 405 614**:
- Measure the length (L1).

  (L1) represents the length from the centre of the handle to the square connector of the reversible ratchet.
- Measure the length (L2).

  (L2) represents the length from the centre of the handle to the square connector of special tool **2 405 614**.
- Calculate the torque to be set using the following calculation: (tightening torque * (L1)) : (L2) = torque to be set

Oil filler plug (GA6HP and GA8HP)

M18	The torque to be set deviates from the specified tightening torque due to the special tool. The torque to be set must be calculated depending on the used torque.	Tightening torque Torque to be set	35 Nm Torque to be set=(35 Nm * L1) : L2



71 – Carrying out vehicle test

- Connect diagnosis system.
- Switch the ignition on.
- Carry out vehicle identification.
- Carry out a vehicle test.
- Wait for the vehicle test to complete.
- Check identified faults and (if necessary) rectify these faults after consulting with customer.

Additional Information

Overview of Tightening Torques

Left/right engine mount to engine support arm Used in step 34

M10		56 Nm
M12		68 Nm

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Air conditioning compressor on crankcase

Used in step 37

M8			19 Nm
M10			38 Nm

Alternator to component carrier

Used in step 38

			38 Nm

Deflecting element to belt tensioner

Used in step 38

			55 Nm

Positive battery cable to alternator

Used in step 38

Nut		M5	13 Nm
		M8	19 Nm

Radiator on module carrier

Used in step 40

			4 Nm

Fan cowl on radiator

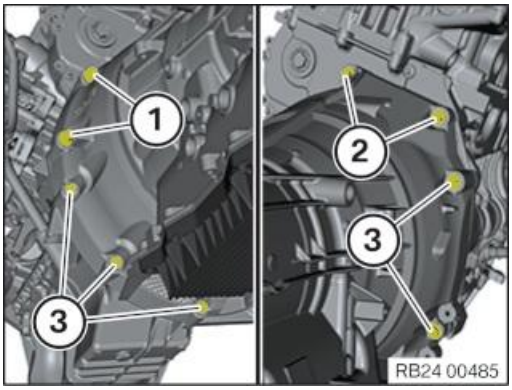
Used in step 42

			4 Nm

Transmission to engine

Used in step 46

Screw (3) M12x100			66 Nm
Bolt (2) M12x75			66 Nm
Bolt (1) M8x50			19 Nm



Holder on the transmission

Used in step 46 49

			19 Nm

Torque converter on the drive plate

Used in step 46

M10	Renew screws.		56 Nm

Transmission oil cooler line to transmission

Used in step 46

M8			8 Nm

Holder on the diesel particulate filter

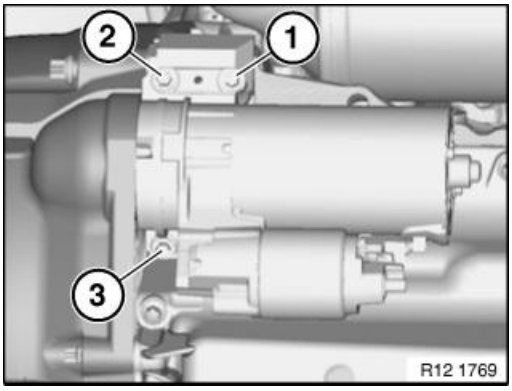
Used in step 46

			21 Nm

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Starter motor — Used in step 47

M8x60	*Tighten screws in the following sequence (1), (2), (3).*	19 Nm



Battery positive lead to starter — Used in step 47

M8		13,4 Nm

Wiring harness to starter (terminal 50) — Used in step 47

M6		7 Nm

Brace, top, to diesel particulate filter — Used in step 49

M8x20		21 Nm

Diesel particulate filter to support — Used in step 49

M8		21 Nm

Exhaust system to turbocharger — Used in step 49

M8	Renew flat band clip.	15 Nm

Rear silencer to body — Used in step 50

M8		21 Nm

Exhaust system bracket — Used in step 50

M12x20		30 Nm

Diesel particulate filter / primary catalytic converter to exhaust system — Used in step 50

M8	Renew flat band clip.	26 Nm
M10	Renew flat band clip.	43 Nm

Reinforcement plate to body — Used in step 51

		19 Nm

Tension strut to body — Used in step 51

M8		24 Nm

Tension strut to compression strut — Used in step 51

Renew screws.

M12		Jointing torque	100 Nm
		Angle of rotation	90 °

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Trailing link to rear axle

Used in step 51

M10			50 Nm

Pedestrian protection to front axle support

Used in step 52

			25 Nm

Underbody panelling on body

Used in step 53 54

Screw not metric			3 Nm
Screw M6			8.8 Nm
Nut			2.5 Nm

Clean air pipe to intake silencer housing

Used in step 57

Clamp			2.5 Nm

Intake silencer housing to the body

Used in step 57

M6			8 Nm

Intake port to front panel

Used in step 57

Screw with Torx socket, for plastic			1.5 Nm

Windscreen wiper arm

Used in step 60

			35 Nm

Battery earth lead to battery

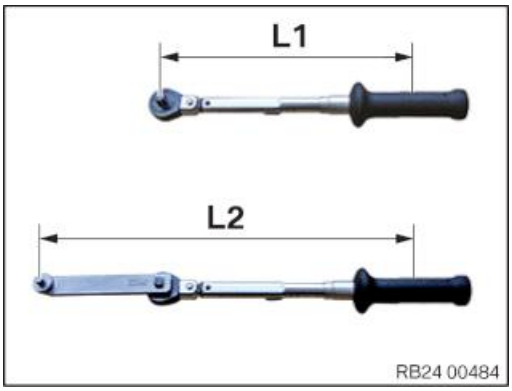
Used in step 66

M6			5 Nm

Oil filler plug (GA6HP and GA8HP)

Used in step 70

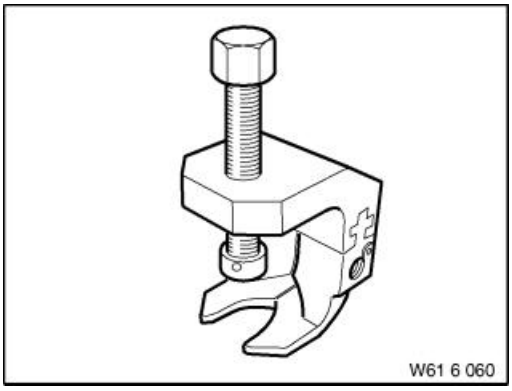
M18	The torque to be set deviates from the specified tightening torque due to the special tool. The torque to be set must be calculated depending on the used torque.	Tightening torque Torque to be set	35 Nm Torque to be set= (35 Nm * L1) : L2



Overview of Special Tools

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0 493 441 (61 6 060) Extractor



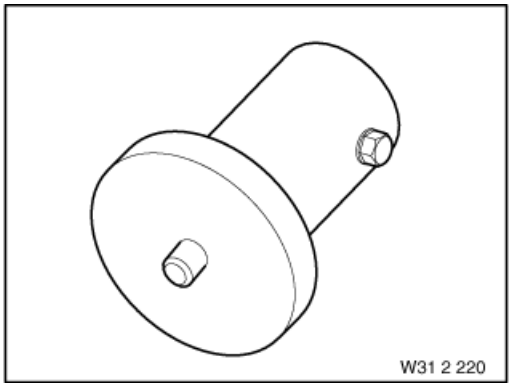
Common Used in step 8

Usage	(Wiper arm puller, universal) To pull off wiper arm from drive shaft
Included in the tool or work	
Storage location	C3
Replaced by	
In connection with	
SI-Number	01 10 99 (433)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 704 (61 6 061)		**Basic body**	
2	0 494 705 (61 6 062)		**Claw** (Left / right claw)	
3	0 494 706 (61 6 063)		**Spindle**	
4	0 494 707 (61 6 064)		**Synchronising key**	

0 491 932 (31 2 220) Upholstery

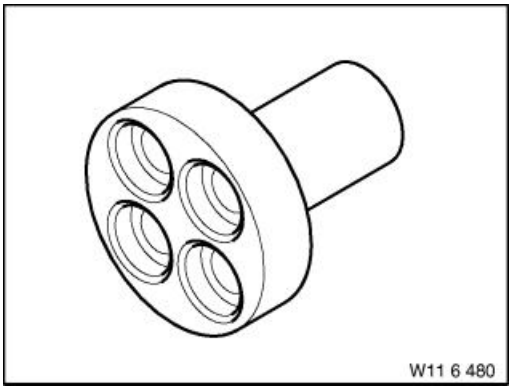


Common Used in step 18

Usage	(Support) For supporting the front axle support and the exhaust system during installation work
Included in the tool or work	
Storage location	B3
Replaced by	
In connection with	
SI-Number	01 06 94 (801)

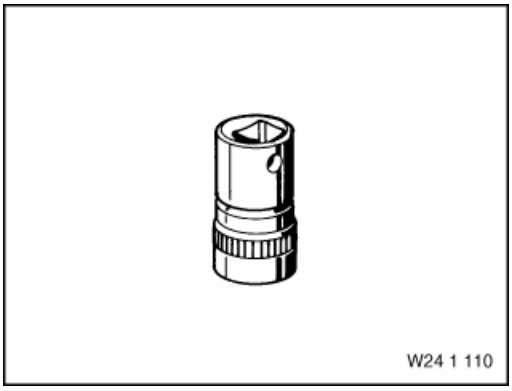
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0 493 380 (11 6 480) Connector



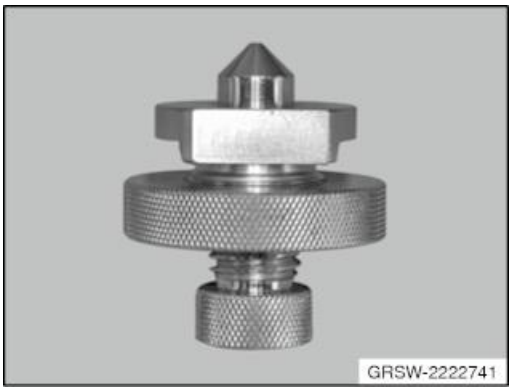
Common	Used in step 22 46
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

0 491 667 (24 1 110) Socket wrench insert



Common	Used in step 22 46
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)

2 222 741 Device



Common	Used in step 22
Usage	To secure the converter when removing and installing the transmission.
Included in the tool or work	
Storage location	B30
Replaced by	
In connection with	
SI-Number	01 27 11 (764)

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0 494 213 (24 2 390) Cap

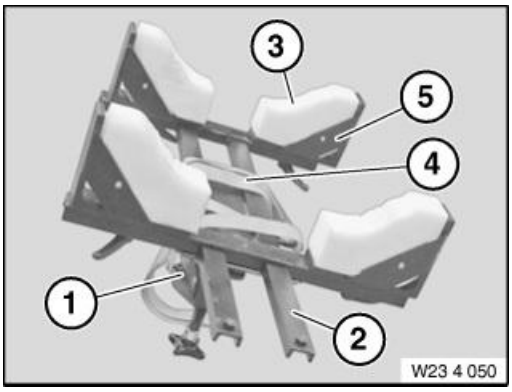


Common	Used in step 22 46
Usage	(protective cap) For sealing off the guide sleeve of the transmission connector
Included in the tool or work	
Storage location	C49
Replaced by	
In connection with	
SI-Number	01 14 01 (766)

0 495 498 (23 4 050) Support

Used in step 22

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Common

Usage	(universal gearbox holder) Support for removing and installing manual gearboxes and automatic transmissions for BMW & RR.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 06 (256)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
3	0 495 549 (23 4 053)		**Insert** (Foam material insert (1 set = 4 pieces)) deleted, can be ordered only via tool set	
1	0 495 547 (23 4 051)		**Joint** Available only as a complete tool set 23 4 050 (83 30 0 495 498) - as of 16.07.12.	
2	0 495 548 (23 4 052)		**Frame** (Basic frame) Available only as a complete tool set 23 4 050 (83 30 0 495 498) - as of 16.07.12.	
4	0 495 550 (23 4 054)		**Belt** (Tensioning strap) Available only as a complete tool set 23 4 050 (83 30 0 495 498) - as of 16.07.12.	
5	0 496 018 (23 4 055)		**Support** (Fixture for foam insert) Available only as a complete tool set 23 4 050 (83 30 0 495 498) - as of 16.07.12.	

2 219 012 Hydraulic lifter

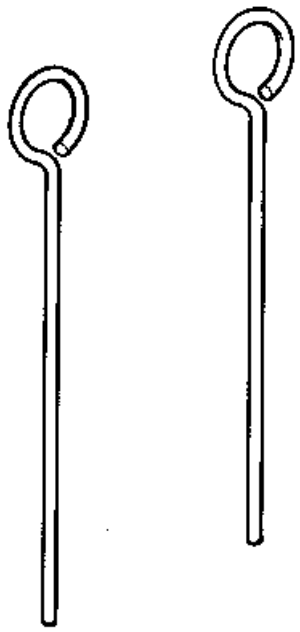


Common Used in step 22

Usage	For raising and lowering various vehicle components.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

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0 490 973 (11 3 340) Pin



Common	Used in step 27 39
Usage	(lock pin (2 pieces)) For retaining the chain tensioner piston (e.g. when removing and installing the cylinder head) and to lock the drive belt tensioner
Included in the tool or work	
Storage location	B1
Replaced by	
In connection with	
SI-Number	01 09 91 (416)

2 220 718 Workshop crane

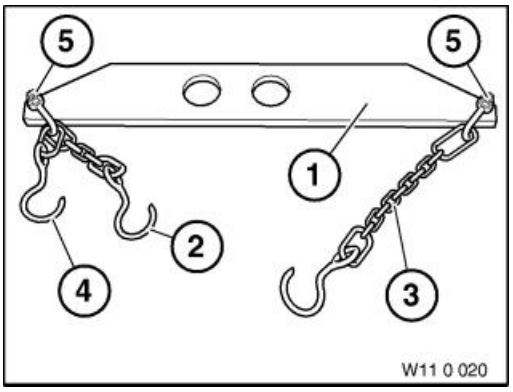


Common	Used in step 33
Usage	WSK 1000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	06 01 11 (701)

0 490 567 (11 0 020) Lifting gear

Used in step 33

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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

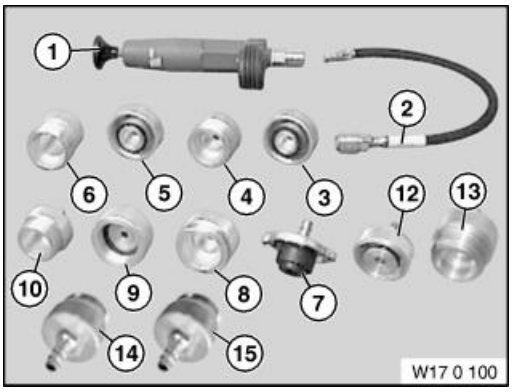
Pos	BMW Order number	Replaced by	Designation	In Connection with
5	0 490 572 (11 0 029)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 020 = 0490567. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 568 (11 0 021)		**Lifting gear** (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.	

0 494 417 (17 0 100) Tester

Common

Used in step 44 45

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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)	

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14	0 495 889 (17 0 115)	**Adapter** For radiator cap Model series: N12, N14

0 494 642 (17 0 113) Adapter



Common	Used in step 44 45
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 45
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	

0 494 418 (17 0 101) Pump



Common	Used in step 45
Usage	
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

2 405 614 Socket wrench



Common	Used in step 70
Usage	For opening and closing the oil filler plug. 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). Replaced by 2455997
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 33 15 (305)

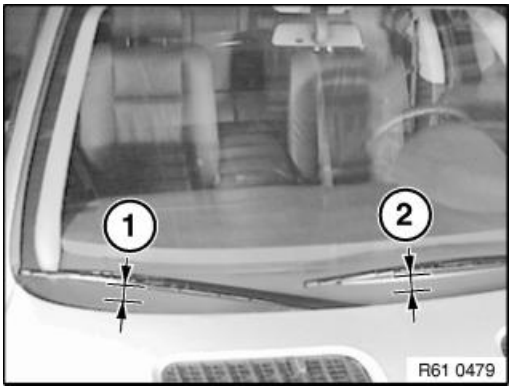
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Overview Technical Data

Opening pressure of coolant sealing cover	Used in step 45
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

Cooling system test pressure	Used in step 45
Test pressure for cooling system (gauge pressure)	1,5 bar
Pressure drop	max. 0,1 bar

Windscreen wiper arm	Used in step 60
Left wiper arm (2)	44 mm ... 50 mm
Right wiper arm (1)	51 mm ... 57 mm



Links

General repair instructions	Used in step
12 00 ... Notes for disconnecting and connecting battery	3
61 00 ... Safety information for handling vehicle battery	3
61 12 ... Notes on intelligent battery sensor (IBS)	3 69
61 20 ... Notes on AGM battery	69
61 20 ... Notes regarding the lithium ion battery	69
61 12 ... Notes regarding the battery electronics (lithium ion battery)	69

Repair instructions	Used in step
24 34 ... Notes on mechatronics (GA8HP45Z,GA8HP70Z,GA8HP90Z)	22 46
23 .. Universal BMW transmission support	22 46
17 00 ... Instructions for repair work on cooling system	23 41 44 45
61 35 ... Notes on ESD protection (Electro Static Discharge)	30 31 36

Operating materials	Used in step
14.0 Automatic transmission fluid for ZF transmissions GA8HP45Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H	70

Operating materials	Used in step
Main group 17	44

Special tool service information	Used in step
Description of the manual Li parameter setting for DEUTRONIC DBL800/1200/1600	69

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Description of the manual Li parameter setting for ELEKTRON HS-1000 69
Description of the manual Li parameter setting for ELTEK MultiCharger 750/900/1500 69

Special tool service information	Used in step
Charging parameters for lithium ion batteries	69
Note for the workshop equipment catalogue BMW, MINI	69

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11 00 050 Removing and installing engine (N47, N47S)

Special tools required:

- 11 0 020

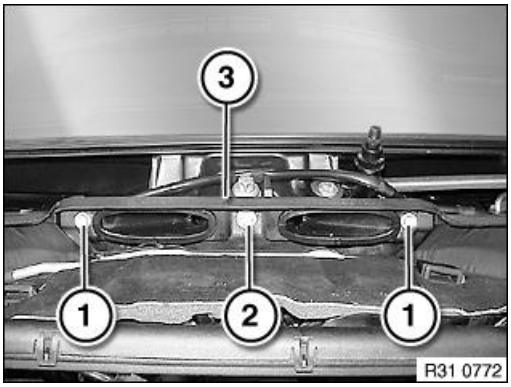
Necessary preliminary work:

- Follow notes for disconnecting and connecting battery.
- Clamp off battery earth lead.
- Move engine compartment lid into service position.
- Remove radiator
- Remove intake silencer housing.
- Disconnect all coolant hoses including heater hose from engine.
- Remove left pressure pipe.
- Remove right pressure pipe.
- Disconnect positive battery cable from alternator
- Remove alternator.
- Release A/C compressor and place to one side.
- If necessary, release power steering pump and place to one side.
- Remove cowl panel cover.
- Release engine wiring harness from electronics box.
- Remove diesel particulate filter.
- Remove transmission.

Recycling:

Catch and dispose of escaping fuel with auxiliary materials.

Observe country-specific waste disposal regulations.



Release screws (1,2).

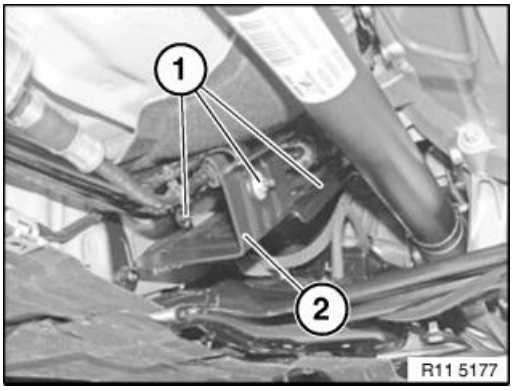
Remove heater end panel (3).

Installation note:

Make sure heater end panel is correctly seated.

M6x20 bolt must be fitted in middle.

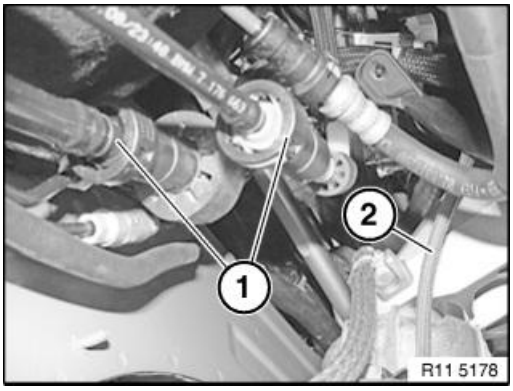
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Release screws (1).

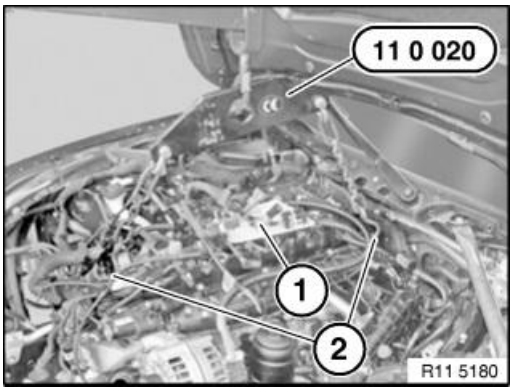
Remove the protective plate (2).

Note:
Graphic (all-wheel drive vehicle).



Unlock fuel feed and return lines (1) and disconnect.

Detach vacuum hose (2) for engine mount.



Secure engine wiring harness (1) on engine against falling out.

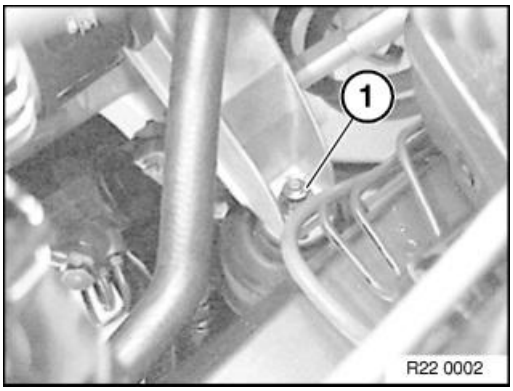
Fit special tool 11 0 020 on engine.

Important!

Pay attention to chain of special tool 11 0 020 . **Risk of damage.**

Only raise engine at the lifting lugs (2) provided for this purpose.

Note:
Graphic F01.



Release nut (1) on left and right engine mounts.

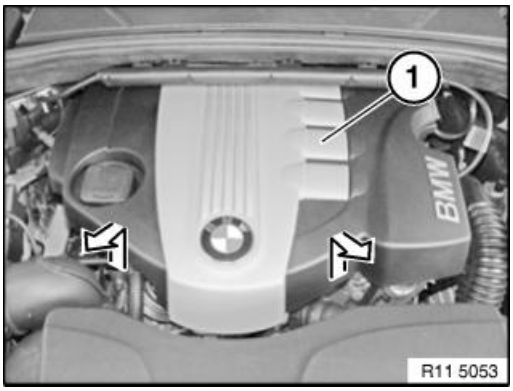
Installation note:
Replace nuts.

Release ground strap on left engine support arm.

Assemble engine.

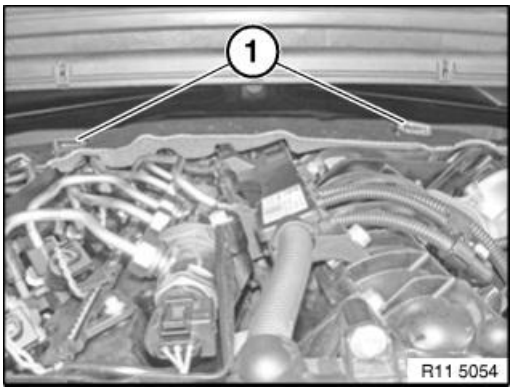
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11 00 Removing and installing/renewing acoustic cover (N47)



Remove acoustic cover (1) in following steps:

- Raise at front.
- Pull out in direction of travel.



Installation note:
Slide acoustic cover into both guides (1).

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



Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

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



Protective measures/rules of conduct:

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



First aid measures:

- Eye contact: Rinse eyes immediately with plenty of water for at least 15 minutes; if available, use an eye-rinsing bottle. If irritation of the eyes persists, consult a doctor.
- Skin contact: Wash off with soap and water immediately. If irritation persists, consult a doctor.

  Note: Do not use solvents/thinners.

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



Warning!

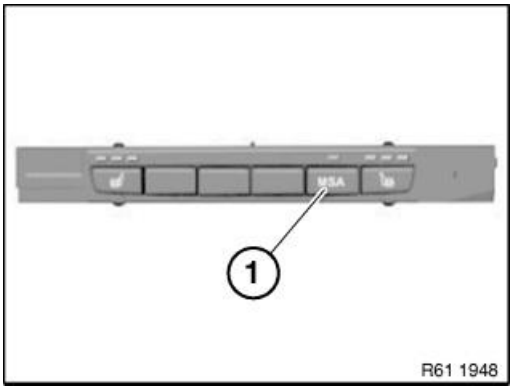
If the engine hood/bonnet contact is pulled upwards (workshop mode), the information "switch closed" is output. The automatic engine start-stop function is active.

An automatic engine start is possible.

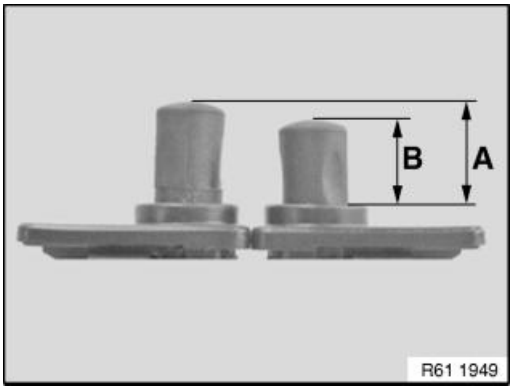
Observe safety precautions when working on MSA vehicles.

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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00 Safety instructions for handling oil



Warning!

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

Risk of injury if oil comes into contact with eyes and skin!



Recycling:

Observe country-specific waste-disposal regulations.



Measures if oil is unintentionally released:

- Personal precautionary measures: Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- Environmental protection measures: Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- Limiting spread: Use oil blocks to prevent the surface spread of oil.
- Cleaning procedure: Bind and dispose of escaped oil with nonflammable absorbents.

  Note: Do not flush oil away with water or aqueous cleaning agents.

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11 00 670 Securing engine in installation position (N47, N47S)



Special tools required:

- 00 6 000
- 00 6 001
- 00 6 002
- 00 6 031
- 00 6 051
- 00 6 053
- 00 6 070
- 00 6 080



Warning!

Risk of injury!

Observe following instructions relating to special tool:

1. Prior to each use, check the special tools for defects, modifications and operational reliability.
2. Damaged/modified special tools must not be used!
3. No changes or modifications may be made to the special tools!
4. Keep special tools dry, clean and free of grease.



Important!

Before lifting the engine, check the lifting eyes for damage (cracks) and secure seating.



Note:

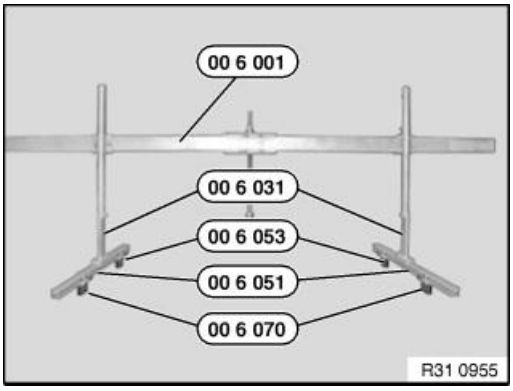
- Numbering system for special tools has been re-encoded.



Necessary preliminary tasks:

- Secure engine compartment lid in service position
- Remove acoustic cover

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Assemble transverse member 00 6 000 with special tools:

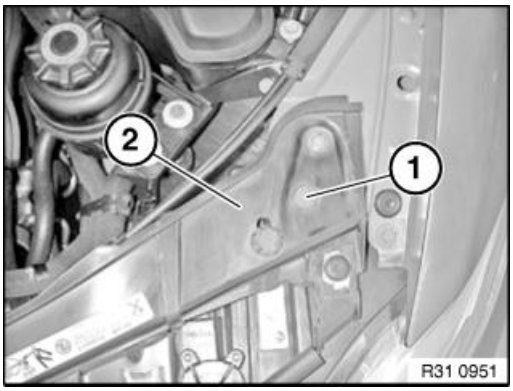
- 00 6 051 (profile strips)
- 00 6 070 (supports)
- 00 6 053 (supports)
- 00 6 031 (connections)

complete.

Important!

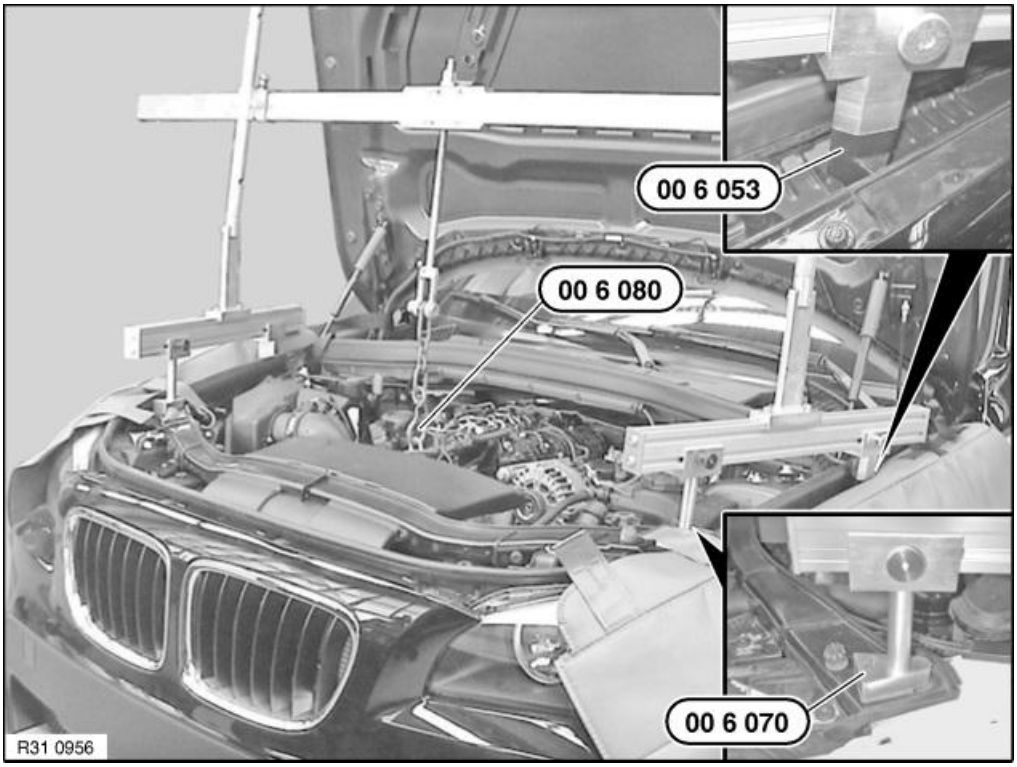
Avoid a change of engine position in the transverse or longitudinal direction.

Always make sure there is sufficient clearance between the engine (or its attachment parts) and the body.



Release screw (1) on front panel (2).

Tightening torque 41 33 1AZ.



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Important!

Risk of damage!

Fit transverse member 00 6 000 with a 2nd person helping.

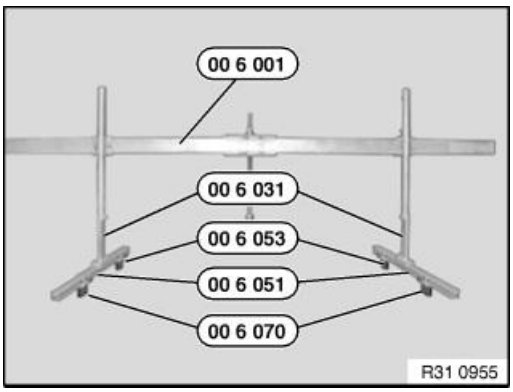
Place front supports in area of front panel screw connection and rear supports on side panel.

Bolt connections of transverse member 00 6 001 must point to windscreen.

Special tool 00 6 070 consists of a left and right support.

Secure chain with hook 00 6 080 to spindle 00 6 002 and align centrally over front engine suspension lug.

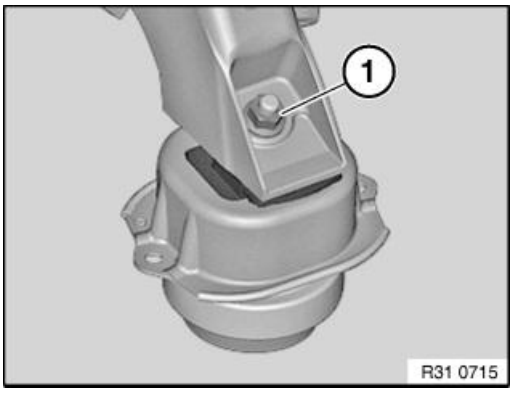
Attach special tool to front suspension lug.



Warning!

Risk of injury!

Tighten down all adjusting screws and nuts on transverse member 00 6 000 .



Unscrew nuts (1).

Raise engine approx. 10 mm with transverse member.

Installation:
Replace self-locking nuts.

Tightening torque 22 11 2AZ.

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11 11 579 Checking crankcase for watertightness (N47 D20 O1)

Special tools required:

- 11 6 281
- 11 6 282
- 11 8 821
- 11 8 822
- 11 8 823
- 11 8 824
- 11 8 825
- 11 8 891

Necessary preliminary work:

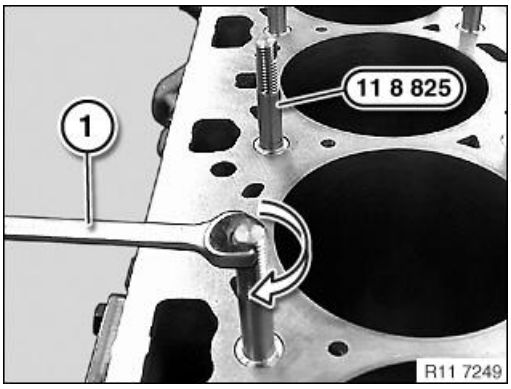
- Remove engine.
- Mount engine on assembly stand
- Remove coolant pump.
- Remove oil filter housing.
- Remove cylinder head.
- Remove all pistons.
- Remove crankshaft.

Important!

Pressure test crankcase to maximum **3** bar.

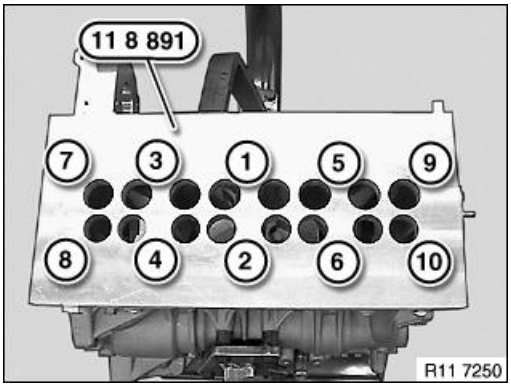
Heat crankcase to 60 °C.

Check for bubble formation in a water bath.



Mount all special tools 11 8 825 on crankcase.

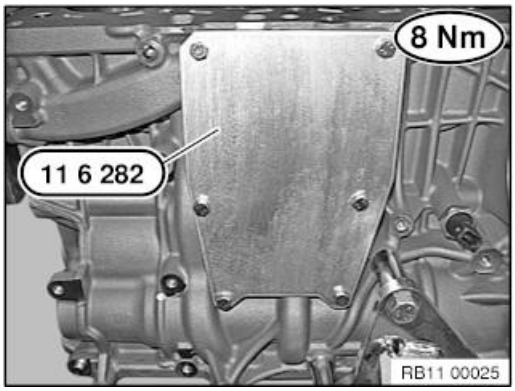
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Place special tool 11 8 891 on crankcase.

Secure special tool in sequence (1 to 10).

Tightening torque: Nut (1 to 10) **8 Nm.**



Secure special tool 11 8 821 with screw (1).

Secure special tool11 8 822 with bolts (3).

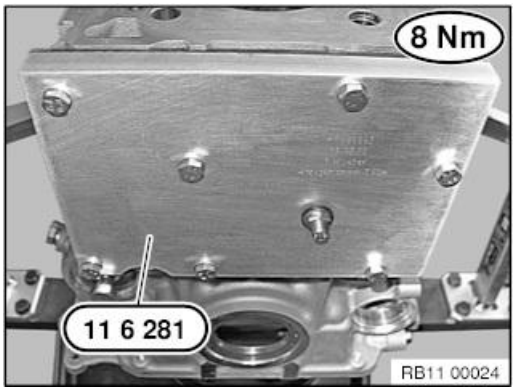
Secure special tool11 8 823 with bolts (2).

Important!

Maximum screw length M6x20 **risk of damage!** on crankcase.

Use bolts to fasten special tool 11 6 282 .

Tightening torque: screws M6x20 with **8 Nm.**

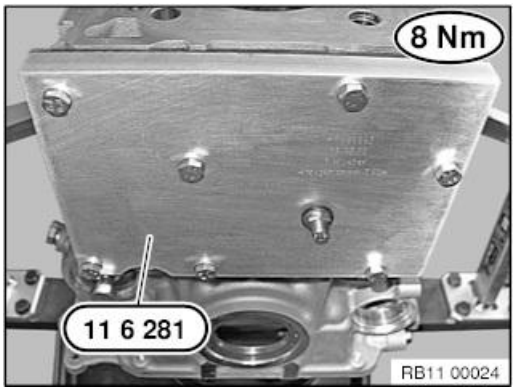


Screw down special 11 6 281 tool on to sealing surface of coolant pump.

Tightening torque: screws with **8 Nm.**

Important!

Maximum screw length M6x20 **risk of damage!** on crankcase.



Release valve cap on compressed air connection.**Important!**

Pressure test crankcase to maximum **3** bar.

Heat crankcase to 60 °C.

Check for bubble formation in a water bath.

Assemble engine.

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11 11 579 Checking crankcase for watertightness (N47, N47S)

Special tools required:

- 11 8 821
- 11 8 822
- 11 8 823
- 11 8 824
- 11 8 825
- 11 8 891

Necessary preliminary tasks:

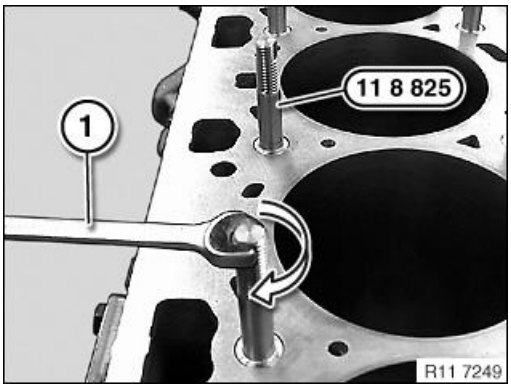
- Remove engine.
- Mount engine on assembly stand
- Remove all pistons.
- Remove cylinder head.
- Remove crankshaft.
- Remove coolant pump.
- Remove oil filter housing.

Important!

Pressure-test crankcase to maximum **3 bar**.

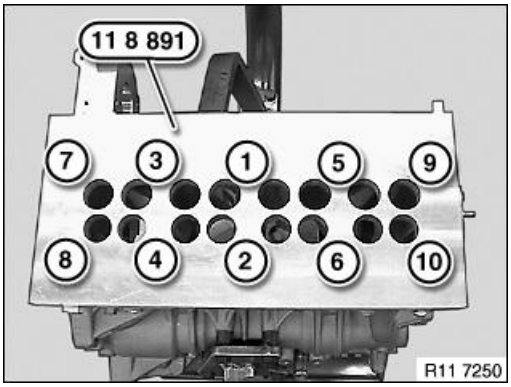
Heat crankcase to 60 °C.

In a water bath for formation of bubbles/blisters.

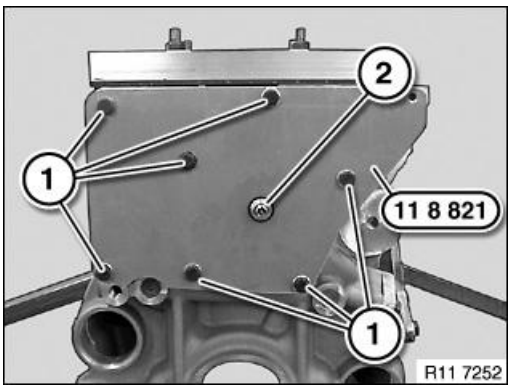


Screw in all special tools 11 8 825 in crankcase.

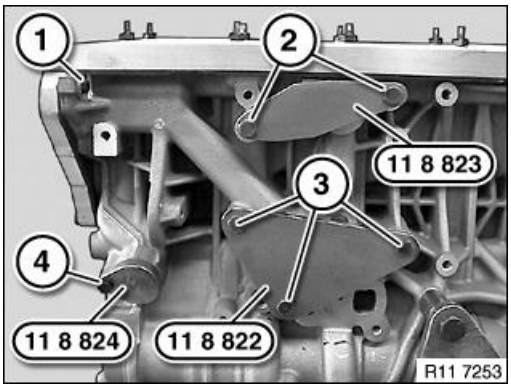
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Place special tool 11 8 891 on crankcase.
Secure special tool in sequence (1 to 10).
Tightening torque: Nuts (1 to 10) **25 Nm.**



Screw down special 11 8 821 tool on to sealing surface of coolant pump.
Secure special tool 11 8 821 with bolts (1).
Tightening torque: Screws (1) with **10 Nm.**

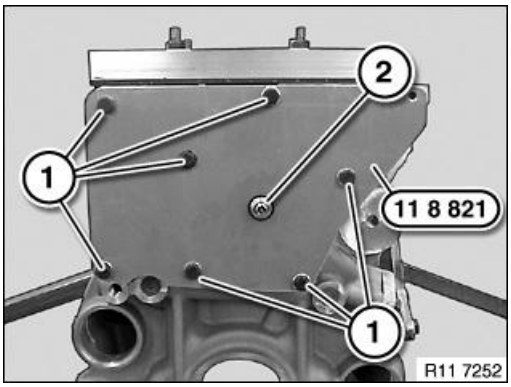


Secure special tool 11 8 821 with screw (1).
Secure special tool11 8 822 with bolts (3).
Secure special tool11 8 823 with bolts (2).

Important!

Screw length (4) is M6x20 **risk of damage!** on crankcase.

Fasten special tool 11 8 824 with screw (4).
Tightening torque: Screws (1 2 3) with **20 Nm.**
Tightening torque: Screws (4) with **10 Nm.**



Release valve cap on compressed air connection (2).
Pressure-test crankcase to MAX **3 bar** compressed air.

Check crankcase for formation of bubbles/blisters.
Assemble engine.

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11 12 729 Checking cylinder head for water leaks (N47 D20 O1)

Special tools required:

- 11 8 890
- 11 8 891
- 11 8 892
- 11 8 893
- 11 6 231
- 11 6 232

Important!

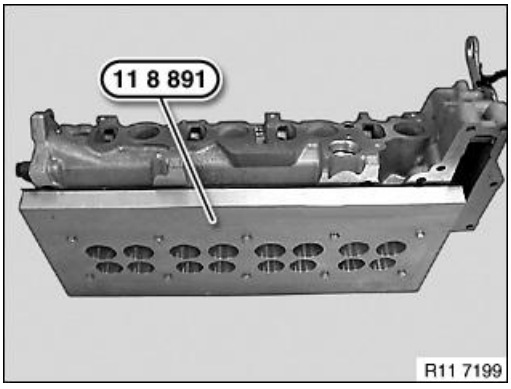
Pressure-test cylinder head to max. **3** bar.

Heat cylinder head to 60 °.

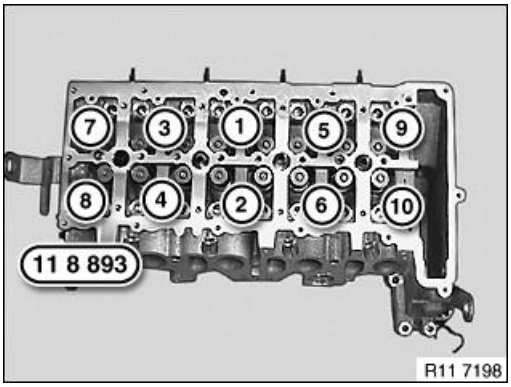
Check for bubble formation in a water bath.

Necessary preliminary tasks:

- Remove cylinder head.
- Disassemble cylinder head.



Extend special tool 11 8 891 with special tool 11 8 893 .

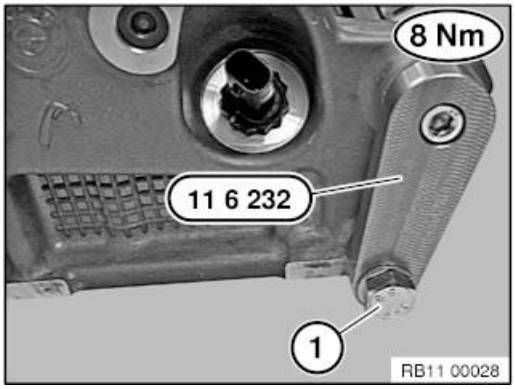


Note:
Mounting special tool 11 8 890

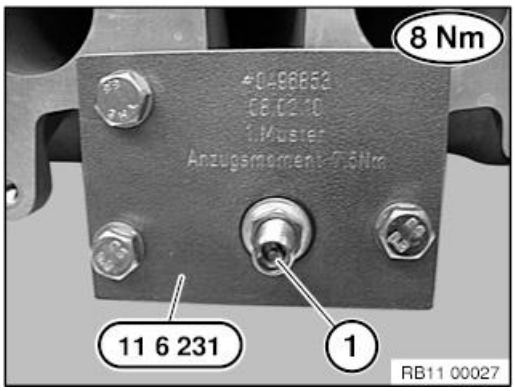
Use bolts to fasten 11 8 891 special tool11 8 893 .

Tightening torque: **25 Nm**.

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Fasten special tool 11 6 232 with screw (1).



Secure special tool 11 6 231 with screw.*Note:*
Compressed air at valve (1) max. **3 bar**.

Heat cylinder head to 60 °.

Check for bubble formation in a water bath.

Assemble engine.

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11 12 729 Checking cylinder head for watertightness (N47, N47S)

Special tools required:

- 11 8 890
- 11 8 891
- 11 8 892
- 11 8 893

Important!

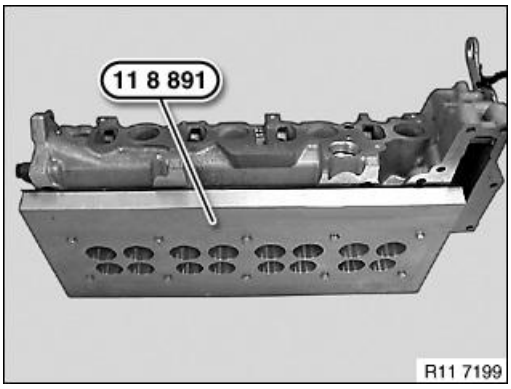
Pressure-test cylinder head to max. **3 bar**.

Heat cylinder head to 60 °.

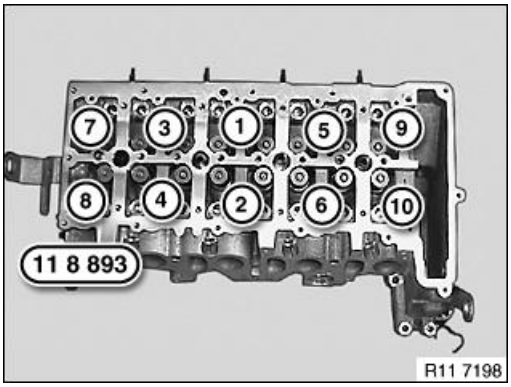
Check for bubble formation in a water bath.

Necessary preliminary tasks:

- Remove cylinder head.
- Disassemble cylinder head.



Extend special tool 11 8 891 with special tool 11 8 893 .

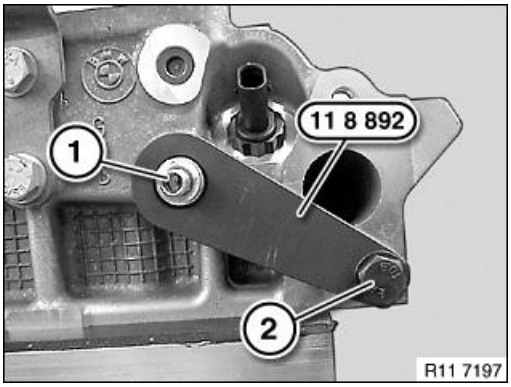


Note:
Mounting special tool 11 8 890

Use bolts to fasten 11 8 891 special tool11 8 893 .

Tightening torque: **25 Nm**.

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Fasten special tool 11 8 892 with screw (2).*Note:* Compressed air at valve (1) max. **3 bar**.

Heat cylinder head to 60 °.

Check for bubble formation in a water bath.

Assemble engine.

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11 12 ... Clean intake plenum (N47, N57)

Necessary preliminary work:

- Remove intake plenum

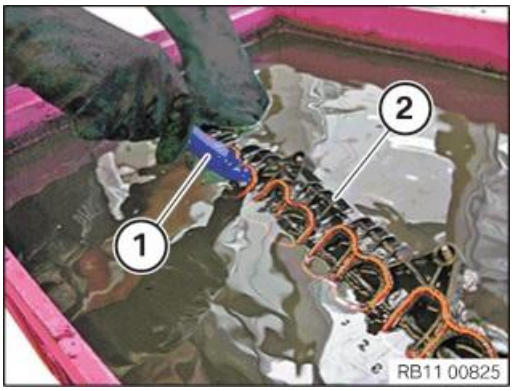
Dismantle intake plenum:

- Remove throttle body
- If applicable, remove adjuster
- If applicable, remove the preheating control unit
- If applicable, remove charging pressure sensor

Wear protective goggles and gloves.

Caution!
Never place electrical components in cleaning agent!

- Put on personal protective clothing/equipment!
- Prepare cleaning agent: Mix 2 parts water with 1 part BMW universal cleaner (part number: 83 19 2 360 981) mixed
- Place intake plenum in cleaning agent
- Adhere to an application time of at least 1 h



Wear protective goggles and gloves.

Caution!
Do not clean electrical components with a parts cleaning unit or high pressure cleaner.

- Remove the intake plenum (2) from the cleaning agent
- Clean the openings of the intake plenum (2) and swirl flaps using the brush (1)

  (Part number: 83 19 2 298 237)
- Clean throttle valve, exhaust-gas recirculation valve, mixing tube and mounted parts with brush (1) if necessary
- Clean the intake plenum (2) with a parts cleaning unit or a high-pressure cleaner.
- Check all seals for damage and replace if necessary.

Pay attention to country specific instructions for disposal.

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Required follow-up work:

Assemble intake plenum:

- Installing the throttle body
- If applicable, install adjuster
- If applicable, install preheating control unit
- If applicable, install charging pressure sensor

- Install intake plenum

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11 12 800 Cleaning cylinder heat intake channels and intake plenum (N47, N57)

Special tools required:

- 11 6 480
- 11 5 320
- 2 356 969
- 2 356 966
- 2 356 967
- 00 9 120

Necessary preliminary work:

- Disconnect battery negative cable
- Removing intake plenum
- Remove electric fan if necessary
- Remove underbody protection
- Remove stiffening plate if necessary

Dismantle intake plenum:

- Remove throttle body
- If applicable, remove adjuster
- If applicable, remove preheating control unit
- If applicable, remove charging pressure sensor



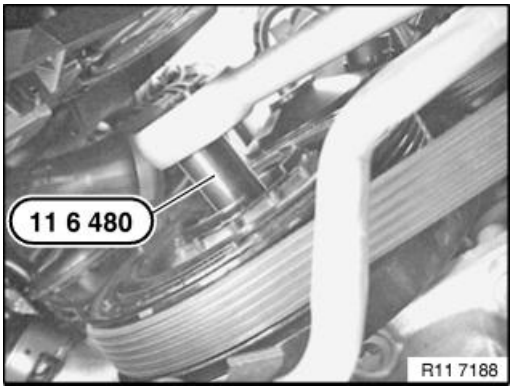
Wear protective goggles and gloves.



Caution!
Never place electrical components in cleaning agent!

- Wear personal protective clothing/equipment
- Prepare cleaning agent: Mix 2 parts water with 1 part BMW universal cleaner (see Section 3.2)
- Place intake plenum in cleaning agent
- Observe application time of at least 1 hour

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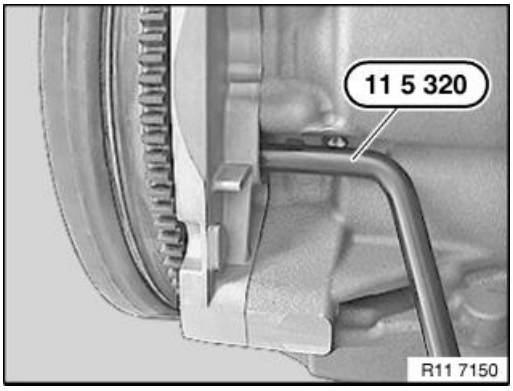
Crank engine to cylinder no. 1 TDC setting:

Crank engine with special tool11 6 480 to TDC firing position of cylinder 1.

Caution!

Do not crank engine in reverse direction.

Note:
Figure N47D.



Remove protective cap of timing case cover.

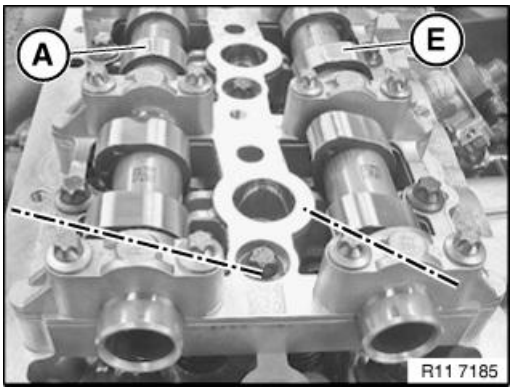
Crank engine at central bolt with special tool 11 6 480

Block crankshaft with special tool 11 5 320 in the TDC firing position of cylinder 1.

Caution!

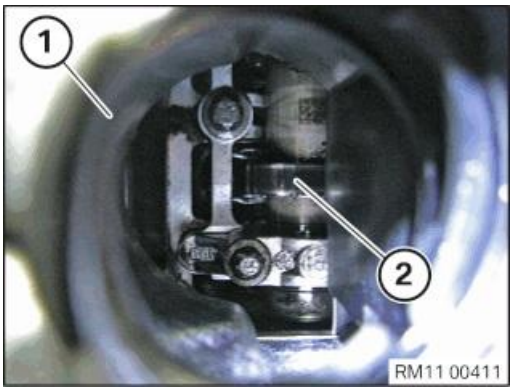
Do not turn the engine back.

Special tool 11 6 480 must be removed before starting the engine.



The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.



Note:
Visual inspection via oil filler cap (1) if necessary. Remove oil filler neck if necessary.

Cam (2) on exhaust camshaft points obliquely outward to the left at cylinder No. 1.

Figure N47.

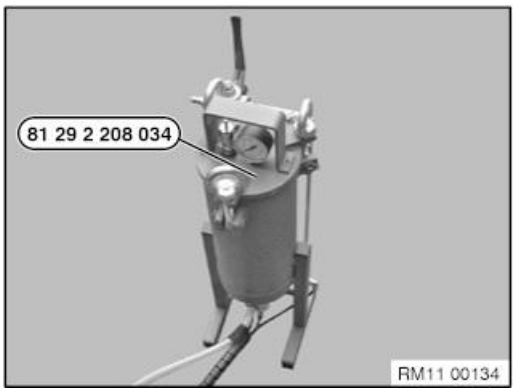
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Cleaning intake ports: Caution!

Risk of engine damage!

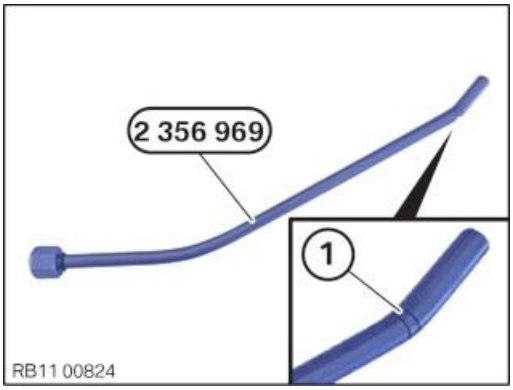
When cleaning the intake ports, it must be ensured that the intake valves of the corresponding cylinder are closed.

Start with the 1st cylinder when cleaning the intake ports.



The following are required:

- Blasting tool 81 29 2 208 034
- Walnut shell granulate
- Vacuum cleaner



Caution!

Front area of sensors is marked with two notches. These can additionally be highlighted in colour.

During the blasting process, only pull the wands out of the vacuum adapter until the mark becomes visible.

Blasting wand for swirl ports:

- 2 356 969



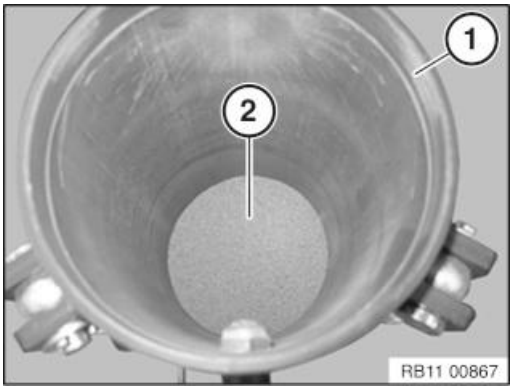
Vacuum adapter for tangential swirl port:

- 2 356 966

Vacuum adapter for swirl port:

- 2 356 967

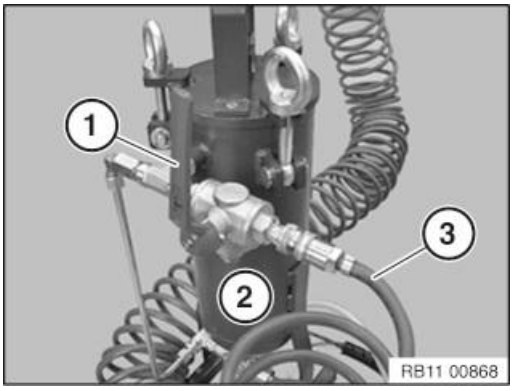
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Note:
Use 2 litres of granulate per cleaning operation; this corresponds to a blasting duration of approx. 20 seconds.

Open blasting tool (1) and pour in 2 litres of granulate (2).

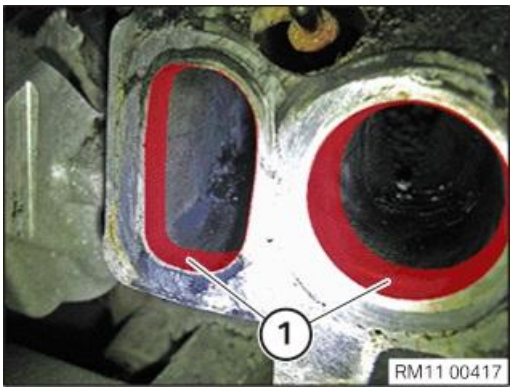
Close the device again.



Note:
Operating pressure 6 - 8 bar.

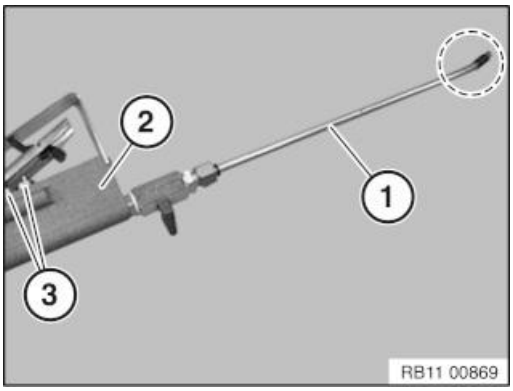
Close main valve (1) on blasting tool (2).

Connect compressed air (3).



Cleaning the swirl port of 1st cylinder:

Prior to the blasting process, clean the front area of both intake ports (1) of first cylinder with a suitable tool (e.g. plastic scraper, brushes 83 19 2 298 237).



Screw together blasting wand 2 356 969 (1) and actuator (2).

Open blasting tool and pour in 2 l granulate.

Close the device again.

Note:
Actuator (3) has two stages!

In stage one, only compressed air flows through the blasting wand.

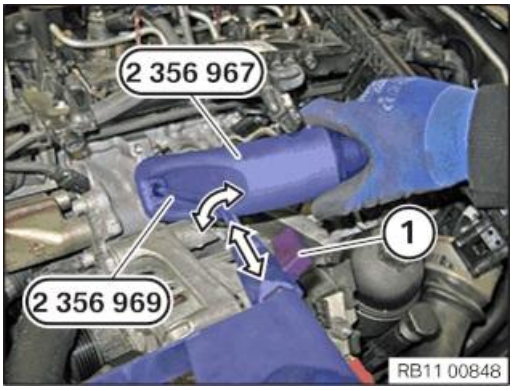
In stage two (operation is fully pressed), granulate is added (blasting process).

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Connect vacuum adapter 2 356 967 to vacuum cleaner. Hold vacuum adapter 2 356 967 against swirl port at no. 1 cylinder.

Open the main valve on the blasting tool and switch the vacuum cleaner on.



Caution!

Danger of injury!

Risk of damage!

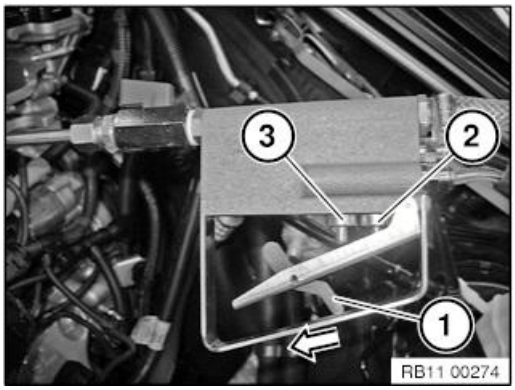
Second person required to assist.

Blasting wand may only be pulled out until the mark becomes visible.

Wear safety goggles

Insert blasting wand 2 356 969 in the adapter 2 356 967 .

Open the actuator valve (1).



Slide locking lever (1) to the front in direction of arrow.

Operate compressed-air valve (2) at stage one; compressed air can now flow in.

Fully operate valve (3) at stage two; walnut shell granulate is now injected.

Clean intake port, rotating the blasting wand and moving it vertically up and down.

Blasting wand may only be pulled out until the mark becomes visible.

When you notice that the collection container is becoming empty, continue operation for at least 10 seconds at stage one in order to swirl up and draw off the remaining granulate.

Close operation valve. Close main valve, check pressure drop at the pressure gauge.

Evaluate result if necessary.

If necessary, repeat procedure.



Cleaning the tangential swirl port of 1st cylinder:

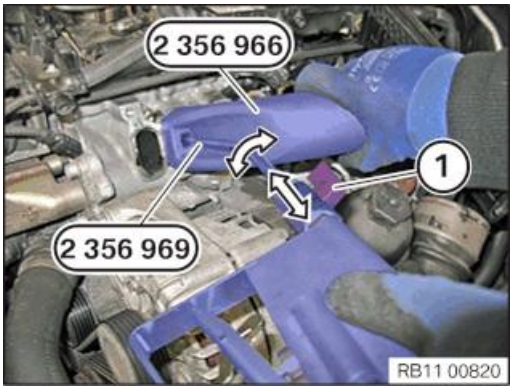
Open blasting tool and pour in 2 l granulate.

Close the device again.

Connect vacuum adapter 2 356 966 to vacuum cleaner. Hold vacuum adapter 2 356 966 on swirl port of first cylinder.

Open the main valve on the blasting tool and switch the vacuum cleaner on.

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Caution!

Danger of injury!

Risk of damage!

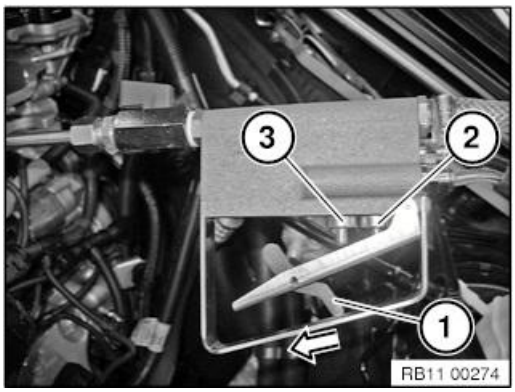
Second person required to assist.

Blasting wand may only be pulled out until the mark becomes visible.

Wear safety goggles

Insert blasting wand 2 356 969 in the adapter 2 356 966 .

Open the actuator valve (1).



Slide locking lever (1) to the front in direction of arrow.

Operate compressed-air valve (2) at stage one; compressed air can now flow in.

Fully operate valve (3) at stage two; walnut shell granulate is now injected.

Clean intake port, rotating the blasting wand and moving it vertically up and down.

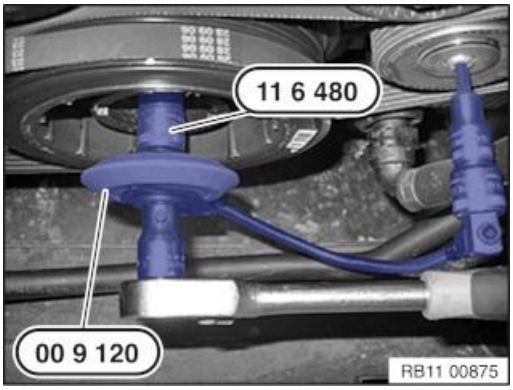
Blasting wand may only be pulled out until the mark becomes visible.

When you notice that the collection container is becoming empty, continue operation for at least 10 seconds at stage one in order to swirl up and draw off the remaining granulate.

Close operation valve. Close main valve, check pressure drop at the pressure gauge.

Evaluate result if necessary.

If necessary, repeat procedure.



Cleaning the other cylinders:

Caution!

Do not crank engine in reverse direction.

Remove special tool for securing the crankshaft.

Proceed in the standard firing order while using the same procedure to clean the swirl ports at the remaining cylinders.

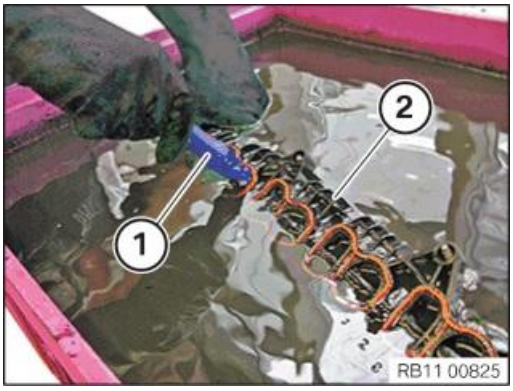
Firing order:

- **1 3 4 2** (4-cylinder engine)
- **1 5 3 6 2 4** (6-cylinder engine)

Thereby, turn motor on the central screw with 00 9 120 and 11 6 480 respectively by **180°** (4-cylinder-engine) and/or **120°** (6-cylinder-engine).

Note:
Figure M47.

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Wear protective goggles and gloves.

Caution!
Do not clean electrical components with a parts cleaning unit or high pressure cleaner!

- Remove the intake plenum (2) from the cleaning agent
- Clean the openings on intake plenum (2) and swirl flap using the brush (1)

  (Part number: 83 19 2 298 237)
- Clean throttle valve, exhaust-gas recirculation valve, mixing tube and mounted parts with the brush (1) if necessary
- Then clean intake plenum (2) with a parts cleaning unit or a high-pressure cleaner
- Check all seals for damage and replace if necessary.

Observe country-specific waste disposal regulations.

Required follow-up work:

Dismantle intake plenum:

- Installing the throttle body
- If applicable, install adjuster
- If applicable, install preheating control unit
- If applicable, install charging pressure sensor

- Crank the engine at the central bolt at minimum twice

- Install intake plenum
- If necessary, install an electric fan
- Install underbody protection
- If necessary, install stiffening plate
- Connect battery earth lead
- Reset the quantity correction under:
  - Service functions
  - 01 Drive
  - Digital Diesel Electronics
  - Reset correction values of injectors

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11 12 100 Removing and installing cylinder head (N47 D20 O1)

Special tools required:

- 11 6 480
- 11 5 320
- 11 4 471
- 11 4 472
- 2 364 711
- 11 6 050
- 00 2 530
- 00 9 120
- 11 8 760

Attention!

Risk of damage to the crankshaft drive by contamination during restoration (cleaning the sealing surfaces).

There must be no coolant, water and engine oil in any of the threaded holes in the engine block.

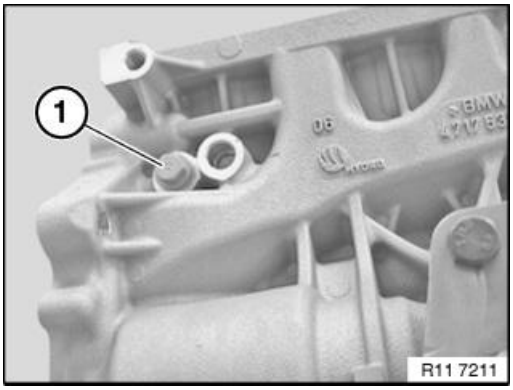
Fit new cylinder head bolts.

Do not wash off bolt coating.

Jointing torque and angle of rotation must be observed without fail (**risk of damage!**).

Necessary preliminary tasks:

- Disconnect ground cable from battery
- Remove cylinder head cover.
- Check timing.
- Remove intake plenum.
- Undo exhaust turbocharger from exhaust manifold.
- Drain and dispose of coolant.
- Remove exhaust-gas recirculation cooler.
- Disconnect coolant hoses.



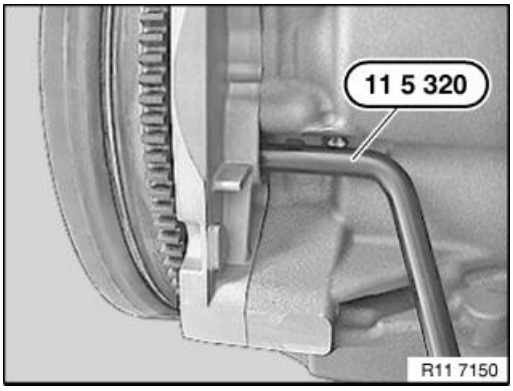
Release coolant drain plug on engine block (if fitted).

Tightening torque: 11 11 2AZ.

Installation note:

Renew the sealing ring.

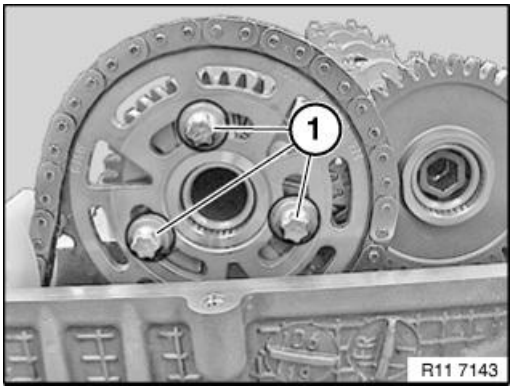
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Turn the engine in the direction of rotation using special tool 11 6 480 until the piston at the first cylinder is positioned at the "top dead centre".

Secure flywheel with special tool 11 5 320 in the TDC firing position of cylinder 1.

Remove chain tensioner.



Release camshaft bolts (1).

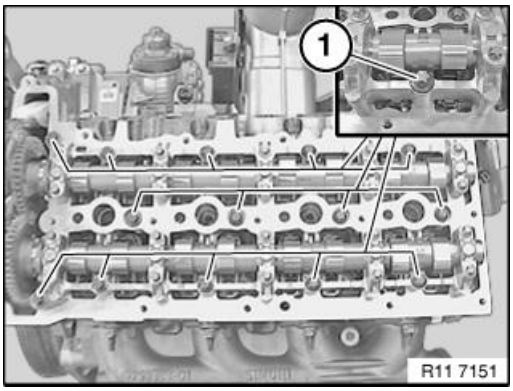
Tightening torque: 11 31 1AZ.

Remove sprocket.

Attention!

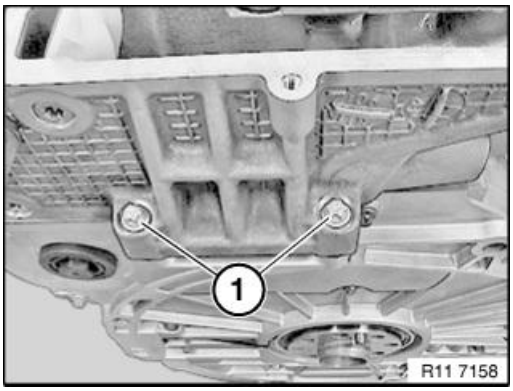
Protect timing chain to prevent it from falling.

Risk of damage to oil spray nozzle.



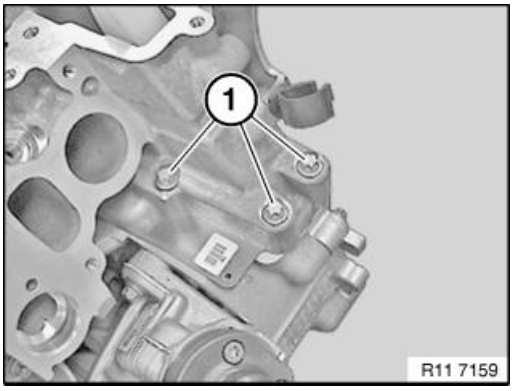
Release bolts (1) from outside to inside.

Remove camshaft carrier with camshafts.

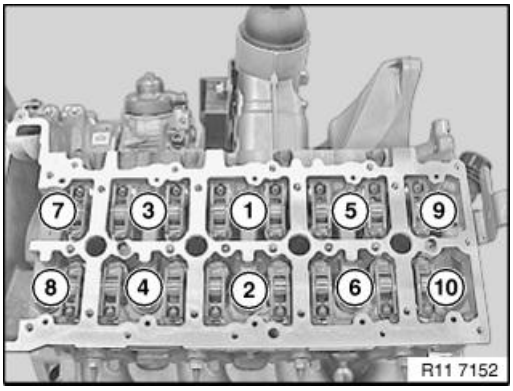


Release screws (1).

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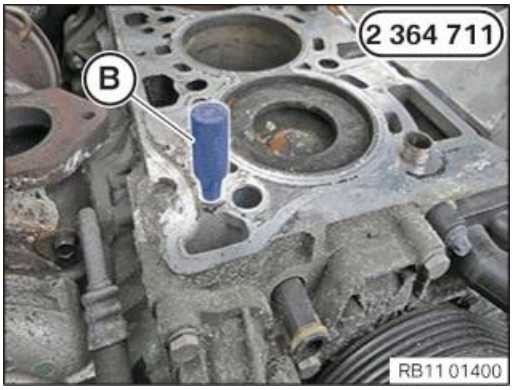


Release screws (1).

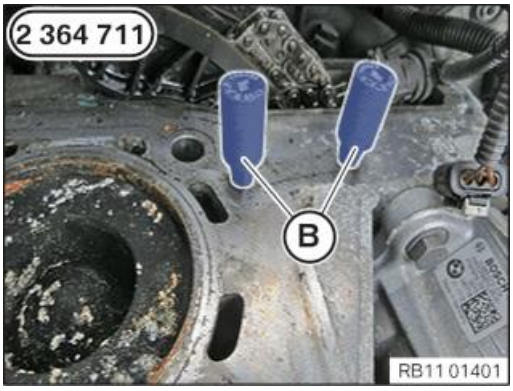


Release cylinder head bolts in sequence 10 to 1.

Installation note:
Seal the oil duct feed lines before cleaning the sealing surfaces using special tools 11 4 471 and 11 4 472 .

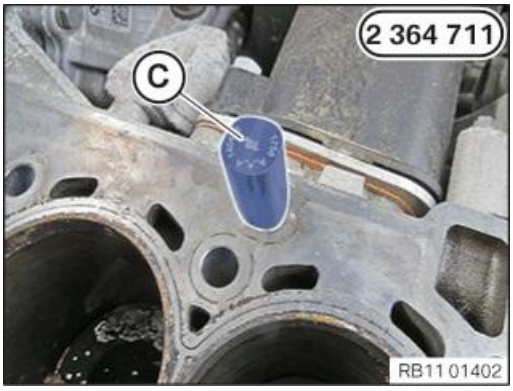


Seal front oil duct with special tool **(B)** from tool set 2 364 711 .**Attention!**
Do not use any metal-cutting tools.

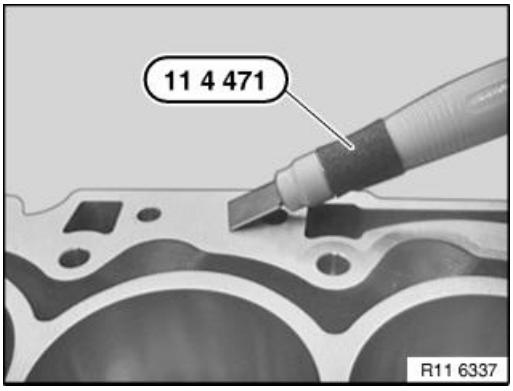


Seal the rear oil ducts using special tool **(B)** from tool set 2 364 711 .**Attention!**
Do not use any metal-cutting tools.

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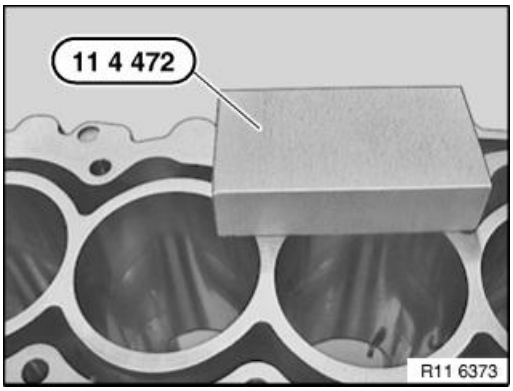
Seal central oil duct using special tool **(C)** from tool set 2 364 711
.**Attention!**
Do not use any metal-cutting tools.



Remove coarse residues on sealing surfaces with special tool 11 4 471 from cylinder head and crankcase.

Attention!
Do not use any metal-cutting tools.

Graphic N52.



Remove fine residues on sealing surfaces with special tool 11 4 472 from cylinder head and crankcase.

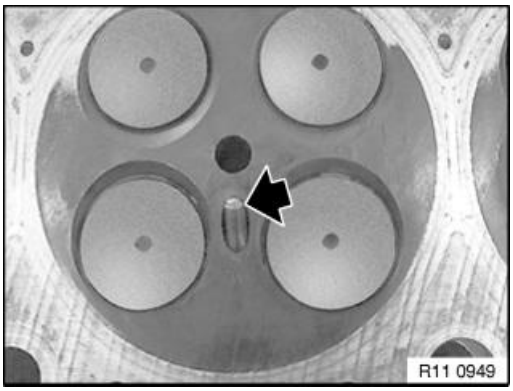
Attention!
Do not use any metal-cutting tools (e.g. abrasive cloth).

There must be no coolant, water or engine oil in the pocket holes.

Risk of cracking and corrosion!

Clean all blind holes.

Graphic N52.

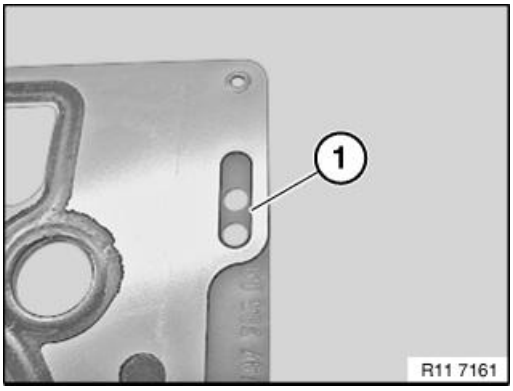


Attention!
All glow elements protrude at the sealing surface and may be damaged when put down.

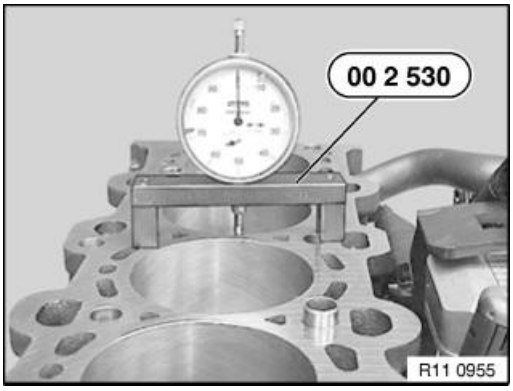
Remove cylinder head and set down in such a way that glow elements are not damaged.

If necessary, remove glow elements with special tool 11 6 050 .

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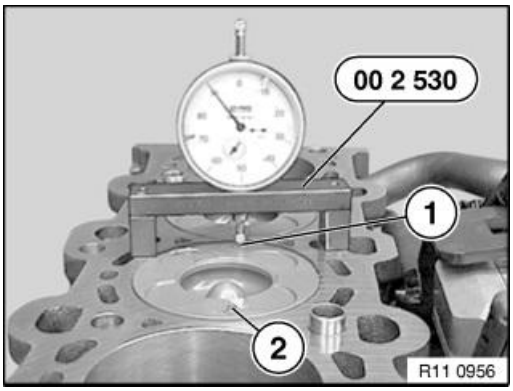
Installation note:
Without repair work on the engine block which alters the piston protrusion, use a new cylinder head gasket with the same gasket thickness.



If repair work was carried out on the crankshaft drive or piston, the gasket thickness must be redetermined.

Measuring the piston protrusion:

Position the dial gauge with special tool 00 2 530 on cleaned cylinder sealing surfaces and set to "zero" under preload.

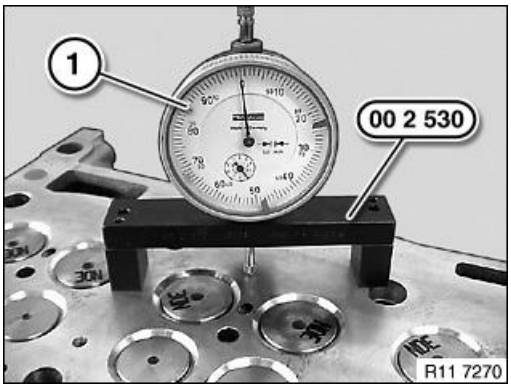


Clean piston at measuring points (1 and 2).

Fit dial gauge at measuring point (1) on cleaned piston and determine highest point by rotating crankshaft.

Measure and note down piston protrusion at measuring points (1 and 2) on all 4 pistons.

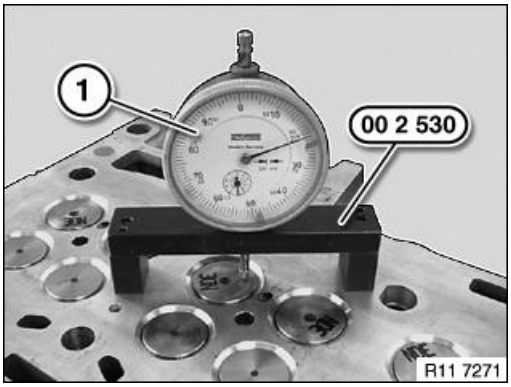
Installation note:
Determine thickness of cylinder head gasket.



Position special tool 00 2 530 with dial gauge (1) on cylinder head.

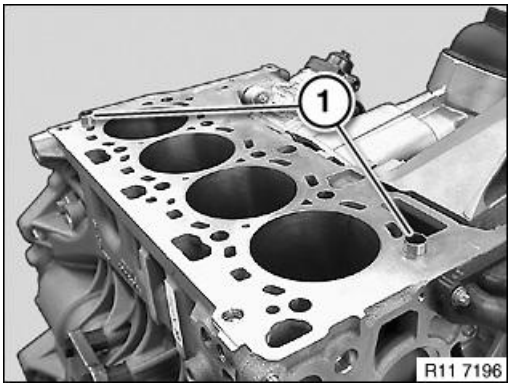
Set the dial gauge (1) to "zero".

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Position special tool 00 2 530 with dial gauge (1) on valve.

Determine valve underprotrusion.



Check fitting sleeves (1) for damage and correct installation position.

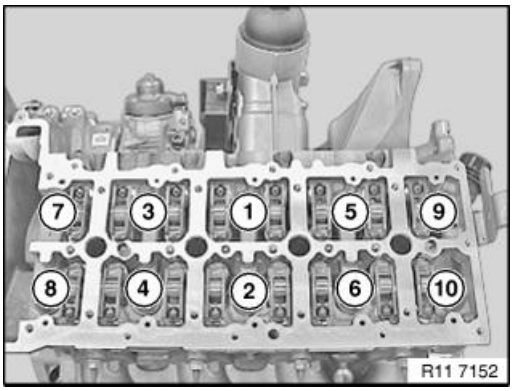
Attention!

There must be no coolant, water and engine oil in any of the threaded holes in the engine block.

Fit new cylinder head bolts.

Do not wash off bolt coating.

Jointing torque and angle of rotation must be observed without fail (**risk of damage!**).

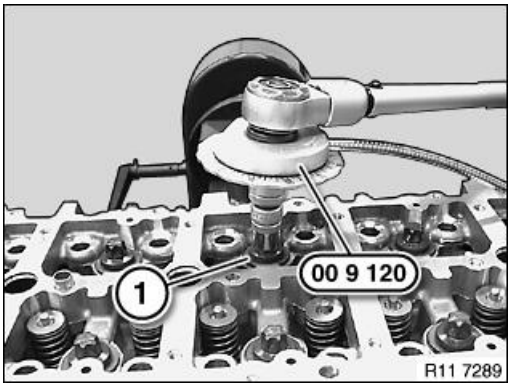


Position the new cylinder head gasket with the previously determined gasket thickness.

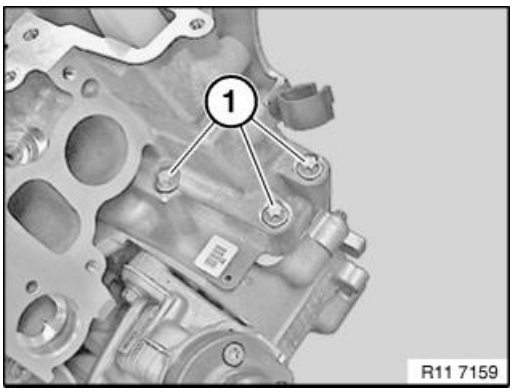
Fit cylinder head and secure with new bolts, tightening in the sequence 1 to 10.

Tightening torque: 11 12 1AZ.

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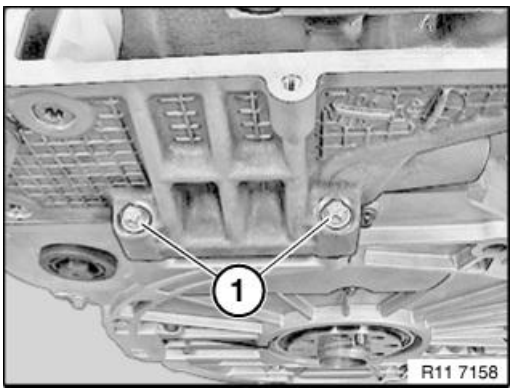


Secure cylinder head bolts (1) with special tool 00 9 120 .



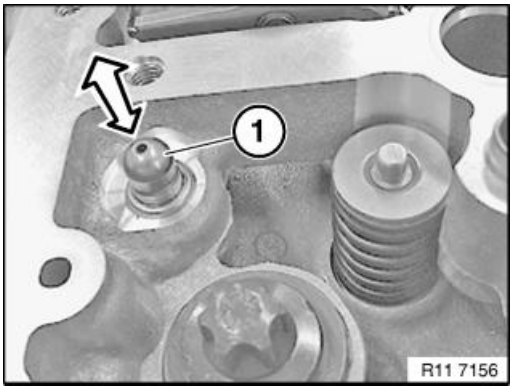
Install and tighten down screws (1).

Tightening torque: 11 12 7AZ.



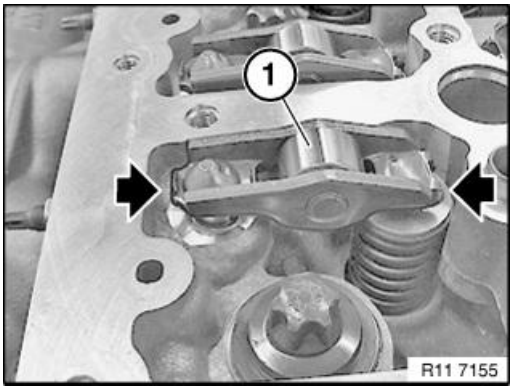
Install and tighten down screws (1).

Tightening torque: 11 12 7AZ.

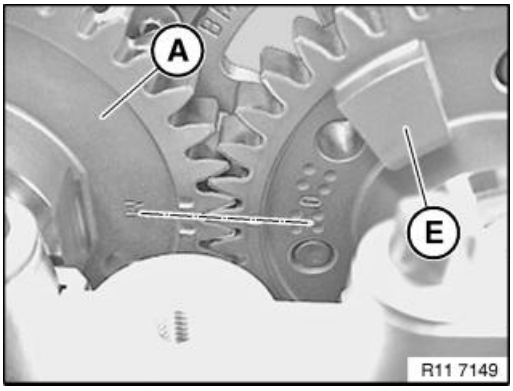


Make sure that the hydraulic valve clearance compensating element (1) is installed in the correct position.

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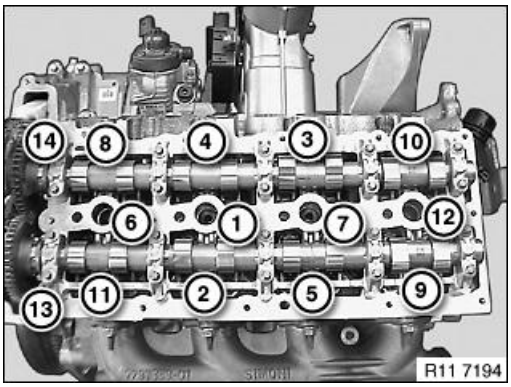


Make sure roller cam followers (1) are in correct installation position.



Attention!

The camshaft sprockets (A and E) must be adjusted to the marks before the camshaft carrier is positioned on the cylinder head. **Risk of damage** to valves.

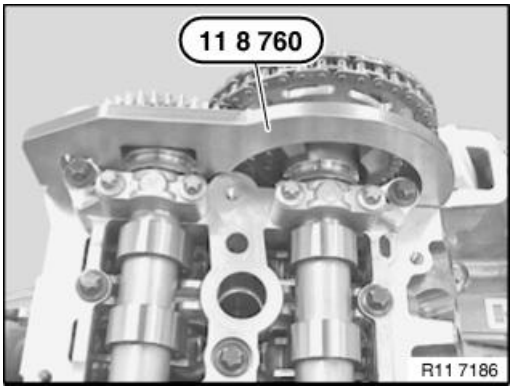


Installation note:
Replace profile seals.

Place camshaft carrier on cylinder head.

Tightening torque: 11 31 3AZ.

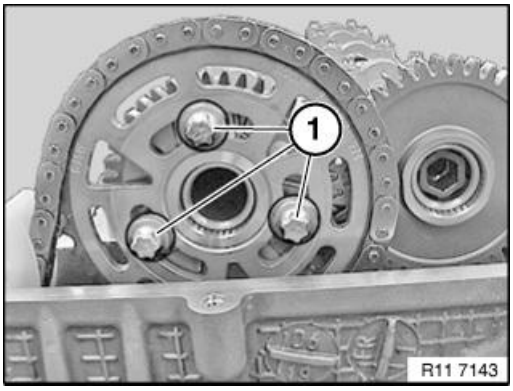
Tighten the screws in sequence (1 to 14).



Place special tool 11 8 760 on exhaust camshaft.**Note:**

Special tool 11 8 760 must lie flush on cylinder head.

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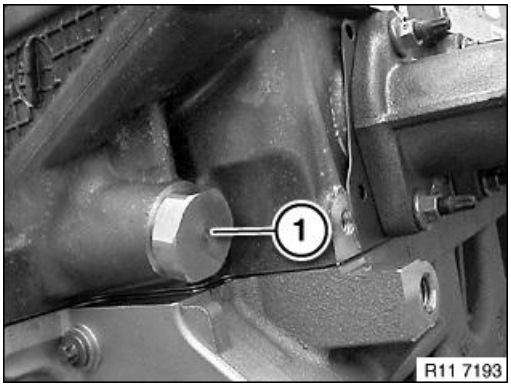


Install chain sprocket with timing chain.

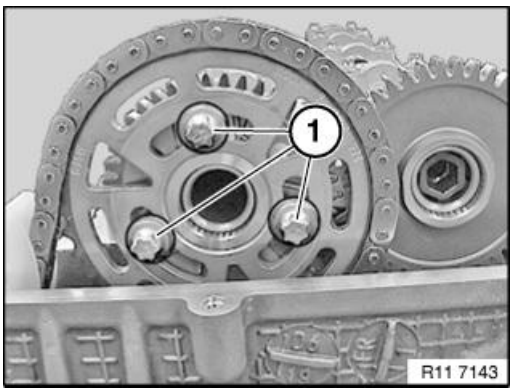
Insert camshaft bolts (1).

Tighten camshaft bolts (1) to 10 Nm.

Release camshaft bolts (1) by 90°.



Install chain tensioner (1).



Tighten camshaft bolts (1).

Tightening torque: 11 31 1AZ.

Assemble engine.

Cooling system must be topped up, vented and checked for watertightness.

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11 12 100 Removing and installing cylinder head (N47, N47S)

Special tools required:

- 00 2 530
- 00 9 120
- 11 5 320
- 11 6 050
- 11 6 480
- 11 4 471
- 11 4 472
- 2 364 711

Important!

No coolant, water or engine oil must be in either threaded bores on the engine block.

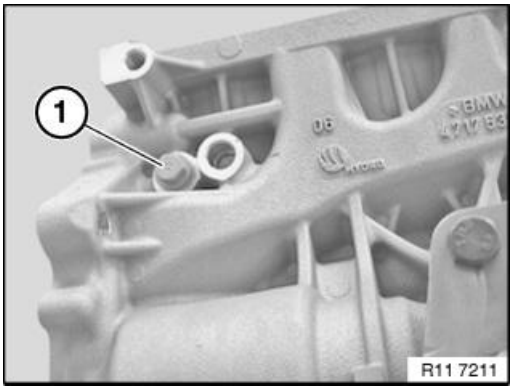
Fit new cylinder head bolts.

Do not wash off bolt coating.

Jointing torque and angle of rotation must be observed without fail (**risk of damage!**).

Necessary preliminary tasks:

- Remove cylinder head cover.
- Remove injector nozzles.
- Remove intake plenum.
- Undo negative lead from battery.
- Undo exhaust turbocharger from exhaust manifold.
- Drain and dispose of coolant.
- Remove exhaust-gas recirculation cooler.
- Disconnect coolant hoses.
- Remove chain tensioner at top.



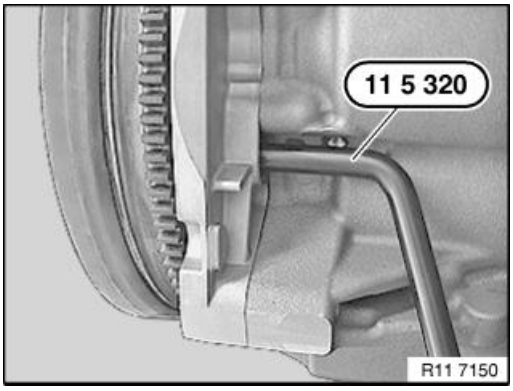
Open coolant drain plug on engine block.

Tightening torque: 11 11 2AZ.

Installation note:

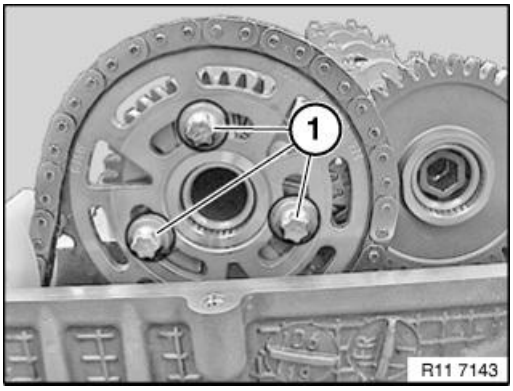
Replace gasket.

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Crank engine with special tool 11 6 480 in direction of rotation until piston of cylinder 1 is in TDC position.

Use special tool 11 5 320 to secure flywheel in TDC firing position of cylinder 1.



Release camshaft bolts (1).

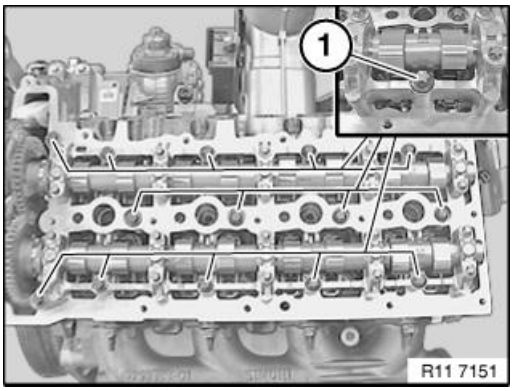
Tightening torque: 11 31 1AZ.

Remove sprocket.

Important!

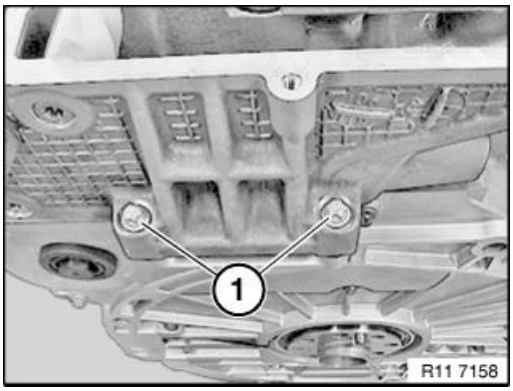
Protect timing chain to prevent it from falling.

Risk of damage to oil spray nozzle.



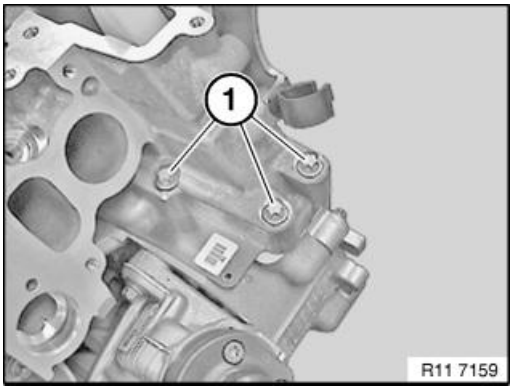
Release bolts (1) from outside to inside.

Remove camshaft carrier.

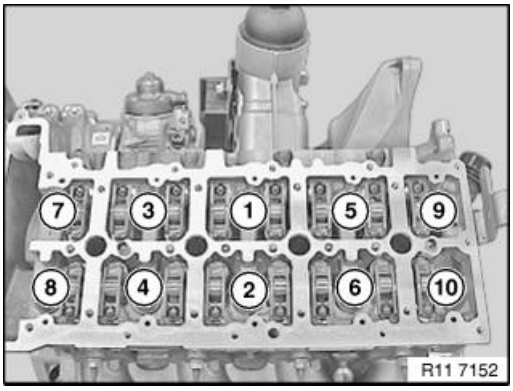


Release screws (1).

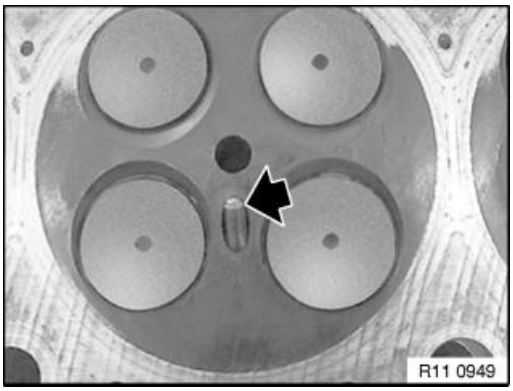
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Release screws (1).



Release cylinder head bolts in sequence 10 to 1.



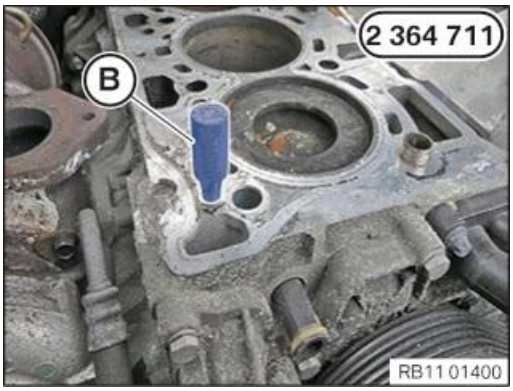
Important!

The glow elements protrude at the sealing surface and may be damaged when the cylinder head is put down.

Important!

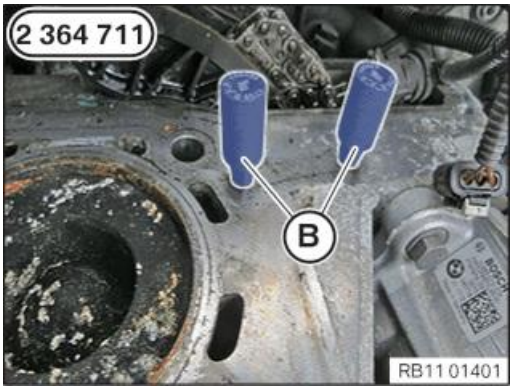
Remove cylinder head and set down in such a way that glow elements are not damaged.

If necessary, remove glow elements with special tool 11 6 050 .

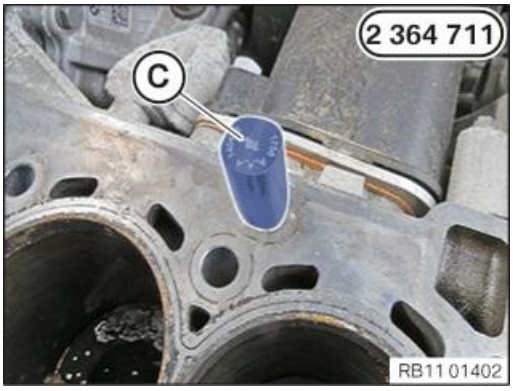


Installation note:
Prior to cleaning the sealing surfaces using special tools 11 4 471 and 11 4 472 , the riser pipes of the oil ducts must be closed.

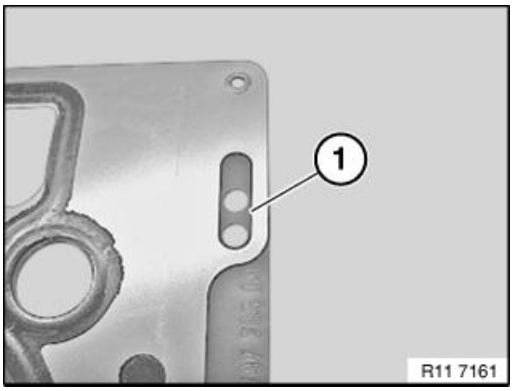
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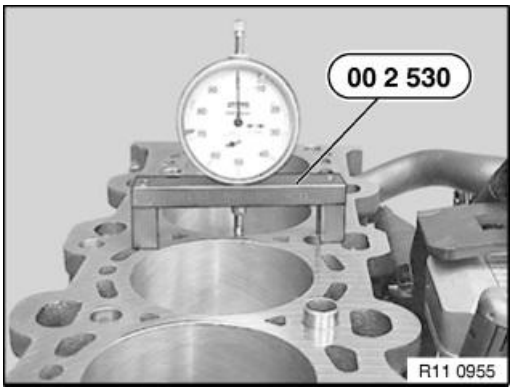
Close oil duct at front using special tool **(B)** from tool set 2 364 711
.**Important!**
Do not use any metal-cutting tools.



Seal oil ducts at rear using special tool **(B)** from tool set 2 364 711
.**Important!**
Do not use any metal-cutting tools.



Installation note:
Without work on the engine block which alters the piston protrusion, use a new cylinder head gasket with the same gasket thickness (number of holes).

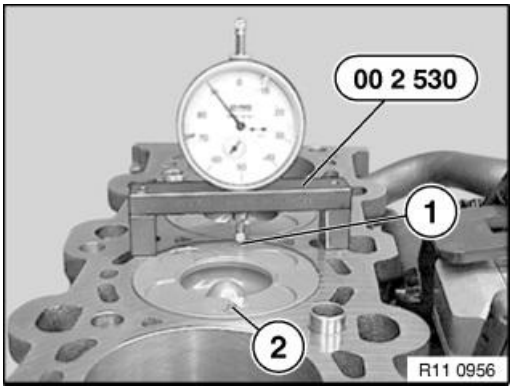


If work is carried out on the crank drive or piston, the gasket thickness must be redetermined.

Measuring the piston protrusion:

Fit dial gauge with measuring fixture special tool 00 2 530 on cleaned cylinder sealing surface and set under preload to zero.

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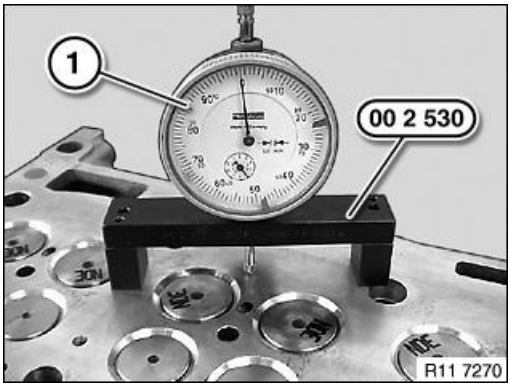


Clean piston at measuring points (1 and 2).

Fit dial gauge at measuring point (1) on cleaned piston and determine highest point by rotating crankshaft.

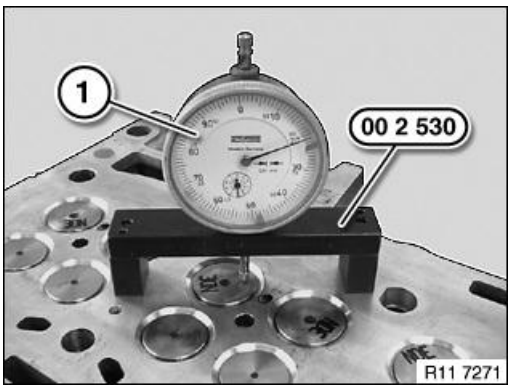
Measure and note down piston protrusion at measuring points (1 and 2) on all 4 pistons.

Installation note:
Determine thickness of cylinder head gasket.



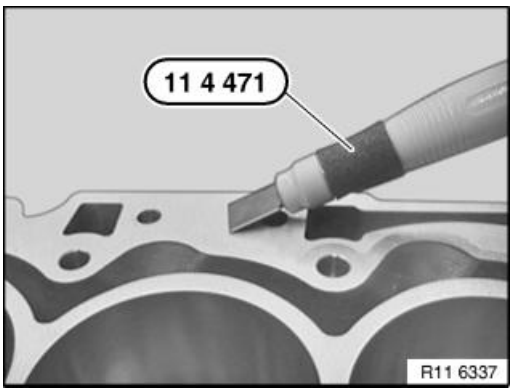
Position special tool 00 2 530 with dial gauge (1) on cylinder head.

Set dial gauge (1) to zero.



Position special tool 00 2 530 with dial gauge (1) on valve.

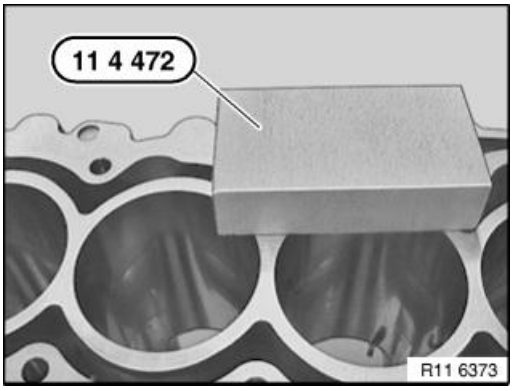
Determine valve recess.



Remove coarse residues on sealing surfaces with special tool 11 4 471 from cylinder head and crankcase.**Important!**

Do not use any metal-cutting tools.

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Remove fine residues on sealing surfaces with special tool 11 4 472 from cylinder head and crankcase.

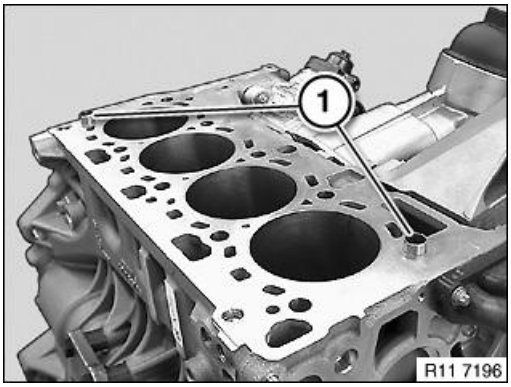
Important!

Do not use any metal-cutting tools (e.g. abrasive cloth).

There must be no coolant, water or engine oil in the pocket holes.

Risk of cracking and corrosion!

Clean all blind holes.



Check fitting sleeves (1) for damage and correct installation position.



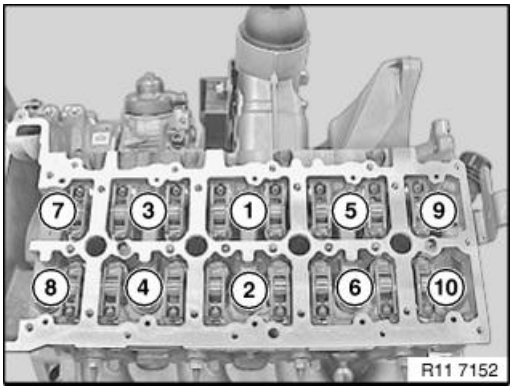
Important!

There must be no coolant, water and engine oil in any of the threaded holes in the engine block.

Fit new cylinder head bolts.

Do not wash off bolt coating.

Jointing torque and angle of rotation must be observed without fail (**risk of damage!**).

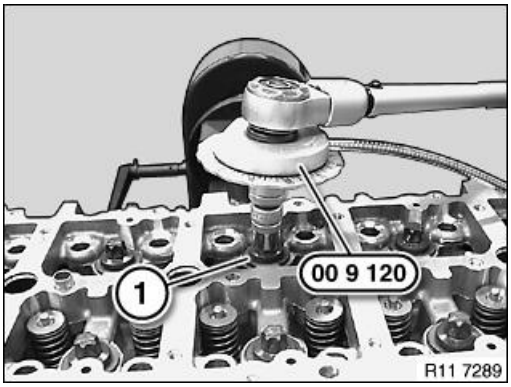


Fit new cylinder head gasket with previously determined gasket thickness (number of holes).

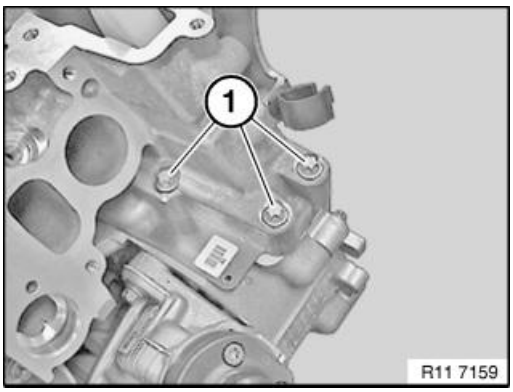
Fit cylinder head and secure with new bolts, tightening in the sequence 1 to 10.

Tightening torque: 11 12 1AZ.

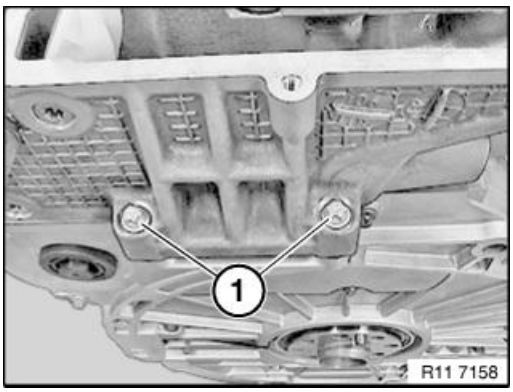
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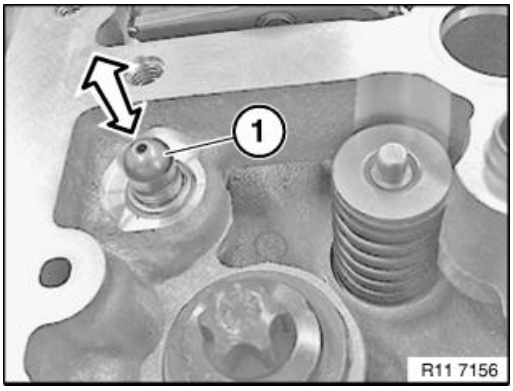
Secure cylinder head bolts (1) with special tool 00 9 120 .



Install and tighten down screws (1).

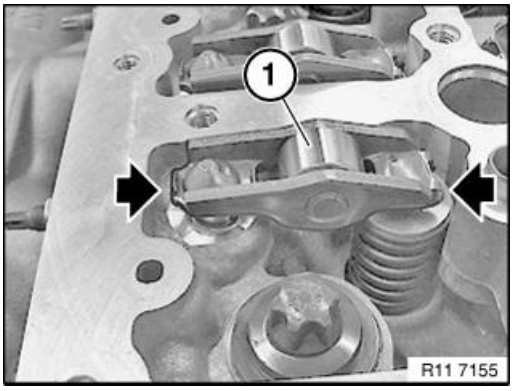


Install and tighten down screws (1).

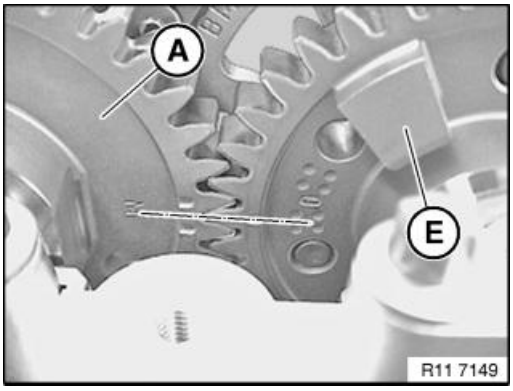


Make sure hydraulic valve clearance compensating elements (1) are in correct installation position.

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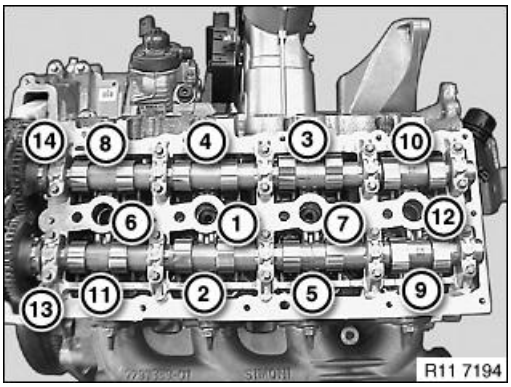


Make sure roller cam followers (1) are in correct installation position.



Important!

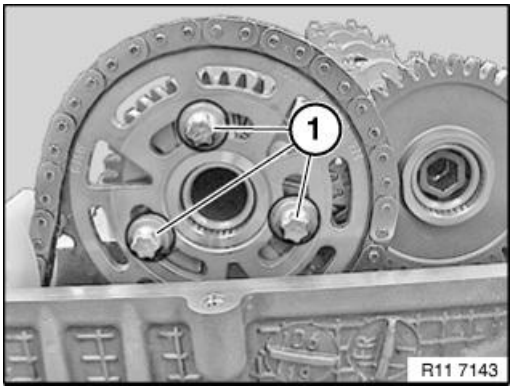
The camshaft sprockets (A and E) must be adjusted to the marking before the camshaft carrier is mounted on the cylinder head. **Risk of damage!** to engine valves.



Installation note:
Replace profile seals.

Place camshaft carrier on cylinder head.

Tighten bolts in sequence (1 to 14).



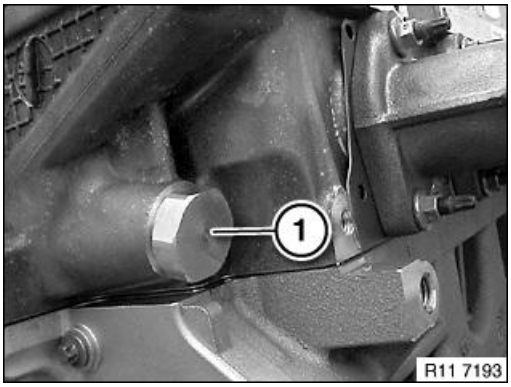
Install chain sprocket with timing chain.

Fit camshaft bolts (1).

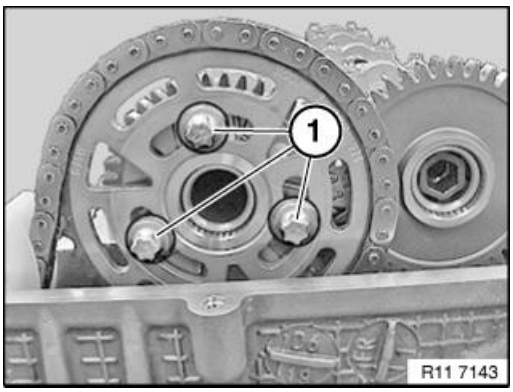
Tighten camshaft bolts (1) to 10 Nm.

Release camshaft bolts (1) by 90°.

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Install chain tensioner (1).



Tighten camshaft bolts (1).

Tightening torque: 11 31 1AZ.

Assemble engine.

Cooling system must be topped up, vented and checked for watertightness.

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11 12 000 Removing and installing/sealing cylinder head cover (N47 D20 O1)

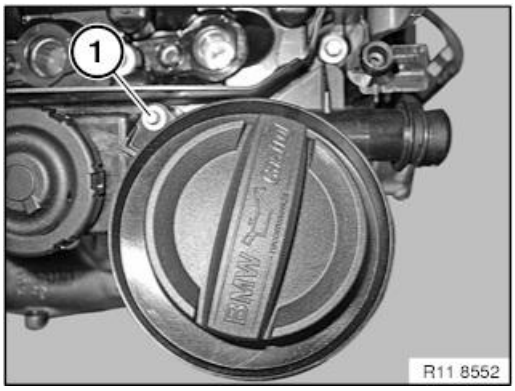
Important!

When carrying out repair work on the oil, coolant or fuel circuit, the alternator must be protected against dirt contamination.

Cover alternator with suitable materials.

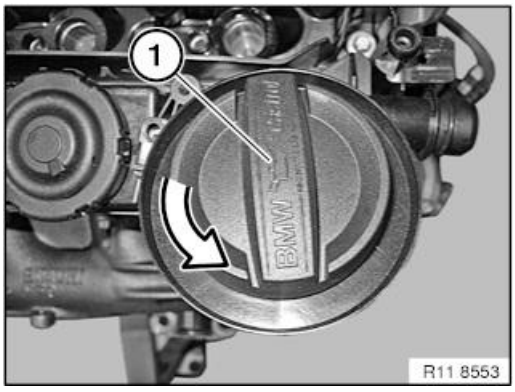
Necessary preliminary work:

- Remove intake silencer housing only F10, F11, F07, F25.
- Remove acoustic cover at front (only F10, F11, F07) and rear.
- Remove bottom section of microfilter (only E9x).
- Remove tension struts, only E9x.
- Remove intake plenum.
- Remove all injectors.
- Remove pressure accumulator.
- Undo engine wiring harness in the area of the cylinder head cover.



Release screw (1).

Tightening torque 11 12 5AZ.

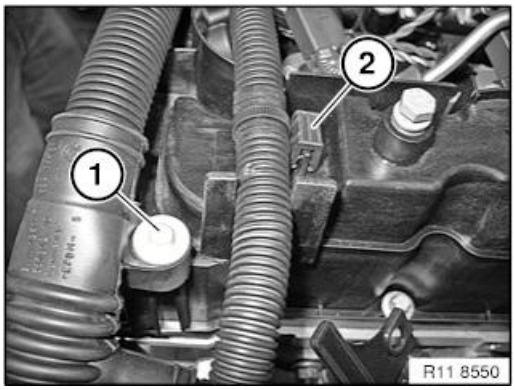


Turn complete oil filler neck (1) clockwise by approx. 25°.

Remove filler neck (1) towards top.

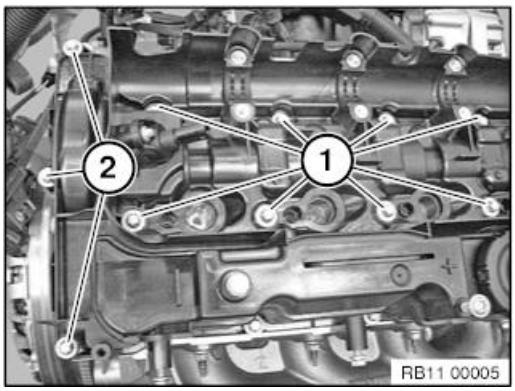
Installation note:
Check O-ring for damage.

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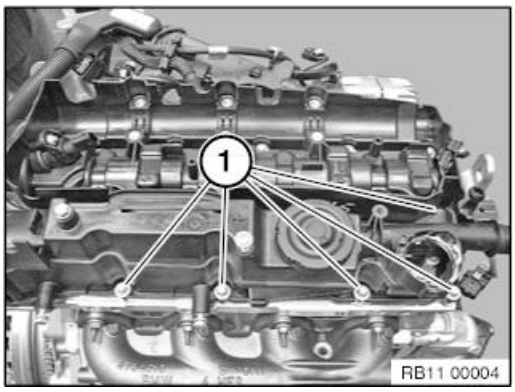
Release screw (1).

Unclip cable clip (2) and lay to one side.



Release screws (1 and 2).

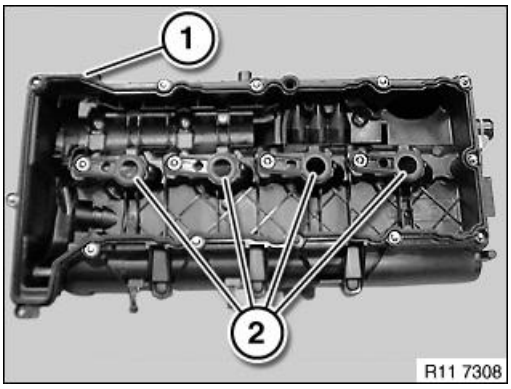
Tightening torque 11 12 2AZ.



Release screws (1).

Tightening torque 11 12 2AZ.

Remove cylinder head cover by lifting it out.



Installation note:
Replace profile seals (1 and 2).

Assemble engine.

Check engine for leak tightness.

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11 12 000 Removing and installing/sealing cylinder head cover (N47, N47S)

Important!

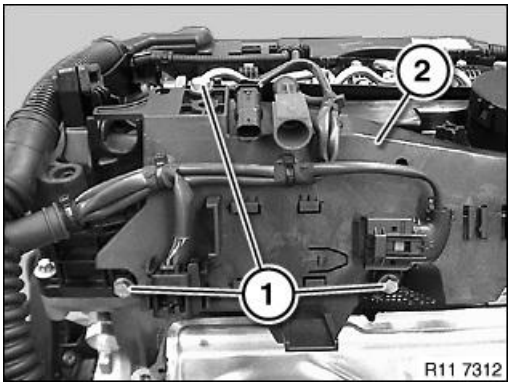
When working on the oil, coolant or fuel circuit, you must protect the alternator against contamination.

Cover alternator with suitable materials.

Failure to comply with this procedure may result in an alternator malfunction.

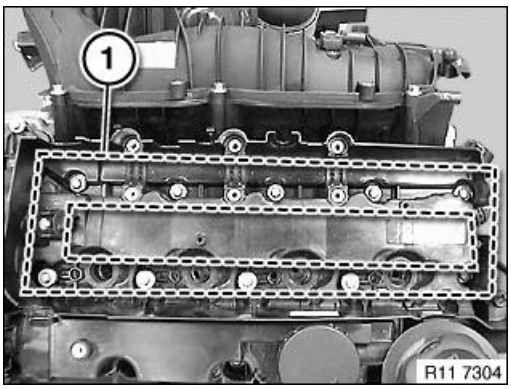
Necessary preliminary tasks:

- Remove intake plenum
- Remove all injection systems
- Loosen engine wiring harness in vicinity of cylinder heat cover



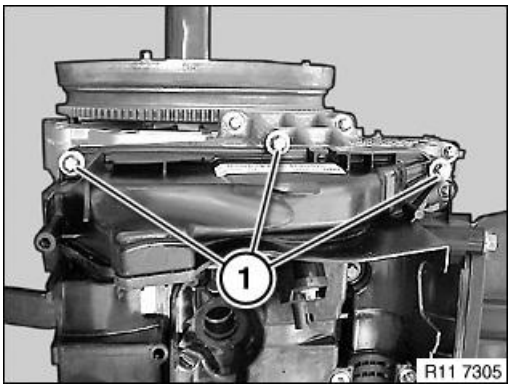
Release screws (1).

Lay cable clip (2) to one side.



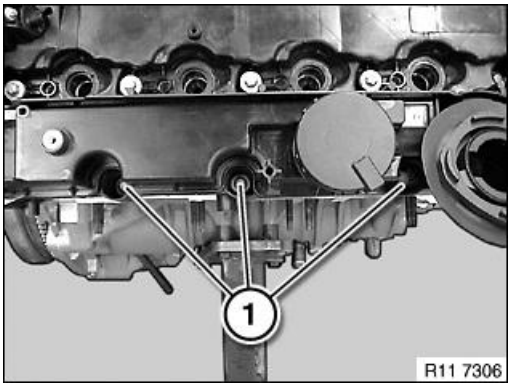
Release bolts along line (1).

Tightening torque 11 12 4AZ.

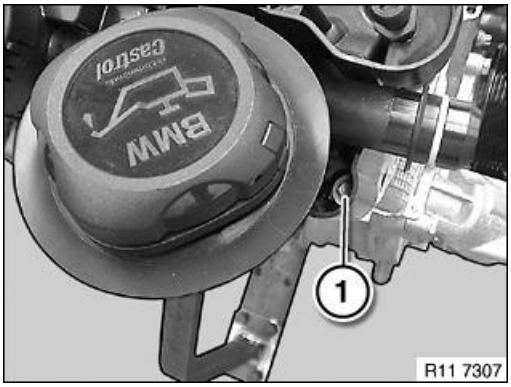


Release screws (1).

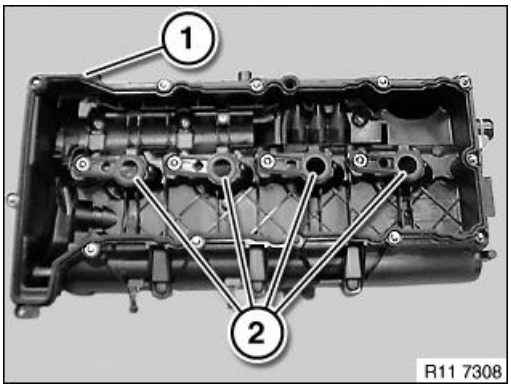
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Release screws (1).



Release screw (1).*Note:*
Bolt (1) is difficult to access through oil cap.



Replace profile seals (1 and 2).

Assemble engine.

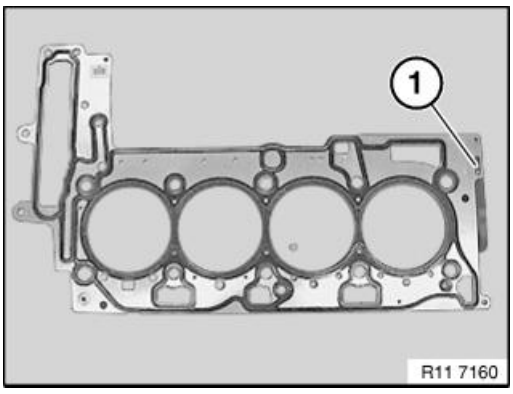
Check engine for leak tightness.

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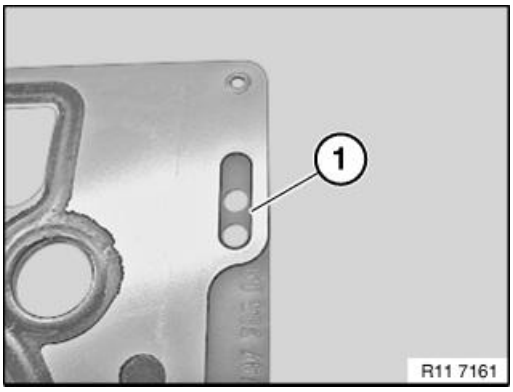
11 12 501 Replacing cylinder head gasket (N47 D20 O1)

Necessary preliminary work:

- Remove cylinder head.



The cylinder head gasket is designed as a beaded metal gasket.
Pay attention to gasket thickness (1).



Highest piston protrusion at measuring points (1 and 2) of all 4 pistons determines thickness of cylinder head gasket.

Piston protrusion up to 0.92 mm

- Install 1-hole cylinder head gasket.

Piston protrusion >0.92 ... 1.03 mm

- Install 2-hole cylinder head gasket.

Piston protrusion greater than >1.03 ...1.18 mm

- Install 3-hole cylinder head gasket.

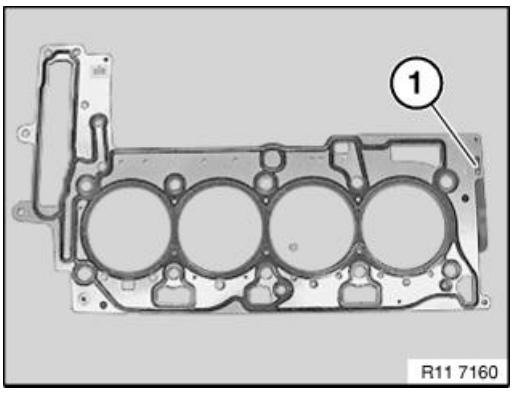
Assemble engine.

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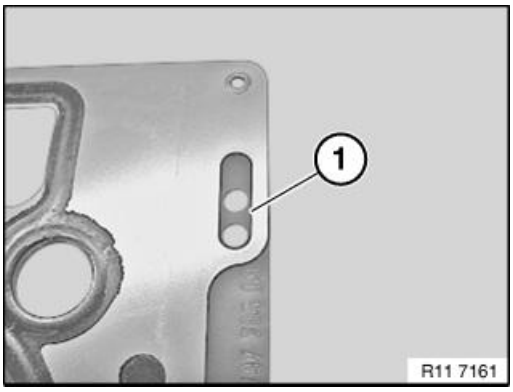
11 12 501 Replacing cylinder head gasket (N47, N47S)

Necessary preliminary tasks:

- Remove cylinder head.



The cylinder head gasket is designed as a beaded metal gasket.
Pay attention to gasket thickness (1).



Highest piston protrusion at measuring points (1 and 2) of all 4 pistons determines thickness of cylinder head gasket.

Piston protrusion up to 0.92 mm

- Install 1 hole cylinder head gasket.

Piston protrusion >0.92 ... 1.03 mm

- Install 2 hole cylinder head gasket.

Piston protrusion greater than >1.03 ... 1.18 mm

- Install 3 hole cylinder head gasket.

Assemble engine.

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11 13 000 Removing and installing, sealing or replacing oil sump (N47 D20 O1)

Special tools required:

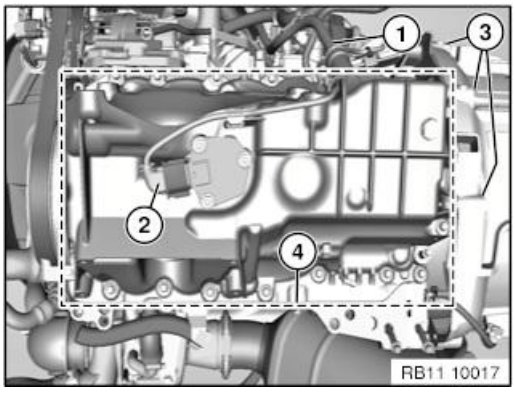
- 00 0 200
- 00 0 201
- 00 0 202
- 00 0 204
- 00 0 208
- 11 0 000
- 11 8 780
- 11 4 472
- 11 4 471

Necessary preliminary work:

- Remove starter motor.
- Drain engine oil.
- Remove front axle differential.
- Remove bearing support.

Note:
Front axle alignment is not required.

Caution!
Engines with surface sealant:
Application time of sealing bead max. 12 minutes.



Release dipstick (1) on oil filter housing and pull upwards out of oil sump.

Installation note:
Renew gasket.

Unplug connector (2) from oil level switch and unclip cable in area of oil sump.

Modify oil level sensor if replacing oil sump.

Release bolts (3) on transmission.

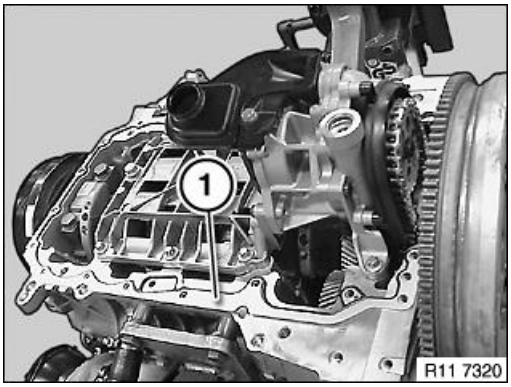
Release sump bolts along dashed line (4).

Tightening torque 11 13 2AZ.

Detach oil sump downward.

Installation note:
Tighten down all screws diagonally and evenly.

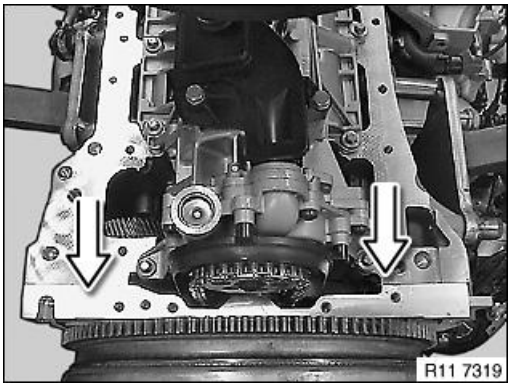
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Only on vehicles with gasket

Remove gasket (1).

Remove gasket debris from sealing surface and clean sealing surface.



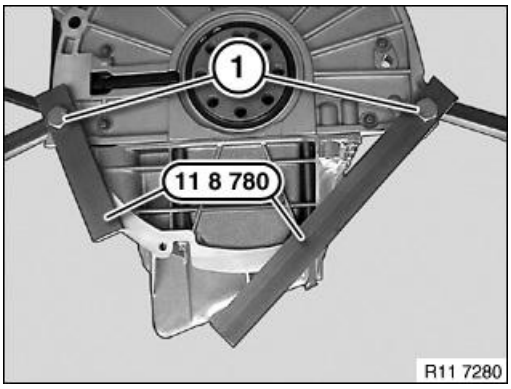
Installation note:
Use liquid sealing compound 2.1 Drei Bond.

Apply Drei Bond liquid sealing compound lightly and evenly in the area of the arrows on the end cover to the engine block.

Caution!

Oil sump gasket must not be lubricated.

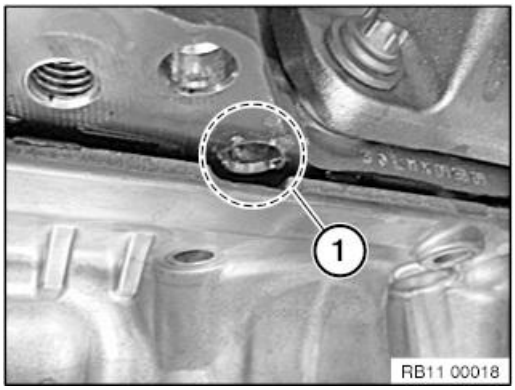
Install oil sump with a new gasket.



Installation note:
Special tool 11 8 780 is only necessary if the engine or the transmission is removed.

Position special tool 11 8 780 with transmission bolts (1) so that engine oil sump is exactly flush with engine block.

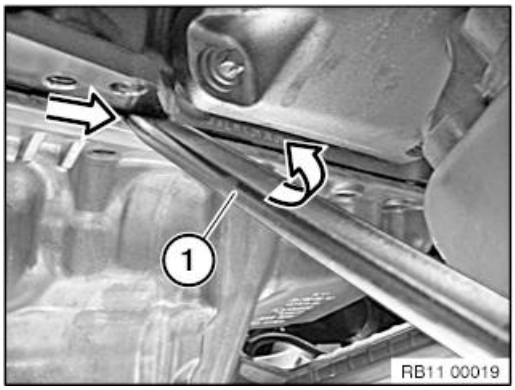
Attaching the oil sump.



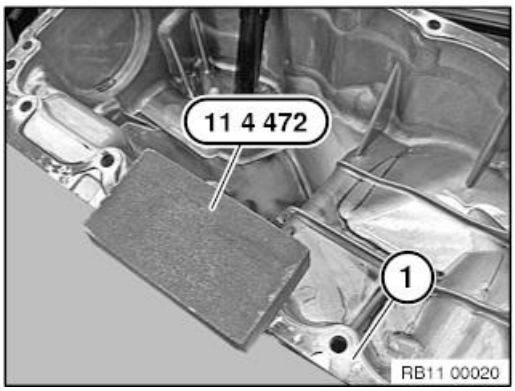
For engines with liquid sealing compound: Caution!

The oil sump can only be loosened in the areas (1) where an aperture is present in the oil sump.

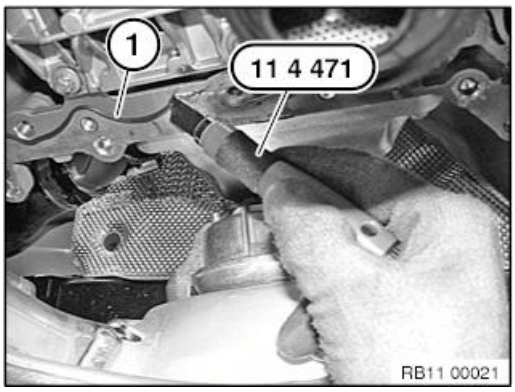
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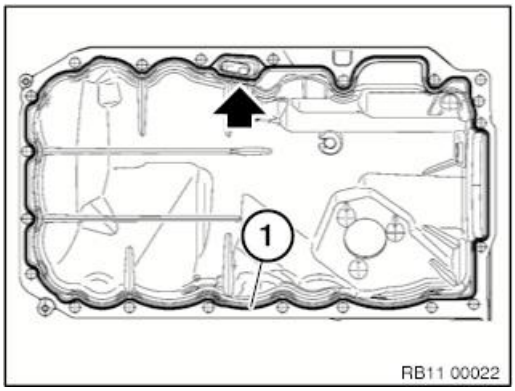
Use a suitable mounting lever (1) to release oil sump in the direction of the arrow at the correct location.



Clean sealing surface (1) with special tool 11 4 472 .*Installation note:*
Sealing surfaces must be free of oil, grease and cleaning agents.



Clean sealing surface (1) with special tool 11 4 471 .*Installation note:*
Sealing surfaces must be free of oil, grease and cleaning agents.



Apply sealing compound:

Apply the sealing compound in area (1).

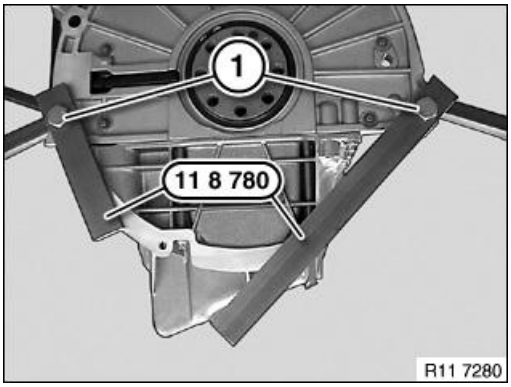
Make sure that the sealing bead runs along the inner edge.

The oil return bore hole must be completely surrounded (see arrow).

Installation note:
The oil sump must be installed approximately 10 minutes after application of the sealing compound.

Sealing compound height approx. 2 to 2.5 mm.

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Installation note:
Special tool 11 8 780 is only necessary if the engine or the transmission is removed.

Position special tool 11 8 780 with transmission bolts (1) so that engine oil sump is exactly flush with engine block.

Attaching the oil sump.

Assemble engine.

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11 13 000 Removing and installing, sealing or replacing oil sump (N47, N47S)

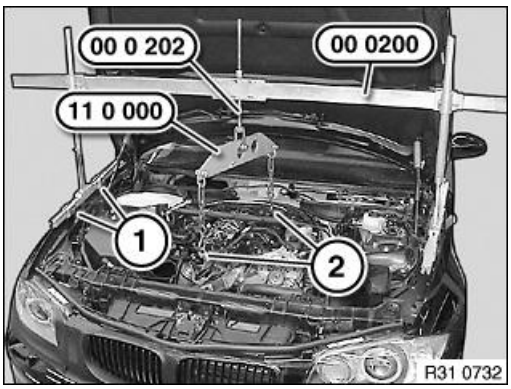
Special tools required:

- 00 0 200
- 00 0 201
- 00 0 202
- 00 0 204
- 00 0 208
- 11 0 000
- 11 8 780

Necessary preliminary tasks:

- Remove acoustic cover.
- Remove engine guard at front and rear.
  Remove guide tube dip stick.
- Remove starter.
- Drain engine oil.
- Remove front axle differential.
- Remove bearing support.
- Lower front axle support.

Note:
Front axle alignment is not required.



Assemble and install special tool 00 0 200 with special tool 00 0 201 / 00 0 202 / 00 0 204 / 00 0 208 .

11 0 000 Suspend special tool from the front and rear engine suspension.

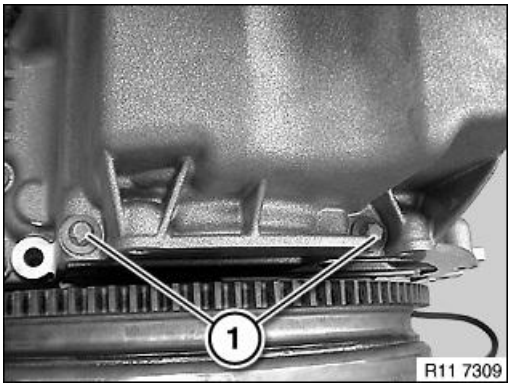
Contacts (1) **must** rest on screws of side walls.

Attention!
Do not exceed lifting height under any circumstances.

Raise engine **max.** 20-25 mm.

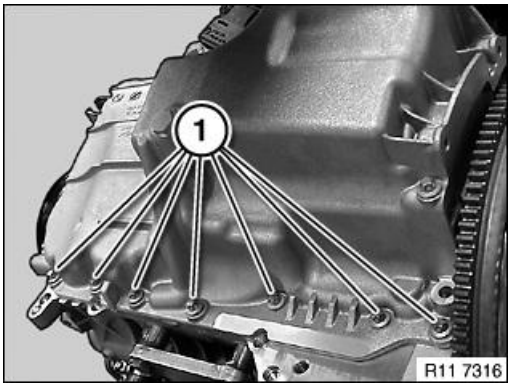
Note:
Graphic E81.

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Release screws (1).

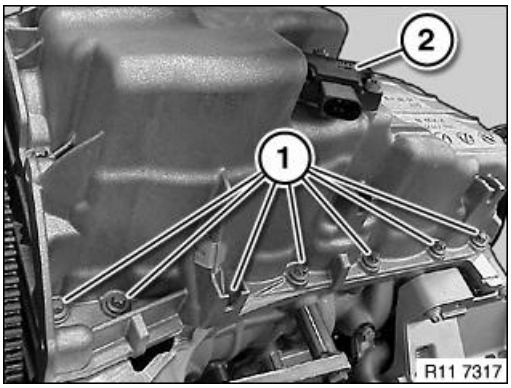
Tightening torque 11 13 2AZ.



Release screws (1).

Tightening torque 11 13 2AZ.

Installation note:
Tighten down all screws diagonally and evenly.

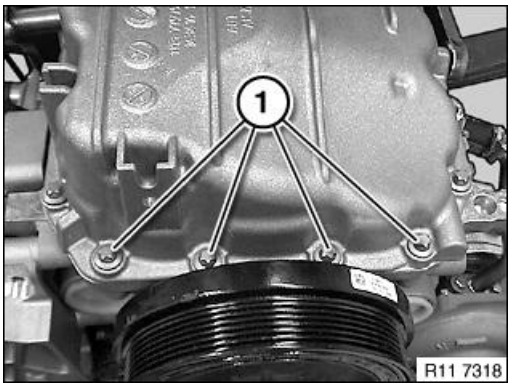


Release screws (1).

Tightening torque 11 13 2AZ.

Disconnect plug connection on oil level sensor.

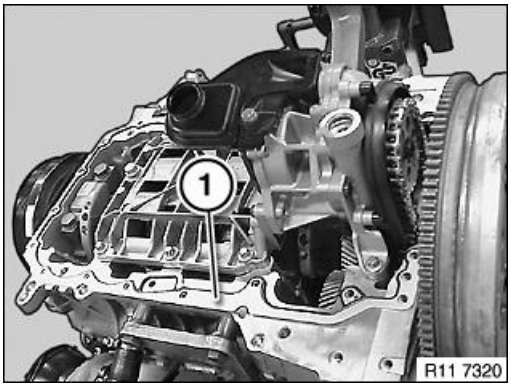
Installation note:
Pay attention to cable holder.



Release screws (1).

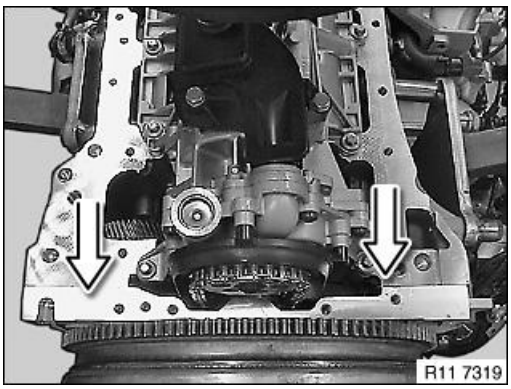
Tightening torque 11 13 2AZ.

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Remove gasket (1).

Remove gasket debris from sealing face and clean sealing face.



Installation note:
Use liquid gasket 2.1.

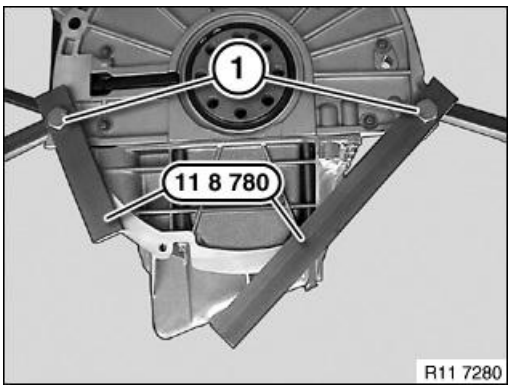
Apply a thin and uniform coating of liquid gasket in area of arrows

- at end cover to engine block.

Apply thin and even coating.

Attention!
Oil sump gasket must not be lubricated.

Install oil sump with a new gasket.



Installation note:
Special tool 11 8 780 is only necessary if transmission is removed.

Position special tool 11 8 780 with transmission bolts (1) so that engine oil sump is exactly flush with engine block.

Secure engine oil sump.

Assemble engine.

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11 14 110 Removing and installing, sealing/replacing gear case cover at rear (N47, N47S)

Special tools required:

- 00 9 120
- 11 4 470
- 11 8 815

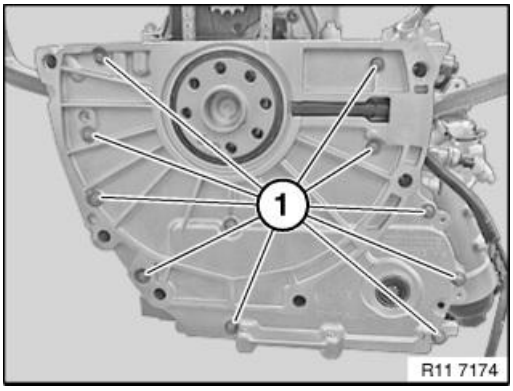
Important!

Engines with surface sealant:

Application time of sealing bead max. 12 minutes.

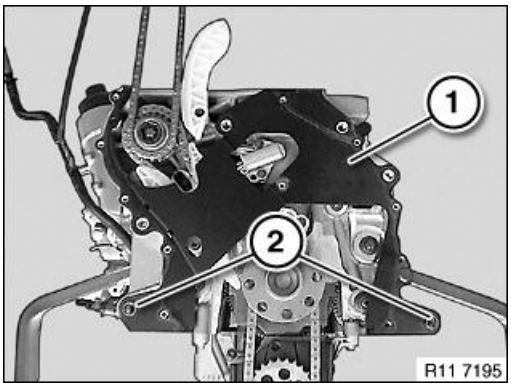
Necessary preliminary tasks:

- Remove engine.
- Remove flywheel.
- Remove cylinder head.
- Removing oil sump.



Release screws (1).

Release screw of high pressure pump (if fitted).

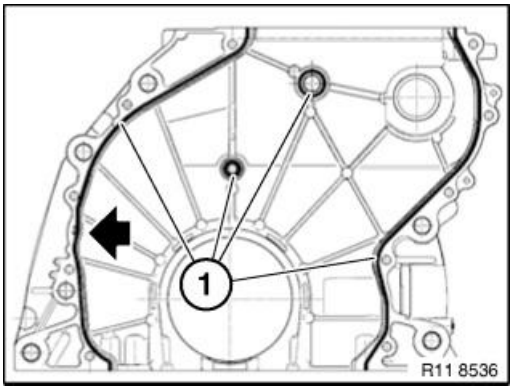


N47 and N47Top engines up to 11/2009.

Remove beaded metal gasket (1).

Check fitting sleeves (2) for damage, replace if necessary.

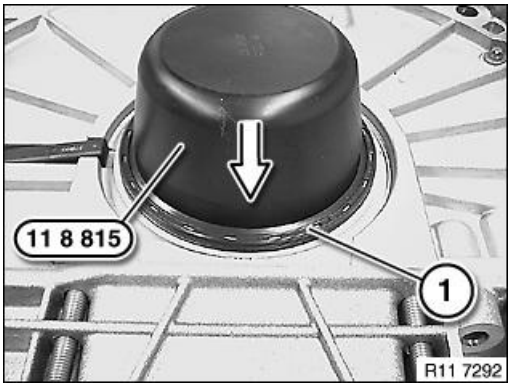
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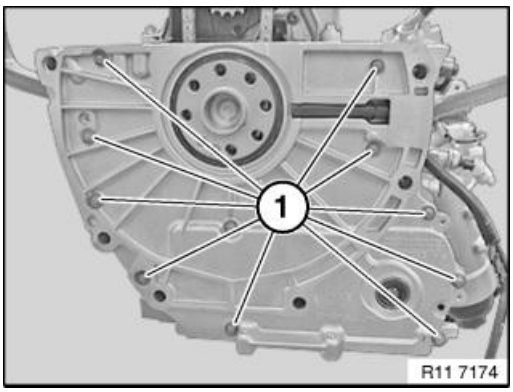
N47Top engines from 11/2009.

Installation note:
Application time of sealing bead (1) max. 12 min.

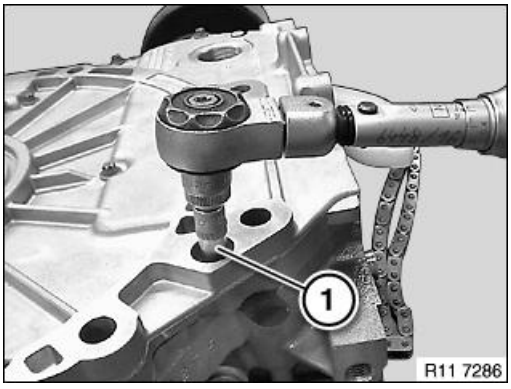
Remove gasket remnants with special tool 11 4 470 .
Apply sealing bead (1) at marked points.
Thickness of sealing bead: **1.5 to 2.0 mm.**



Preassemble special tool 11 8 815 on crankshaft.
Fit FPM ring (1) with lid dry and without lubricant.

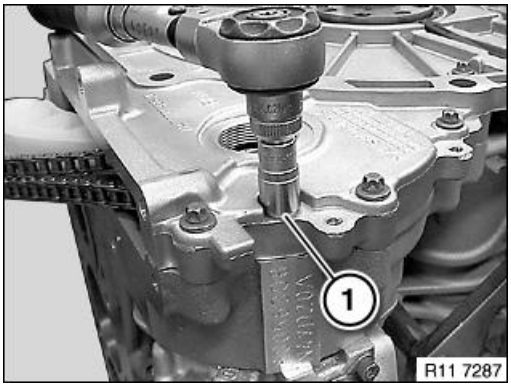


Insert bolts (1).



Secure special tool 00 9 120 with bolts (1).
Tightening torque: 11 14 2AZ.

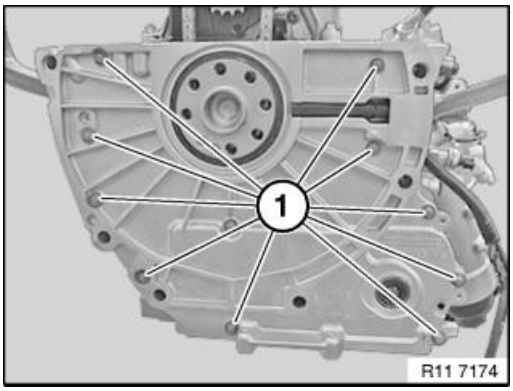
cardiagn.com



Insert screw (1) of high pressure pump (if fitted).

Tightening torque: 11 14 3AZ.

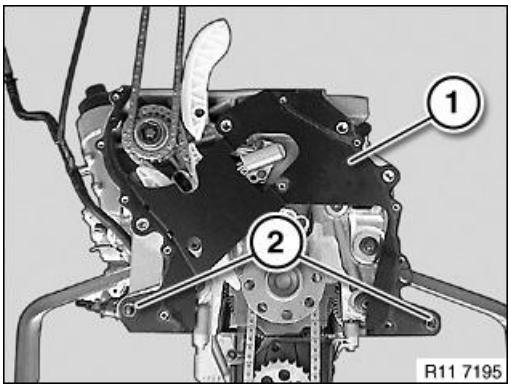
Assemble engine.



Procedure for replacing gear case.

Release screws (1).

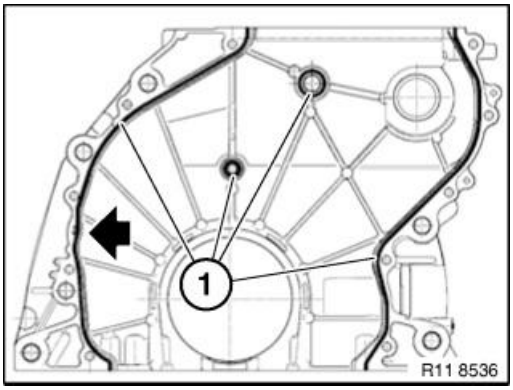
Release bolt holding high pressure pump.



N47 and N47Top engines up to 11/2009.

Remove beaded metal gasket (1).

Check fitting sleeves (2) for damage, replace if necessary.



N47Top engines from 11/2009.

Installation note:
Application time of sealing bead (1) max. 12 minutes.

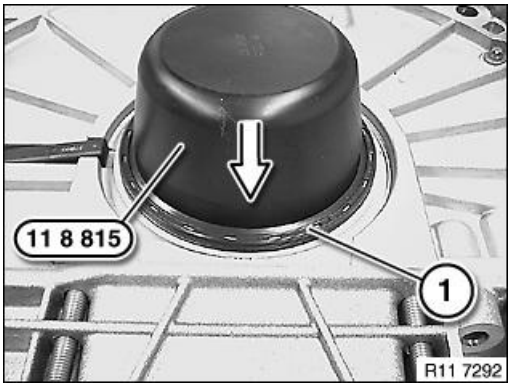
Remove gasket remnants from gear case cover and from crankcase with special tool 11 4 470 .

Apply sealing bead (1) at marked points.

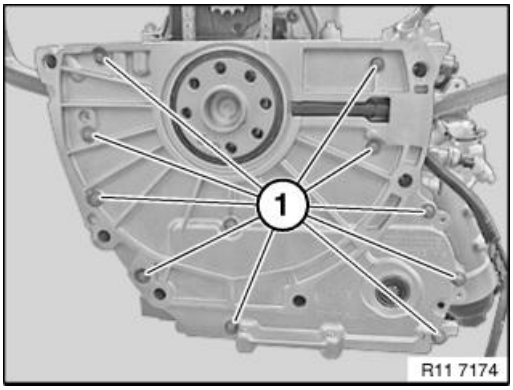
Position sealing bead (1) at marked point (see arrow) on inside on gear case cover.

Thickness of sealing bead: **1.5 to 2.0 mm.**

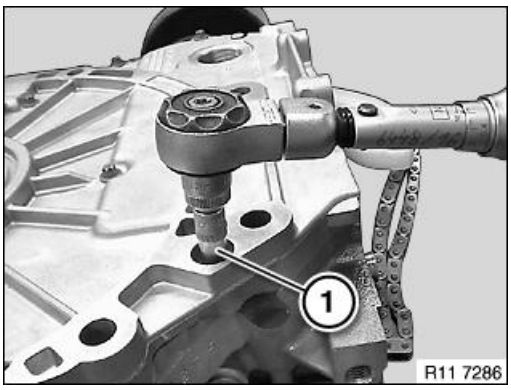
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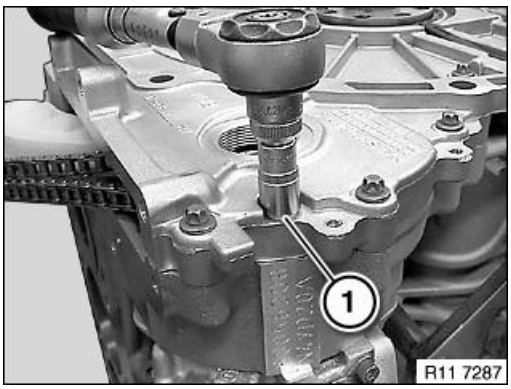
Preassemble special tool 11 8 815 on crankshaft.
Fit FPM ring (1) with lid dry and without lubricant.



Insert bolts (1).



Secure special tool 00 9 120 with bolts (1).
Tightening torque: 11 14 2AZ.



Insert screw (1) of high pressure pump (if fitted).
Tightening torque: 11 14 3AZ.

Assemble engine.

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11 14 110 Removing and installing, sealing/replacing rear timing case cover (N47, D20O1)

Special tools required:

- 00 9 120
- 11 4 470
- 11 8 815

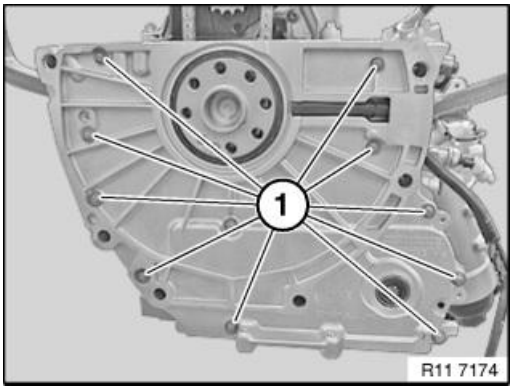
Important!

Engines with surface sealant:

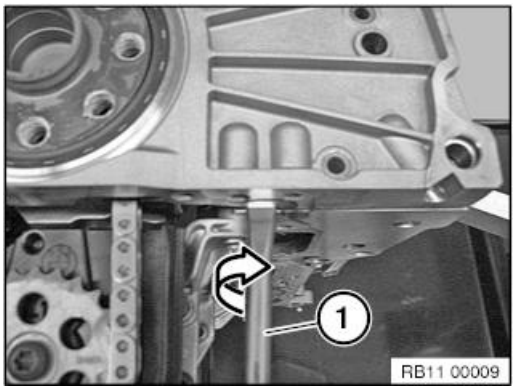
Application time of sealing bead max. 12 minutes.

Necessary preliminary tasks:

- Remove engine.
- Remove flywheel.
- Remove cylinder head.
- Removing oil sump.

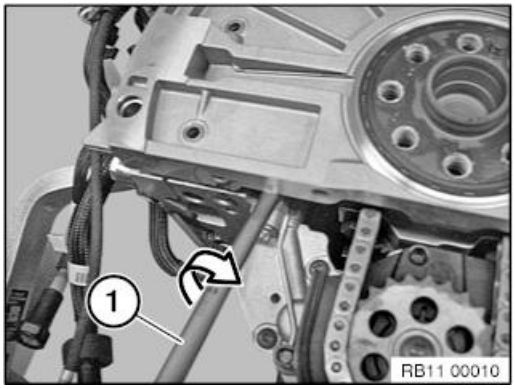


Release screws (1).



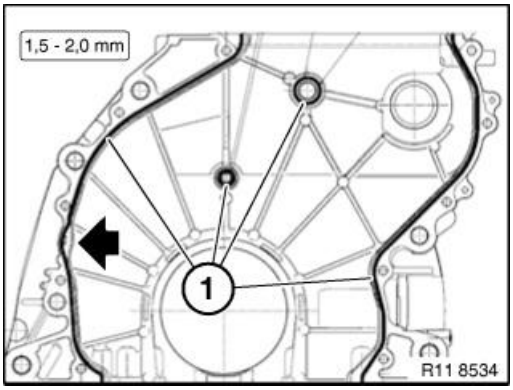
Loosen the timing case cover with a screwdriver (1) in direction of arrow.

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Loosen the timing case cover with a screwdriver (1) in direction of arrow.

Remove the timing case cover.



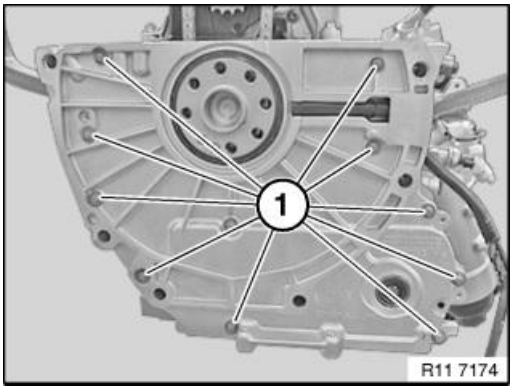
Remove gasket remnants from crankcase and timing case cover using special tool 11 4 470 .

Apply sealing bead (1) at marked points.

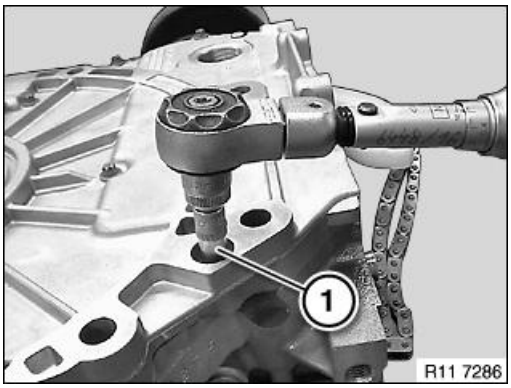
Installation note:
Application time of sealing bead (1) max. 12 minutes.

Position sealing bead (1) at marked point (see arrow) on outside of timing case cover.

Thickness of sealing bead: **1.5 to 2.0 mm.**



Insert bolts (1).



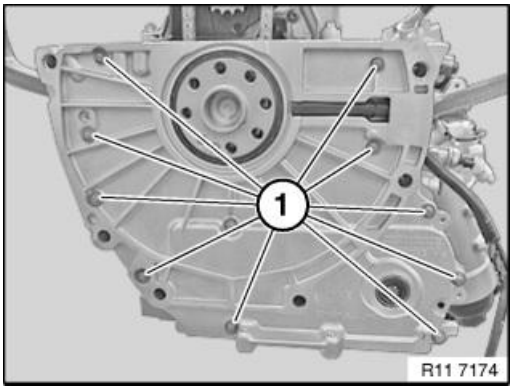
Secure special tool 00 9 120 with bolts (1).

Tightening torque: 11 14 2AZ.

Replace radial shaft seal at front.

Assemble engine.

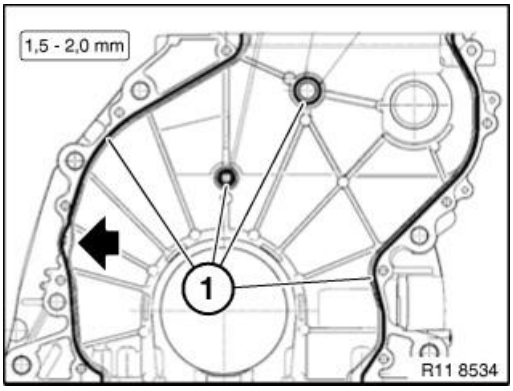
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Procedure for renewing timing case cover.

Release screws (1).

Release bolt holding high pressure pump.



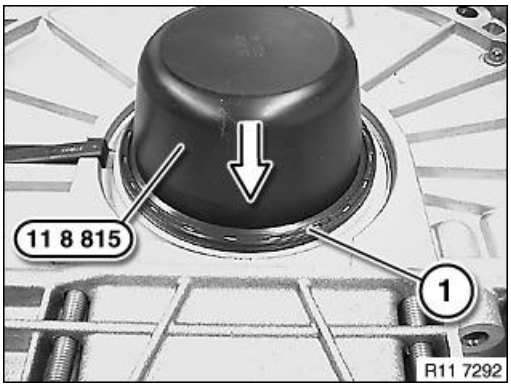
Remove gasket remnants from the crankcase with special tool 11 4 470 .

Apply sealing bead (1) at marked points.

Installation note:
Application time of sealing bead (1) max. 12 minutes.

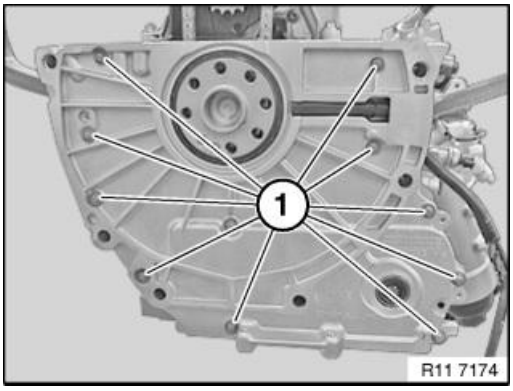
Position sealing bead (1) at marked point (see arrow) on inside of timing case cover.

Thickness of sealing bead: **1.5 to 2.0 mm.**



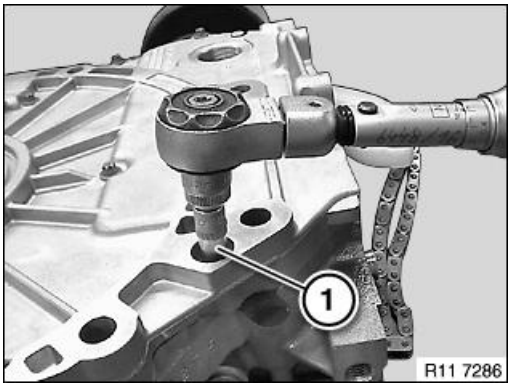
Preassemble special tool 11 8 815 on crankshaft.

Mount radial shaft seal (1) with timing case cover without lubricant.



Insert bolts (1).

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Secure special tool 00 9 120 with bolts (1).
Tightening torque: 11 14 2AZ.

Assemble engine.

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11 14 151 Replacing crankshaft seal at rear (N47, N47S)

Special tools required:

- 11 8 810
- 11 8 811
- 11 8 812
- 11 8 813
- 11 8 815

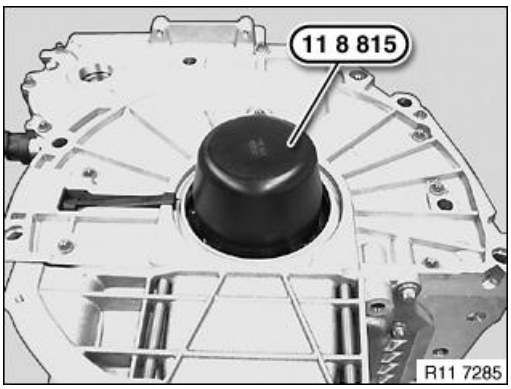
Necessary preliminary tasks:

- Remove transmission.
- Drain engine oil.
- Remove flywheel.
- Remove FPM ring using suitable tool.

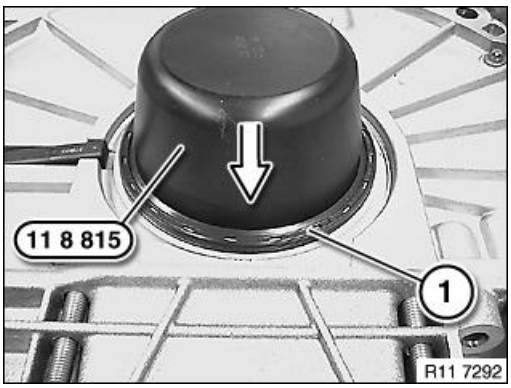
Important!

Accelerator pedal module rings must be installed in a dry condition.

Do not use engine oil or lubricant.



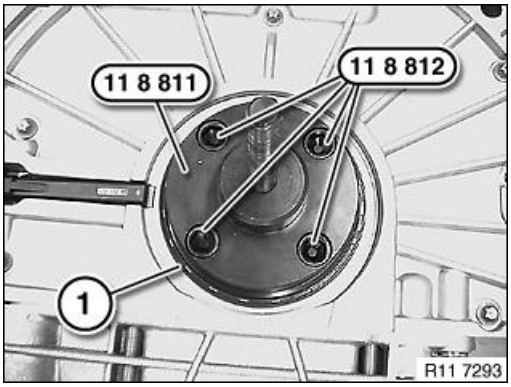
Position special tool 11 8 815 on crankshaft.



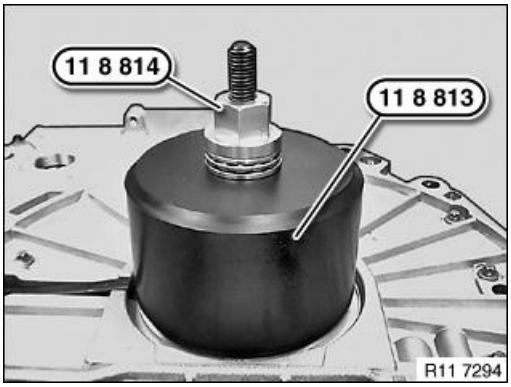
Use special tool 11 8 815 to fit accelerator pedal module ring in direction of arrow just up to gear case cover and position.

Remove special tool 11 8 815 .

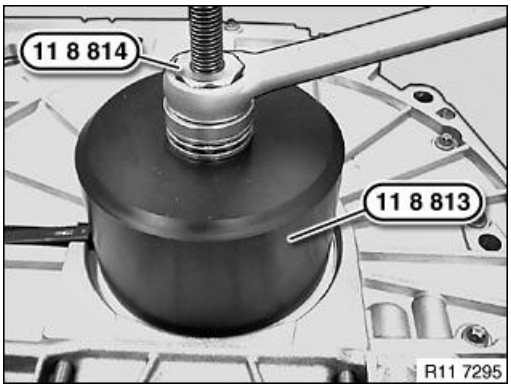
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Fasten special tool 11 8 811 with special tool 11 8 812 on the crankshaft.
Position accelerator pedal module ring (1).



Slide on special tool 11 8 813.
Screw down special tool 11 8 814.



Press in accelerator pedal module ring with special tool 11 8 813 .
Screw in special tool 11 8 813 up to gear case cover.

Remove all special tools 11 8 810 .
Assemble engine.
Check engine for leak tightness.

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11 14 005 Replacing front crankshaft seal (N47 D20 O1)

Special tools required:

- 11 8 801
- 11 8 802
- 11 8 803
- 11 8 804

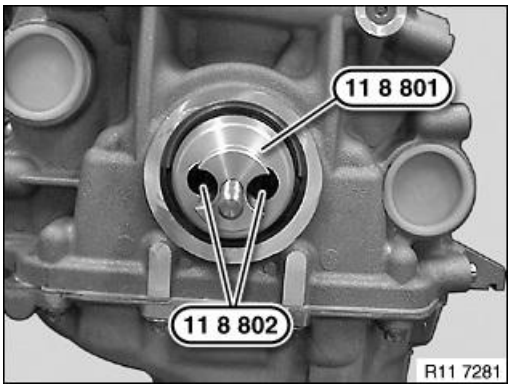
Necessary preliminary work:

- Removing vibration damper:
- Lever out FPM ring using suitable tool.

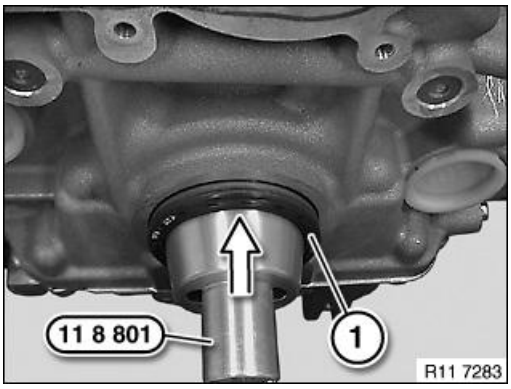
Important!

Accelerator pedal module rings must be installed in a dry condition.

Do not use engine oil or lubricant.

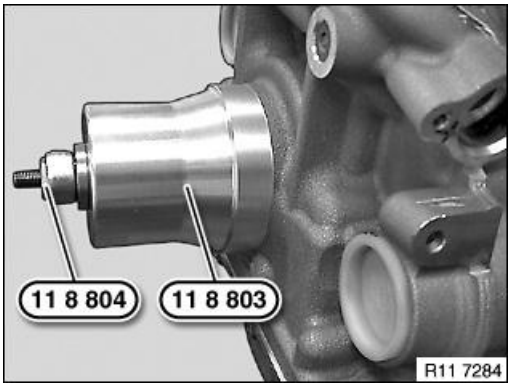


Fasten special tool 11 8 801 with11 8 802 on the crankshaft.



Position accelerator pedal module ring on the special tool 11 8 801 .

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Pull on accelerator pedal module- ring with special tool 11 8 803 and 11 8 804 .

Screw in special tool 11 8 803 until it is flush with the crankkase.

Assemble engine.

Important!

Do not start engine without drive belt **(risk of damage!)**.

Check engine for leak tightness.

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11 14 005 Replacing front crankshaft seal (N47, N47S)

Special tools required:

- 11 8 801
- 11 8 802
- 11 8 803
- 11 8 804

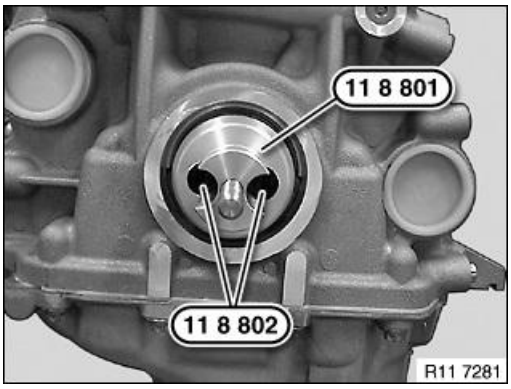
Necessary preliminary tasks:

- Removing vibration damper:
- Lever out FPM ring using suitable tool.

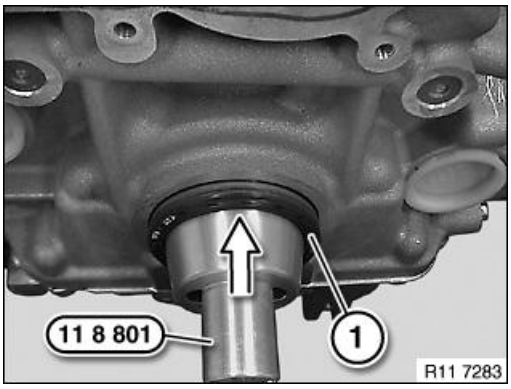
Attention!

FPM-rings must be installed in a dry condition.

Do not use engine oil or lubricant.

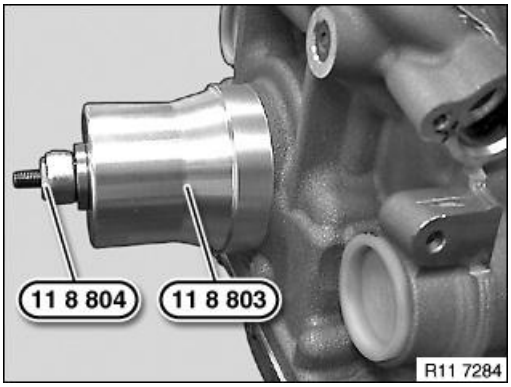


Fasten special tool 11 8 801 with11 8 802 on the crankshaft.



Position accelerator pedal module ring on the special tool 11 8 801 .

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Pull on accelerator pedal module- ring with special tool 11 8 803 and 11 8 804 .

Screw in special tool 11 8 803 until it is flush with the crankkase.

Assemble engine.

Attention!

Do not start engine without drive belt **(risk of damage!)**.

Check engine for leak tightness.

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11 14 151 Replacing rear crankshaft seal (N47 D20 O1)

Special tools required:

- 11 8 810
- 11 8 811
- 11 8 812
- 11 8 813
- 11 8 815
- 11 8 814

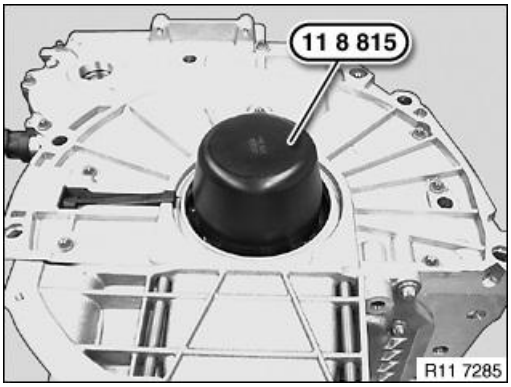
Necessary preliminary work:

- Drain engine oil.
- Remove flywheel.
- Remove radial shaft seal with a suitable tool.

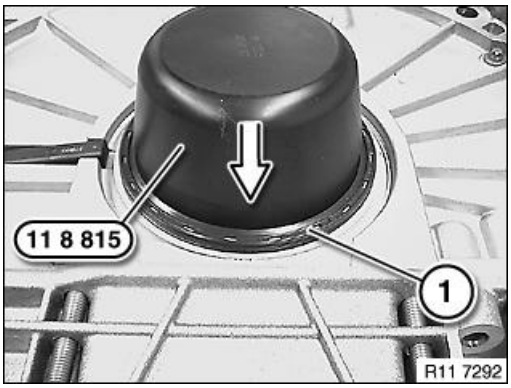
Important!

The radial shaft seals must be installed dry.

Do not use engine oil or lubricant.



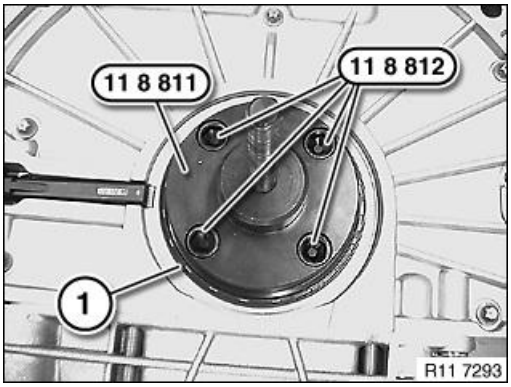
Position special tool 11 8 815 on crankshaft.



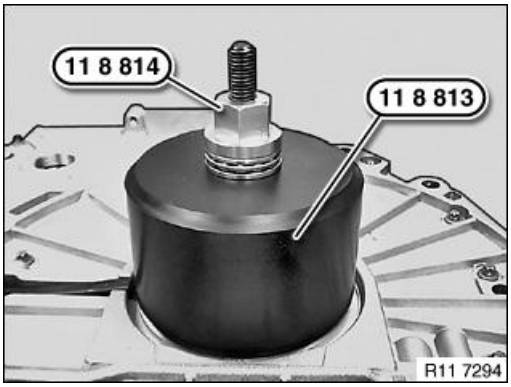
Connect the radial shaft seal (1) with the aid of special tool 11 8 815 in the direction of arrow up to timing case cover and position.

Remove special tool 11 8 815 .

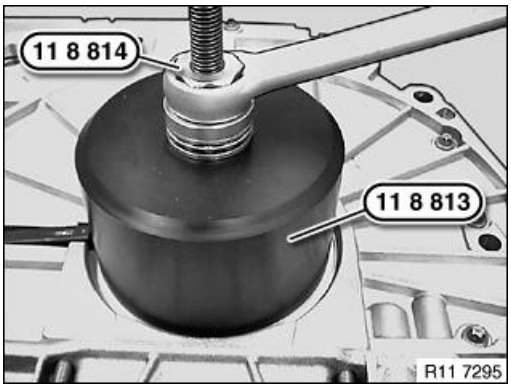
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Fasten special tool 11 8 811 with special tool 11 8 812 on the crankshaft.
Position radial shaft seal (1).



Slide on special tool 11 8 813 .
Screw down special tool 11 8 814 .



Press in radial shaft seal with special tool 11 8 813 .
Screw in special tool 11 8 813 up to timing case cover.

Remove all special tools 11 8 810 .
Assemble engine.
Check engine for leak tightness.

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11 21 531 Replacing all crankshaft main bearing shells (N47 D20 O1)

Special tools required:

- 00 2 590

Important!

Replace main bearing bolts.

There must be no oil in the blind holes **(risk of cracking)**.

Do not wash off bolt coating.

Incorrect installation of the bearing cap leads to damage to the crankcase.

Check grinding stage of crankshaft.

The code letter **K** on the crankcase and on the crankshaft stands for "Kupplungsseite" (German = clutch end).

Installation note:

The assignment of the bearing shells in the crankcase (classification) may no longer apply after the crankshaft has been replaced.

Install yellow bearing shells in crankcase (see BMW Parts installation instructions).

Bearing classification from 1 to 3 possible.

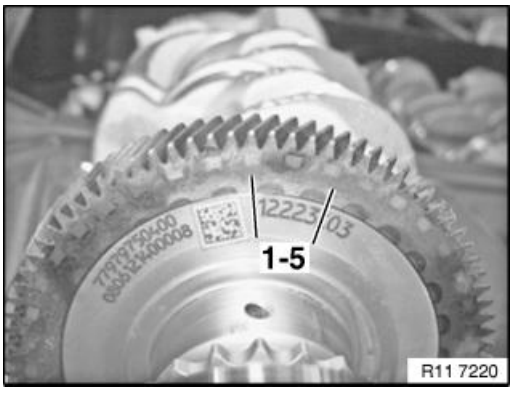
1: Bearing colour - yellow

2: Bearing colour - green

3: Bearing colour - white

Necessary preliminary tasks:

- Remove crankshaft.



Bearing classification in bearing cap:

The number combination from left to right is from 1 to 5.

Example: Possible combination of bearing colours.

1: 1 = yellow

2: 2 = green

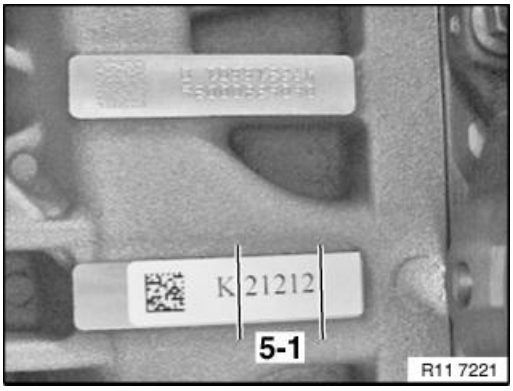
3: 2 = green

4: 2 = green

5. 3 = white

See illustration.

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Bearing classification in crankcase:

The code letter **K** on the crankcase stands for "Kupplungsseite" (German = clutch end).

The number combination from left to right is from bearing seat 5 to 1.

Example: Possible combination of bearing colours.

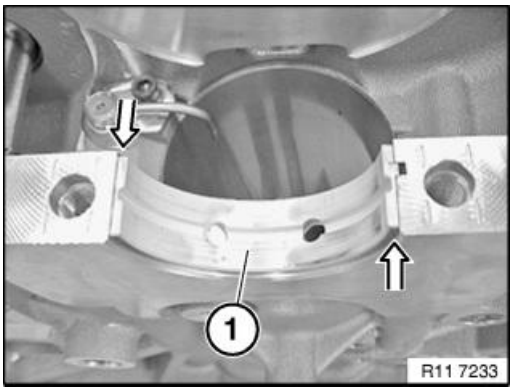
1:	2 = green
2:	1 = yellow
3:	2 = green
4:	1 = yellow
5.	2 = green

The classifications 1 (yellow) and 3 (white) and 3 (white) and 1 (yellow) are not allowed.

The classification 2 (green) and 2 (green) should be selected.

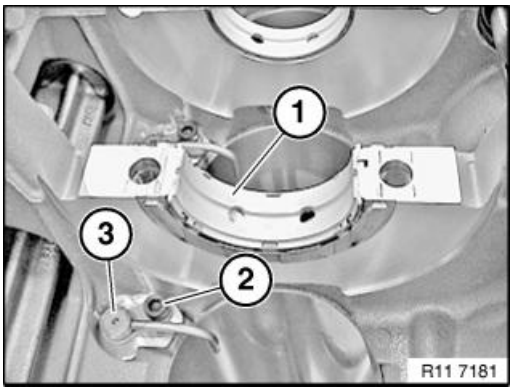
See illustration.

(1/1) Bearing cap / yellow	**(2/1)** Bearing cap / yellow	**(3/1)** Bearing cap / green
(1/1) Crankcase / yellow	**(2/1)** Crankcase / green	**(3/1)** Crankcase / green
(1/2) Bearing cap / green	**(2/2)** Bearing cap / green	**(3/2)** Bearing cap / green
(1/2) Crankcase / yellow	**(2/2)** Crankcase / green	**(3/2)** Crankcase / white
(1/3) Bearing cap / green	**(2/3)** Bearing cap / white	**(3/3)** Bearing cap / white
(1/3) Crankcase / green	**(2/3)** Crankcase / green	**(3/3)** Crankcase / white



Place main bearing shell (1) with lubricating groove in crankcase (see arrows).

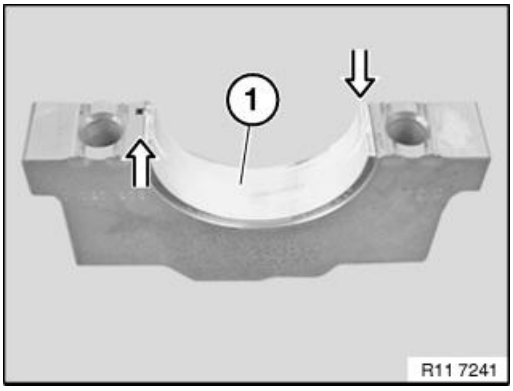
Observe combination of bearing colours according to the table.



Installation note:
Thrust bearing (1) on the crankshaft is installed at bearing position 3.

Observe combination of bearing colours according to the table.

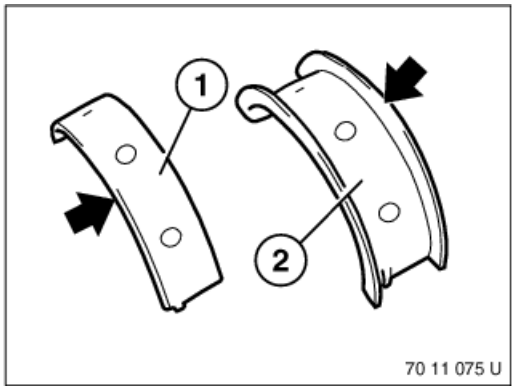
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Place main bearing shell (1) with no lubricating groove in the bearing cap (see arrows).

Installation note:
Pay attention to guide lug on main bearing shell (1).

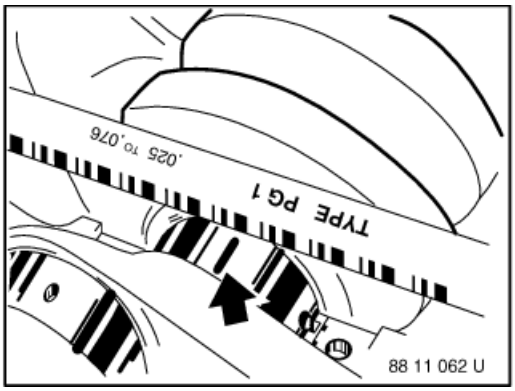
Observe combination of bearing colours according to the table.



The bearing shells are marked with yellow, green or white colour.

1. Bearing shell
2. Guide bearing

Observe grinding stage of main bearing journals.

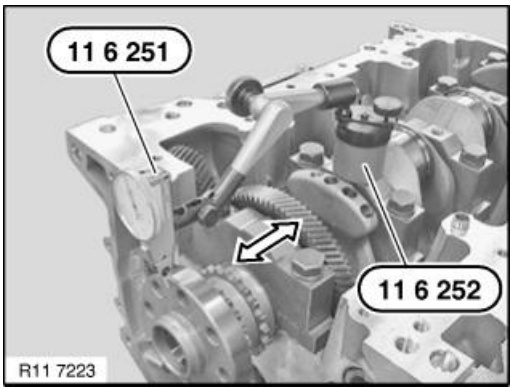


Position special tool 00 2 590 on main bearing to be measured and bolt to main bearing cap.

Tightening torque: 11 11 1AZ.

Remove main bearing cap and read off radial clearance at width of flattened plastic thread (Plastigage) with assistance of measuring scale.

If necessary, to correct bearing clearance, fit new bearing shells with a different colour coding.



Check side clearance.

If necessary, check guide bearing shells, crankshaft and engine block.

Assemble engine.

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11 21 531 Replacing all crankshaft main bearing shells (N47, N47S)

Special tools required:

- 00 2 590

Important!

Replace main bearing bolts.

There must be no oil in the blind holes **(risk of cracking)**.

Do not wash off bolt coating.

Incorrect installation of the bearing cap leads to damage to the crankcase.

Check grinding stage of crankshaft.

The code letter **K** on the crankcase stands for "Kupplungsseite" (German = clutch end).

Installation note:

The assignment of the bearing shells in the crankcase (classification) may no longer apply after the crankshaft has been replaced.

Install yellow bearing shells in crankcase (see BMW Parts installation instructions).

Bearing classification from 1 to 3 possible.

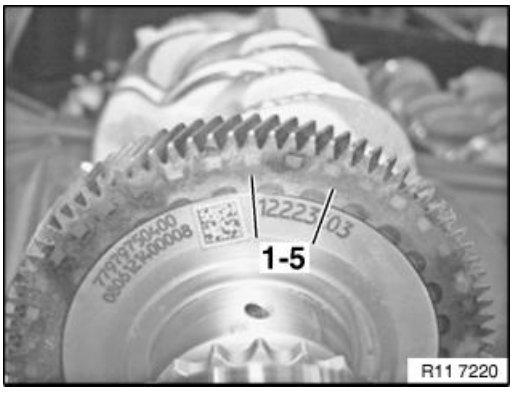
1: Bearing colour - yellow

2: Bearing colour - green

3: Bearing colour - white

Necessary preliminary tasks:

- Remove crankshaft.



Bearing classification in bearing cap:

The number combination from left to right is from 1 to 5.

Possible combination of bearing colours.

1: 1 = yellow

2: 2 = green

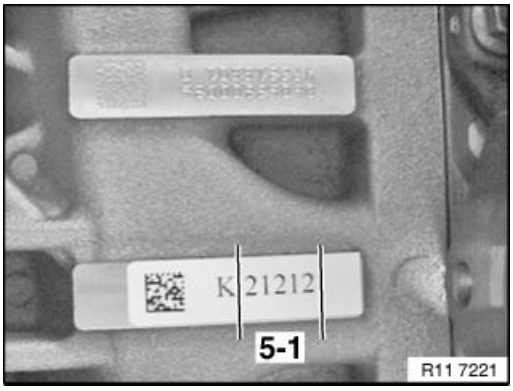
3: 2 = green

4: 2 = green

5. 3 = white

See illustration.

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Bearing classification in crankcase:

The code letter **K** on the crankcase stands for "Kupplungsseite" (German = clutch end).

The number combination from left to right is from bearing seat 5 to 1.

Possible combination of bearing colours.

1: 2 = green

2: 1 = yellow

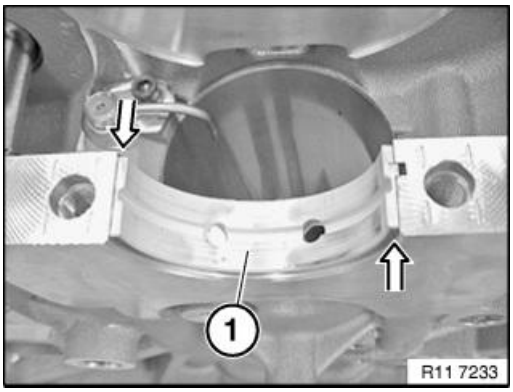
3: 2 = green

4: 1 = yellow

5. 2 = green

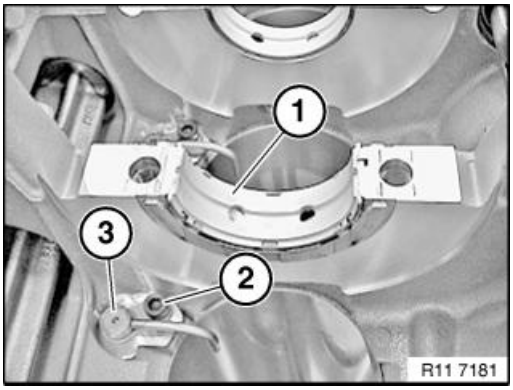
See illustration.

(1/1) Bearing cap / yellow	**(2/1)** Bearing cap / yellow	**(3/1)** Bearing cap / green
(1/1) Crankcase / yellow	**(2/1)** Crankcase / green	**(3/1)** Crankcase / green
(1/2) Bearing cap / green	**(2/2)** Bearing cap / green	**(3/2)** Bearing cap / green
(1/2) Crankcase / yellow	**(2/2)** Crankcase / green	**(3/2)** Crankcase / white
(1/3) Bearing cap / green	**(2/3)** Bearing cap / white	**(3/3)** Bearing cap / white
(1/3) Crankcase / green	**(2/3)** Crankcase / green	**(3/3)** Crankcase / white



Place main bearing shell (1) with lubricating groove in crankcase (see arrows).

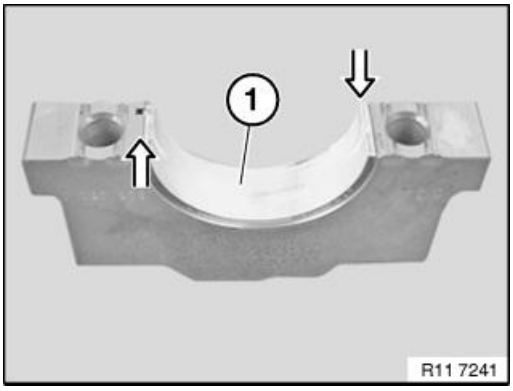
Observe combination of bearing colours according to the table.



Installation note:
Thrust bearing (1) on the crankshaft is installed at bearing position 3.

Observe combination of bearing colours according to the table.

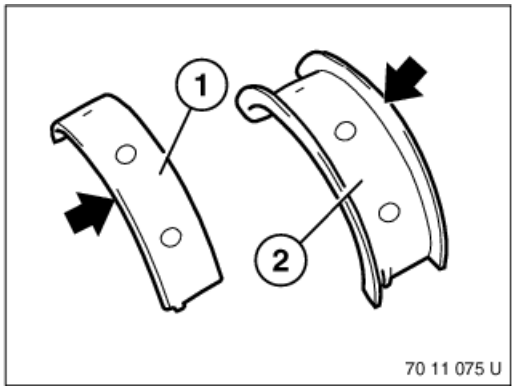
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Place main bearing shell (1) with no lubricating groove in the bearing cap (see arrows).

Installation note:
Pay attention to guide lug on main bearing shell (1).

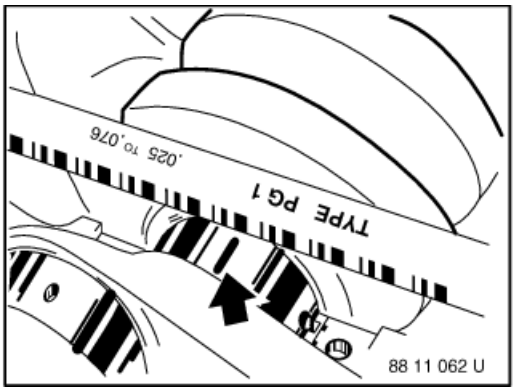
Observe combination of bearing colours according to the table.



The bearing shells are marked with yellow, green or white colour.

1. Bearing shell
2. Guide bearing

Observe grinding stage of main bearing journals.

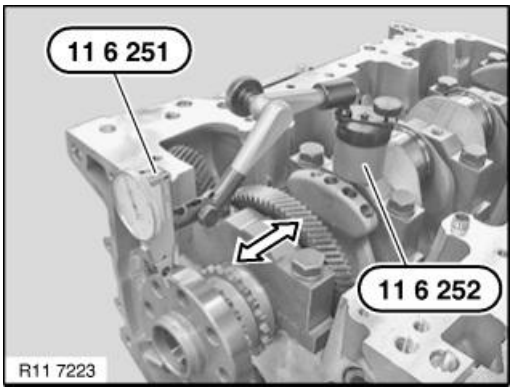


Position special tool 00 2 590 on main bearing to be measured and bolt to main bearing cap.

Tightening torque: 11 11 1AZ.

Remove main bearing cap. Read off bearing clearance at width of crushed plastic thread (Plastigage) with aid of measuring scale.

If necessary, to correct bearing clearance, fit new bearing shells, or ones with a different colour code.



Check side clearance.

If necessary, check guide bearing shells, crankshaft and engine block.

Assemble engine.

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11 21 500 Replacing crankshaft (N47 D20 O1)



Special tools required:

- 00 2 300
- 00 9 120
- 11 6 250
- 11 8 750
- 11 8 791
- 11 8 792
- 11 8 793
- 11 8 870
- 64 1 020
- 2 318 115



Important!

Replace main and connecting rod bolts.

There must be no oil in the blind holes **(risk of cracking)**.

Do not wash off bolt coating.

Incorrect assembly of the bearing caps will result in damage to the crankcase.

It is necessary to remove the counterbalance shafts (AGW) in order to remove the crankshaft.

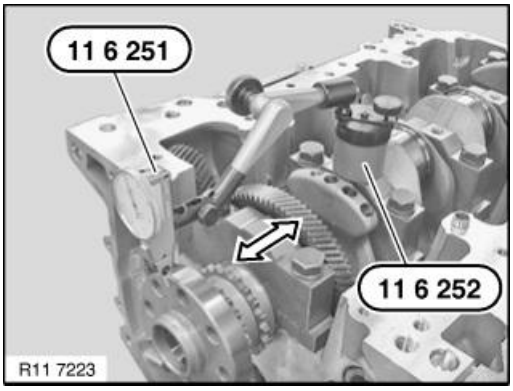
To properly adjust the counterbalance shafts, a new, coated intermediate gear must always be fitted.



Necessary preliminary tasks:

- Remove engine.
- Mount engine on assembly stand.
- Remove coolant pump.
- Remove cylinder head.
- Remove oil pump.
- Remove end cover at rear.
- Remove both timing chains.
- Remove all pistons.

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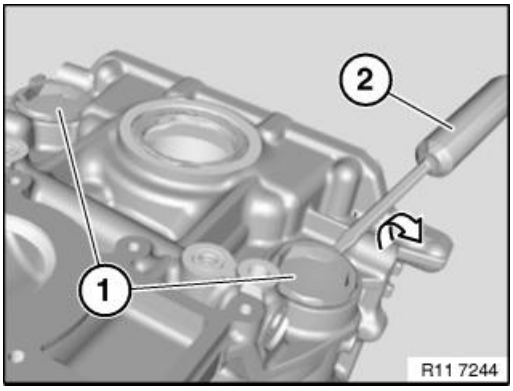
Check crankshaft side clearance.

Fit special tool 11 6 250 .

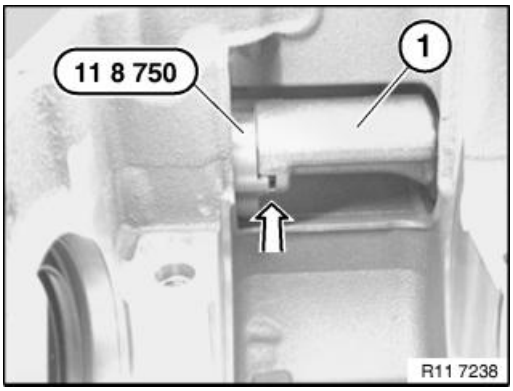
Side clearance.

If the permitted side clearance is exceeded:

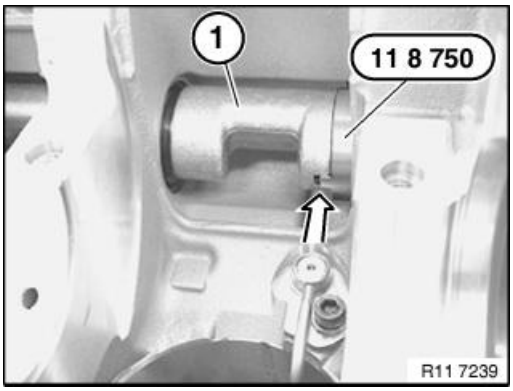
- Check crankshaft and guide bearing shells.
- Replace worn component.



Remove sealing caps (1) with a suitable tool (2).*Installation note:*
Replace sealing cap with O-ring.



Turn crankshaft until special tool 11 8 750 engages in left counterbalance shaft (1) (see arrow).*Note:*
Graphic without crankshaft

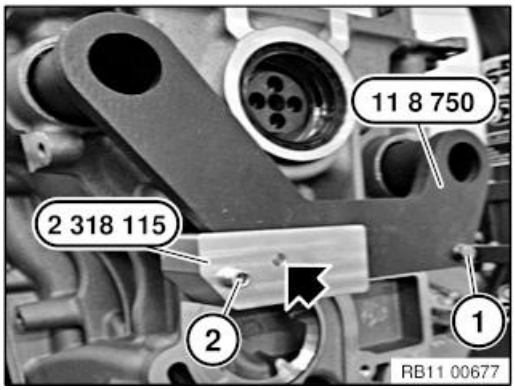


Turn crankshaft until special tool 11 8 750 engages in right counterbalance shaft (1).

See arrow.

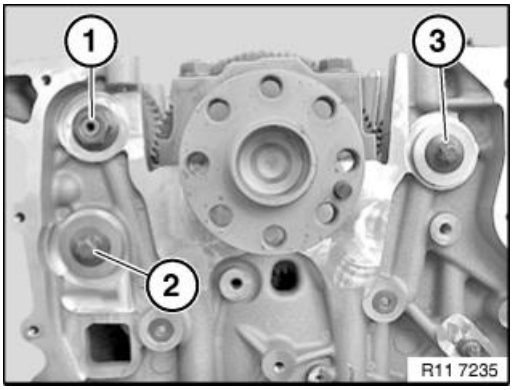
Note:
Graphic without crankshaft.

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Secure special tool 11 8 750 to crankcase using screw (1) for coolant pump.

Position special tool 2 318 115 on special tool 11 8 750 and secure with screw (2).

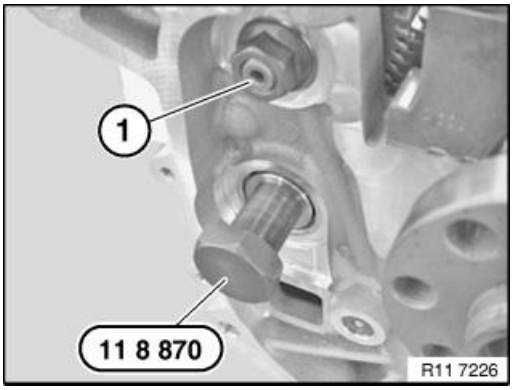


Slacken nut (1).

Tightening torque: 11 27 2AZ.

Undo screws (2 and 3)

Tightening torque: 11 27 1AZ



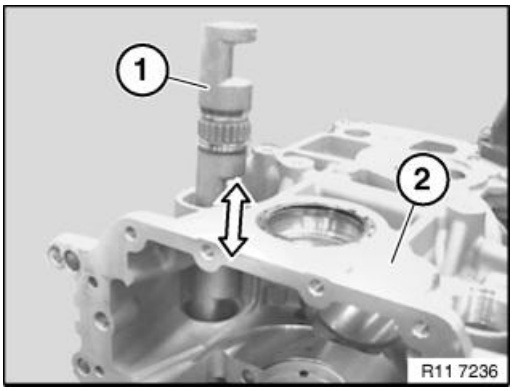
Remove nut from intermediate gearwheel (1).

Remove intermediate gearwheel (1).

Note:
The gear is pressed onto the counterbalance shaft with a taper and can only be released with special tool 11 8 870 .

Once the gear has been released from the counterbalance shaft, special tool 11 8 870 can be unscrewed again by hand.

Screw special tool 11 8 870 into counterbalance shaft gear, thereby releasing counterbalance shafts from the gears.



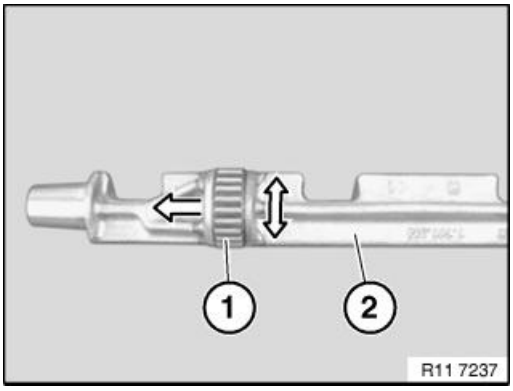
Important!

Risk of damage! on crankcase.

Use special tool 00 2 300 to move engine to vertical position.

Remove counterbalance shaft (1) in upward direction of arrow from crankcase (2).*Note:*
Shown with crankshaft removed for clearer illustration.

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Important!

Danger of mixing up needle bearings.

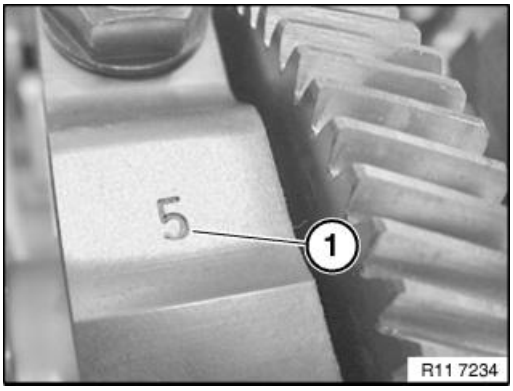
Needle bearings have different diameters.

See BMW Parts Department for information on diameters.

Release needle bearing (1) in direction of arrow.

Remove released needle bearing (1) from counterbalance shaft (2) in direction of arrow.

Check counterbalance shaft (2) for wear at the bearing position and replace if necessary.

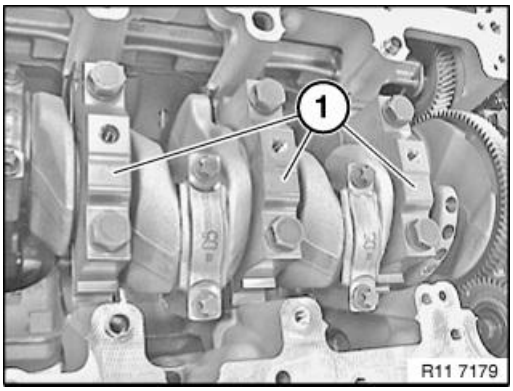


Note:

Bearing caps (1) 1...5 are marked on the exhaust side.

Bearing cap 3 is installed as a thrust bearing.

Note:
Graphic at bearing seat number 5.



Release main bearing screw connection of main bearing cap (1).

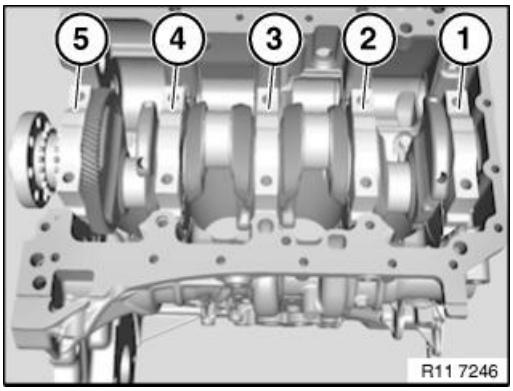
Remove main bearing cap 1...5.

Important!

With the assistance of a second person, remove crankshaft and carefully place to one side.

Pay attention to oil hole in bearing shell.

Pay attention to installation position of crankshaft main bearing shells.



Oil bearing shell.

Install crankshaft.

Fit bearing caps 1 to 5 so that the ID codes always point to the exhaust side.

Both locating grooves of bearing shells in crankcase and on bearing cap must be mounted on one side.

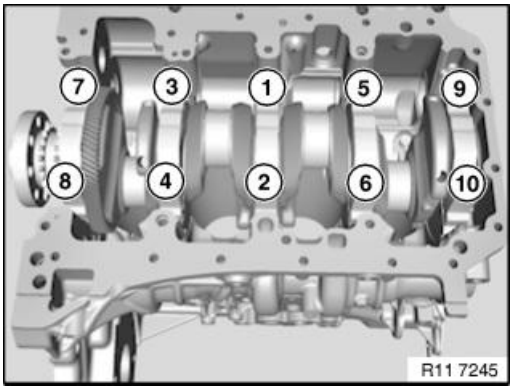
Important!

Do not fit bearing cap in incorrect position.

Risk of damage to moulding on crankcase.

Align bearing cap exactly.

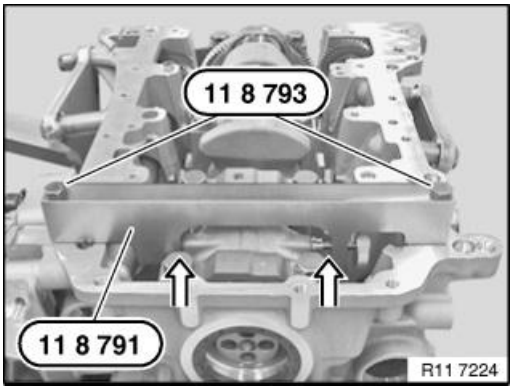
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Fit main bearing bolts.

Tighten main bearing bolts in sequence (1 to 10) (observe tightening specifications).

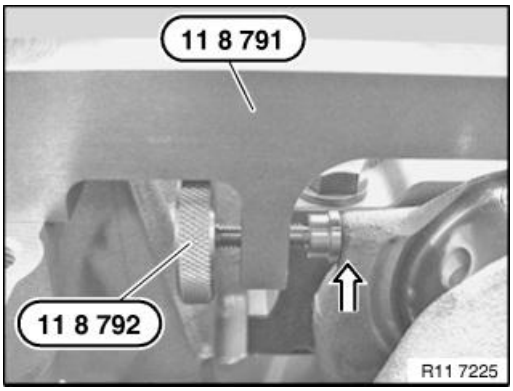
Tightening torque: 11 11 1AZ.



Important!

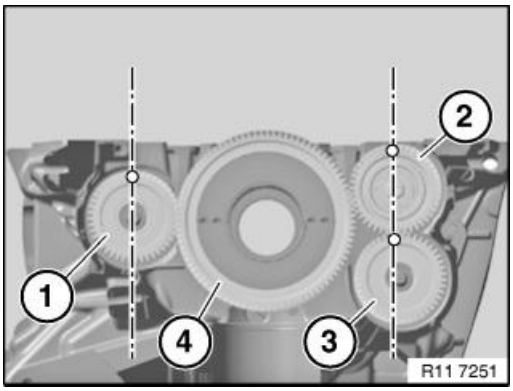
The crankshaft must be fixed in the BDC position of cylinder No. 1 in order to adjust the counterbalance shafts.

Position special tool 11 8 791 on crankcase and secure with special tool 11 8 793 .



Secure crankshaft with knurled screw 11 8 792 on special tool 11 8 791 .

Use special tool 00 2 300 to move engine to vertical position.



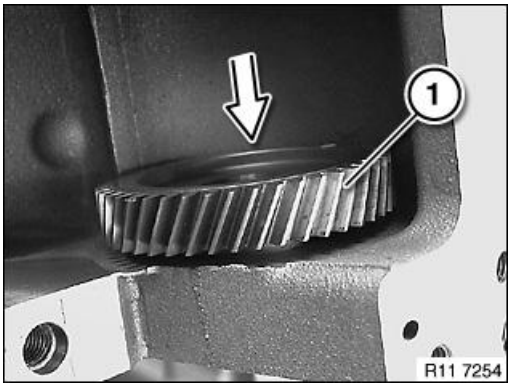
Schematic representation of the differential bevel and intermediate gears.

Important!

To adjust the counterbalance shafts, it is essential to fit a new coated intermediate gearwheel (2).

All marks on the drive gears (1 and 3) and intermediate gearwheel (2) must point vertically to the oil sump sealing surface (upwards).

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Installation note:
To facilitate installation of counterbalance shafts, rotate engine with special tool 00 2 300 to a convenient working position.

Fit gear (1) for right counterbalance shaft in direction of arrow.

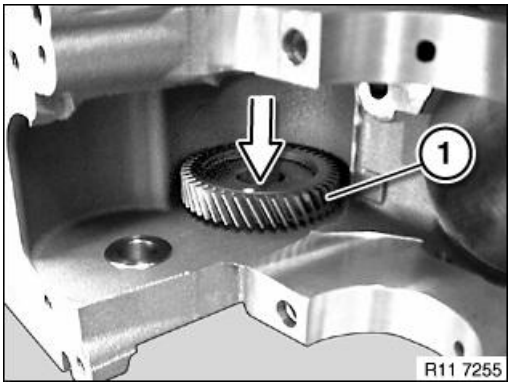
Marks on drive gear counterbalance shaft (1) must point vertically to oil sump sealing surface (upwards).

Note:
For better graphic without crankshaft.

Important!

Risk of mixing up gears.

Pay attention to inclination of tooth flanks.



Fit gear (1) for left counterbalance shaft in direction of arrow.

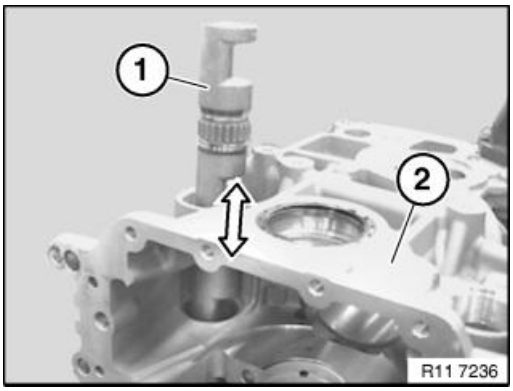
Marking on drive gear (1) must point vertically to oil pan sealing surface (upwards).

Note:
For better graphic without crankshaft.

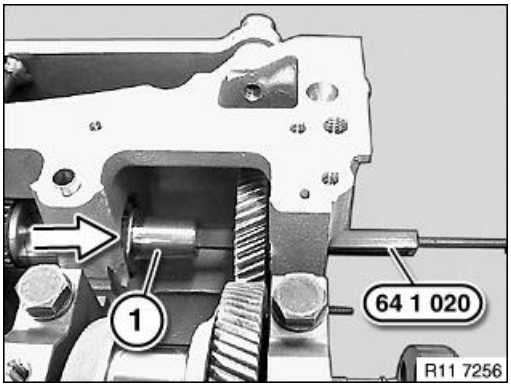
Important!

Risk of mixing up gears.

Pay attention to inclination of tooth flanks.



Insert counterbalance shafts (1) in direction of arrow in crankcase (2).*Note:*
For better graphic without crankshaft.



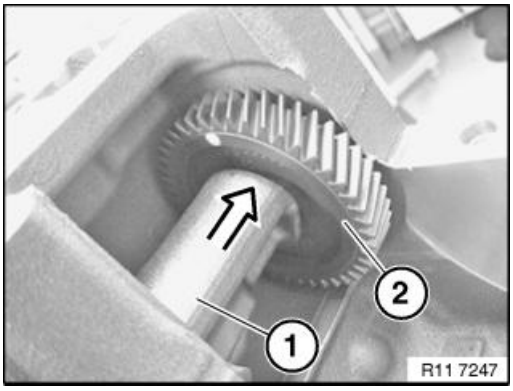
Important!

Do not drop counterbalance shafts into the bearing positions.

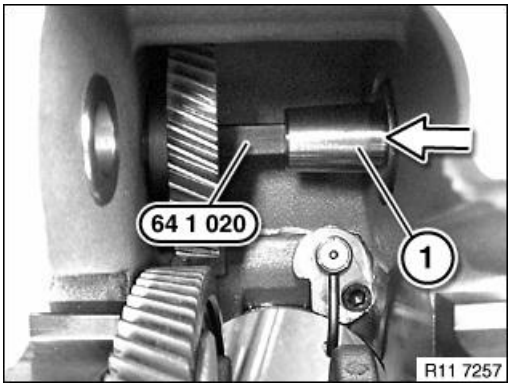
Insert special tool 64 1 020 or a suitable tool through the gear into the counterbalance shaft.

Carefully insert counterbalance shaft (1) into gear in direction of arrow.

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Position counterbalance shaft (1) in direction of arrow in gear (2).*Note:* For better graphic without crankshaft.

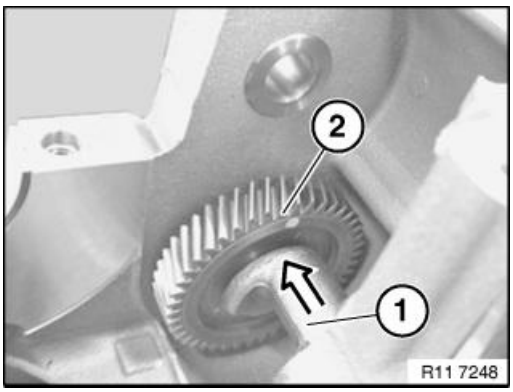


Important!

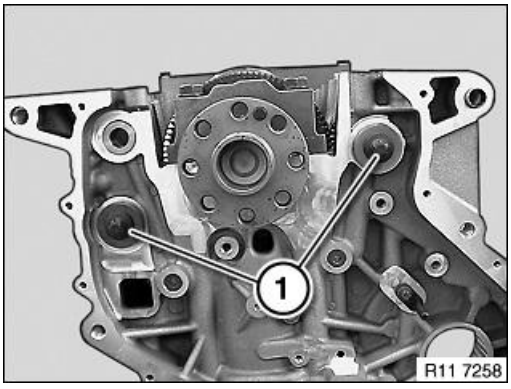
Do not drop counterbalance shafts into the bearing positions.

Insert special tool 64 1 020 or a suitable tool through the gear into the counterbalance shaft.

Carefully insert counterbalance shaft (1) into gear in direction of arrow.



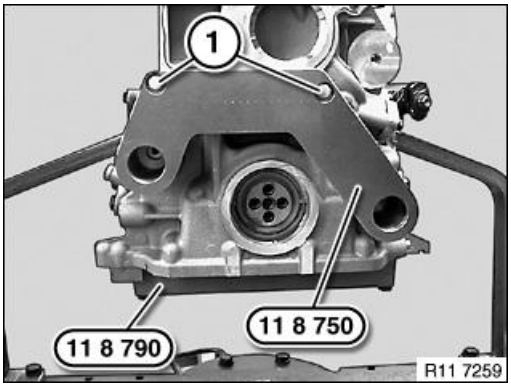
Position counterbalance shaft (1) in direction of arrow in gear (2).*Note:* For better graphic without crankshaft.



Screw both bolts (1) into the counterbalance shafts on the left and right.

Do not tighten both bolts otherwise the counterbalance shafts may jam and it will no longer be possible to position them in the next operation.

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Position both counterbalance shafts.

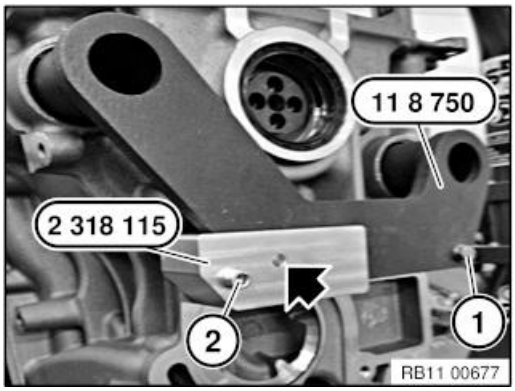
The balance weights of the counterbalance shafts must point to the oil sump. For this purpose, the engine must be moved into the normal position with special tool 00 2 300 .

Both counterbalance shafts together with the balance weights must now face downwards towards the oil sump.

Secure special tool 11 8 750 to the crankcase using the screws (1) for the coolant pump.

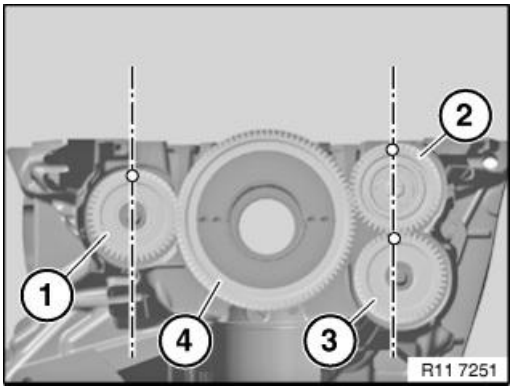
Special tool 11 8 750 can only be attached to the coolant pump on the crankcase using a bolt (1).

Note:
Graphic N47.



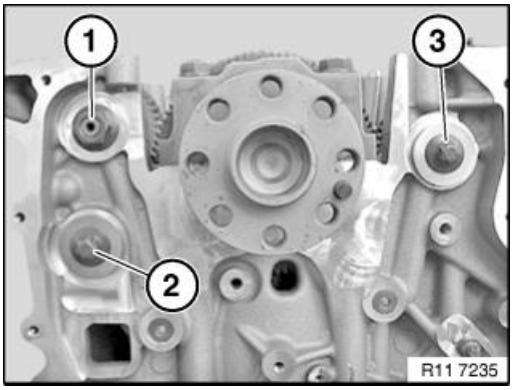
Secure special tool 11 8 750 to crankcase using screw (1) for coolant pump.

Position special tool 2 318 115 on special tool 11 8 750 and secure with screw (2).



Schematic representation of the differential bevel and intermediate gears.

All marks on the drive gears (1 and 3) and intermediate gearwheel (2) must point vertically to the oil sump sealing surface (upwards).



Installation note:
The gear must be loose on the right-hand counterbalance shaft otherwise it will not be possible to install the intermediate gearwheel.

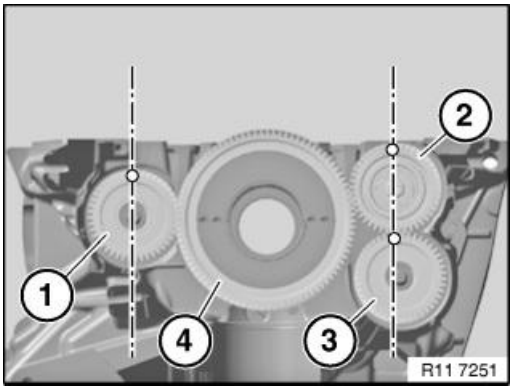
Install new intermediate gearwheel with coating.

Install intermediate gearwheel.

Secure bolt for counterbalance shafts (2 and 3) using special tool 00 9 120 .

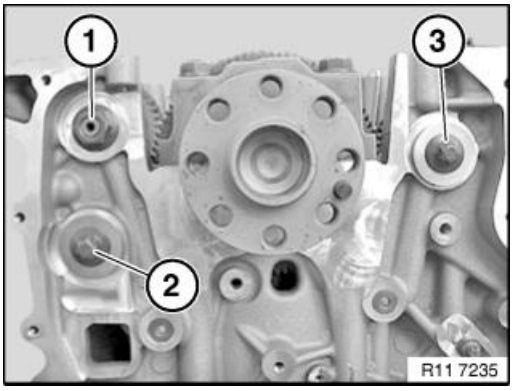
Tightening torque: 11 27 1AZ.

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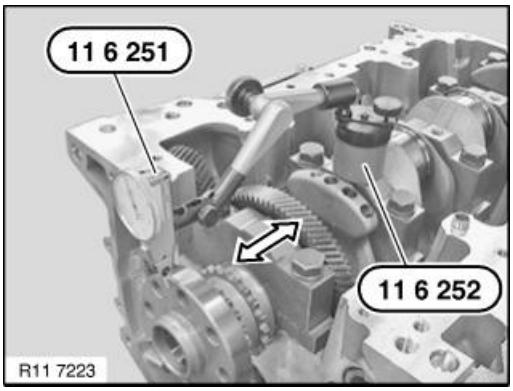
Important!

Before the intermediate gear (2) is secured, the intermediate gear (2) must be pressed hand-tight onto the **gearing** of the crankshaft (4) and counterbalance shaft (3) until zero-lash is achieved in both gears.



Tighten nut (1).

Tightening torque: 11 27 2AZ.



Check side clearance.

Assemble engine.

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11 21 500 Replacing crankshaft (N47 D20 O1) as from 6/2013



Special tools required:

- 00 2 300
- 00 9 120
- 11 6 250
- 11 8 750
- 11 8 791
- 11 8 792
- 11 8 793
- 11 8 870
- 64 1 020
- 2 288 054



Important!

Replace main and connecting rod bolts.

There must be no oil in the blind holes **(risk of cracking)**.

Do not wash off bolt coating.

Incorrect assembly of the bearing caps will result in damage to the crankcase.

It is necessary to remove the counterbalance shafts (AGW) in order to remove the crankshaft.

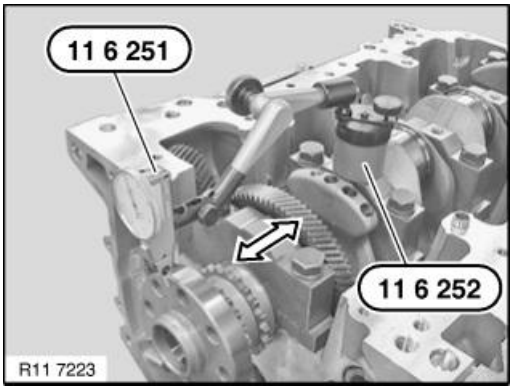
To properly adjust the counterbalance shafts, a new, coated intermediate gear must always be fitted.



Necessary preliminary tasks:

- Remove engine.
- Mount engine on assembly stand.
- Remove cylinder head.
- Remove coolant pump.
- Remove oil pump.
- Remove end cover at rear.
- Remove both timing chains.
- Remove all pistons.

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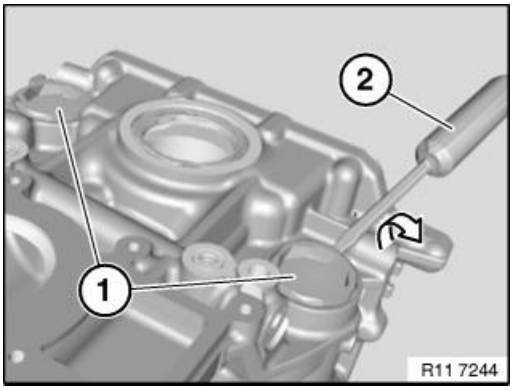
Check crankshaft side clearance.

Fit special tool 11 6 250 .

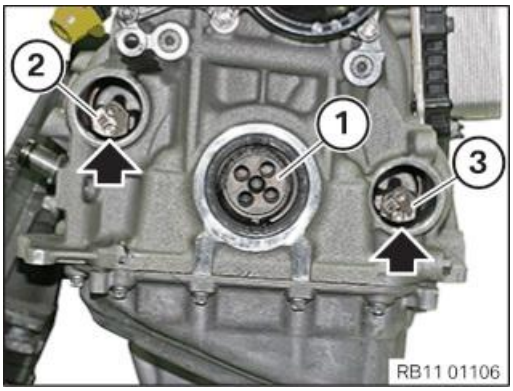
Side clearance.

If the permitted side clearance is exceeded:

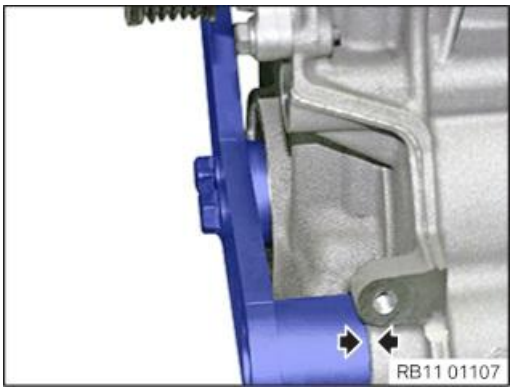
- Check crankshaft and guide bearing shells.
- Replace worn component.



Remove sealing caps (1) with a suitable tool (2).*Installation note:* Replace sealing cap with O-ring.



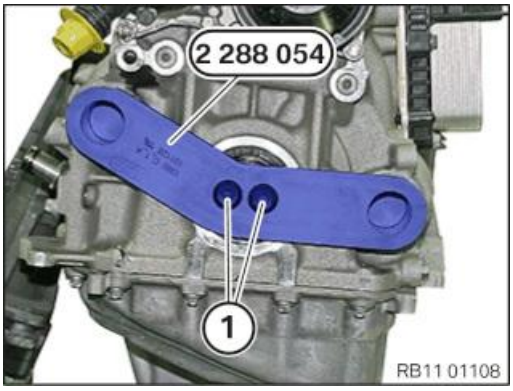
Turn crankshaft (1) to top dead centre until the counterbalance shafts (2 and 3) are facing down with the locating bore (see arrow).



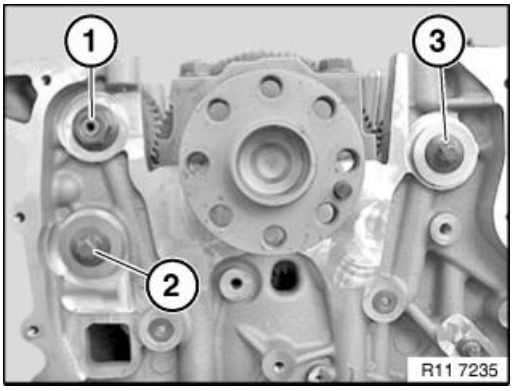
Turn crankshaft until special tool 2 288 054 engages in the counterbalance shaft.

See arrows.

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Secure special tool 2 288 054 to the crankshaft with screws (1).

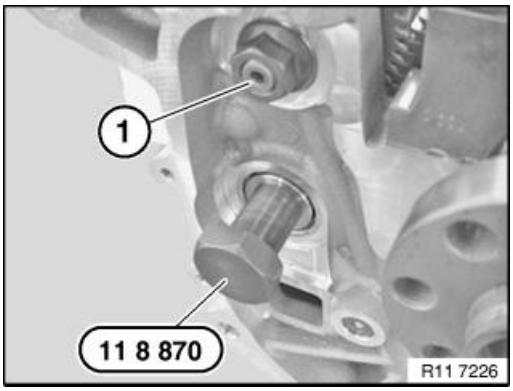


Slacken nut (1).

Tightening torque: 11 27 2AZ.

Undo screws (2 and 3)

Tightening torque: 11 27 1AZ



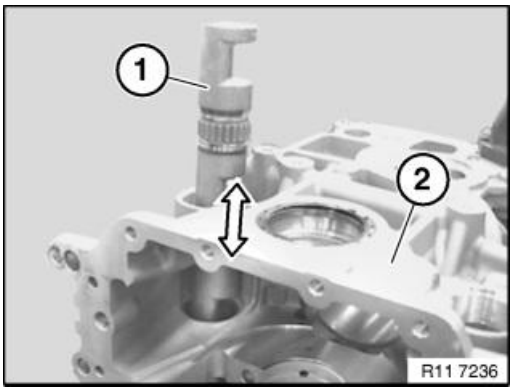
Remove nut from intermediate gearwheel (1).

Remove intermediate gearwheel (1).

Note:
The gear is pressed onto the counterbalance shaft with a taper and can only be released with special tool 11 8 870 .

Once the gear has been released from the counterbalance shaft, special tool 11 8 870 can be unscrewed again by hand.

Screw special tool 11 8 870 into counterbalance shaft gear, thereby releasing counterbalance shafts from the gears.



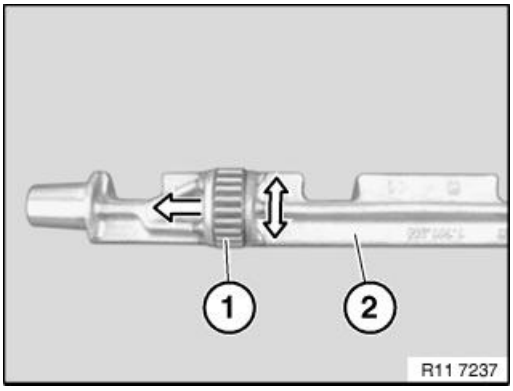
Important!

Risk of damage! on crankcase.

Use special tool 00 2 300 to move engine to vertical position.

Remove counterbalance shaft (1) in upward direction of arrow from crankcase (2).*Note:*
Shown with crankshaft removed for clearer illustration.

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Important!

Danger of mixing up needle bearings.

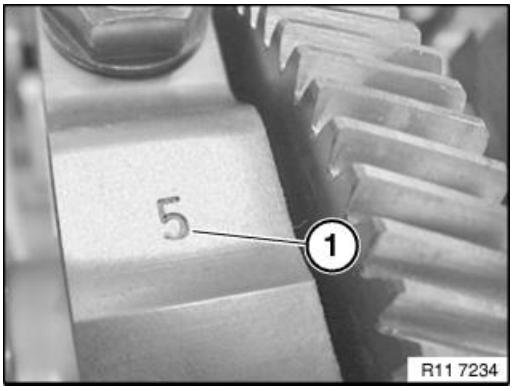
Needle bearings have different diameters.

See BMW Parts Department for information on diameters.

Release needle bearing (1) in direction of arrow.

Remove released needle bearing (1) from counterbalance shaft (2) in direction of arrow.

Check counterbalance shaft (2) for wear at the bearing position and replace if necessary.

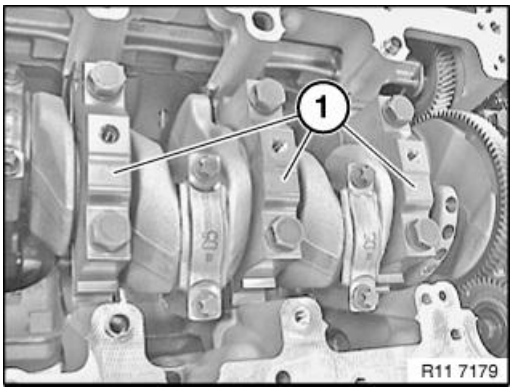


Note:

Bearing caps (1) 1...5 are marked on the exhaust side.

Bearing cap 3 is installed as a thrust bearing.

Note:
Graphic at bearing seat number 5.



Release main bearing screw connection of main bearing cap (1).

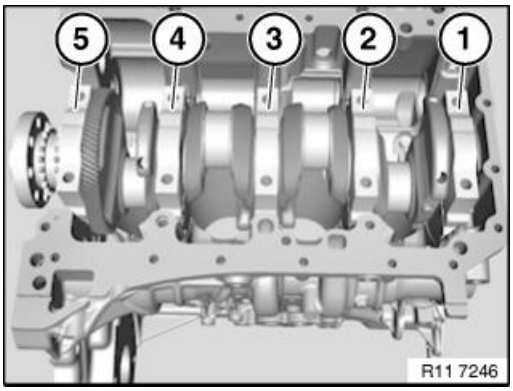
Remove main bearing cap 1...5.

Important!

With the assistance of a second person, remove crankshaft and carefully place to one side.

Pay attention to oil hole in bearing shell.

Pay attention to installation position of crankshaft main bearing shells.



Oil bearing shell.

Install crankshaft.

Fit bearing caps 1 to 5 so that the ID codes always point to the exhaust side.

Both locating grooves of bearing shells in crankcase and on bearing cap must be mounted on one side.

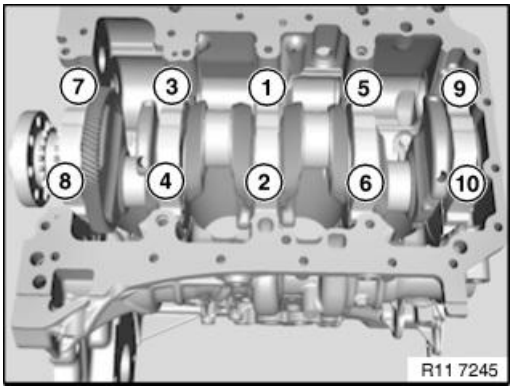
Important!

Do not fit bearing cap in incorrect position.

Risk of damage to moulding on crankcase.

Align bearing cap exactly.

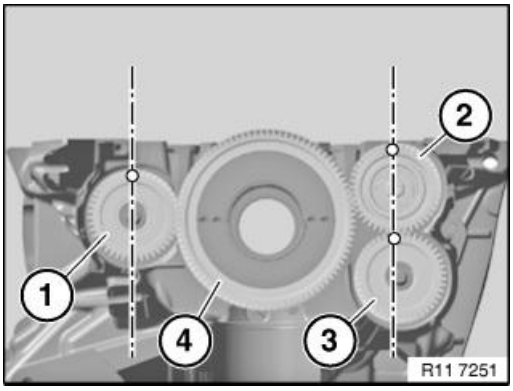
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Fit main bearing bolts.

Tighten main bearing bolts in sequence (1 to 10) (observe tightening specifications).

Tightening torque: 11 11 1AZ.

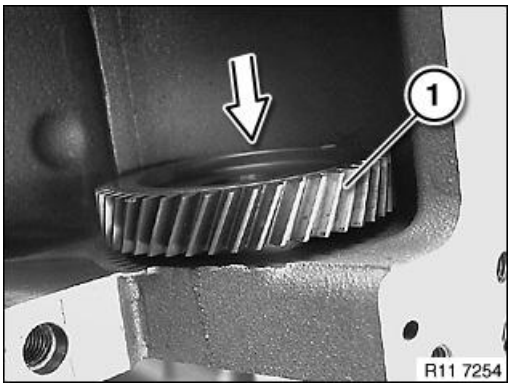


Schematic representation of the differential bevel and intermediate gears.

Important!

To adjust the counterbalance shafts, it is essential to fit a new coated intermediate gearwheel (2).

All marks on the drive gears (1 and 3) and intermediate gearwheel (2) must point vertically to the oil sump sealing surface (upwards).



Installation note:
To facilitate installation of counterbalance shafts, rotate engine with special tool 00 2 300 to a convenient working position.

Fit gear (1) for right counterbalance shaft in direction of arrow.

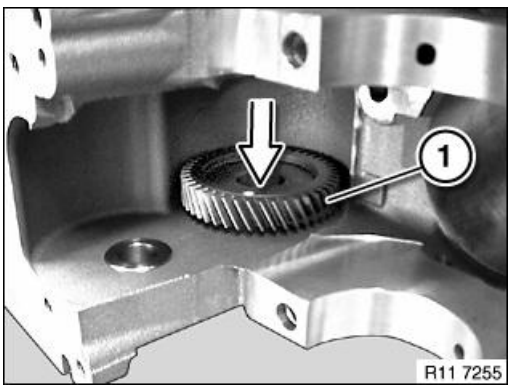
Marks on drive gear counterbalance shaft (1) must point vertically to oil sump sealing surface (upwards).

Note:
For better graphic without crankshaft.

Important!

Risk of mixing up gears.

Pay attention to inclination of tooth flanks.



Fit gear (1) for left counterbalance shaft in direction of arrow.

Marking on drive gear (1) must point vertically to oil pan sealing surface (upwards).

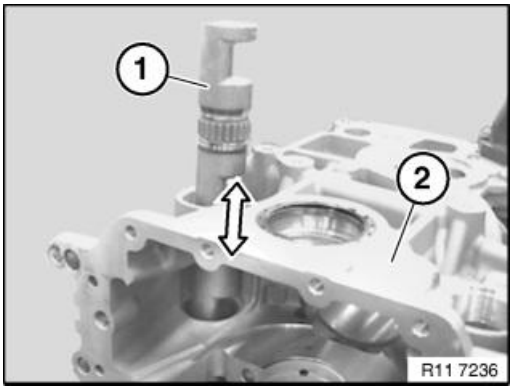
Note:
For better graphic without crankshaft.

Important!

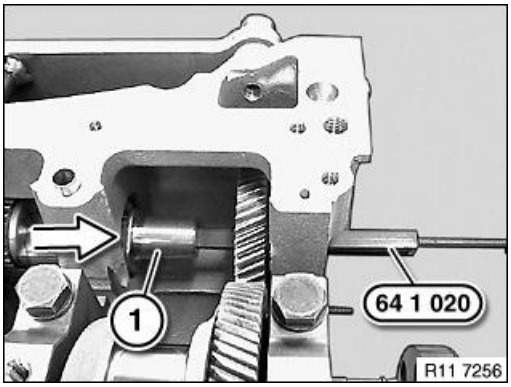
Risk of mixing up gears.

Pay attention to inclination of tooth flanks.

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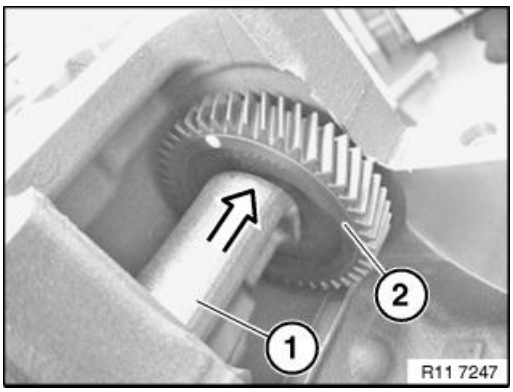
Insert counterbalance shafts (1) in direction of arrow in crankcase (2).*Note:*
For better graphic without crankshaft.



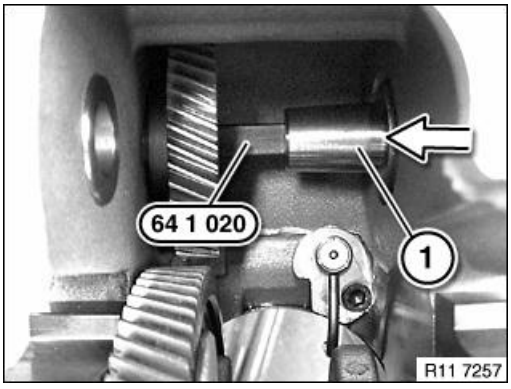
Important!
Do not drop counterbalance shafts into the bearing positions.

Insert special tool 64 1 020 or a suitable tool through the gear into the counterbalance shaft.

Carefully insert counterbalance shaft (1) into gear in direction of arrow.



Position counterbalance shaft (1) in direction of arrow in gear (2).*Note:*
For better graphic without crankshaft.

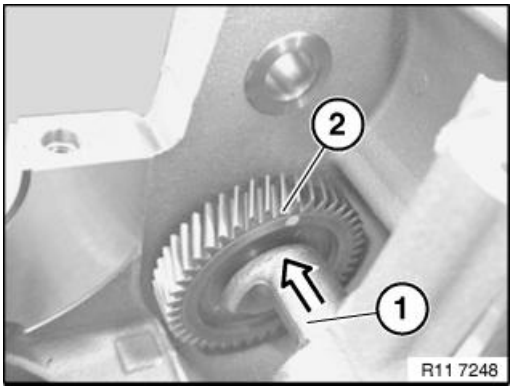


Important!
Do not drop counterbalance shafts into the bearing positions.

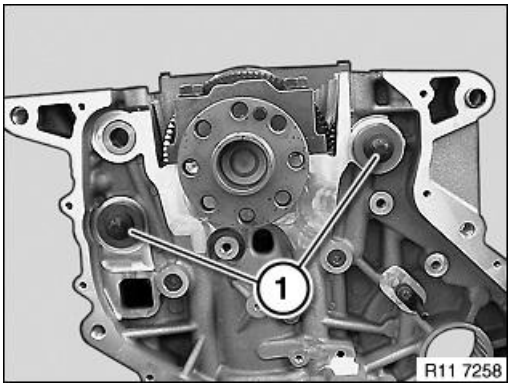
Insert special tool 64 1 020 or a suitable tool through the gear into the counterbalance shaft.

Carefully insert counterbalance shaft (1) into gear in direction of arrow.

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Position counterbalance shaft (1) in direction of arrow in gear (2).*Note:* For better graphic without crankshaft.



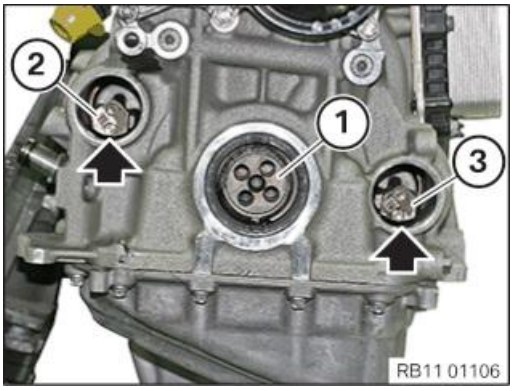
Screw both bolts (1) into the counterbalance shafts on the left and right.

Do not tighten both bolts otherwise the counterbalance shafts may jam and it will no longer be possible to position them in the next operation.

The balance weights of the counterbalance shafts must point to the oil sump. For this purpose, the engine must be moved into the normal position with special tool 00 2 300 .



Prepare special tool 2 288 054 .

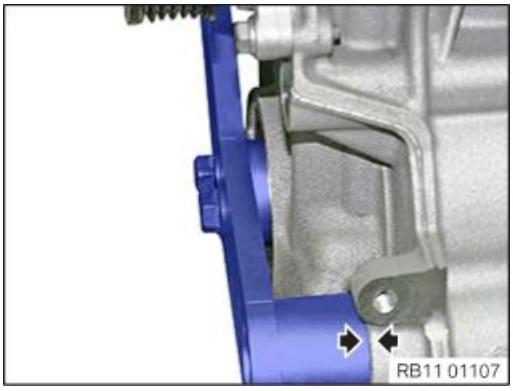


Adjust crankshaft (1) in first cylinder top dead centre.

Turn counterbalance shafts (2 and 3) to installation position (see arrows).

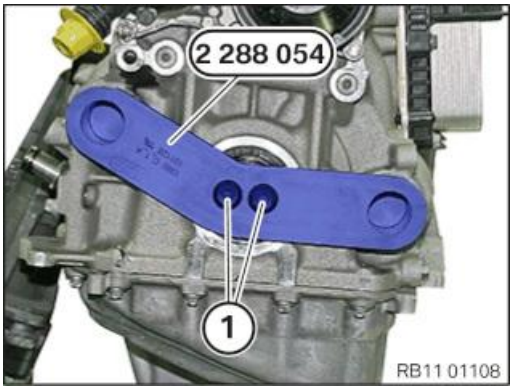
Both counterbalance shafts together with the balance weights must now face downwards towards the oil sump.

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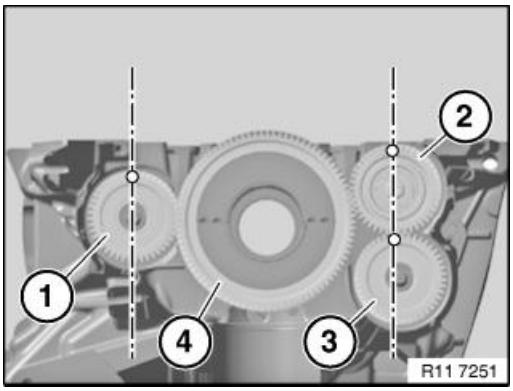
Position both counterbalance shafts.

Position special tool 2 288 054 so that there is no gap.



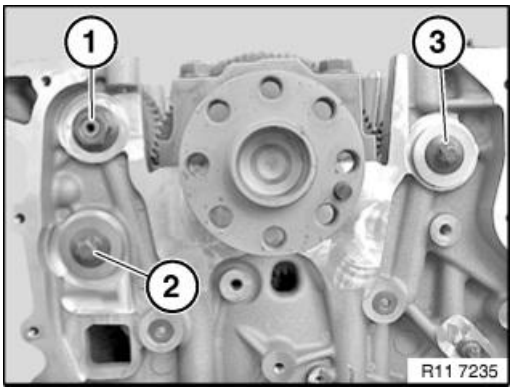
Screw special tool 2 288 054 into the crankshaft with 20 Nm with screws (1).

The crankshaft and counterbalance shafts are now positioned.



Schematic representation of the differential bevel and intermediate gears.

All marks on the drive gears (1 and 3) and intermediate gearwheel (2) must point vertically to the oil sump sealing surface (upwards).



Installation note:
The gear must be loose on the right-hand counterbalance shaft otherwise it will not be possible to install the intermediate gearwheel.

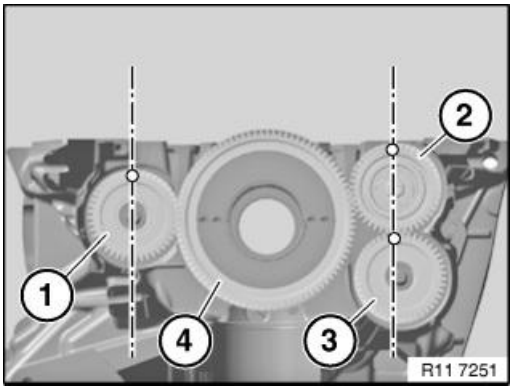
Install new intermediate gearwheel with coating.

Install intermediate gearwheel.

Secure bolt for counterbalance shafts (2 and 3) using special tool 00 9 120 .

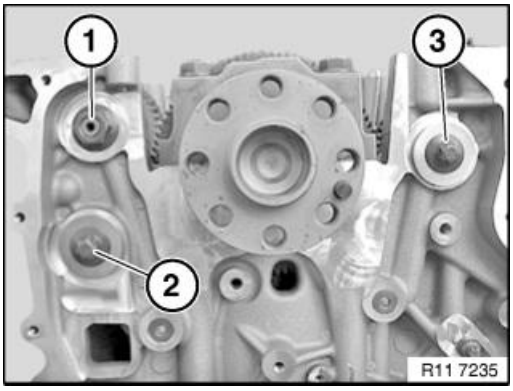
Tightening torque: 11 27 1AZ.

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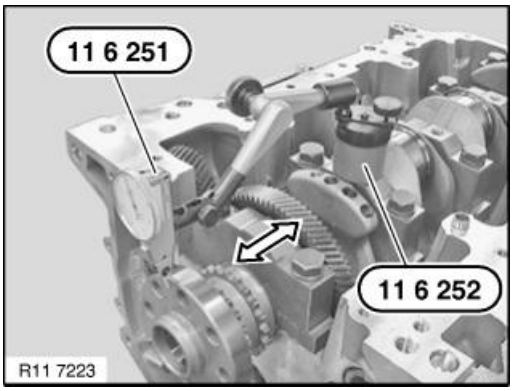
Important!

Before the intermediate gear (2) is secured, the intermediate gear (2) must be pressed hand-tight onto the **gearing** of the crankshaft (4) and counterbalance shaft (3) until zero-lash is achieved in both gears.



Tighten nut (1).

Tightening torque: 11 27 2AZ.



Check side clearance.

Assemble engine.

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11 21 500 Replacing crankshaft (N47, N47S)

Special tools required:

- 00 2 300
- 00 9 120
- 11 6 250
- 11 8 750
- 11 8 870
- 64 1 020
- 11 8 790

Important!

Replace main and connecting rod bolts.

There must be no oil in the blind holes **(risk of cracking)**.

Do not wash off bolt coating.

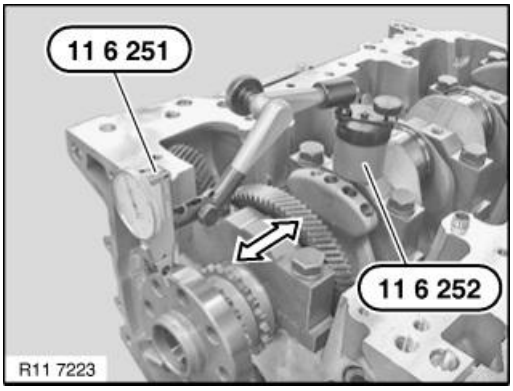
Incorrect assembly of the bearing caps will result in damage to the crankcase.

It is necessary to remove the counterbalance shafts (AGW) in order to remove the crankshaft.

To properly adjust the counterbalance shafts, a new, coated intermediate gear must always be fitted.

Necessary preliminary tasks:

- Remove engine.
- Mount engine on assembly stand.
- Remove cylinder head.
- Remove oil pump.
- Remove end cover at rear.
- Remove timing chain.
- Remove all pistons.
- Remove coolant pump



Check crankshaft side clearance.

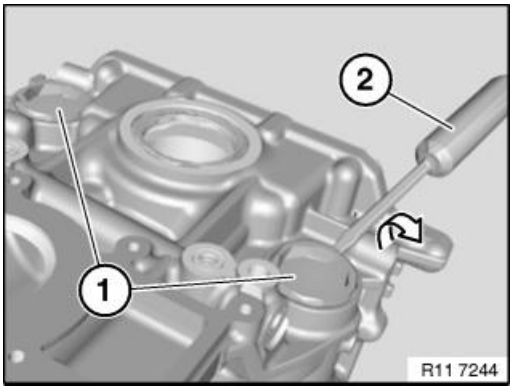
Fit special tool 11 6 250 .

Side clearance.

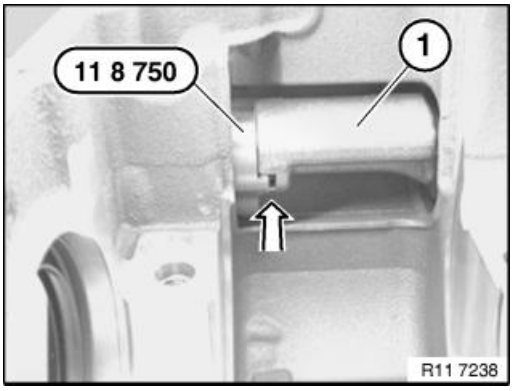
If the permitted side clearance is exceeded:

- Check crankshaft and guide bearing shells.
- Replace work parts.

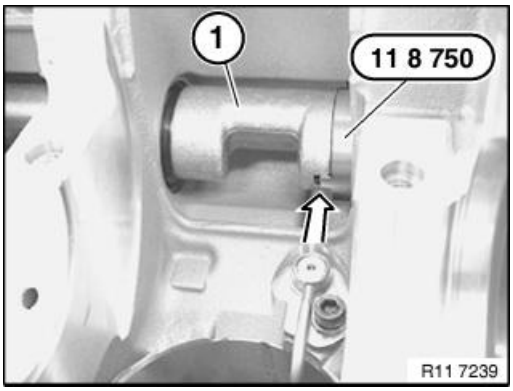
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Remove sealing caps (1) with a suitable tool (2).*Installation note:*
Replace sealing cap with O-ring.



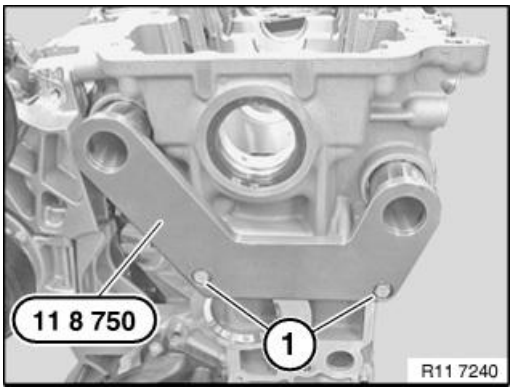
Turn crankshaft until special tool 11 8 750 engages in left counterbalance shaft (1) (see arrow).*Note:*
Figure shows crankshaft removed.



Turn crankshaft until special tool 11 8 750 engages in right counterbalance shaft (1).

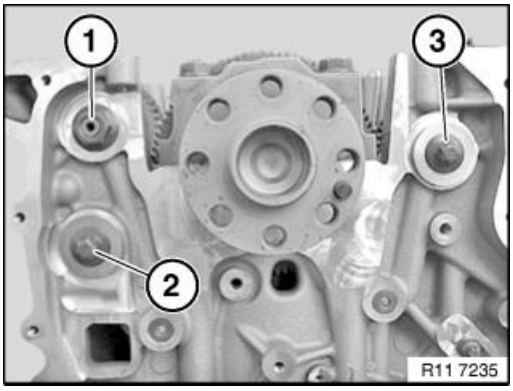
See arrow.

Note:
Graphic shows crankshaft removed.



Secure special tool 11 8 750 to crankcase using two bolts (1) for coolant pump.

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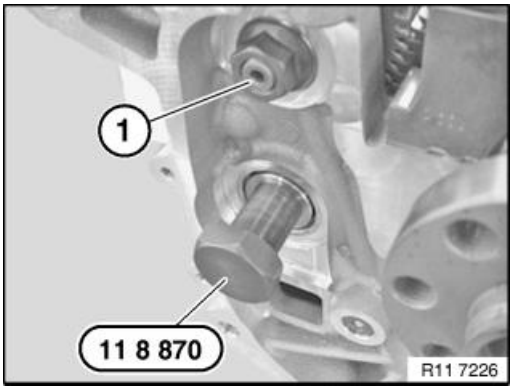


Slacken nut (1).

Tightening torque: 11 27 2AZ.

Undo screws (2 and 3)

Tightening torque: 11 27 1AZ



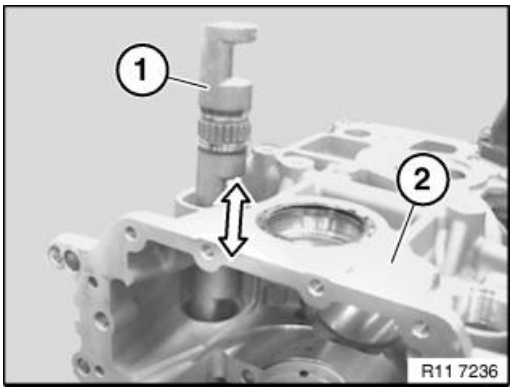
Remove nut from intermediate gearwheel (1).

Remove intermediate gearwheel (1).

Note:
The gear is pressed onto the counterbalance shaft with a taper and can only be released with special tool 11 8 870 .

Once the gear has been released from the counterbalance shaft, special tool 11 8 870 can be unscrewed again by hand.

Screw special tool 11 8 870 into counterbalance shaft gear and release counterbalance shafts from gears.

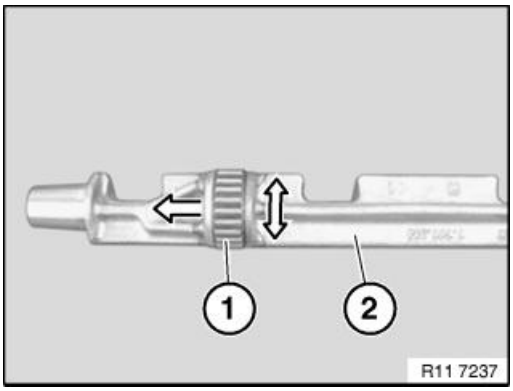


Important!

Risk of damage! on crankcase.

Use special tool 00 2 300 to move engine to vertical position.

Remove counterbalance shaft (1) in upward direction of arrow from crankcase (2).*Note:*
Shown with crankshaft removed for clearer illustration.



Important!

Danger of mixing up needle bearings.

Needle bearings have different diameters.

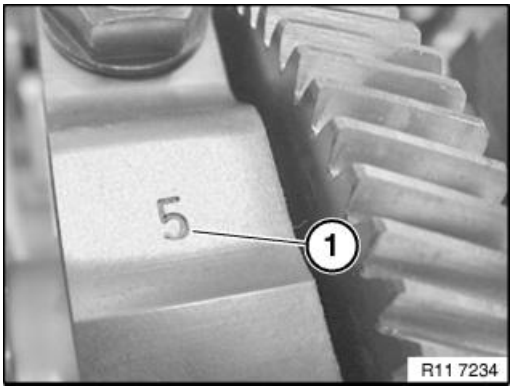
See BMW Parts Department for information on diameters.

Release needle bearing (1) in direction of arrow.

Remove released needle bearing (1) from counterbalance shaft (2) in direction of arrow.

Check counterbalance shaft (2) for wear at the bearing position and replace if necessary.

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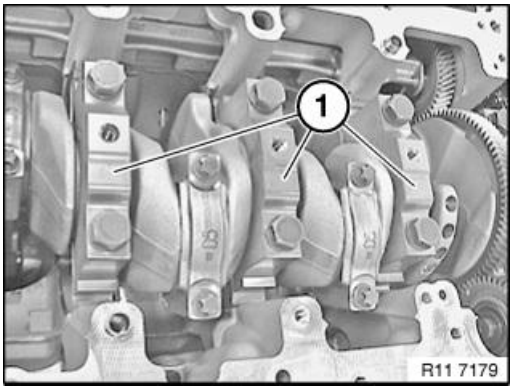


Note:

Bearing caps 1...5 are marked on the exhaust side.

Bearing cap 3 is installed as a thrust bearing.

Note:
Graphic at bearing seat number 5.



Release main bearing screw connection of main bearing cap (1).

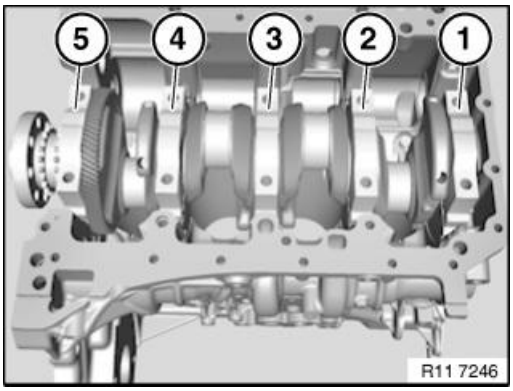
Remove main bearing cap 1...5.

Important!

With the assistance of a second person, remove crankshaft and carefully place to one side.

Pay attention to oil hole in bearing shell.

Pay attention to installation position of crankshaft main bearing shells.



Coat bearing shells with oil.

Install crankshaft.

Fit bearing caps 1 to 5 so that the ID codes always point to the exhaust side.

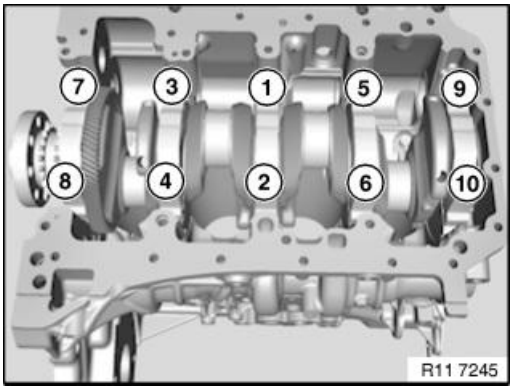
Both locating grooves of bearing shells in crankcase and on bearing cap must be mounted on one side.

Important!

Do not fit bearing cap in incorrect position.

Risk of damage to moulding on crankcase.

Align bearing cap exactly.

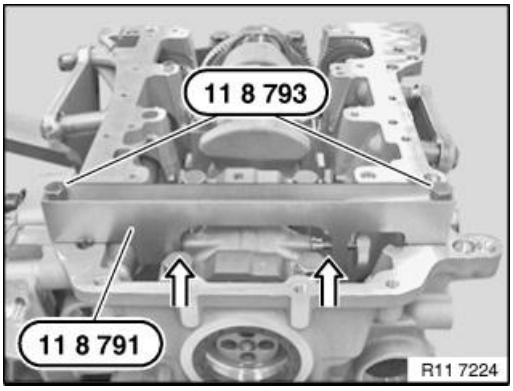


Fit main bearing bolts.

Tighten main bearing bolts in sequence (1 to 10) (observe tightening specifications).

Tightening torque: 11 11 1AZ.

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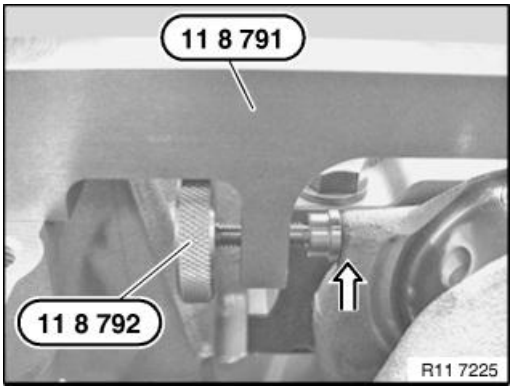


Important!

The crankshaft must be fixed in the BDC position of cylinder No. 1 in order to adjust the counterbalance shafts.

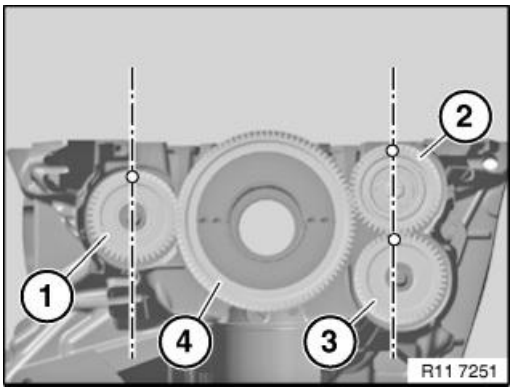
Position special tool 11 8 791 on crankcase and secure with special tool 11 8 793.

Both special tools are contained in set 11 8 790 .



Fix crankshaft with knurled screw 11 8 792 on special tool 11 8 791.

Use special tool 00 2 300 to move engine to vertical position.

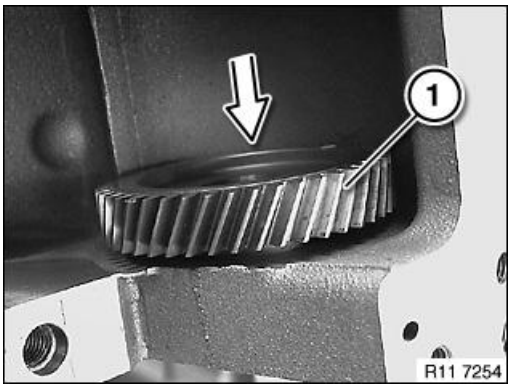


Schematic representation of the differential bevel and intermediate gears.

Important!

To adjust the counterbalance shafts, it is essential to fit a new coated intermediate gearwheel.

All marks on the drive gears (1 and 3) and intermediate gearwheel (2) must point vertically to the oil sump sealing surface (upwards).



Installation note:
To facilitate installation of counterbalance shafts, rotate engine with special tool 00 2 300 to a convenient working position.

Fit gear (1) for right counterbalance shaft in direction of arrow.

Marks on drive gear counterbalance shaft (1) must point vertically to oil sump sealing surface (upwards).

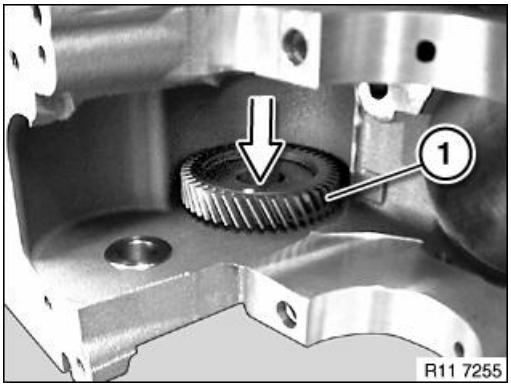
Note:
For better graphic without crankshaft.

Important!

Risk of mixing up gears.

Pay attention to inclination of tooth flanks.

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Fit gear (1) for left counterbalance shaft in direction of arrow.

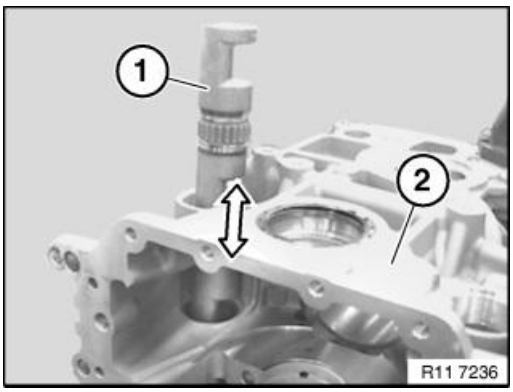
Marking on drive gear (1) must point vertically to oil pan sealing surface (upwards).

Note:
For better graphic without crankshaft.

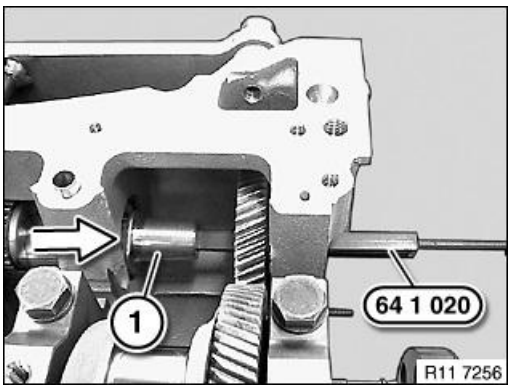
Important!

Risk of mixing up gears.

Pay attention to inclination of tooth flanks.



Insert counterbalance shafts (1) in direction of arrow in crankcase (2).*Note:*
For better graphic without crankshaft.

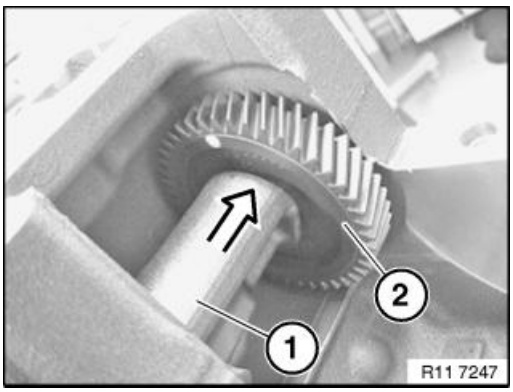


Important!

Do not drop counterbalance shafts into the bearing positions.

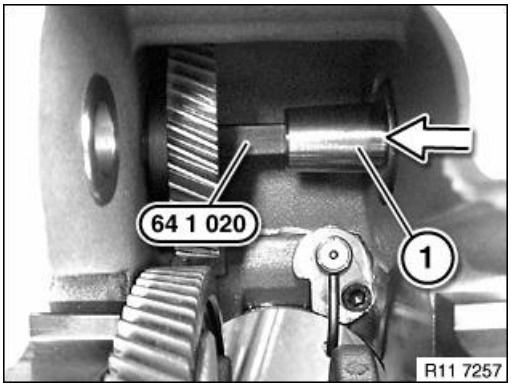
Insert special tool 64 1 020 into counterbalance shaft through gear.

Carefully insert counterbalance shaft (1) into gear in direction of arrow.



Position counterbalance shaft (1) in direction of arrow in gear (2).*Note:*
For better graphic without crankshaft.

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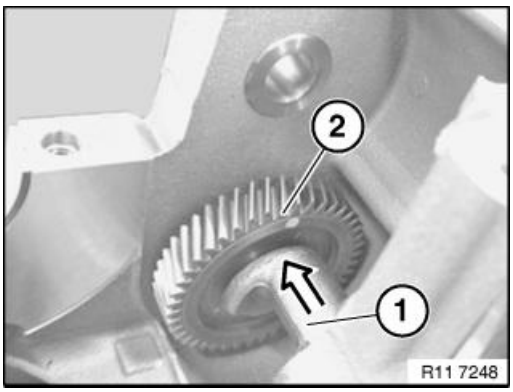


Important!

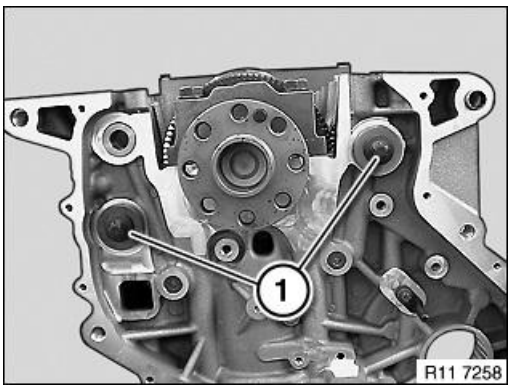
Do not drop counterbalance shafts into the bearing positions.

Insert special tool 64 1 020 into counterbalance shaft through gear.

Carefully insert counterbalance shaft (1) into gear in direction of arrow.

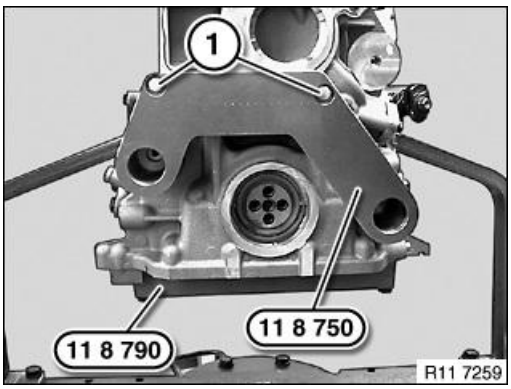


Position counterbalance shaft (1) in direction of arrow in gear (2).*Note:* For better graphic without crankshaft.



Screw both bolts (1) into the counterbalance shafts on the left and right.

Do not tighten both bolts otherwise the counterbalance shafts may jam and it will no longer be possible to position them in the next operation.



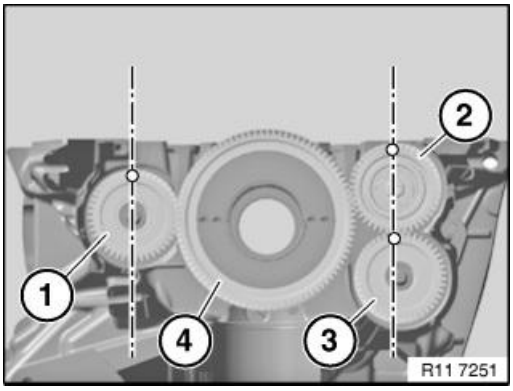
Position both counterbalance shafts.

The balance weights of the counterbalance shafts must point to the oil sump. For this purpose, the engine must be moved into the normal position with special tool 00 2 300 .

Both counterbalance shafts together with the balance weights must now face downwards towards the oil sump.

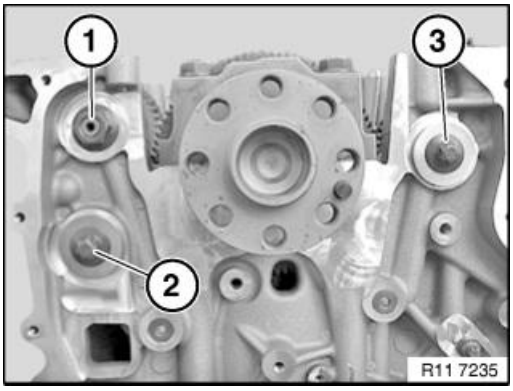
Secure special tool 11 8 750 to the crankcase using the screws (1) for the coolant pump.

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Schematic representation of the differential bevel and intermediate gears.

All marks on the drive gears (1 and 3) and intermediate gearwheel (2) must point vertically to the oil sump sealing surface (upwards).



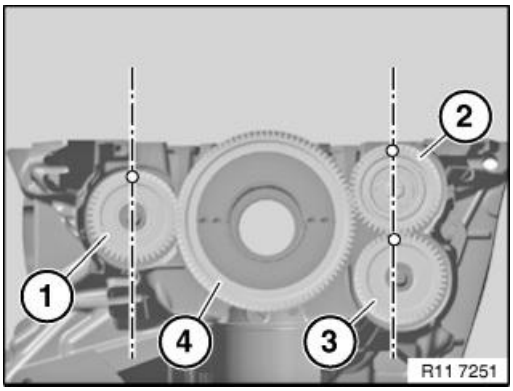
Installation note:
The gear must be loose on the right-hand counterbalance shaft otherwise it will not be possible to install the intermediate gearwheel.

Install new intermediate gearwheel with coating.

Install intermediate gearwheel.

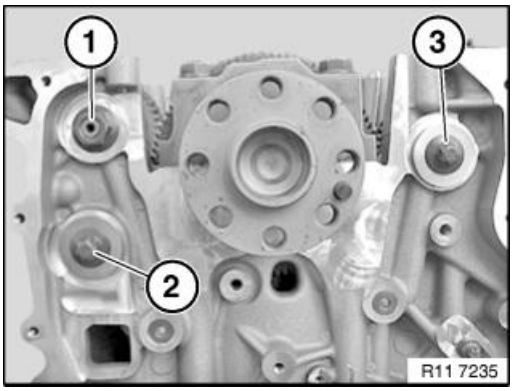
Secure bolt for counterbalance shafts (2 and 3) using special tool 00 9 120 .

Tightening torque: 11 27 1AZ.



Important!

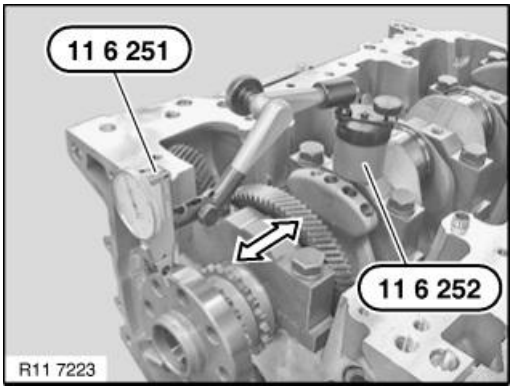
Before the intermediate gear (2) is secured, the intermediate gear (2) must be pressed hand-tight onto the **gearing** of the crankshaft (4) and counterbalance shaft (3) until zero-lash is achieved in both gears.



Tighten nut (1).

Tightening torque: 11 27 2AZ.

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Check side clearance.

Assemble engine.

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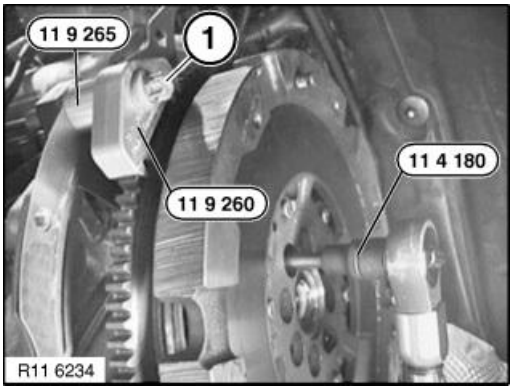
11 22 000 Removing and installing/replacing flywheel (N47 D20 O1)

Special tools required:

- 11 4 180
- 11 9 260
- 11 9 263
- 11 9 264
- 11 9 265

Necessary preliminary tasks:

- Disconnect negative battery terminal.
- Remove and install front and rear assembly underbody protection.
- Remove clutch.
- Remove and install transmission.



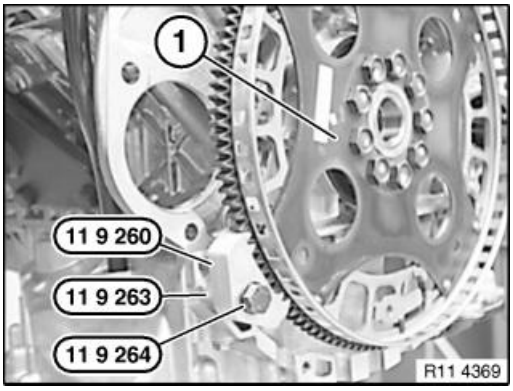
Manual gearbox.

Secure flywheel with special tool 11 9 260 / 11 9 265 .

Attach special tool 11 9 260 to the crankcase with a gearing screw (1).

Release flywheel studs with special tool 11 4 180 /

Tightening torque: 11 22 2AZ.



Automatic transmission.

Secure flywheel (1) with special tool 11 9 260 / 11 9 263 / 11 9 264 .

Unfasten flywheel studs.

Tightening torque: 11 22 1AZ.

Assemble engine.

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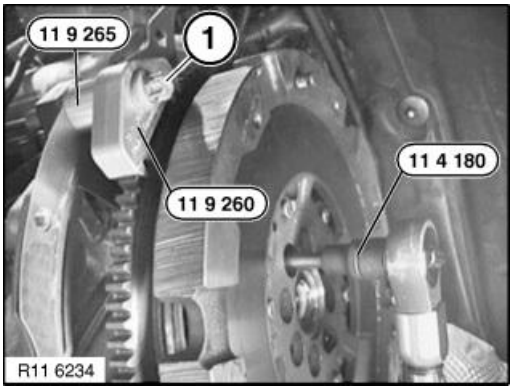
11 22 000 Removing and installing/replacing flywheel (N47, N47S)

Special tools required:

- 11 4 180
- 11 9 260
- 11 9 263
- 11 9 264
- 11 9 265

Necessary preliminary tasks:

- Disconnect negative battery terminal.
- Remove and install front assembly underside protection.
- Remove and install complete exhaust system.
- Remove and install reinforcing plate.
- Remove and install transmission.
- Manual gearbox: Remove clutch.

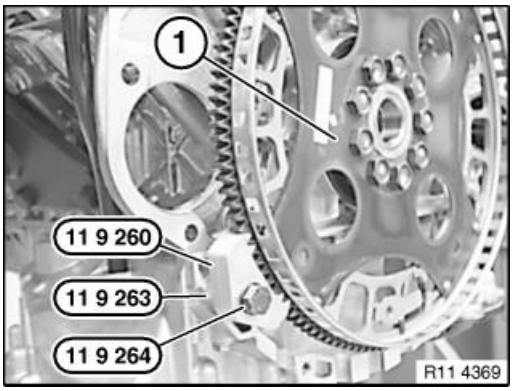


Manual gearbox.

Secure flywheel with transmission bolt (1) and special tool 11 9 260 / 11 9 265 .

Release flywheel studs with special tool 11 4 180 /

Tightening torque: 11 22 1AZ.



Automatic transmission.

Secure flywheel (1) with special tool 11 9 260 / 11 9 263 / 11 9 264 .

Unfasten flywheel bolts.

Tightening torque: 11 22 1AZ.

Assemble engine.

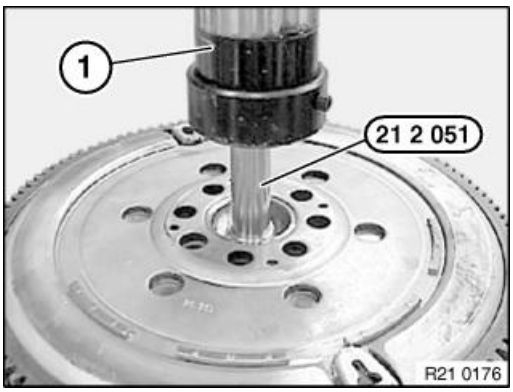
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11 22 513 Replacing roller bearing for dual-mass flywheel (N47 D20 O1)

Special tools required:

- 21 2 051
- 21 2 052

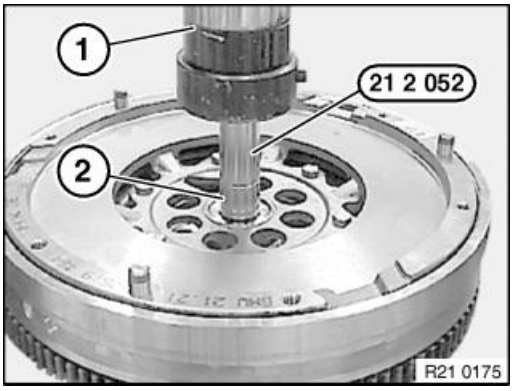
Note:
Flywheel removed!



Using hydraulic press (1) and special tool 21 2 051 , press roller bearing out of dual-mass flywheel downwards on engine side.**Important!**

Risk of damage:

Roller bearing must not be driven out.



Push roller bearing (2) onto special tool 21 2 052 .

Using hydraulic press (1), press roller bearing into dual-mass flywheel as far as it will go on clutch side.

Important!

Risk of damage:

Observe press-in instruction:

- Roller bearing must not be driven in.
- Roller bearing mounting force/travel monitored:

  Min. 2000 N 1 mm before end of pressing in.

  Max. 15,000 N during entire press-in procedure.

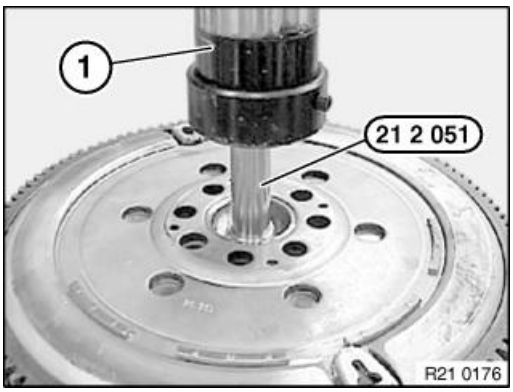
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11 22 513 Replacing roller bearing for dual-mass flywheel (N47 N47S)

Special tools required:

- 21 2 051
- 21 2 052

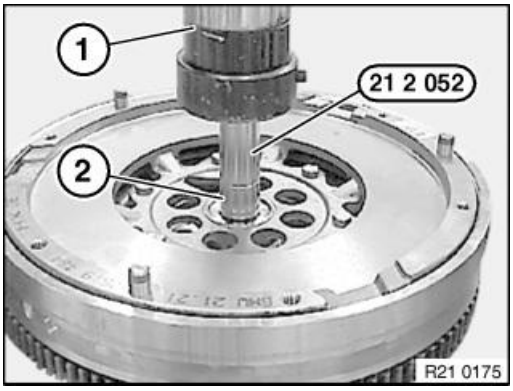
Note:
Flywheel removed!



Using hydraulic press (1) and special tool 21 2 051 , press roller bearing out of dual-mass flywheel downwards on engine side.**Important!**

Risk of damage:

Roller bearing must not be driven out.



Push roller bearing (2) onto special tool 21 2 052 .

Using hydraulic press (1), press roller bearing into dual-mass flywheel to limit position on clutch side.

Important!

Risk of damage:

Observe press-in instruction:

- Roller bearing must not be driven in.
- Roller bearing mounting force/travel monitored:

  Min. 2000 N 1 mm before end of pressing in.

  Max. 15,000 N during entire press-in procedure.

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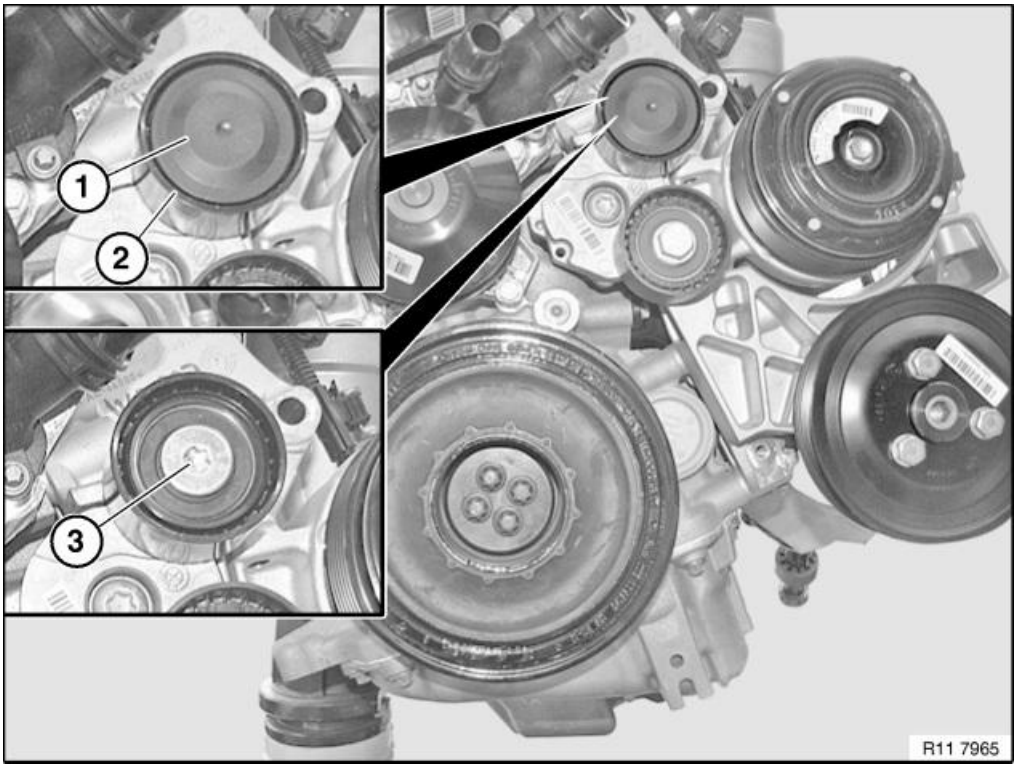
11 23 010 Removing and installing/replacing vibration damper (N47 D20 O1)

Special tools required:

- 11 6 480
- 11 7 221
- 11 7 222
- 11 7 223

Necessary preliminary work:

- Remove acoustic cover
- Remove acoustic cover at front for belt drive, only F10, F11.
- Remove drive belt for alternator.

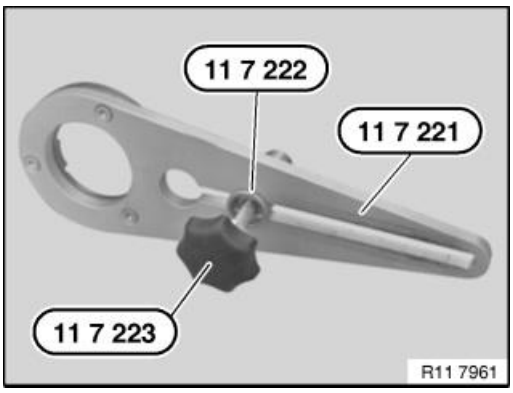


Using a suitable tool, remove the protective cap (1) from deflecting element (2).

Release screw (3).

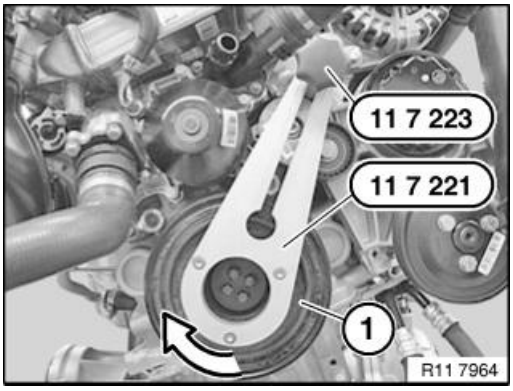
Tightening torque 11 00 4AZ.

Remove deflecting element (2).



Assemble special tool 11 7 221 with special tool 11 7 222 and 11 7 223

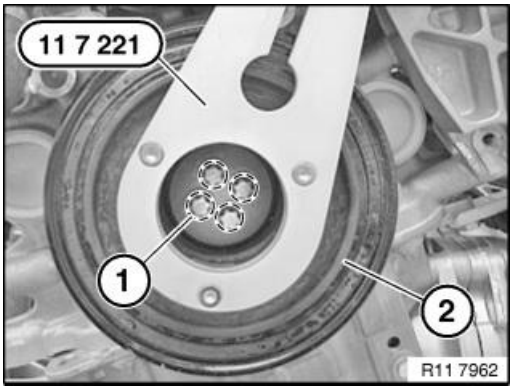
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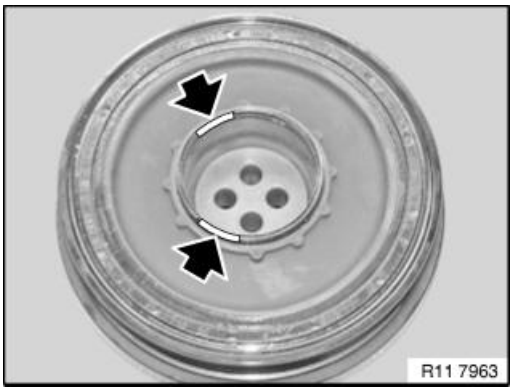
Screw special tool 11 7 221 with special tool 11 7 223 into receptacle of the guide pulley.

Note:
Use special tool 11 7 221 to turn the vibration damper in the direction of travel until the special tool 11 6 480 audibly clicks into place on the vibration damper.

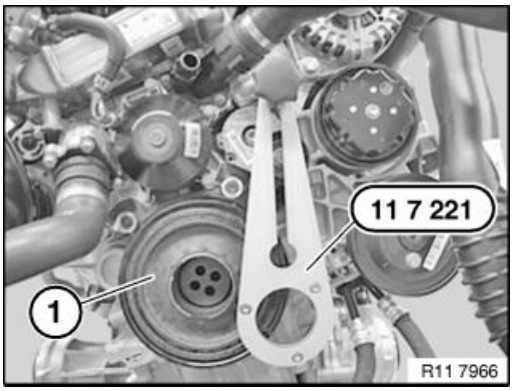
Secure special tool 11 7 221 vibration damper (1).



Loosen bolts (1) on the vibration absorber (2).*Installation note:*
Replace radial shaft seal at front.



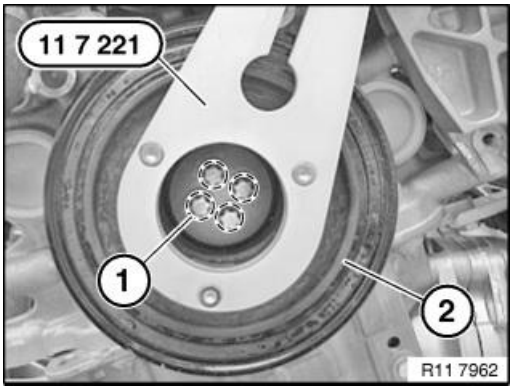
Installation note:
Position vibration damper as illustrated when refitting.



Installation note:
Secure the special tool 11 7 221 again in the area of the vibration damper to tighten the screws.

Tighten screws crosswise.

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Undo bolts (1) on vibration damper (2).

Remove special tool 11 7 221 in the area of the vibration damper (1).

Remove vibration damper.

Tightening torque 11 23 1AZ.

Assemble engine.**Important!**

Do not run engine without ribbed drive belt.

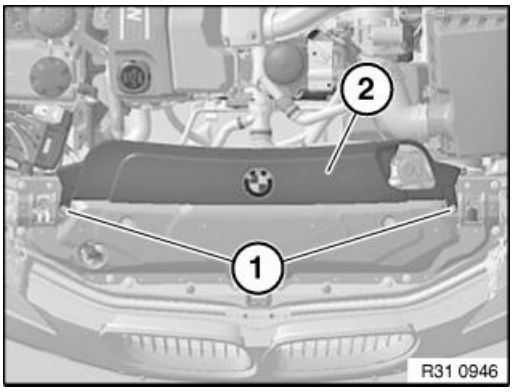
Risk of damage! to vibration absorber.

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11 23 010 Removing and installing/replacing vibration damper (N47, N47S)

Special tools required:

- 11 6 480
- 11 7 221
- 11 7 222
- 11 7 223

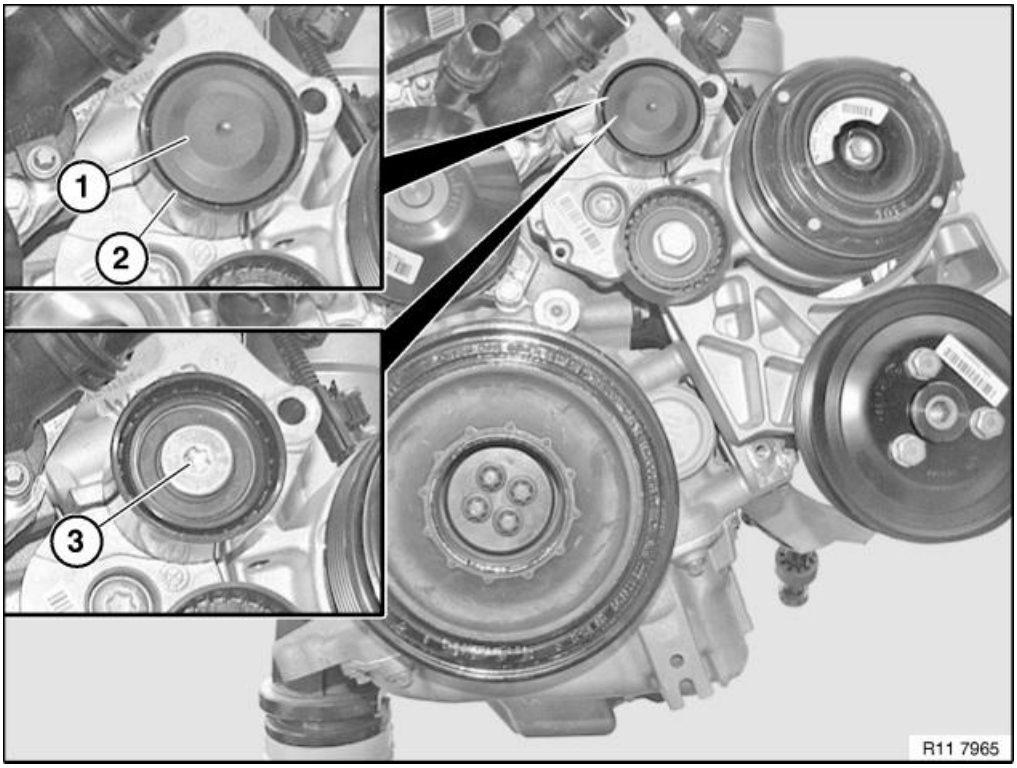


Necessary preliminary tasks:

- E60, E61: undo screws (1) on design cover (2).
  Remove design cover.

Necessary preliminary tasks:

- E81, E82, E84, E87, E88, E90, E91, E92, E93: remove intake port.
- Remove acoustic cover
- E81, E82, E83, E87: remove intake filter housing
- E81, E82, E87: remove fan cowl
- Remove alternator drive belt in the area of the vibration damper.



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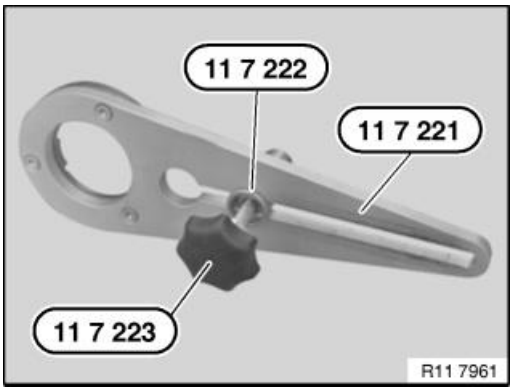
Note:
Drive belt shown removed for greater clarity.

Using a suitable tool, lever off protective cap (1) from deflecting element (2).

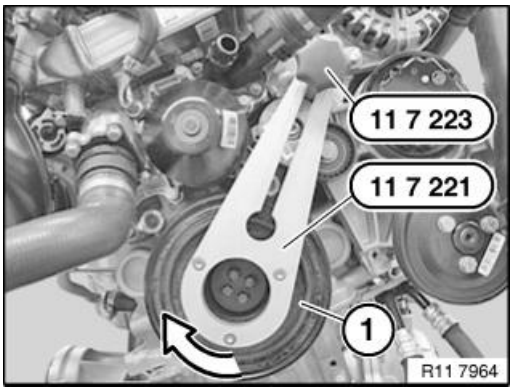
Release screw (3).

Tightening torque 11 00 4AZ.

Remove deflection pulley (2).



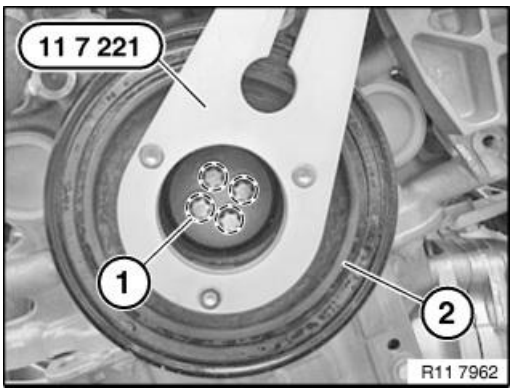
Assemble special tool 11 7 221 with special tool 11 7 222 and 11 7 223



Screw special tool 11 7 221 with special tool 11 7 223 into receptacle of the guide pulley.

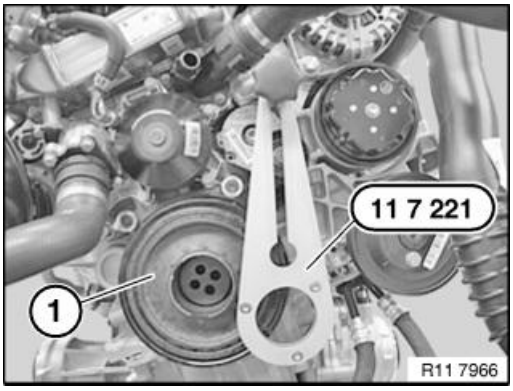
Secure special tool 11 7 221 vibration damper (1).

Note:
If necessary, use special tool 11 7 221 to turn the vibration damper in the direction of travel until the special tool 11 6 480 audibly clicks into place on the vibration damper.



Undo bolts (1) on vibration damper (2).

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Remove special tool 11 7 221 in the area of the vibration damper (1).

Remove vibration damper.

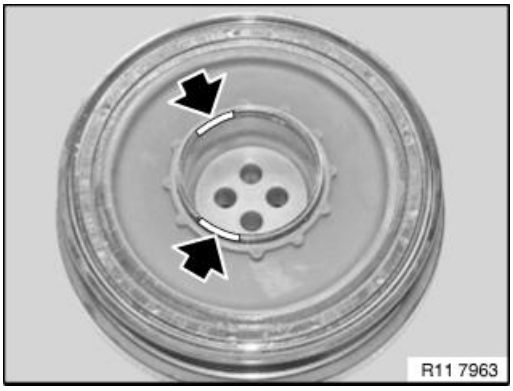
Tightening torque 11 23 1AZ.

Installation note:
Replace screws.

Replace radial shaft seal at front.

Secure the special tool 11 7 221 again in the area of the vibration damper to tighten the screws.

Tighten screws crosswise.



Installation note:
Position vibration damper as illustrated when refitting.

Assemble engine.**Important!**

Do not run engine without ribbed drive belt.

Risk of damage! to vibration damper.

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11 24 571 Replace all connecting rod bearings (N47 D20 O1)

Special tools required:

- 00 2 590
- 00 9 120
- 11 2 110

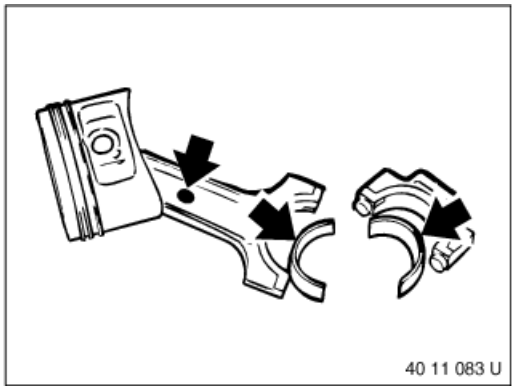
Necessary preliminary work:

- Removing all pistons

Important!

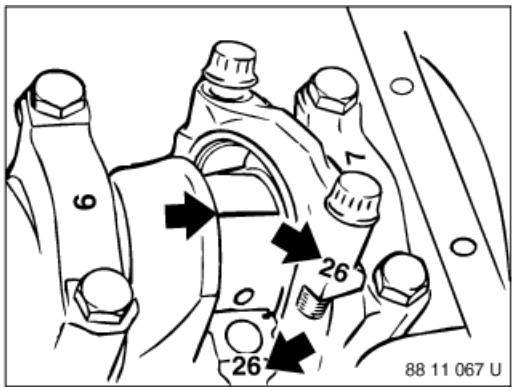
The connecting rod bearing shells for the connecting rod and the connecting rod bearing cap are **different**.

Replace connecting rod bolts.



Insert one blue and one red bearing shell for each connecting rod (irrespective of the colour coding on the connecting rod shaft).**Important!**

Note grinding stages on crankshaft.



Install piston.

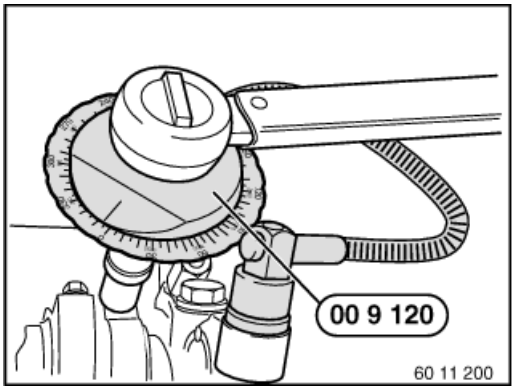
Check connecting-rod bearing play.

Piston in BDC position.

Fit special tool 00 2 590 (Plastigage type PG 1) to oil-free crankshaft.

Fit bearing caps so that matching numbers match up.

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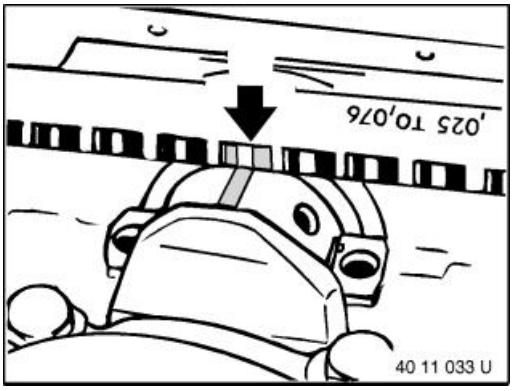
Important!

Do not turn the connecting rods or crankshaft.

Use the old connecting rod bolts to check connecting-rod bearing play.

00 9 120 Tighten down connecting rod bolts with special tool or special tool .11 2 110

Tightening torque 11 24 1AZ.

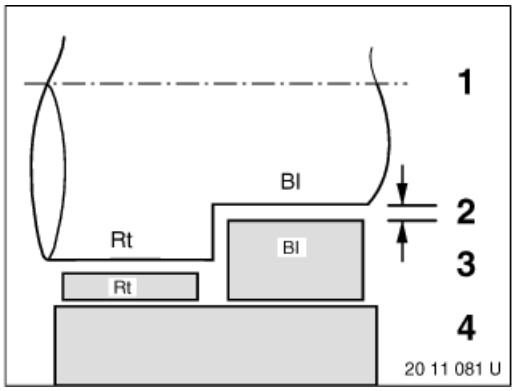


Remove bearing caps.

Read off bearing clearance at width of crushed plastic thread (Plastigage) with aid of measuring scale.

Connecting rod bearing play.

Remove Plastigage.



Overview:

Colour code/shaft diameter/bearing strength

Rt = red

Bl = blue

1. Crankshaft journal
2. Bearing clearance
3. Bearing shells: red or blue
4. connecting rod

Assemble engine.

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11 24 571 Replacing all connecting rod bearings (N47, N47S)

Special tools required:

- 00 2 590
- 00 9 120
- 11 2 110

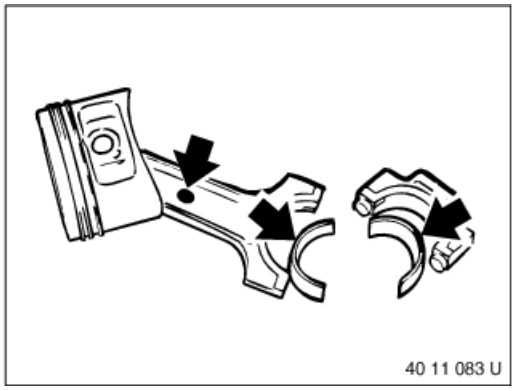
Necessary preliminary tasks:

- Removing all pistons

Important!

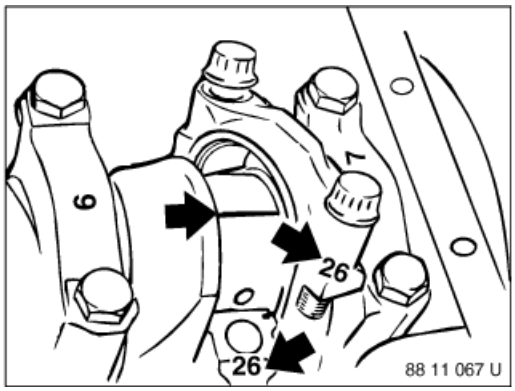
The connecting rod bearing shells for the connecting rod and the connecting rod bearing cap are **different**.

Replace connecting rod bolts.



Insert one red and one blue bearing shell for each connecting rod (irrespective of the colour coding on the connecting rod shaft).**Important!**

Note grinding stages on crankshaft.



Install piston.

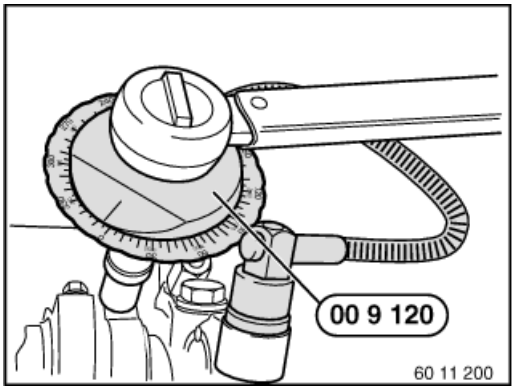
Check connecting-rod bearing play.

Piston in BDC position.

Fit special tool 00 2 590 (Plastigage type PG 1) to oil-free crankshaft.

Fit bearing caps so that matching numbers match up.

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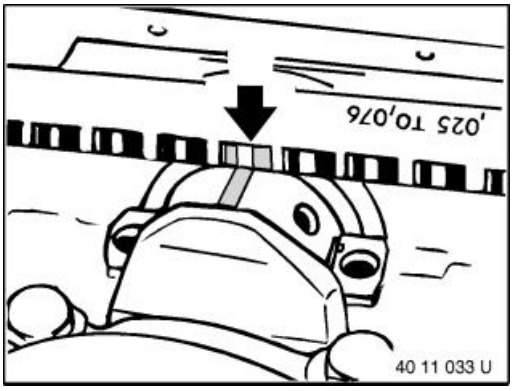
Important!

Do not turn the connecting rods or crankshaft.

Use the old connecting rod bolts to check connecting-rod bearing play.

00 9 120 Tighten down connecting rod bolts with special tool or special tool .11 2 110

Tightening torque 11 24 1AZ.

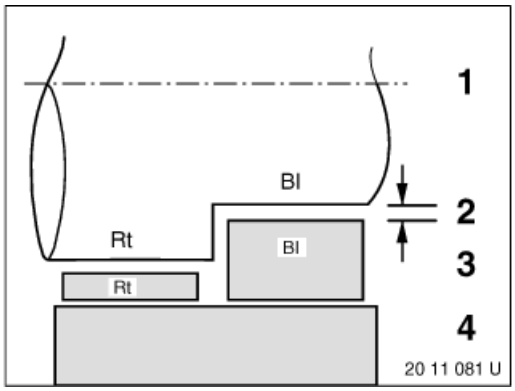


Remove bearing caps.

Read off bearing clearance at width of crushed plastic thread (Plastigage) with aid of measuring scale.

Connecting rod bearing play.

Remove Plastigage.



Overview:

Colour code/shaft diameter/bearing strength

Rt = red

Bl = blue

1. Crankshaft journal
2. Bearing clearance
3. Bearing shells: red or blue
4. connecting rod

Assemble engine.

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11 25 530 Removing and installing or replacing all pistons (N47 D20 O1)



Special tools required:

- 00 2 530
- 11 8 140
- 11 8 831
- 11 8 860
- 11 5 464



Warning!

Safety goggles must be worn when working on the gudgeon pin circlip.



Necessary preliminary work

- Remove engine.
- Remove cylinder head.
- Removing oil sump.
- Remove oil pump with vacuum pump.



Important!

If pistons, connecting rods and bearing shells are reused, they must be reinstalled in the same places.

Individual connecting rod replacement is not permitted; they are classified by weight class.

Connecting rods and connecting rod bearing caps are denoted with the same pairing letters. Mixing up the components will result in engine damage.

Piston and gudgeon pins are paired and must not be fitted individually or confused.



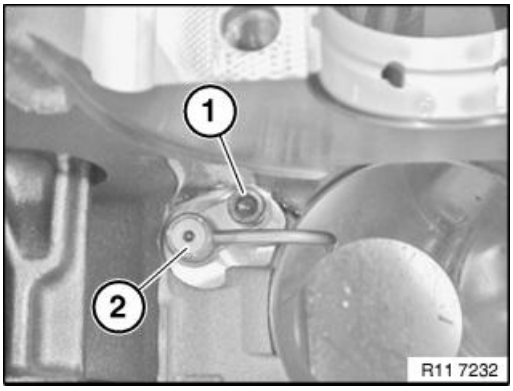
Installation note:
Different piston diameter at small eye.

In the bottom power stage a choice of installations is possible, renew piston in the same way as for used part:

Piston (1) Mahle piston (MAHLE) small and lower power stage.

Piston (2) Federal-Mogul I (FMN) lower top and top power stage.

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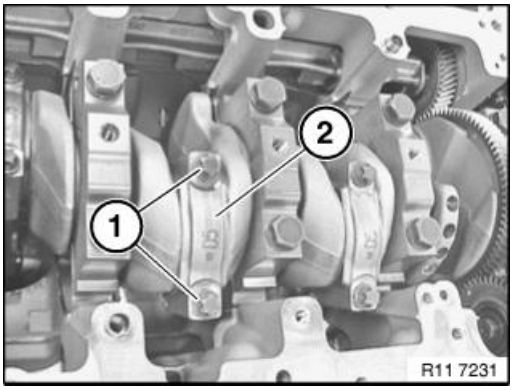


Important!

Do not release screw (1).

Oil spray nozzles (2) must not be maladjusted or bent.

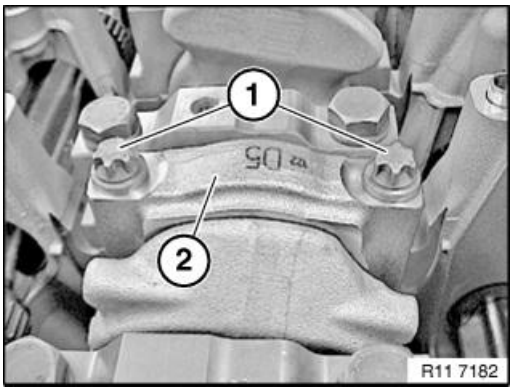
A bent oil spray nozzle cannot be adjusted and must be replaced.



Important!

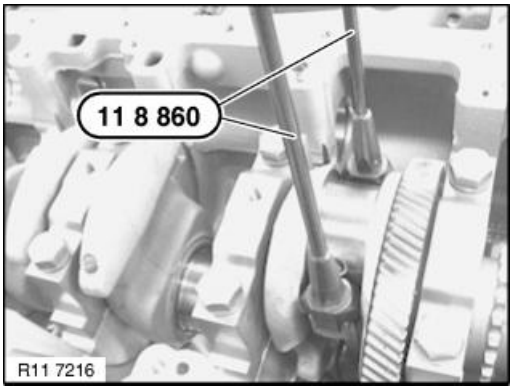
Position crankshaft vertically.

Proceed with care at the cylinder wall and oil spray nozzles **Risk of damage**!



Undo the connecting rod bolt (1).

Remove connecting rod bearing caps (2) and set down in neat order.

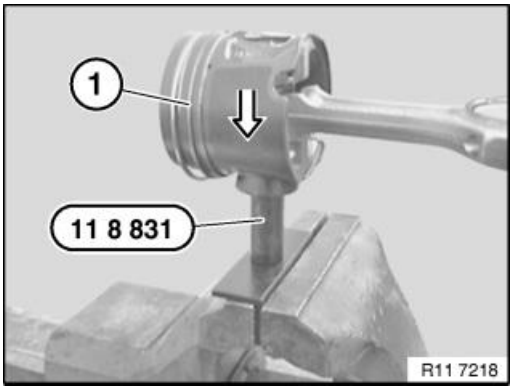


Screw special tool 11 8 860 in at large connecting rod eye.

Remove piston and connecting rod.

Installation note:
Pay attention to the protective edge for the cylinder wall.

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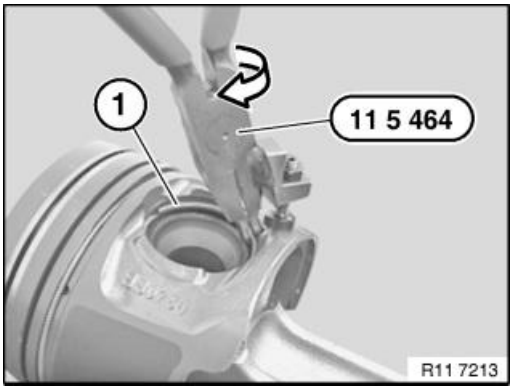


Position piston (1) with connecting rod on special tool 11 8 831 .



Warning!

Safety goggles must be worn for the next operation.



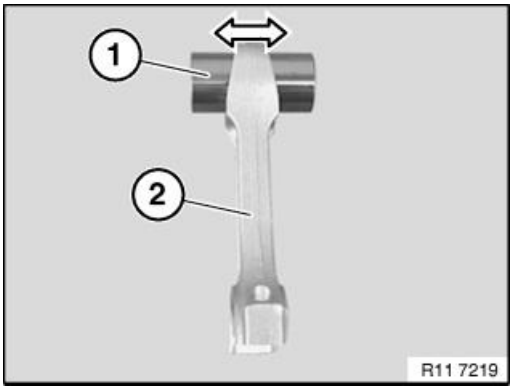
Warning!

Safety goggles must be worn.

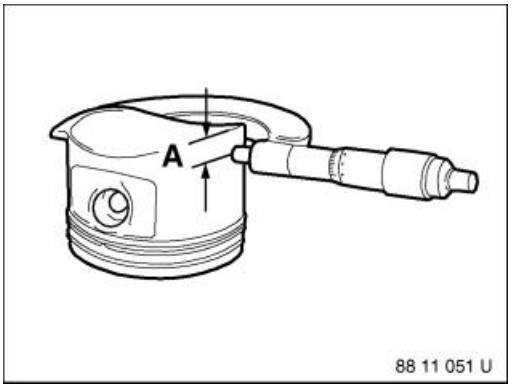
Lever out piston circlip (1) with special tool 11 5 464 in direction of arrow.**Important!**

Piston and gudgeon pin are matched to each other.

They must not be mixed up.



If necessary, replace connecting rod bearing.*Installation note:*
It must be possible to press gudgeon pin (1) through the bush (small connecting rod eye) and must not display any significant play.

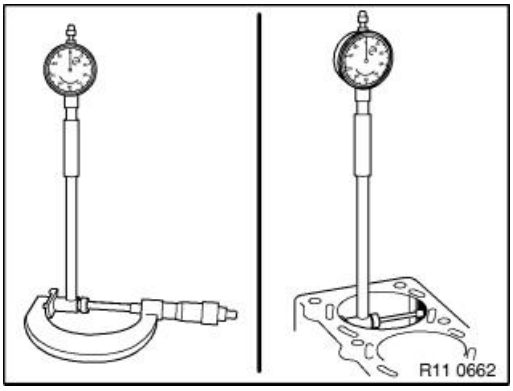


Before installation, measure piston installation clearance. Measure piston diameter with micrometre at measuring point A from lower edge of piston and offset at 90° to the axis of the gudgeon pin.

Distance A,

Refer to Technical Data.

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Adjust micrometre to cylinder bore of engine block. Set internal measuring device on micrometer to zero. Measure bottom, centre and top of cylinder bore in direction of travel and direction of rotation.

Diameter of the cylinder bore,

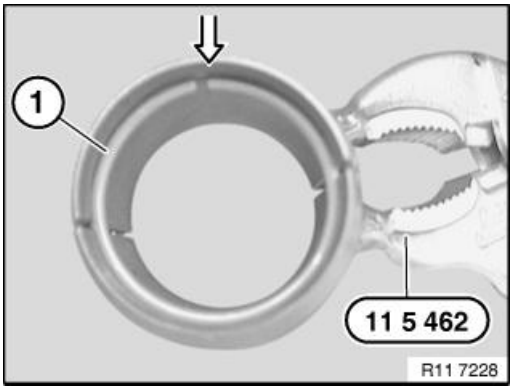
Technical Data.

Piston installation clearance,

Technical Data.

Permitted total wear clearance,

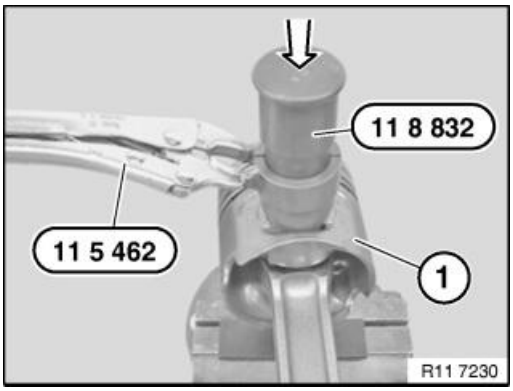
Technical Data.



Warning!

Safety goggles must be worn.

Fit gudgeon pin retaining ring (1) in connecting rod at the piston.

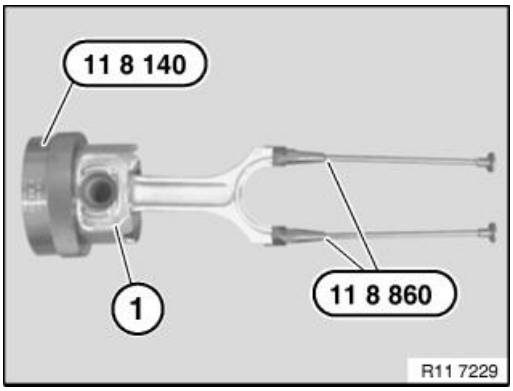


Important!

Piston and gudgeon pin are matched to each other.

They must not be mixed up.

Install circlip so that opening is opposite recess.



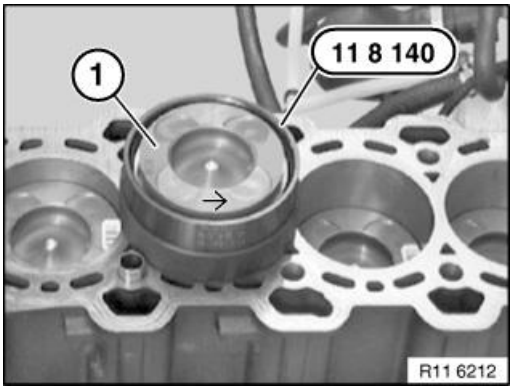
Align contact points of piston rings (offset at approx. 120°, but do not arrange over gudgeon pin boss).

Lightly coat pistons and piston rings with oil.

Prepare piston with piston ring on special tool 11 8 140 .

Screw special tool 11 8 860 on at large connecting rod eye.

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Insert piston (1) with connecting rod in cylinder.

Important!

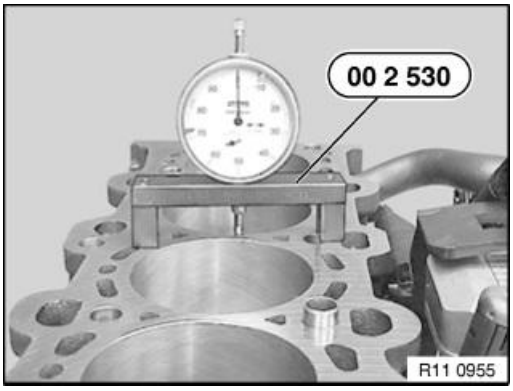
Risk of piston ring breakage.

Risk of damage to oil spray nozzle.

Only press pistons in with finger force - do **not** knock in!

Install piston so that arrow points forward in direction of travel.

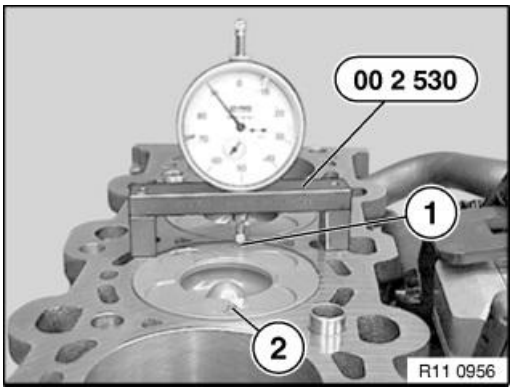
Bolt piston (1) with connecting rod to crankshaft.



The gasket thickness must be recalculated when repair work is carried out on the crankshaft drive or pistons.

Measuring the **piston protrusion:**

Fit dial gauge with measuring fixture special tool 00 2 530 on cleaned engine block sealing surface and set to zero under preload.



Position piston at TDC.

Clean piston at measuring points (1 and 2).

Fit dial gauge at measuring point (1) on piston and determine highest point by rotating crankshaft.

Measure and note down piston protrusion at measuring points (1 and 2) on all pistons.

Determine thickness of cylinder head gasket.

Assemble engine.

Check engine function and check for leak tightness.

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11 25 530 Removing and installing/replacing all pistons (N47, N47S)

Special tools required:

- 00 2 530
- 11 8 140
- 11 8 831
- 11 8 860

Warning!

Safety goggles must be worn when working on the gudgeon pin circlip.

Necessary preliminary work

- Remove engine.
- Remove cylinder head.
- Removing oil sump.
- Remove oil pump with vacuum pump.

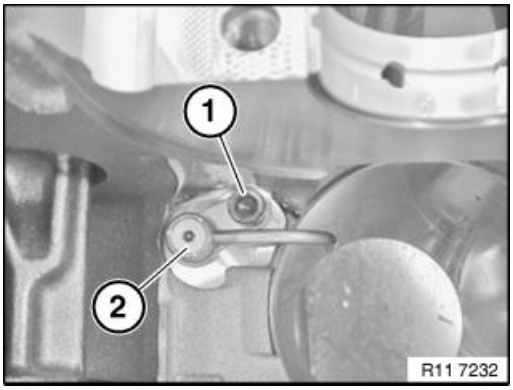
Important!

If pistons, connecting rods and bearing shells are reused, they must be reinstalled in the same places.

Individual connecting rod replacement is not permitted; they are classified by weight class.

Connecting rods and connecting rod bearing caps are denoted with the same pairing letters; mixing them up will result in engine damage.

Piston and gudgeon pins are paired and must not be fitted individually.



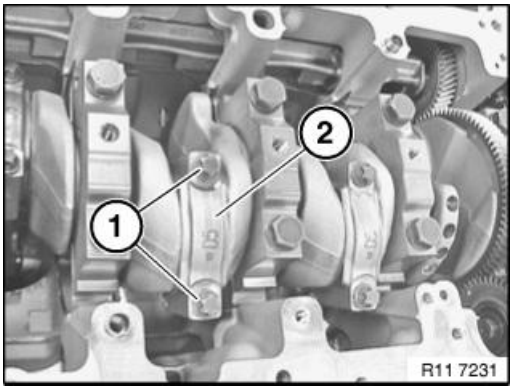
Important!

Do not release screw (1).

Oil spray nozzles (2) must not be maladjusted or bent.

A bent oil spray nozzle cannot be adjusted and must be replaced.

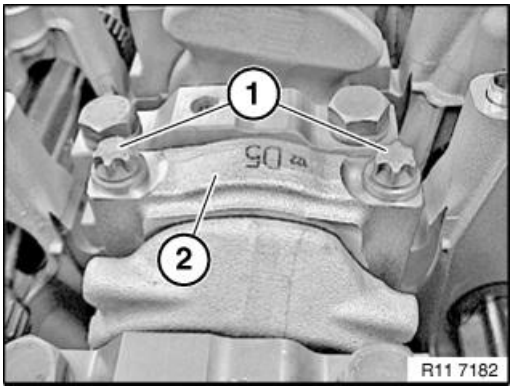
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Important!

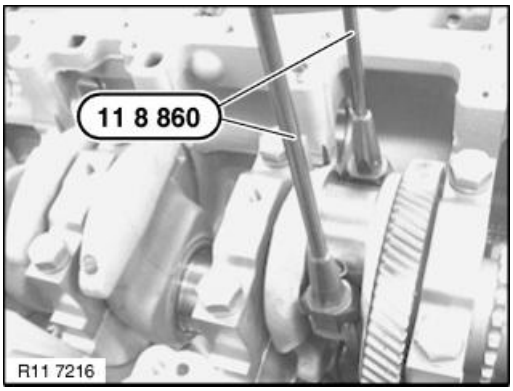
Position crankshaft vertically.

Proceed with care at the cylinder wall and oil spray nozzles **Risk of damage**!



Release connecting rod bolts (1).

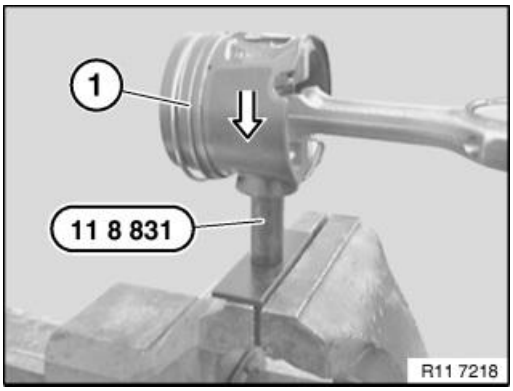
Remove connecting rod bearing caps (2) and set down in neat order.



Screw special tool 11 8 860 in at large connecting rod eye.

Remove piston and connecting rod.

Installation note:
Pay attention to protective edge.



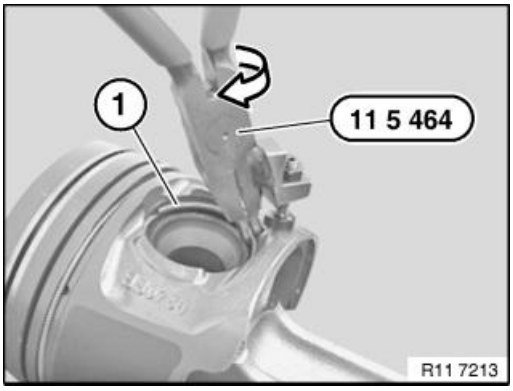
Position piston (1) with connecting rod on special tool 11 8 831 .



Warning!

Safety goggles must be worn for the next operation.

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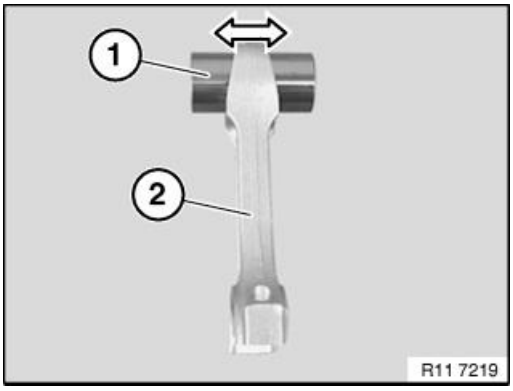
Warning!

Safety goggles must be worn.

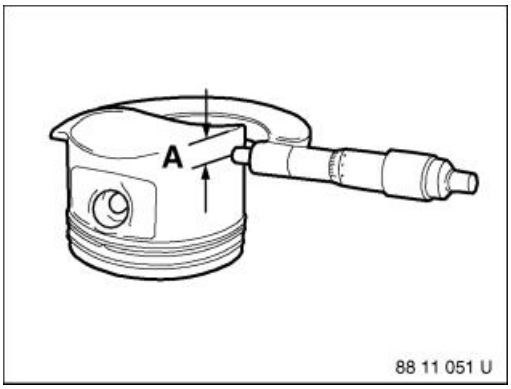
Lever out piston circlip (1) with special tool 11 5 464 in direction of arrow.**Important!**

Piston and gudgeon pin are matched to each other.

They must not be mixed up.



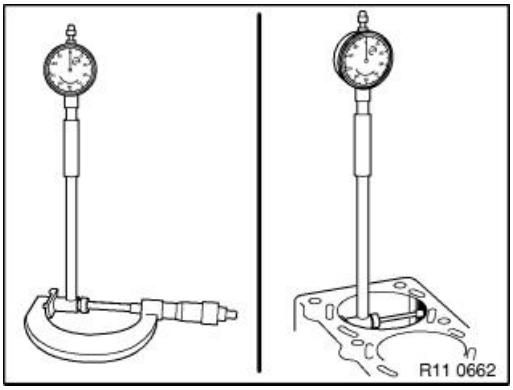
If necessary, replace connecting rods.*Installation note:*
It must be possible to press gudgeon pin (1) through the bush (small connecting rod eye) and must not display any significant play.



Before installation, measure piston installation clearance. Measure piston diameter with micrometre at measuring point A from lower edge of piston and offset at 90° to the axis of the gudgeon pin.

Distance A,

Refer to Technical Data.



Adjust micrometre to cylinder bore of engine block. Set internal measuring device on micrometre to zero. Measure bottom, centre and top of cylinder bore in direction of travel and direction of rotation.

Diameter of the cylinder bore,

Technical Data.

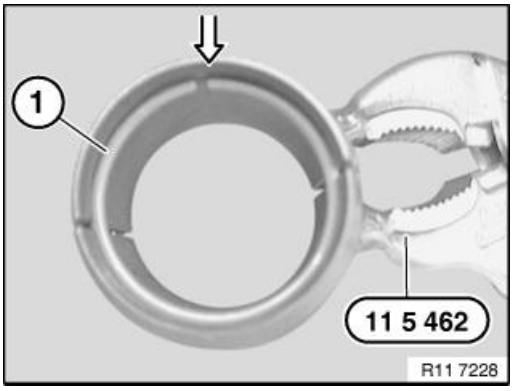
Piston installation clearance,

Technical Data.

Permitted total wear clearance,

Technical Data.

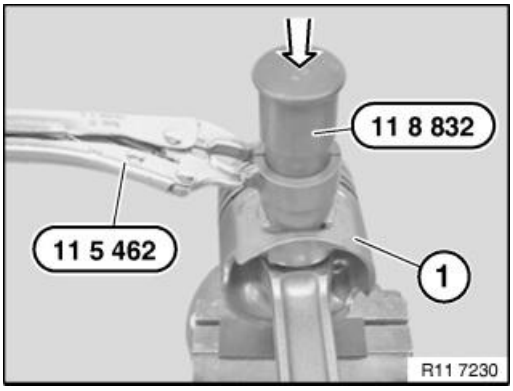
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Warning!

Safety goggles must be worn.

Fit gudgeon pin retaining ring (1) in connecting rod at the piston.

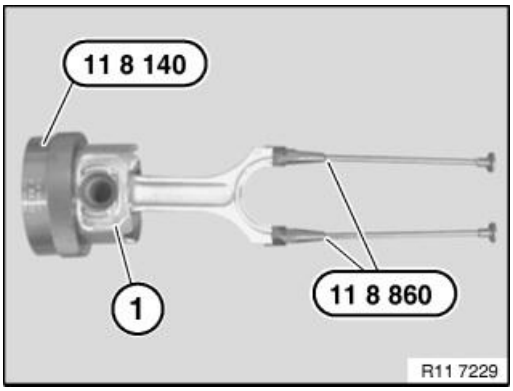


Important!

Piston and gudgeon pin are matched to each other.

They must not be mixed up.

Install circlip so that opening is opposite recess.

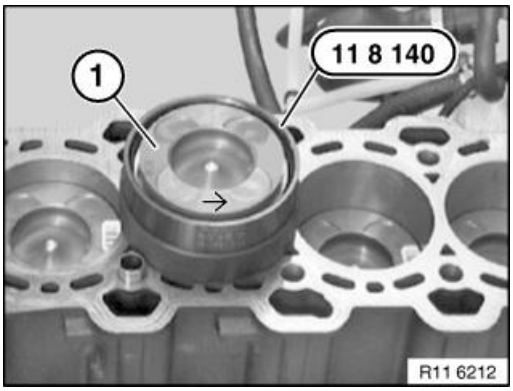


Align contact points of piston rings (offset at approx. 120°, but do not arrange over gudgeon pin boss).

Lightly coat pistons and piston rings with oil.

Prepare piston with piston rings on special tool 11 8 140 .

Screw special tool 11 8 860 on at large connecting rod eye.



Insert piston (1) with connecting rod in cylinder.

Important!

Risk of piston ring breakage.

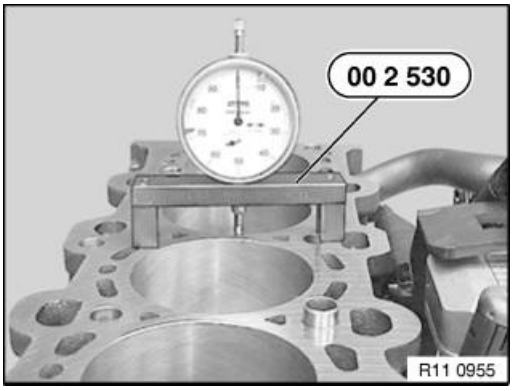
Risk of damage to oil spray nozzle.

Only press pistons in with finger force - do **not** knock in!

Install piston so that arrow points forward in direction of travel.

Bolt piston (1) with connecting rod to crankshaft.

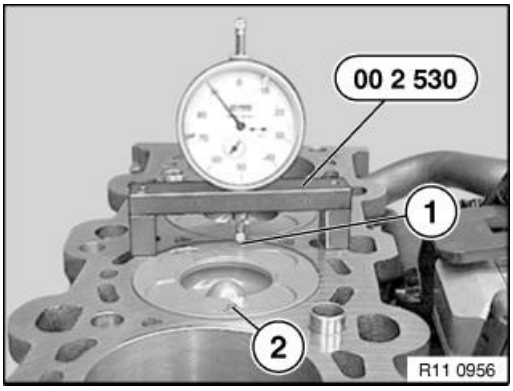
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The gasket thickness must be recalculated when repair work is carried out on the crankshaft drive or pistons.

Measuring the **piston protrusion:**

Fit dial gauge with measuring fixture special tool 00 2 530 on cleaned engine block sealing surface and set to zero under preload.



Position piston at TDC.

Clean piston at measuring points (1 and 2).

Fit dial gauge at measuring point (1) on piston and determine highest point by rotating crankshaft.

Measure and note down piston protrusion at measuring points (1 and 2) on all pistons.

Determine thickness of cylinder head gasket.

Assemble engine.

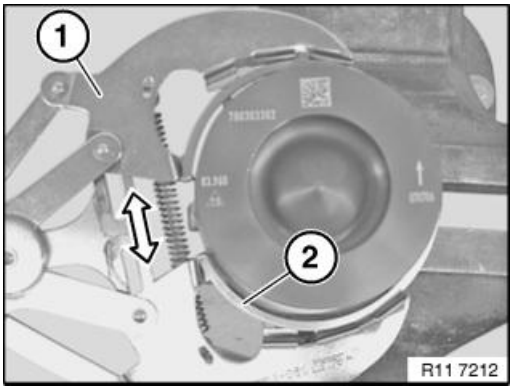
Check engine function and check for leak tightness.

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11 25 671 Replacing piston rings on all pistons (N47 D20 O1)

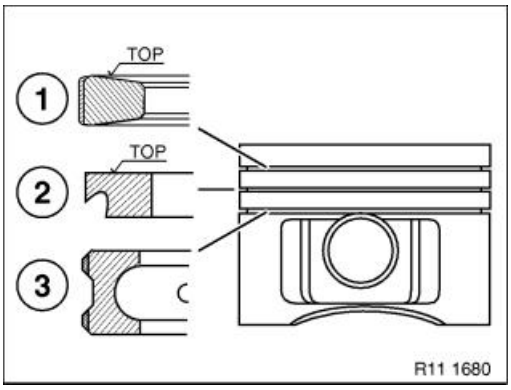
Necessary preliminary work:

- Remove pistons.



Remove all piston rings (2) with piston ring pliers (1).**Note:**
It might not be possible to find the identification on used piston rings.

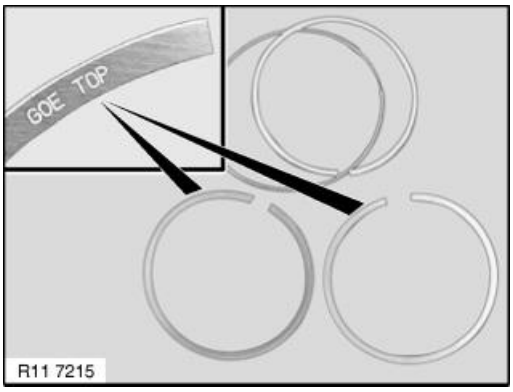
Put aside piston rings in correct sequence and installation position.



Installation note:
Piston rings with "TOP" identification must point to piston crown.

1. Plain rectangular compression ring
2. Piston ring
3. Bevelled roof ring with spiral expander

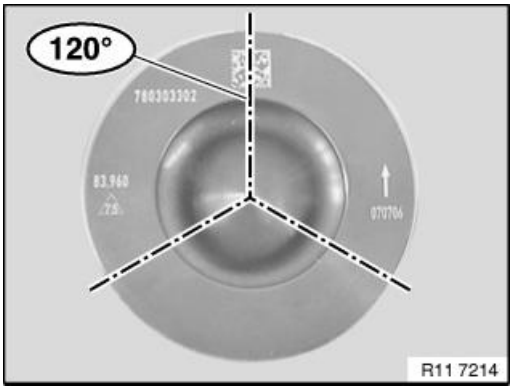
Arrange piston ring contact points with offset of approx. 120° to one another, but not over gudgeon pin boss.



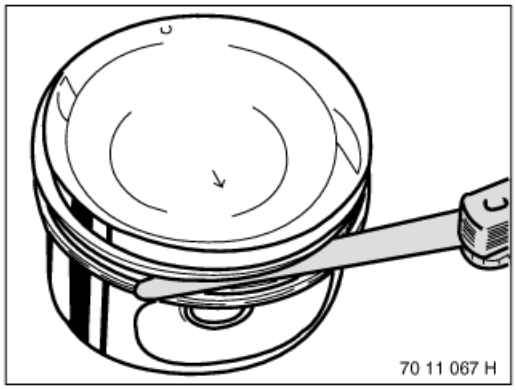
Installation note:
Marking (TOP) must point towards piston crown.

The oil scraper ring has no identification marking and can be installed in any position.

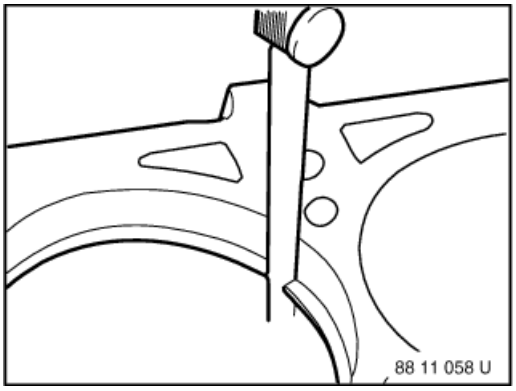
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Adjust piston rings to 120 degree position.



Measure axial play.
Refer to Technical Data.



Measure end clearance.
Refer to Technical Data.

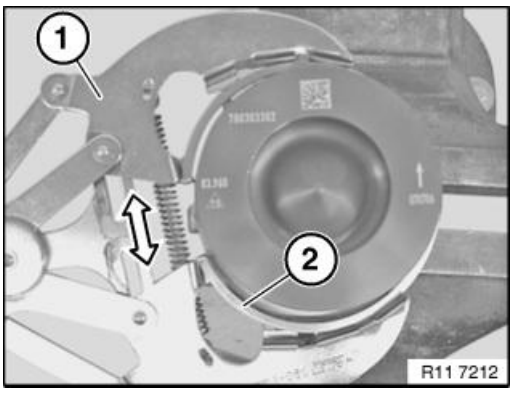
Assemble engine.

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11 25 671 Replacing piston rings on all pistons (N47, N47S)

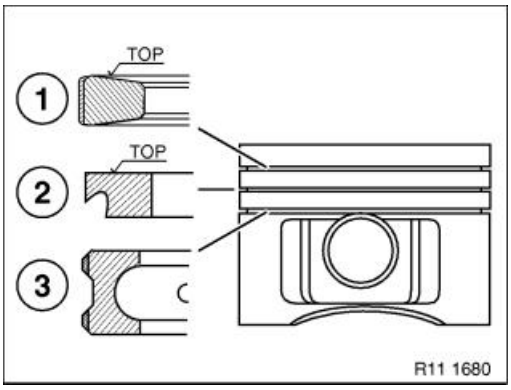
Necessary preliminary tasks:

- Remove pistons.



Remove all piston rings (2) with piston ring pliers (1).**Note:**
It might not be possible to find the identification on used piston rings.

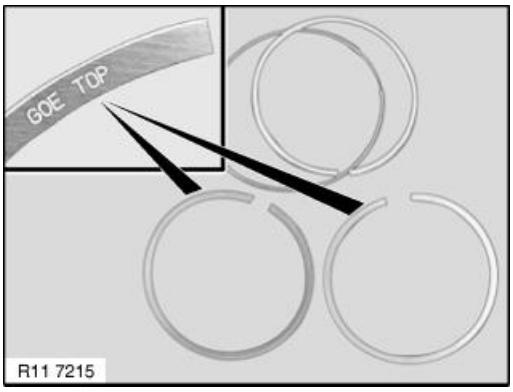
Put aside piston rings in correct sequence and installation position.



Installation note:
Install piston rings with "TOP" to piston crown.

1. Taper face compression ring
2. Stepped ring
3. Bevelled roof ring with spiral expander

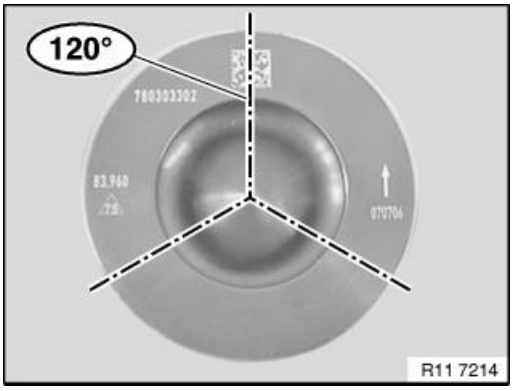
Arrange piston ring contact points with offset of approx. 120° to one another, but not over gudgeon pin boss.



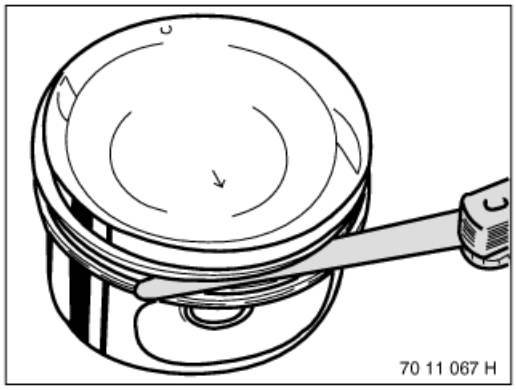
Installation note:
Marking (TOP) must point towards piston crown.

The oil scraper ring has no identification marking and can be installed in any position.

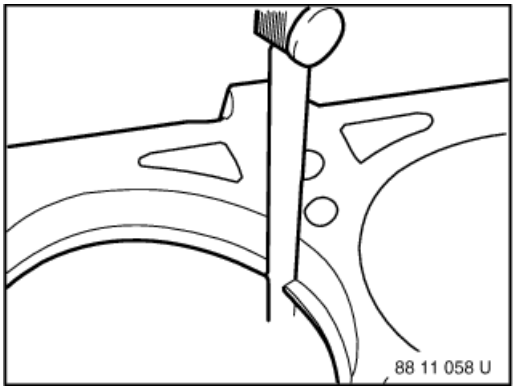
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Adjust piston rings to 120 degree position.



Measure side clearance.
Refer to Technical Data.



Measure end clearance.
Refer to Technical Data.

Assemble engine.

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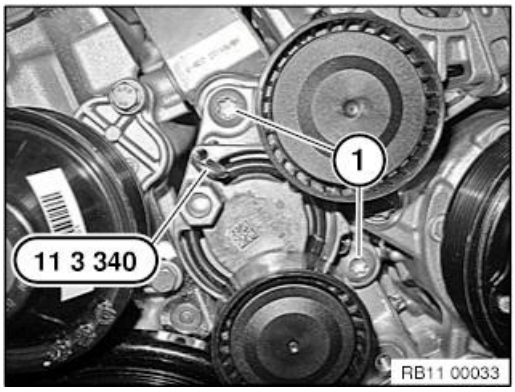
11 28 020 Removing and installing / replacing belt tensioner for the alternator (N47 D20 O1)

Special tools required:

- 11 3 340

Necessary preliminary tasks:

- Remove alternator drive belt.



Release screws (1).

Remove belt tensioner (2) with roller and deflecting element.

Assemble engine.

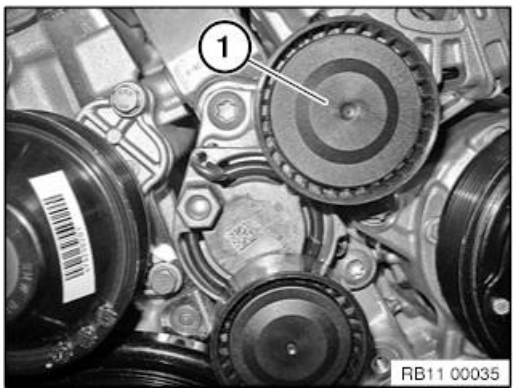
If a tensioning device is no longer needed, the special tool 11 3 340 must be removed using a vice.

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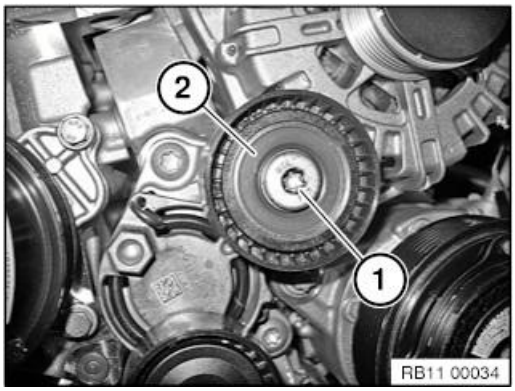
11 28 025 Removing and installing / replacing deflection pulley (N47 D20 O1)

Necessary preliminary tasks:

- Remove alternator drive belt.



Unclip protective cap (1) with a suitable tool.



Release screw (1).

Tightening torque: 11 00 4AZ.

Remove deflection pulley (2).

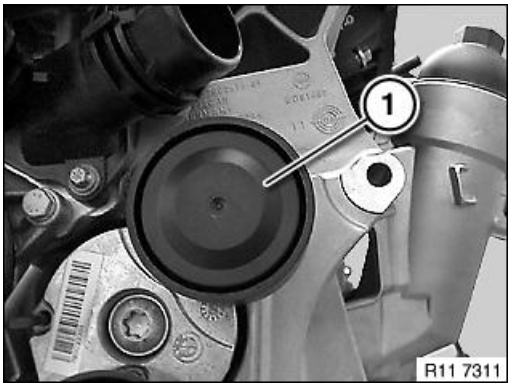
Assemble engine.

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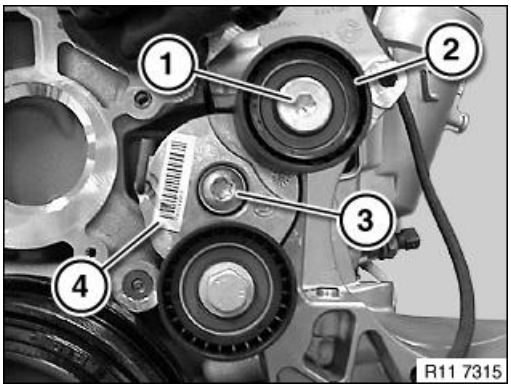
11 28 020 Removing and installing belt tensioner for alternator (N47, N47S) ,

Necessary preliminary work:

- Remove alternator drive belt.



Remove cover (1) with a suitable tool.



Release screws (1).
Tightening torque 11 28 2AZ.
Remove deflecting element (2).
Release screw (3).
Tightening torque 11 28 1AZ.
Remove belt tensioner (4) with roller.

Assemble engine.

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11 28 010 Removing and installing/replacing alternator drive belt (N47 D20 O1)

Special tools required:

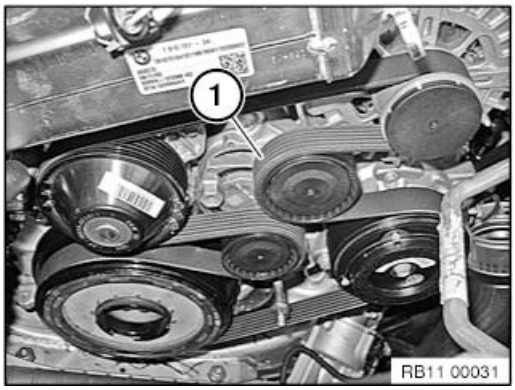
- 11 3 340

Necessary preliminary tasks:

- Remove acoustic cover

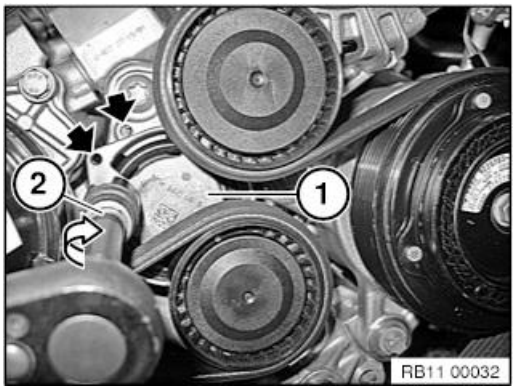
Check drive belt for coolant and oil residues, replace if necessary.**Important!**

The drive belt must be replaced if it is contaminated with hydraulic fluid.



Important!

Belt tensioner (1) is preloaded.

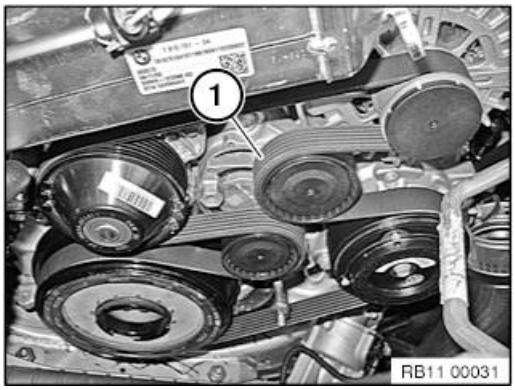


Increase preload on tensioning pulley (1) with tool (2) until special tool can be positioned on tensioning pulley 11 3 340 (1).

Preload belt tensioner (1).

Both bore holes, see arrow, must be flush.

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Remove drive belt.

Assemble engine.

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11 31 ... 00 62 885 Measure chain elongation with measuring chain tensioner, replace chain tensioner and top and bottom timing chain

Special tools required:

- 11 6 480
- 11 8 760
- 11 4 470
- 11 4 320
- 11 8 740
- 11 3 340
- 2 285 671
- 11 8 780
- 11 5 320

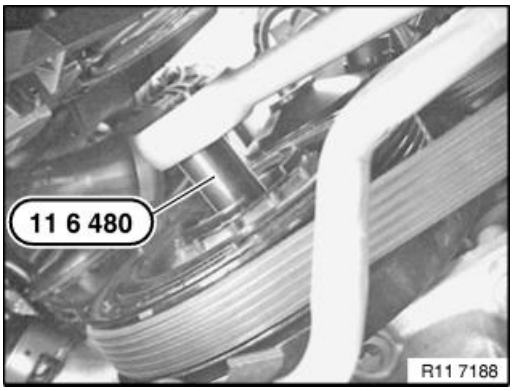
Prerequisites:

- Timing chain including measuring timing chain tensioner checked. (see repair instructions 11 31 540)
  and tester instruction: Check lag of the camshaft.
- Lag of the camshaft checked (see repair instructions 11 31 544)
  and tester instruction: Replace both timing chains.

Necessary preliminary tasks:

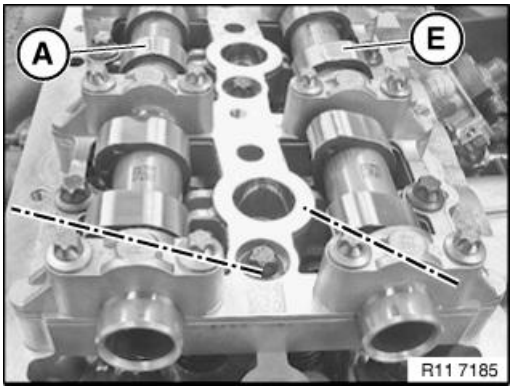
- Remove engine (see repair instructions 11 00 050)
- Mount engine on assembly stand
- Remove flywheel (see repair instructions 11 22 000)
- Remove oil sump (see repair instructions 11 13 000)

Removal:



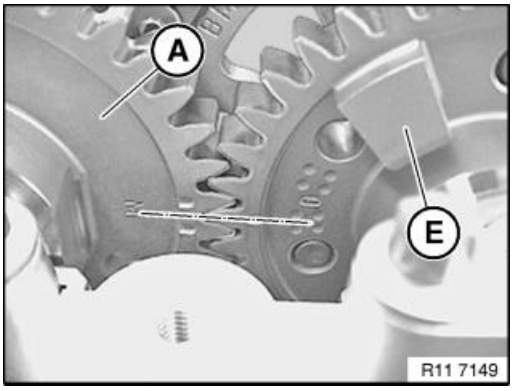
Crank engine with special tool 11 6 480 to TDC firing position of cylinder no. 1.**Important!**
Do not turn the engine against the direction of travel.

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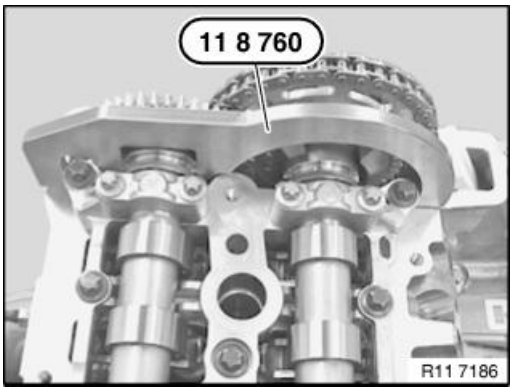


The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.



The mark on the exhaust camshaft (A) must correspond to the mark on the intake camshaft (E).*Note:*
See image.



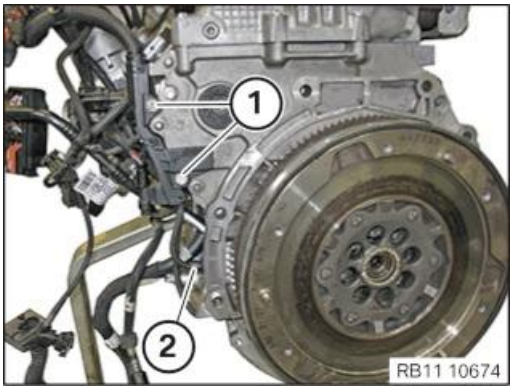
Place special tool 11 8 760 on exhaust camshaft.**Note:**
Special tool 11 8 760 must lie flush on cylinder head.



Important!
Magnet wheel (1) is magnetic.
Keep magnet wheel (1) in a plastic bag away from swarf.

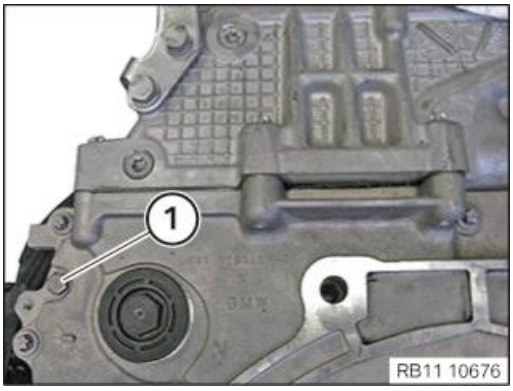
Remove magnet wheel (1) from crankshaft.

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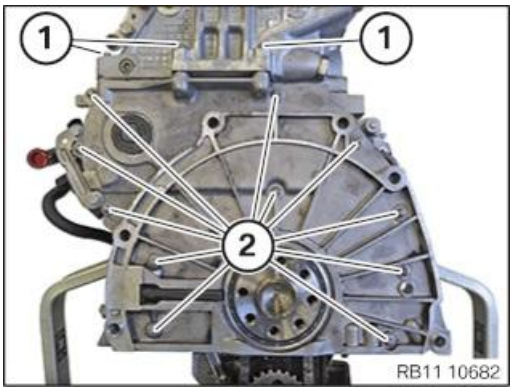


Release screws (1) of wiring harness.

Unlock plug connection (2) of the crankshaft pulse sensor and disconnect.

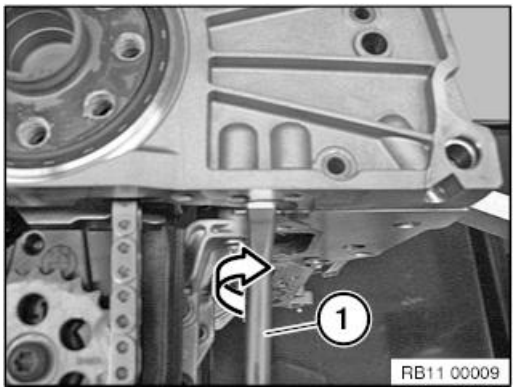


Release screw of high pressure pump (if fitted).



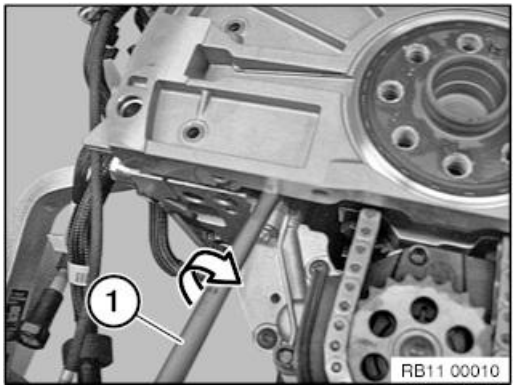
Release screws (1).

Unfasten screws (2).

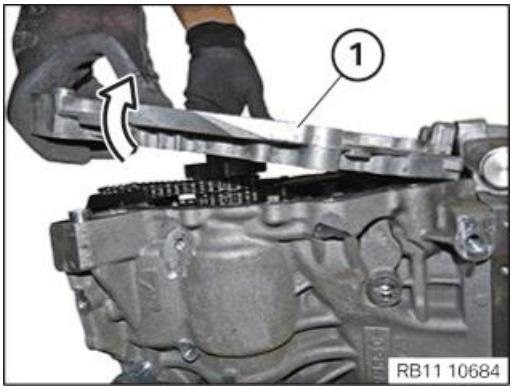


Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

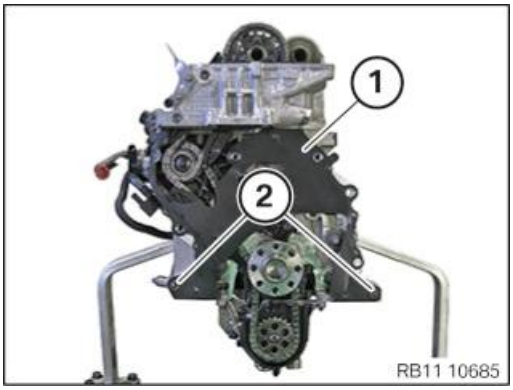
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Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

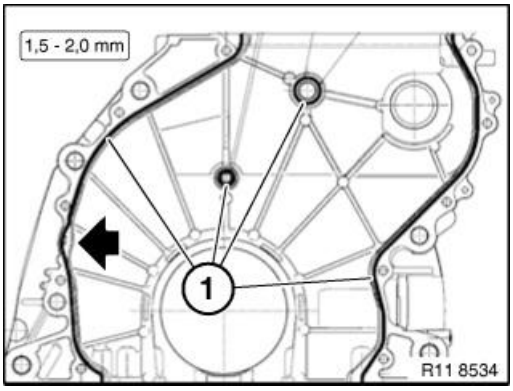


Carefully remove timing case cover (1) in direction of arrow.



On engines up to 11/2009:

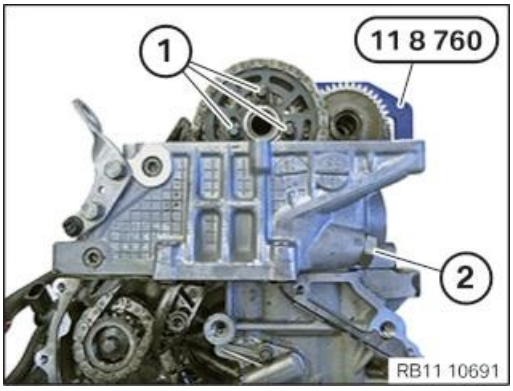
Remove beaded metal gasket (1).



On engines from 11/2009.

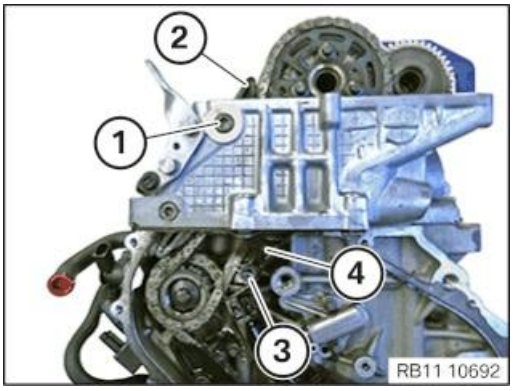
Remove gasket remnants from crankcase and timing case cover using special tool 11 4 470 .

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Only release screws (1).

Remove chain tensioner (2).

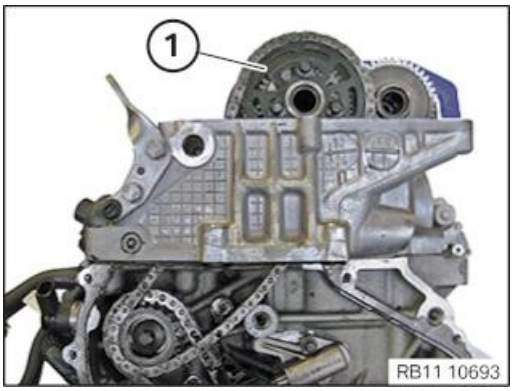


Release bearing journal (1).

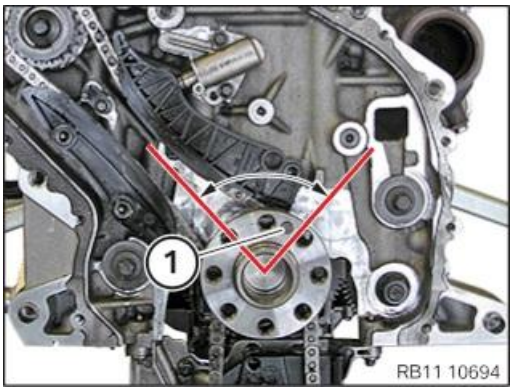
Remove guide rail (2) upwards.

Release bearing journal (3).

Remove tensioning rail (4) downwards.



Remove top timing chain with camshaft sprocket (1).



Important!

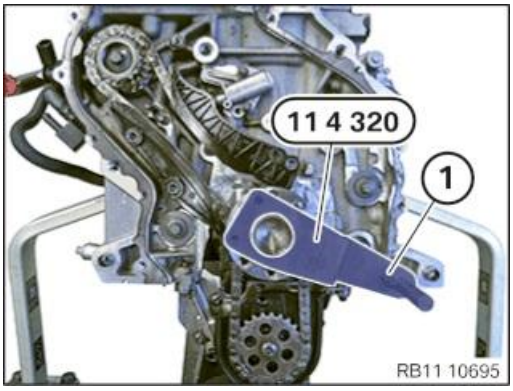
Risk of damage to the valve gear

The guide pin (1) of the crankshaft may not exit the marked area during the entire repair process.

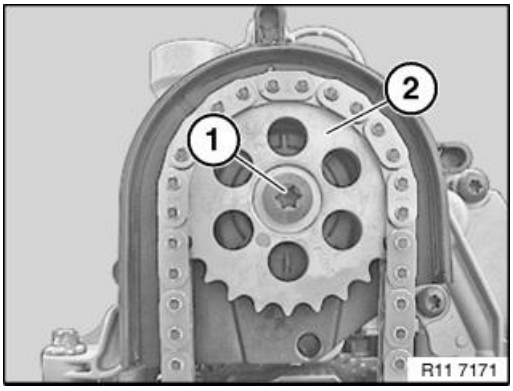
Only after final setting of the timing the engine may be spun again.

Note:
Cylinder head remains mounted.

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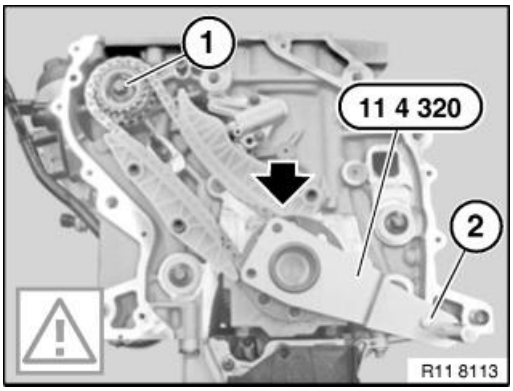
Fix special tool 11 4 320 on crankshaft and fix with a screw (1).



Important!

Left-hand threads.

Release screw (1) on camshaft sprocket of oil pump.

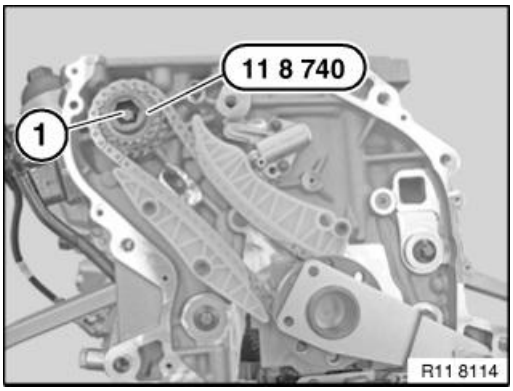


Note:
To loosen the central bolt on the high pressure pump, crankshaft must remain fixed with special tool 11 4 320 .

Release central bolt (1) of high pressure pump.**Important!**

Release central bolt only, do not remove.

Pistons of cylinder 1 and 4 are at 45° after TDC position.

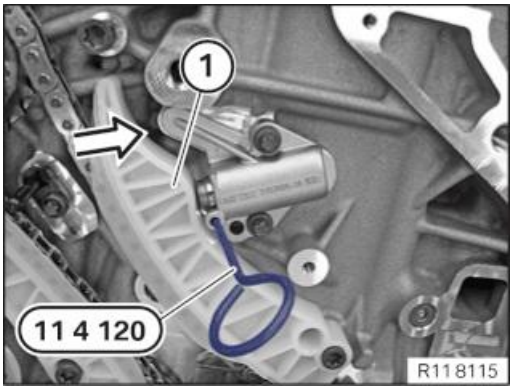


Note:
To loosen the central bolt on the high pressure pump, the crankshaft must remain fixed with special tool 11 4 320 .

Screw special tool 11 8 740 in hand-tight.

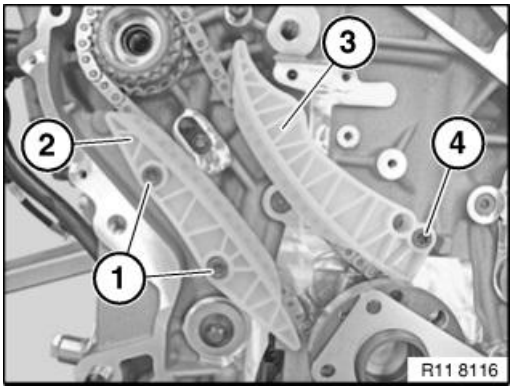
Twist out central bolt of high pressure pump (1) until impeller has detached from taper of high pressure pump.

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Using tensioning rail (1), press chain tensioner in direction of arrow until special tool 11 3 340 can be positioned.

Remove chain tensioner.

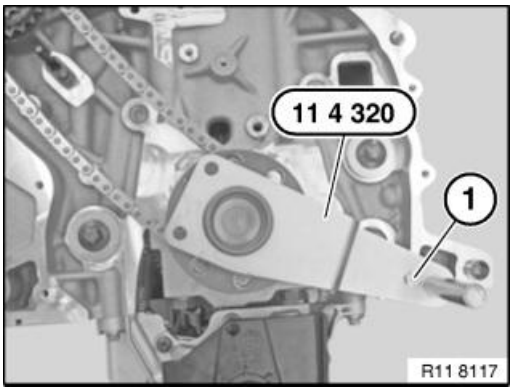


Release bearing journal (1).

Remove guide rail (2).

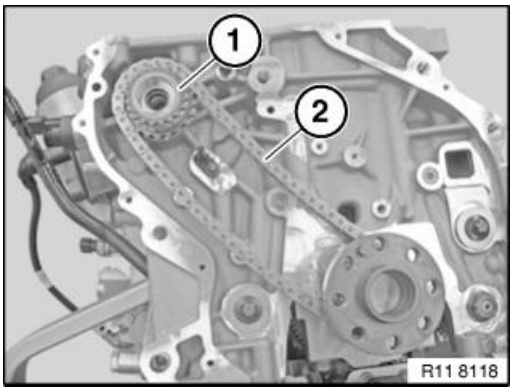
Release bearing journal (4).

Remove tensioning rail (3).



Release screw (1).

Remove special tool 11 4 320 .



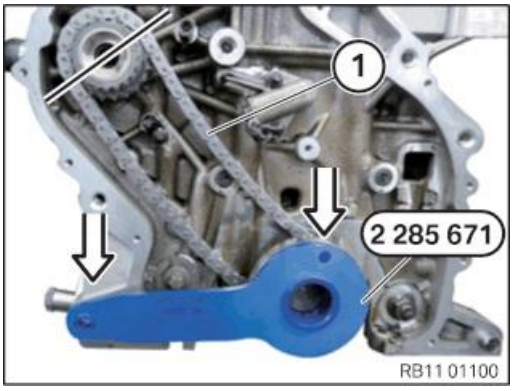
Remove camshaft sprocket of the oil pump and drive chain of the oil pump.

Remove impeller (1) with timing chain (2) from high pressure pump.

Remove timing chain (2).

Installation:

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Important!

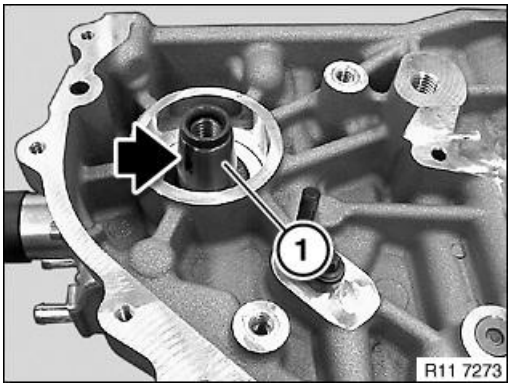
High pressure pump and crankshaft must be positioned **to each other**.

Fit timing chain (1).

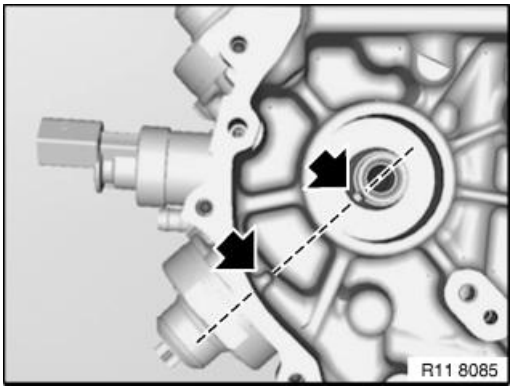
Lay drive chain for oil pump.

Position crankshaft with special tool 2 285 671 (crankshaft is in the **11° top dead centre**).

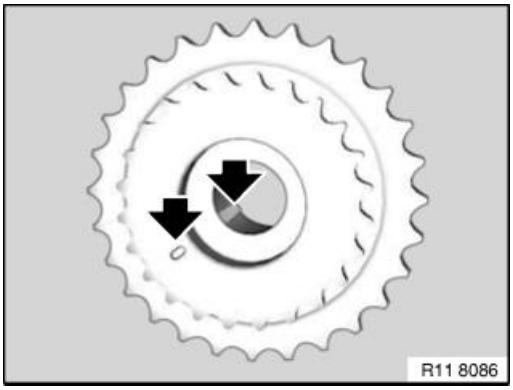
Fix special tool 2 285 671 via the fitting bush on the crankcase.



Pay attention to spline groove on high pressure pump (1).

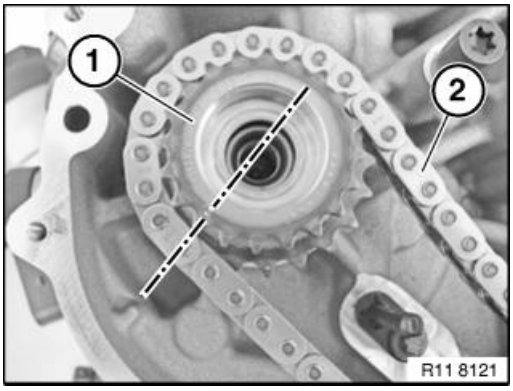


Installation note:
The marking on the crankcase and spline groove on the high pressure pump must be in line (graphic N57).

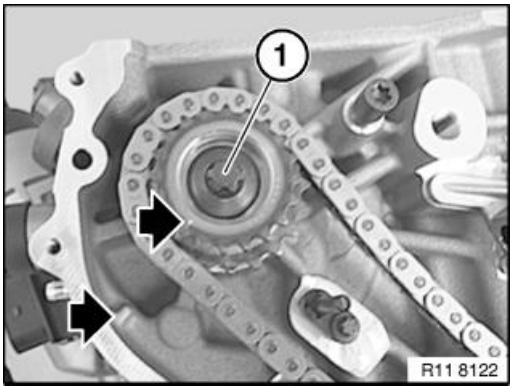


Installation note:
Groove and marking (0) on pinion are on a single plane.

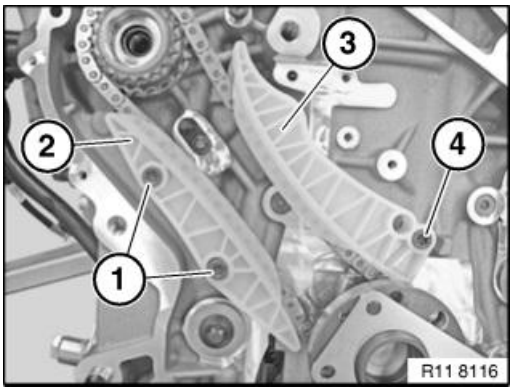
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Position impeller (1) with timing chain (2) on high pressure pump.
Marking (0) and cast lug must be in line.

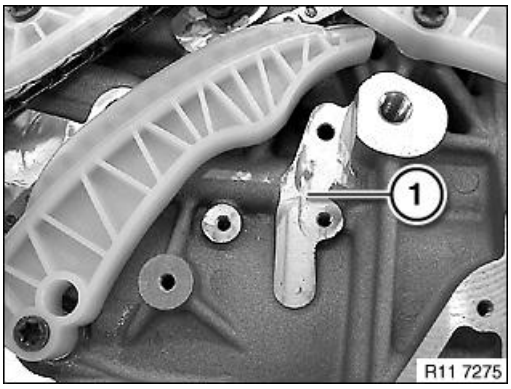


Insert central bolt (1) of high pressure pump.



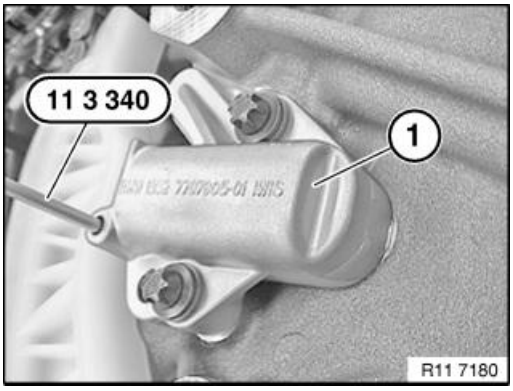
Installation note:
Clean all threads of bearing journals.
Renew all bearing journals.

Position guide rail (2).
Screw in bearing journals (1).
Tightening torque: **20 Nm**.
Position and tighten tensioning rail (3).
Screw in and tighten bearing journal (4).
Tightening torque: **20 Nm**.



Important!
Clean sealing surfaces (1) with compressed air.

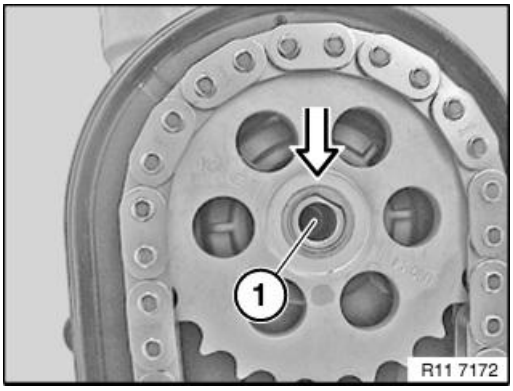
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Secure hydraulic chain tensioner (1) at bottom with two screws.

Tightening torque: **10 Nm.**

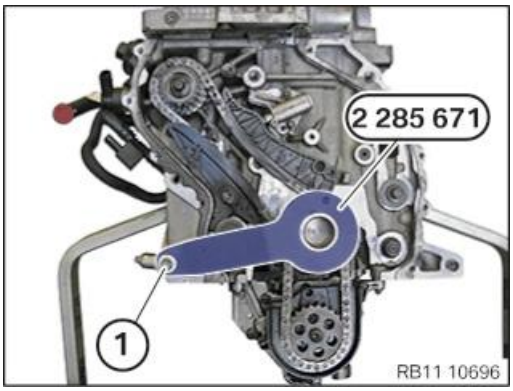
Remove special tool 11 3 340 .



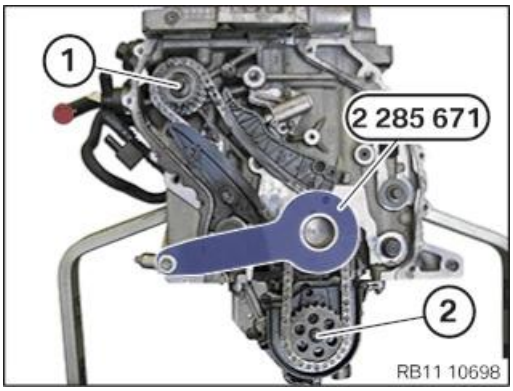
Position timing chain with secondary sprocket wheel for oil pump.

Screw in screw in oil pump shaft (1).

Installation note:
Pay attention to mounting flats on oil pump shaft (1) (see arrow).



For better support of the special tool 2 285 671 screw in transmission bolt (1) slightly.



Tighten central bolt (1) of high pressure pump.

Tightening torque: **65 Nm**.

Important!

Left-hand threads.

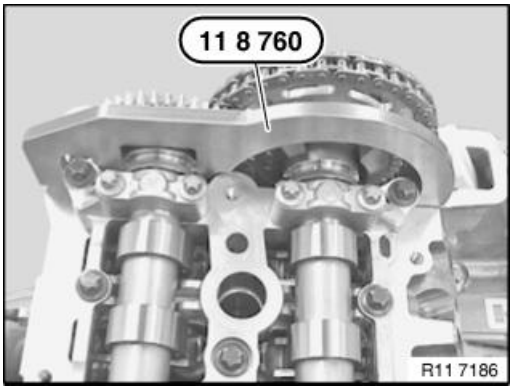
Replace screw.

Tighten screw (2) of oil pump.

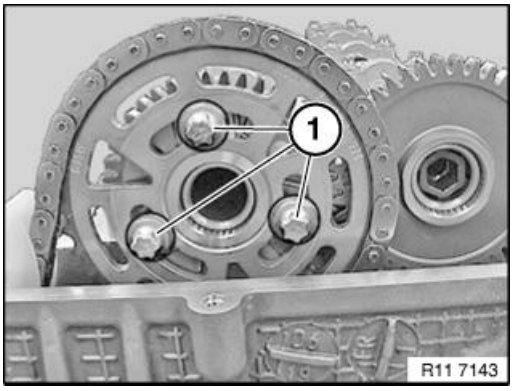
Tightening torque: **5 Nm + 90° angle of rotation**.

Note:
Do **not** remove special tool 2 285 671 yet.

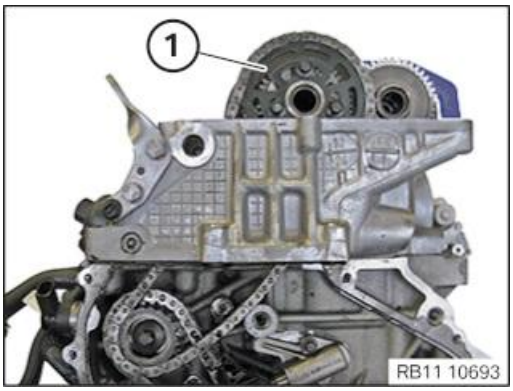
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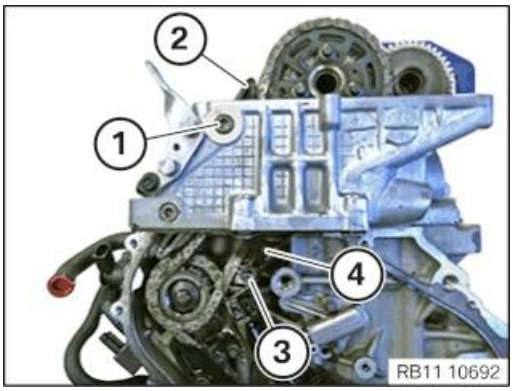
Special tool 11 8 760 must lie flush on cylinder head.



Installation note:
Place the camshaft sprocket with timing chain on the intake camshaft such that screws (1) are located in the centre of the elongated holes.



Lay timing chain on top with camshaft sprocket (1) and fix screws.



Installation note:
Clean all threads of bearing journals.

Renew all bearing journals.

Install guide rail (2).

Screw in and tighten bearing journal (1).

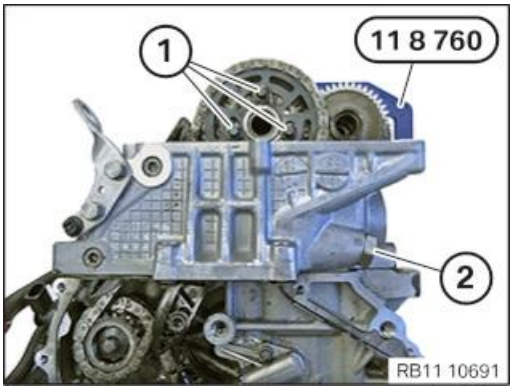
Tightening torque: **20 Nm**.

Install tensioning rail (4).

Screw in and tighten bearing journal (3).

Tightening torque: **20 Nm**.

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Installation note:
Renew chain tensioner.

Fix screws (1) with 10 Nm and release by 90°.

Install chain tensioner (2) and tighten.

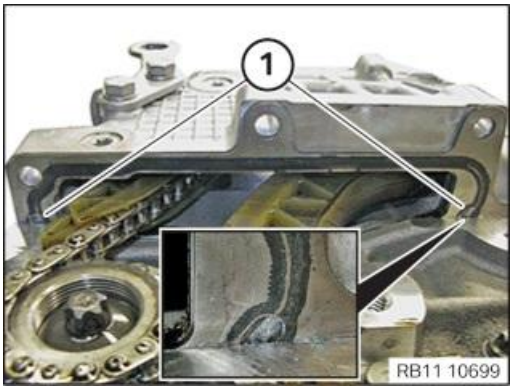
Tightening torque: **70 Nm**.

Remove special tool 2 285 671 .

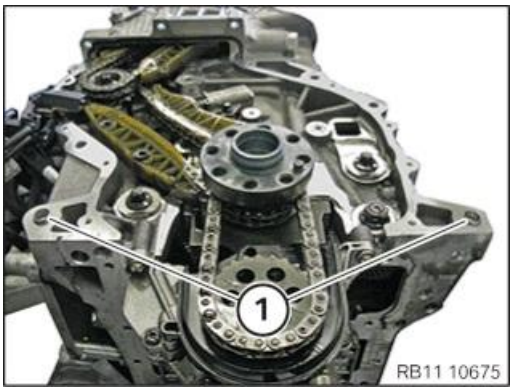
Important!

Engine is still found at 11° as per TDC.

In order to adjust the timings timing case cover and flywheel must be mounted.



If necessary remove the gasket residue at the cylinder head gasket (1).

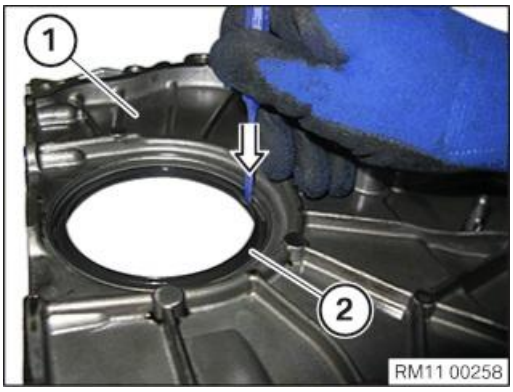


Important!

Fitting sleeves (1) must be exchanged.

Use the fitting sleeves with 9 millimetre length (11 22 7 557 611, refer Electronic Parts Catalogue).

Mount the fitting sleeves (1) in the crankcase at the limit position.



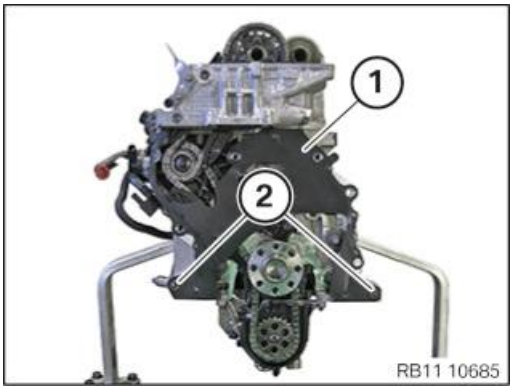
Installation note:
Mount the timing case cover without the crankshaft seal.

Support the timing case cover (1) from below.

Set the inner punch in the crankshaft seal (2).

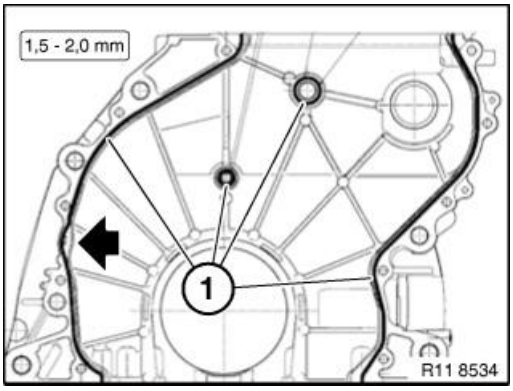
Drive the crankshaft seal (2) outwards.

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On engines up to 11/2009:

Position the beaded metal gasket (1) on the fitting sleeves (2).



On engines from 11/2009.

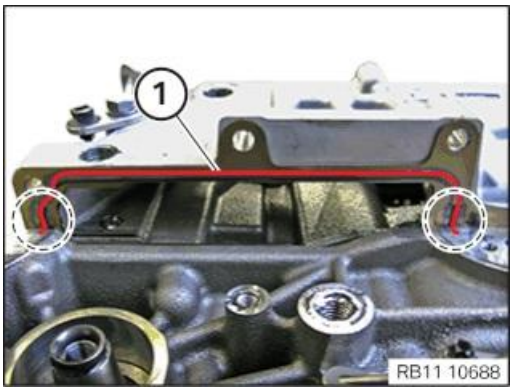
Remove gasket remnants from crankcase and timing case cover using special tool 11 4 470 .

Apply sealing bead (1) at marked points.

Installation note:
Loctite 5970, (liquid sealing compound 2.2 under consumable)

Maximum application time of the sealing bead (1) 12 min.

Thickness of sealing bead: **1.5 to 2.0 mm.**



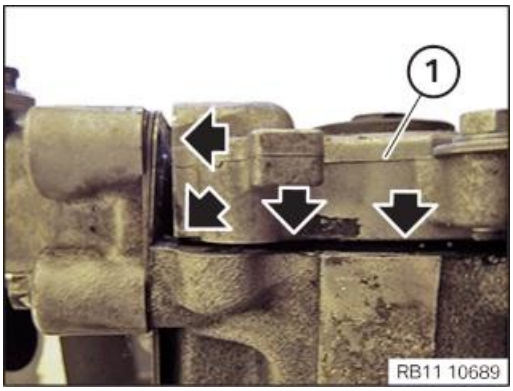
Installation note:
Loctite 5970, (liquid sealing compound 2.2 under consumable)

Maximum application time of the sealing bead (1) 12 min.

Apply sealing bead (1) as shown on the cylinder head gasket.

Thickness of sealing bead: **1.5 to 2.0 mm.**

Strength of the sealing bead on the ends (marked area): **2.5 to 3.0 mm.**

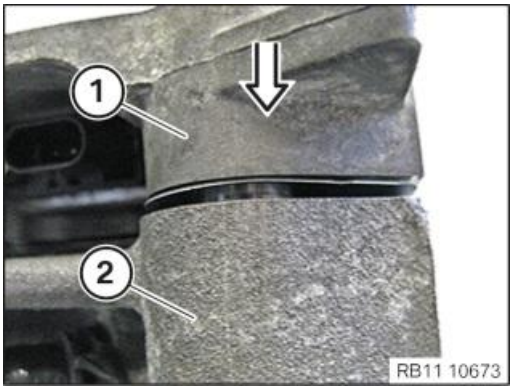


Important!

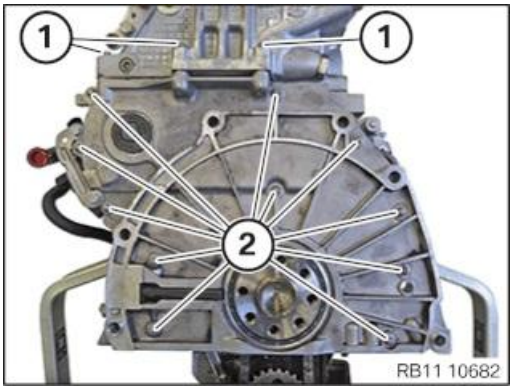
Do not shear off sealing beads.

Place the timing case cover (1) uniformly on the crankcase/cylinder head.

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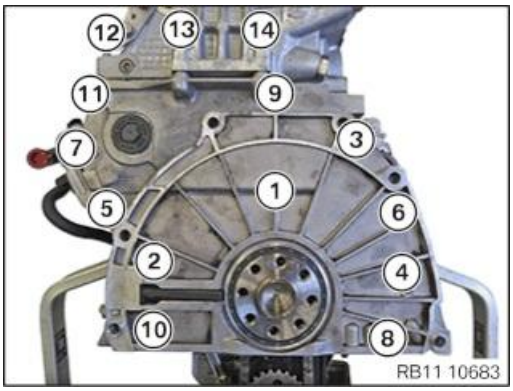


Place the timing case cover (1) on the fitting sleeves in the crankcase (2) in the center and attach with a rubber mallet in direction of arrow.



Insert screw (2) and tighten until it makes contact.

Insert bolts (1).



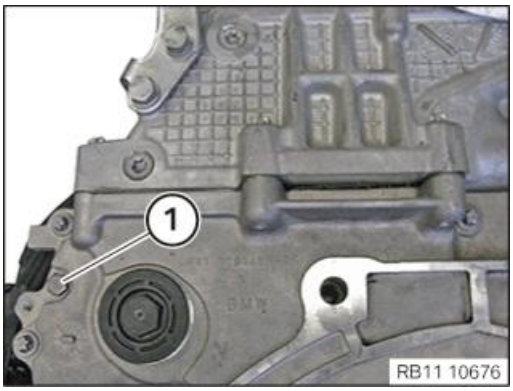
Installation note:
Replace screws 1 - 11.

Tighten screws in the sequence **1 - 11**.

Tightening torque: **8 Nm + 90°**, 11 14 2AZ.

Tighten the screws **12 - 14**.

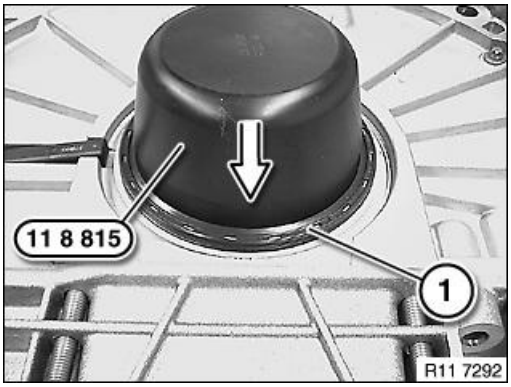
Tightening torque : **19 Nm**, 11 00 4AZ.



Tighten the screw of the high pressure pump (if installed).

Tightening torque : **11 Nm,** 11 14 3AZ.

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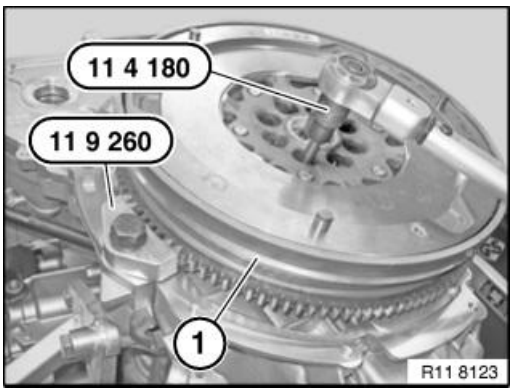
Replace crankshaft seal (1) (refer REP 11 14 151).



Install the oil sump using special tool 11 8 780 (see REP 11 13 000).

Position magnet wheel (1) on crankshaft.

Note:
Note the installation position of the magnet wheel.



Installation note:
Flywheel must be installed to determined TDC.

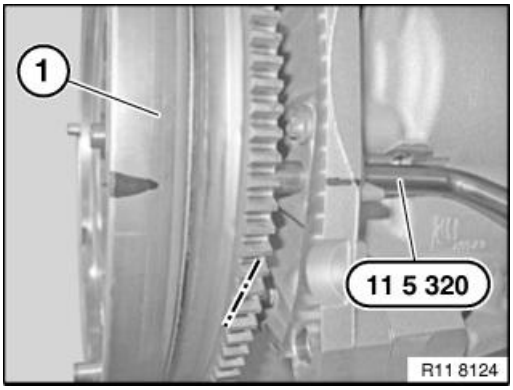
Important!

Clean thread in the crankshaft.

Replace screws.

Position flywheel.

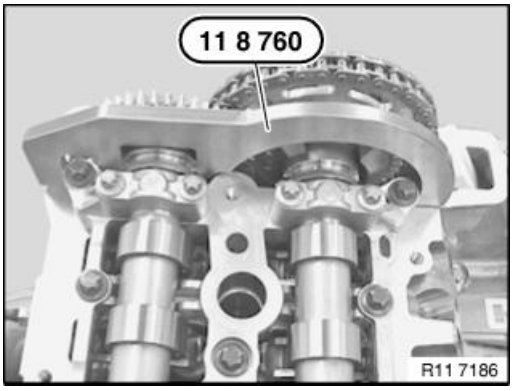
Attach flywheel (refer REP 11 22 000).



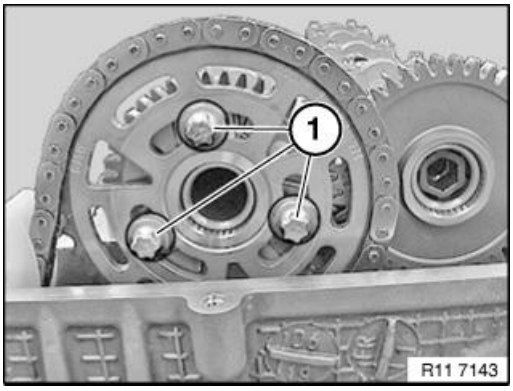
Turn back the flywheel (1) from the 11° to the OT-position.

Block crankshaft with special tool 11 5 320 in TDC firing position for cylinder 1.

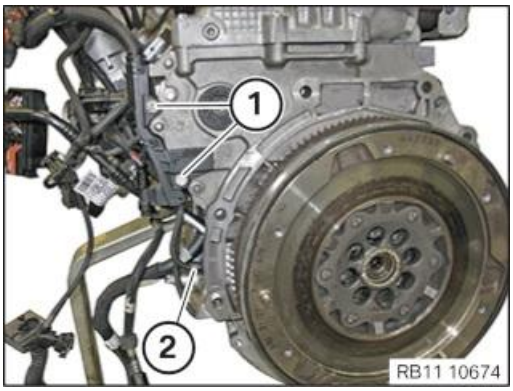
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Special tool 11 8 760 must lie flush on cylinder head.



Tighten camshaft bolts (1).
Tightening torque : **15 Nm**, 11 31 1AZ.
Spin engine twice in the direction of rotation.
Check timing and if necessary correct.
Remove all special tools.



Tighten screws (1) of the wiring harness.
Tightening torque : **8 Nm**, 11 00 2AZ.
Connect the plug connection (2) of the pulse sensor of crankshaft.

Required follow-up work:

- Attach cylinder head cover (refer REP 11 12 000)
- Attach if necessary clutch (refer REP 21 21 500)
- Remove engine from assembly stand
- Install engine (refer REP 11 00 050)

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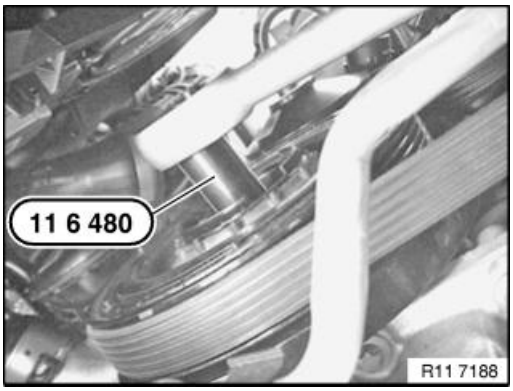
11 31 505 Adjusting camshaft timing (N47 D20 O1)

Special tools required:

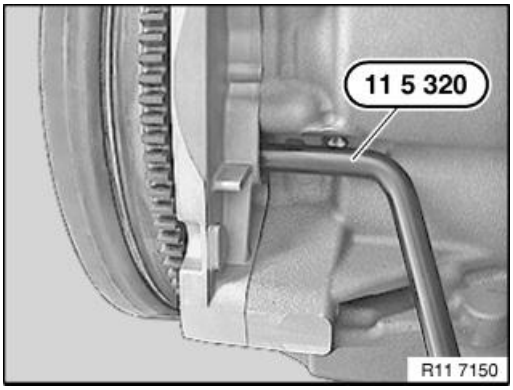
- 11 4 480
- 11 5 320
- 11 6 480
- 11 8 760

Necessary preliminary tasks:

- Remove cylinder head cover.

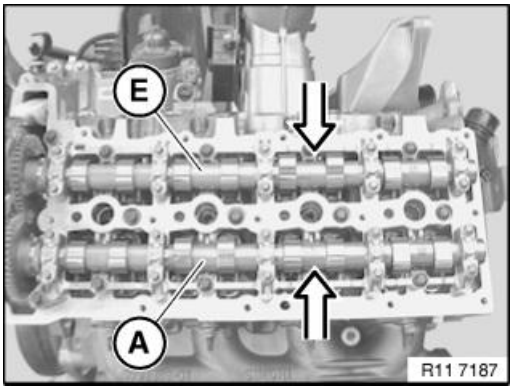


Crank engine at central bolt with special tool 11 6 480 **Important!**
Do not turn the engine against the direction of travel.



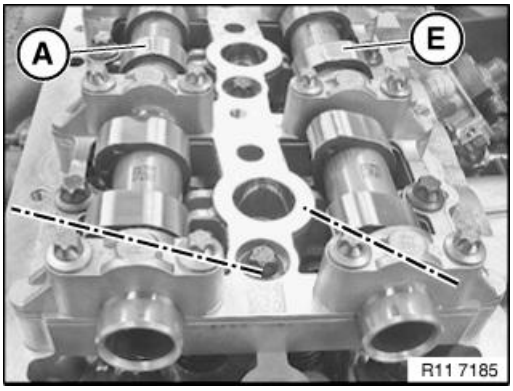
Remove protective cap of gear case cover.

Block crankshaft with cylinder no. 1 in TDC firing position with special tool11 5 320 .



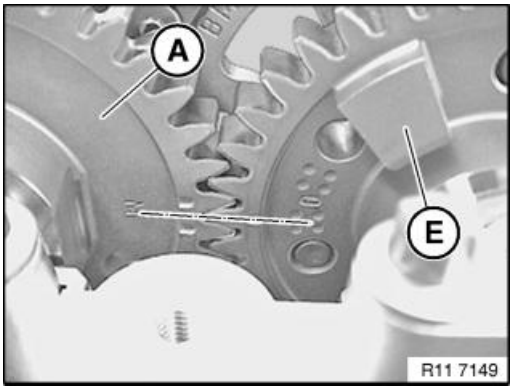
It must be possible to read the part number on the exhaust and intake camshafts (E and A) from above.*Note:*
See graphic.

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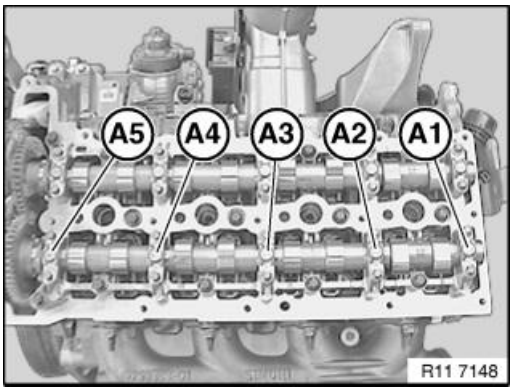
The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.



The marking on exhaust sprocket wheel (A) must be aligned with the marking on intake sprocket wheel (E).*Note:*
See graphic.

The exhaust camshaft must be removed if the marks do not agree (are not aligned).

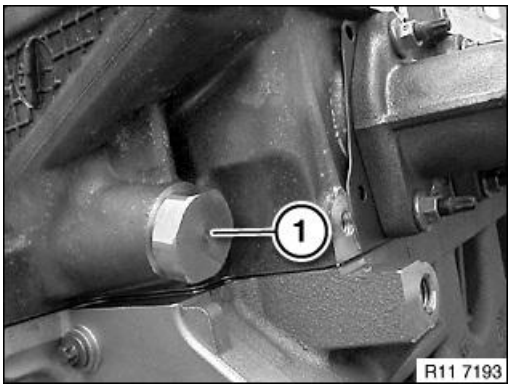


Release all bolts of bearing caps A1 to A5 working from the outside inwards.

Tightening torque: 11 31 2AZ.

Remove exhaust camshaft in upward direction.

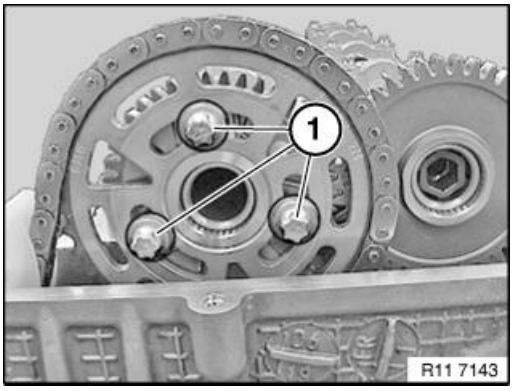
Place all components on special tool 11 4 480 in a tidy and orderly fashion.



Release chain tensioner (1).

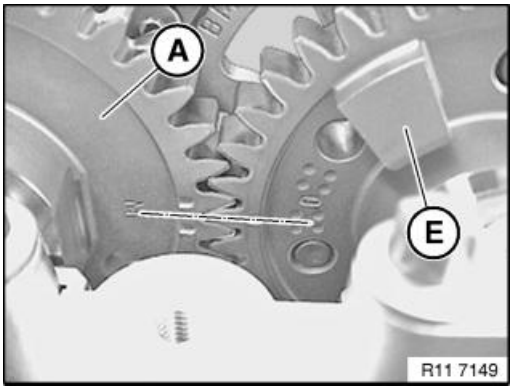
Tightening torque: 11 12 2AZ.

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Remove camshaft bolts (1) and detach camshaft sprocket.

Tightening torque: 11 31 1AZ.

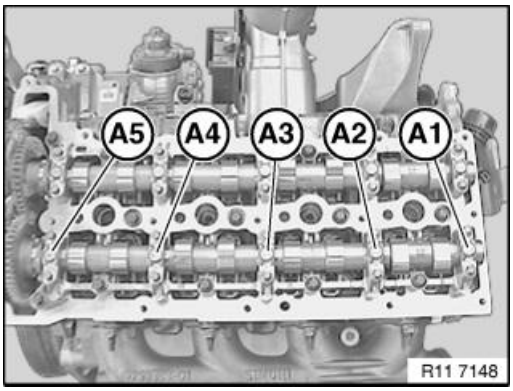


Position intake camshaft (E).

Installation note:
Note installation position of roller cam follower.

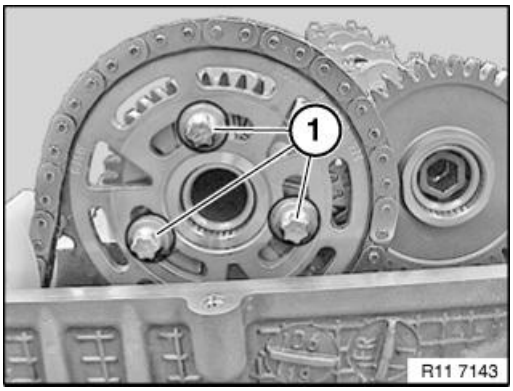
Fit exhaust camshaft (A) in such a way that both marks are aligned.

Note:
See graphic.



Tighten all bearing caps A1 to A5 working from the inside outwards.

Tightening torque: 11 31 2AZ.



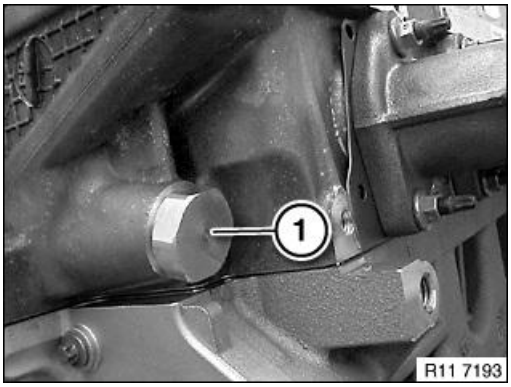
Place the camshaft sprocket with timing chain on the intake camshaft such that bolts (1) are located in the centre of the slots.

Insert bolts (1).

Tighten bolts (1) to 10 Nm.

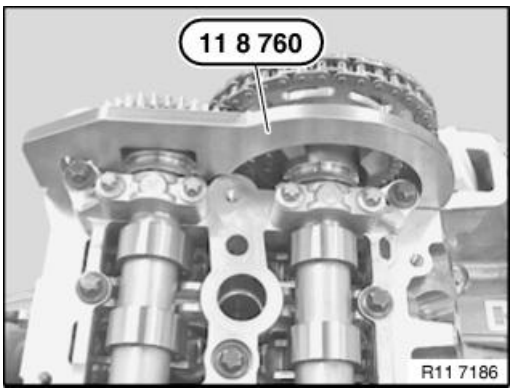
Release bolts (1) again by a 90° turn.

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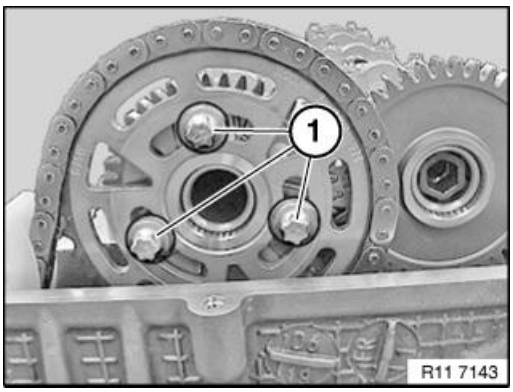
Install chain tensioner (1).

Tightening torque: 11 12 3AZ.



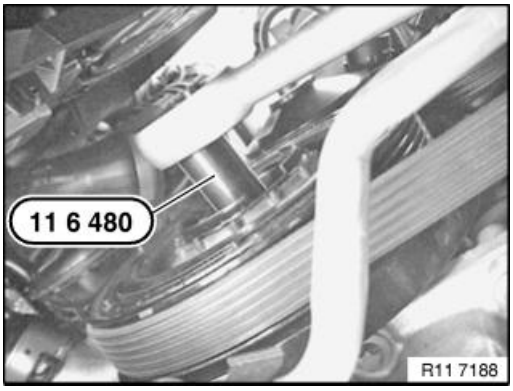
Place special tool 11 8 760 on exhaust camshaft.**Note:**

Special tool 11 8 760 must lie flush on cylinder head.



Tighten down screws (1).

Tightening torque: 11 31 1AZ.



Crank engine twice in direction of rotation with special tool 11 6 480 up to TDC firing position of cylinder no. 1.

Check camshaft adjustment.

Important!

Do not turn the engine back.

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Assemble engine.

Turn over engine twice.

Check timing.

Important!

Special tool 11 5 320 must be removed before starting engine.

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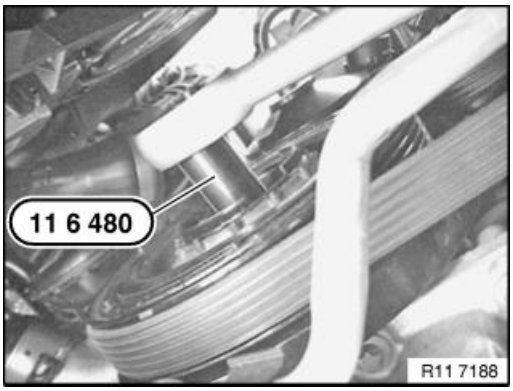
11 31 505 Adjusting camshaft timing (N47, N47S)

Special tools required:

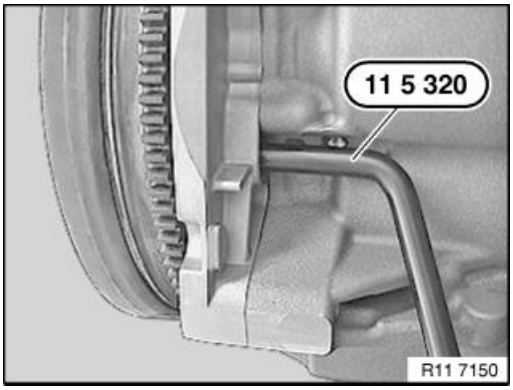
- 11 4 480
- 11 5 320
- 11 6 480
- 11 8 760

Necessary preliminary tasks:

- Remove cylinder head cover.

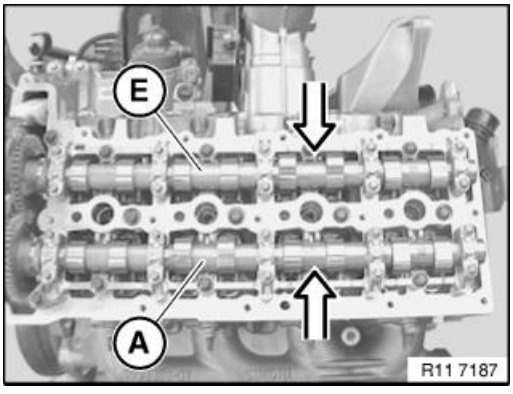


Crank engine at central bolt with special tool 11 6 480 **Important!**
Do not turn the engine back.
Special tool 11 6 480 must be removed before starting engine.



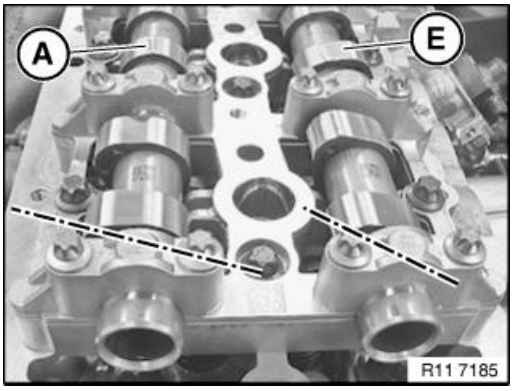
Remove protective cap of gear case cover.

Block crankshaft with cylinder no. 1 in TDC firing position with special tool11 5 320 .



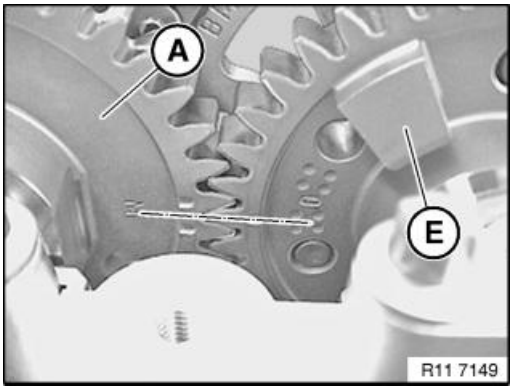
It must be possible to read the part number on the exhaust and intake camshafts (E and A) from above.*Note:*
See illustration.

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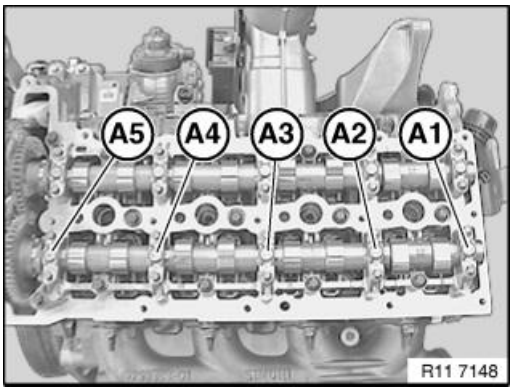
The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.



The marking on exhaust sprocket wheel (A) must be aligned with the marking on intake sprocket wheel (E).*Note:*
See illustration.

The exhaust camshaft must be removed if the marks do not agree (are not aligned).

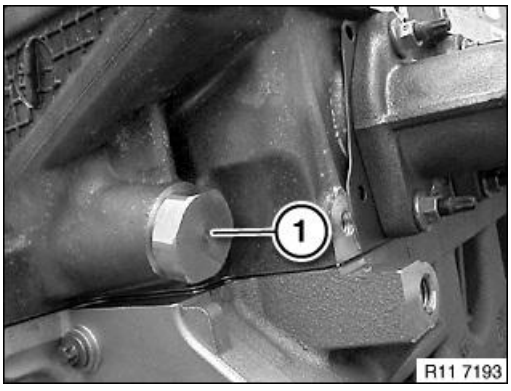


Release all bolts of bearing caps A1 to A5 working from the outside inwards.

Tightening torque: 11 31 2AZ.

Remove exhaust camshaft in upward direction.

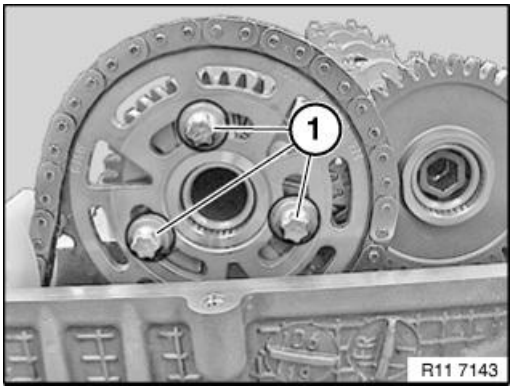
Place all components on special tool 11 4 480 in a tidy and orderly fashion.



Release chain tensioner (1).

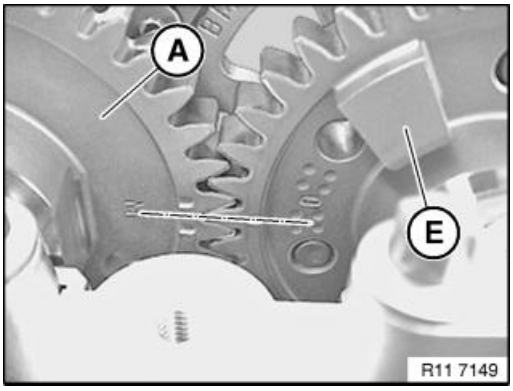
Tightening torque: 11 12 2AZ.

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Remove camshaft bolts (1) and detach camshaft sprocket.

Tightening torque: 11 31 1AZ.

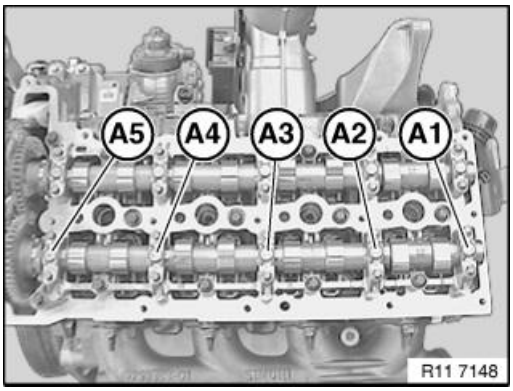


Position intake camshaft (E).

Installation note:
Note installation position of roller cam follower.

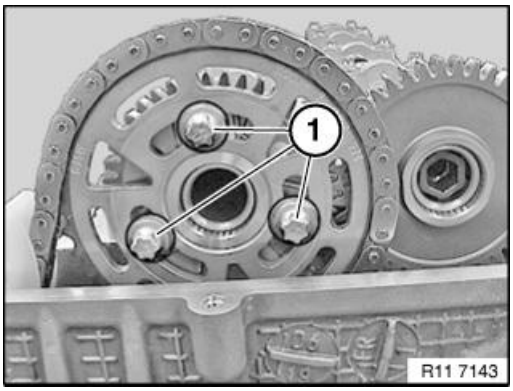
Fit exhaust camshaft (A) in such a way that both marks are aligned.

Note:
See illustration.



Tighten all bearing caps A1 to A5 working from the inside outwards.

Tightening torque: 11 31 2AZ.



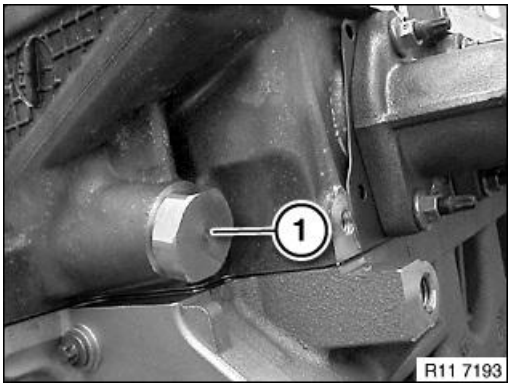
Place the camshaft sprocket with timing chain on the intake camshaft such that bolts (1) are located in the centre of the slots.

Insert bolts (1).

Tighten bolts (1) to 10 Nm.

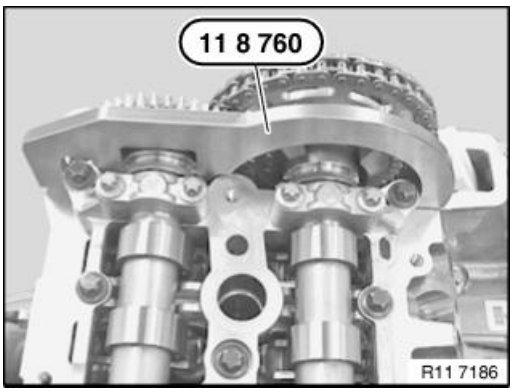
Release bolts (1) again by a 90° turn.

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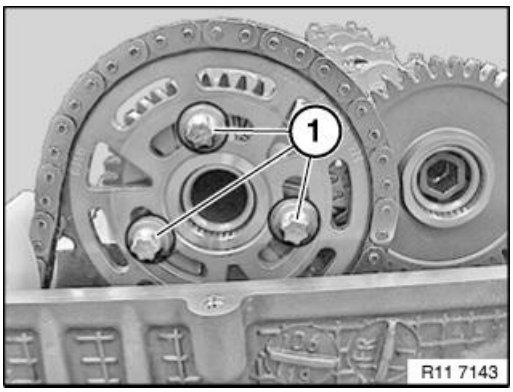
Install chain tensioner (1).

Tightening torque: 11 12 2AZ.



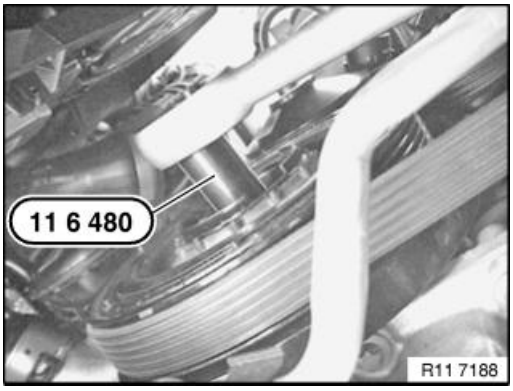
Place special tool 11 8 760 on exhaust camshaft.**Note:**

Special tool 11 8 760 must lie flush on cylinder head.



Tighten down screws (1).

Tightening torque: 11 31 1AZ.



Crank engine twice in direction of rotation with special tool 11 6 480 up to TDC firing position of cylinder no. 1.

Check camshaft adjustment.

Important!

Do not turn the engine back.

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Assemble engine.

Turn over engine twice.

Check timing.

Important!

Special tool 11 5 320 must be removed before starting engine.

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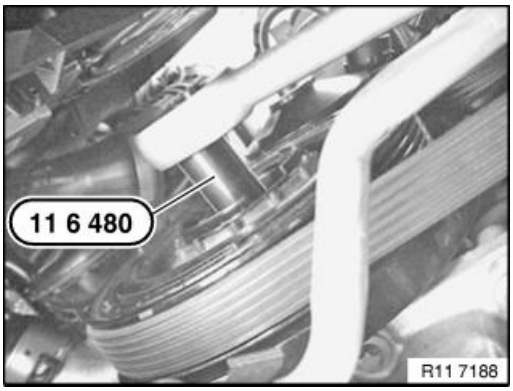
11 31 005 Checking camshaft timing (N47, N47S)

Special tools required:

- 11 5 320
- 11 6 480
- 11 8 760

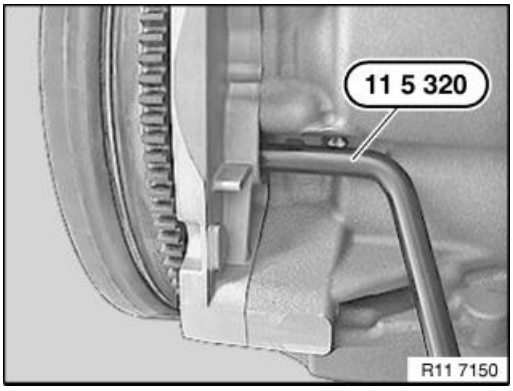
Necessary preliminary tasks:

- Remove cylinder head cover.



Crank engine with special tool 11 6 480 to TDC firing position of first cylinder.**Important!**

Do not crank back the engine.



Remove protective cap of gear case cover.

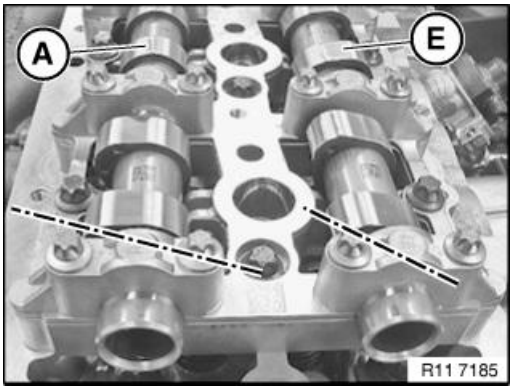
Crank engine at central bolt with special tool 11 6 480

Block crankshaft in TDC position of cylinder No. 1.

Important!

Do not turn the engine back.

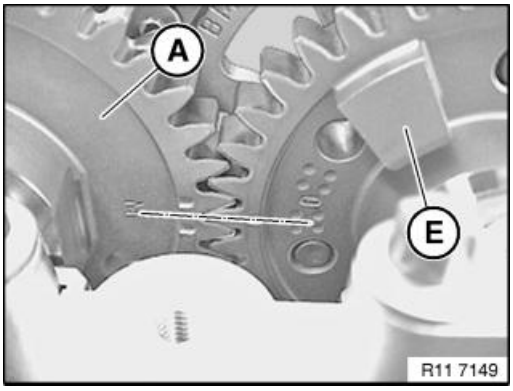
Special tool 11 6 480 must be removed before starting engine.



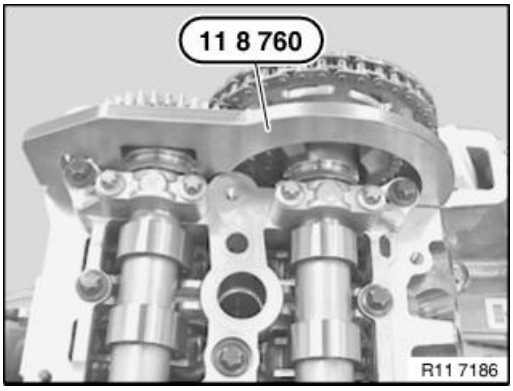
The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.

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The marking on exhaust sprocket wheel (A) must be aligned with the marking on intake sprocket wheel (E).*Note:*
See graphic.



Place special tool 11 8 760 on exhaust camshaft.

Note:

Special tool 11 8 760 must lie flush on cylinder head.

If necessary, adjust camshaft timing.

Assemble engine.**Important!**

Special tool 11 5 320 must be removed before starting engine.

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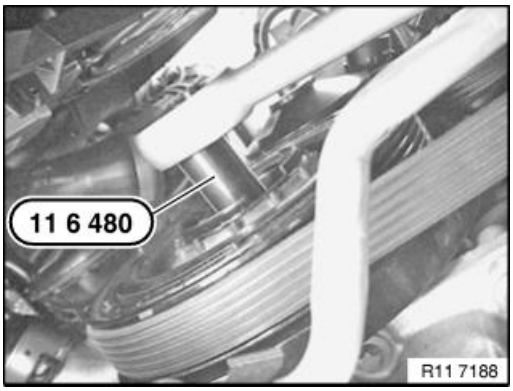
11 31 005 Checking camshaft timing (N47D20 O1)

Special tools required:

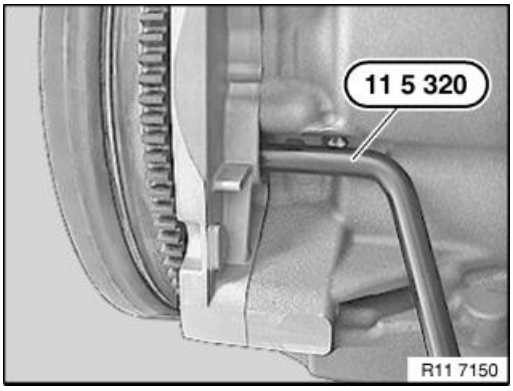
- 11 5 320
- 11 6 480
- 11 8 760

Necessary preliminary work:

- Remove cylinder head cover.



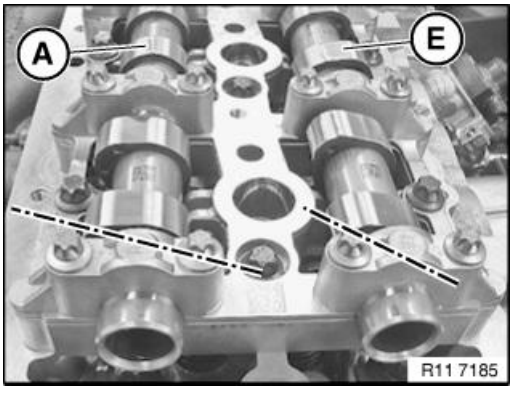
Crank engine with special tool 11 6 480 to TDC firing position of cylinder no. 1.**Important!**
Do not turn the engine against the direction of travel.



Remove protective cap of timing case cover.

Crank engine at central bolt with special tool 11 6 480

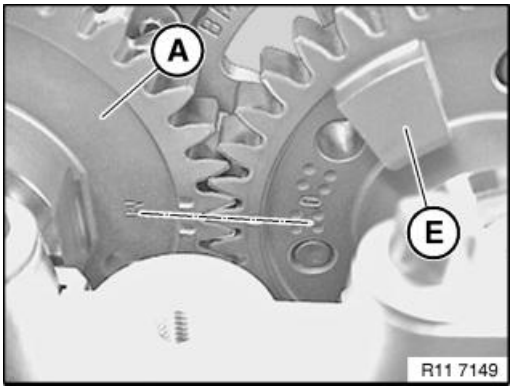
Use special tool 11 5 320 to block the crankshaft in the TDC firing position Cylinder 1



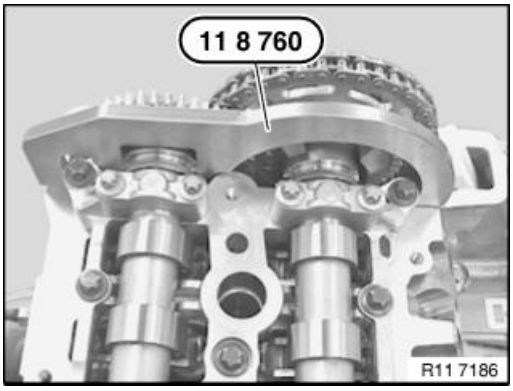
The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.

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The marking on camshaft sprocket on the exhaust side (A) must be aligned with the marking on camshaft sprocket on the intake side (E).*Note:*
See image.



Place special tool 11 8 760 on exhaust camshaft.

Note:

Special tool 11 8 760 must lie flush on cylinder head.

If necessary, adjust camshaft timing.

Assemble engine.**Important!**

11 5 320 Remove special tool before starting engine.

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11 31 548 Checking timing chain for elongation and replacing both timing chains (N47D K/U/O/T 0/1)

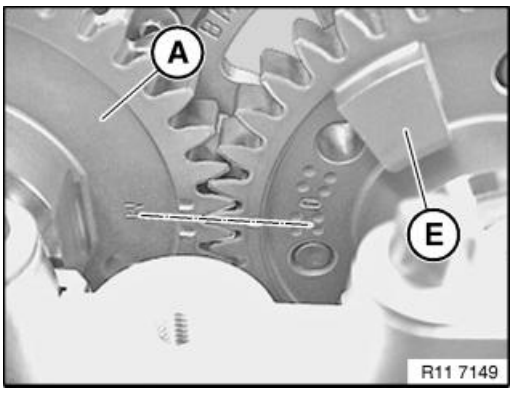
Special tools required:

- 11 5 320
- 11 6 480
- 11 8 760
- 11 4 320
- 2 285 671
- 11 8 740
- 11 3 340
- 11 4 120
- 11 4 470
- 11 8 780

Necessary preliminary tasks:

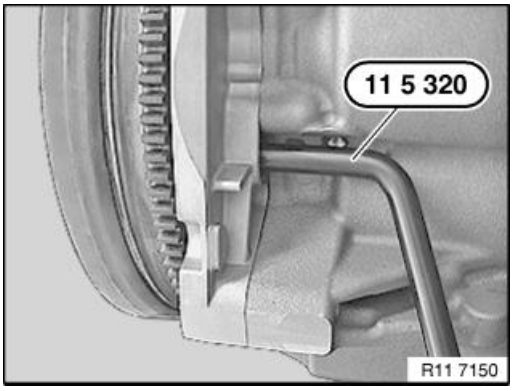
- Check timing chain top measurement chain tensioner
- Remove cylinder head cover

Follow diagnosis instruction.



The marking on exhaust sprocket wheel (A) must be aligned with the marking on intake sprocket wheel (E).*Note:*
See illustration.

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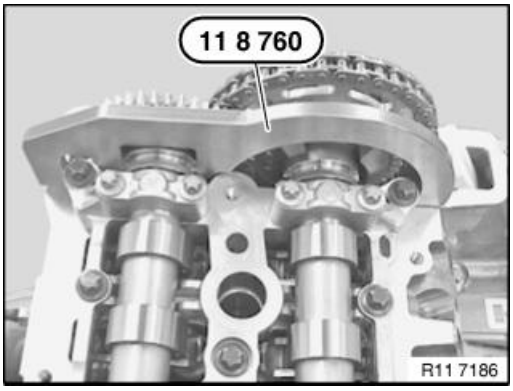
Installation note:
It is not permitted to turn the engine back, measured values are distorted.

Special tool 11 5 320 must be exactly in the alignment position.

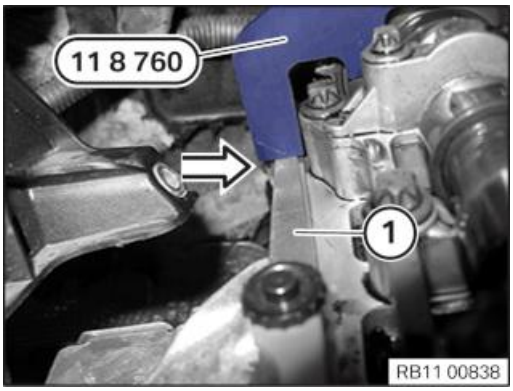
Remove protective cap of timing case cover.

Turn engine with special tool 11 6 480 .

Use special tool 11 5 320 to block the crankshaft in the TDC firing position Cylinder 1



Place special tool 11 8 760 on exhaust camshaft.



Determine gap dimension.

Slide feeler gauge (1) between cylinder head and special tool 11 8 760 without jamming (see arrow).

Follow diagnosis instruction.

Necessary preliminary tasks:

- Remove engine
- Mount engine on assembly stand
- Remove flywheel
- Remove oil sump

Note:
Cylinder head is **not** removed.

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Removal:

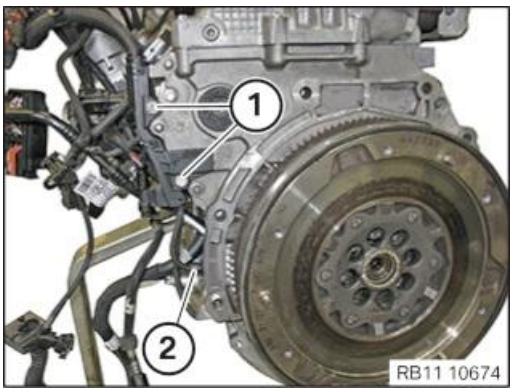


Important!

Magnet wheel (1) is magnetic.

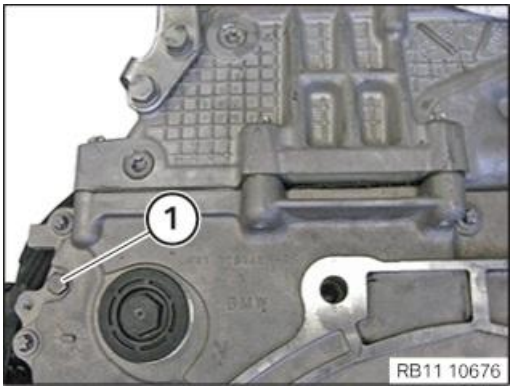
Keep magnet wheel (1) in a plastic bag away from swarf.

Remove magnet wheel (1) from crankshaft.

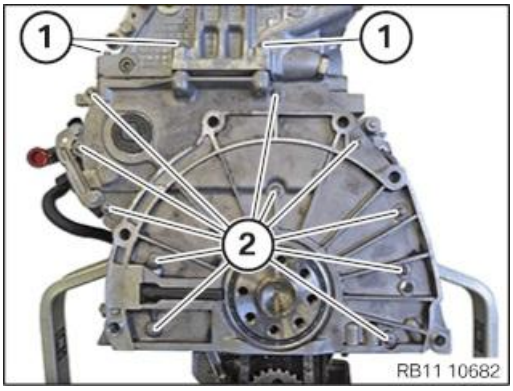


Release screws (1) of wiring harness.

Unlock plug connection (2) of the crankshaft pulse sensor and disconnect.



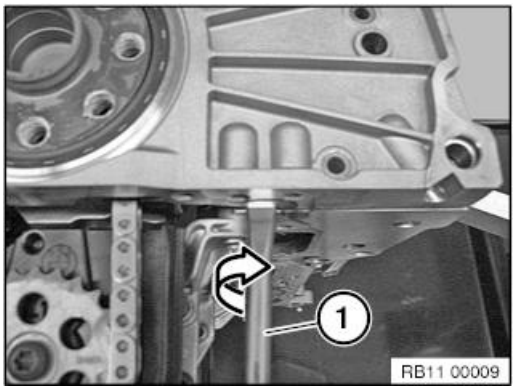
Release screw of high pressure pump (if fitted).



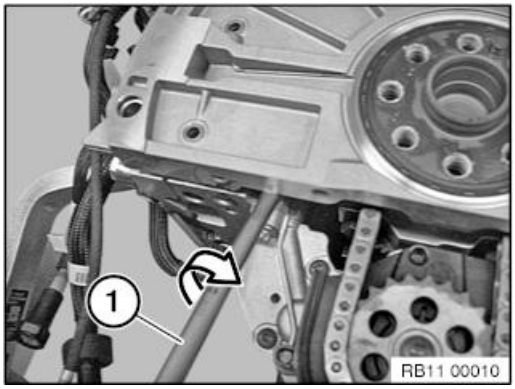
Release screws (1).

Unfasten screws (2).

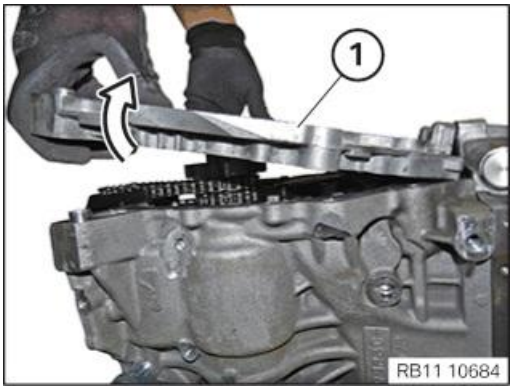
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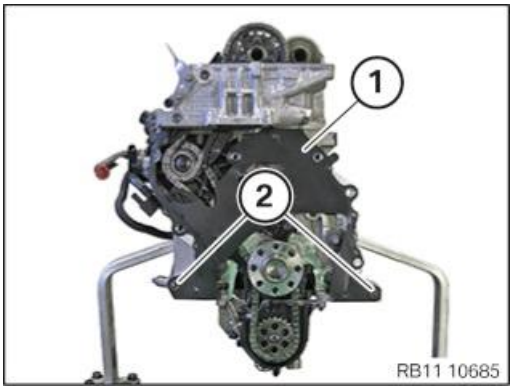
Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.



Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.



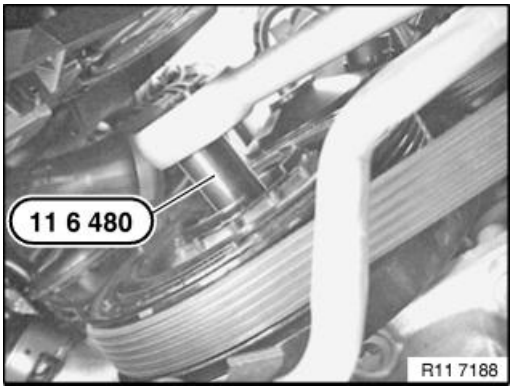
Carefully remove timing case cover (1) in direction of arrow.



On engines up to 11/2009:

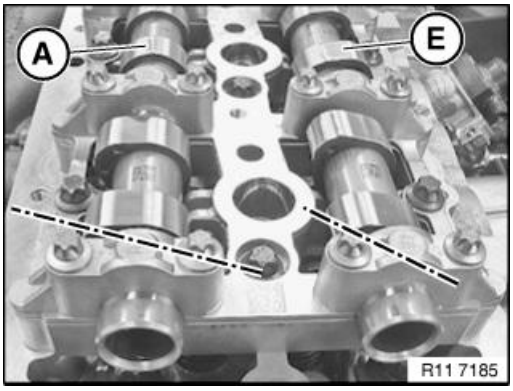
Remove beaded metal gasket (1).

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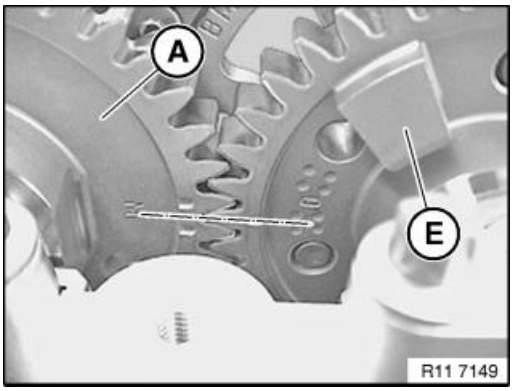
Crank engine with special tool 11 6 480 to TDC firing position of cylinder no. 1.**Important!**

Do not turn the engine against the direction of travel.

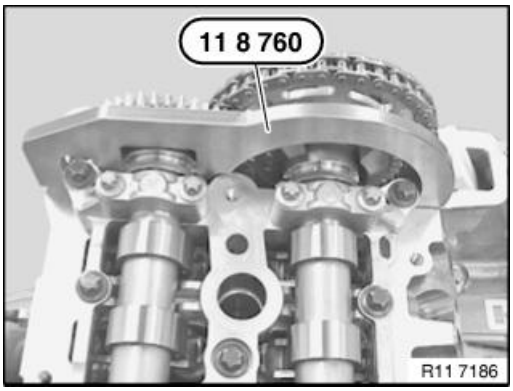


The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.



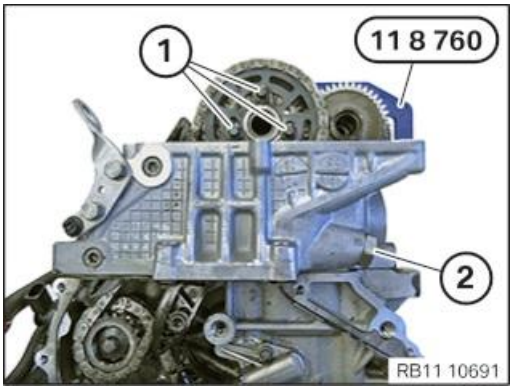
The mark on the exhaust camshaft (A) must correspond to the mark on the intake camshaft (E).*Note:*
See image.



Place special tool 11 8 760 on exhaust camshaft.**Note:**

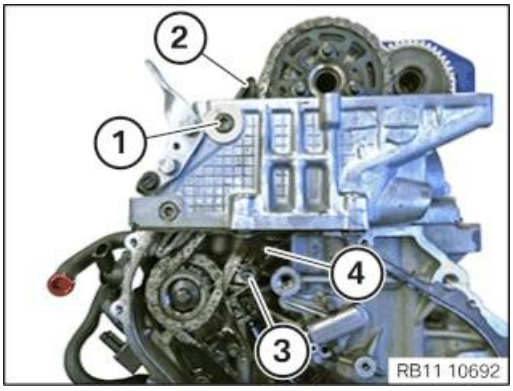
Special tool 11 8 760 must lie flush on cylinder head.

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Only release screws (1).

Remove chain tensioner (2).

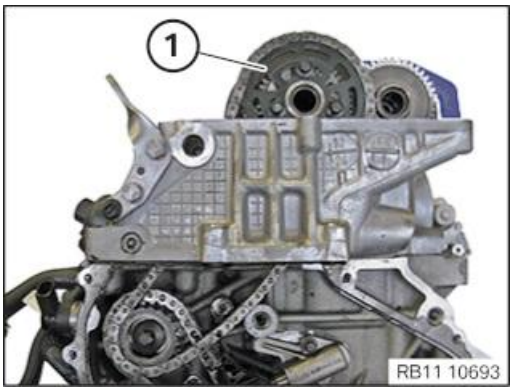


Release bearing journal (1).

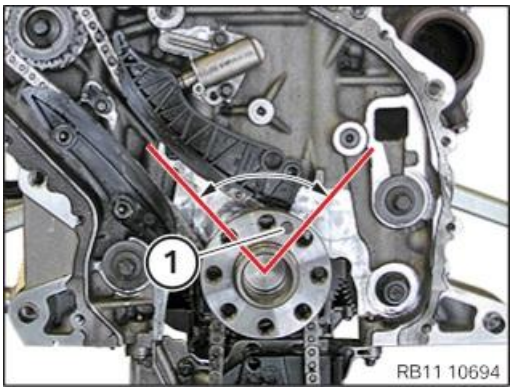
Remove guide rail (2) upwards.

Release bearing journal (3).

Remove tensioning rail (4) downwards.



Remove top timing chain with camshaft sprocket (1).



Important!

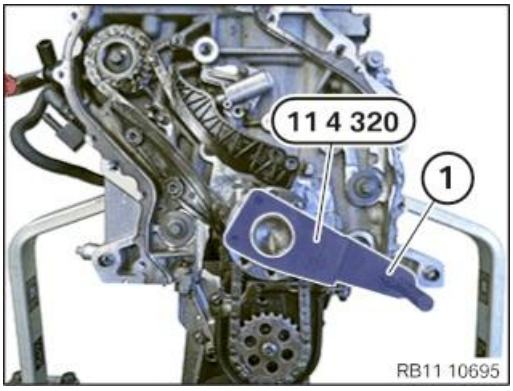
Risk of damage to the valve gear

The guide pin (1) of the crankshaft may not exit the marked area during the entire repair process.

Only after final setting of the timing the engine may be spun again.

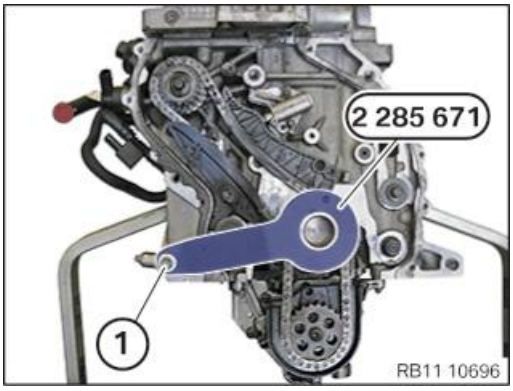
Note:
Cylinder head remains mounted.

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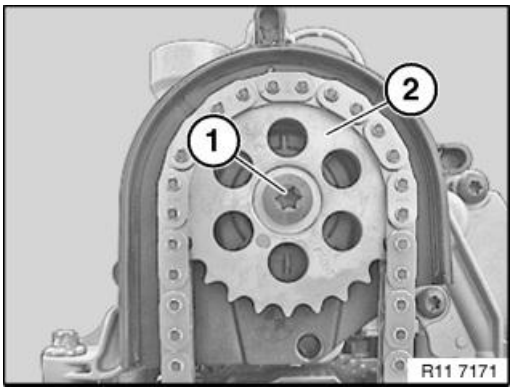
Vehicles before 5/2013:

Fix special tool 11 4 320 on crankshaft and fix with a screw (1).



Vehicles after 5/2013:

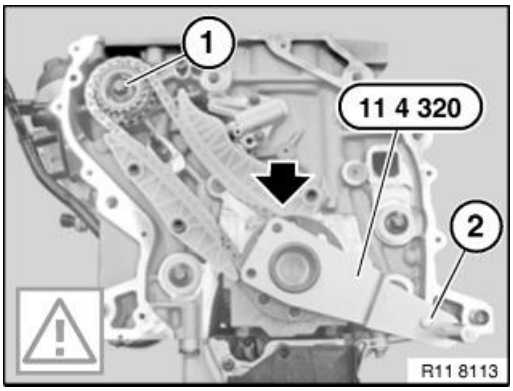
Mount special tool 2 285 671 on the crankshaft, screw in transmission bolt (1) somewhat.



Important!

Left-hand threads.

Release screw (1) on camshaft sprocket of oil pump.



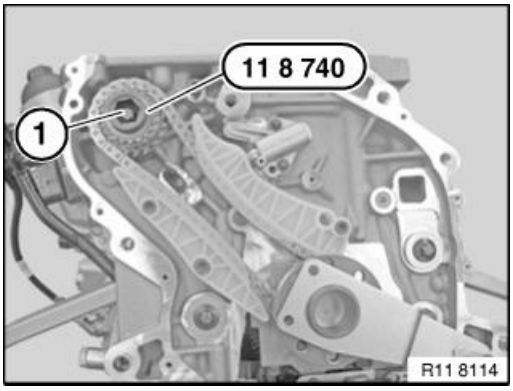
Note:
To loosen the central bolt on the high pressure pump, crankshaft must remain fixed with special tool 11 4 320 or 2 285 671 .

Release central bolt (1) of high pressure pump.**Important!**

Release central bolt only, do not remove.

Pistons of cylinder 1 and 4 are at 45° after TDC position.

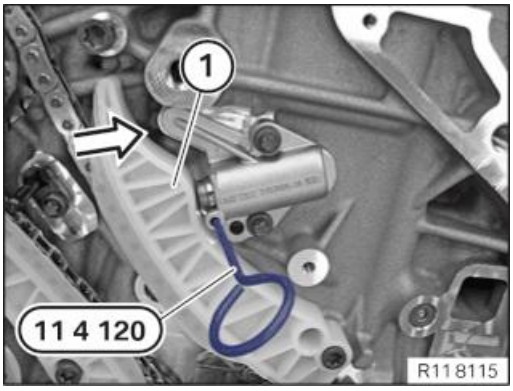
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Note:
To loosen the central bolt on the high pressure pump, crankshaft must remain fixed with special tool 11 4 320 or 2 285 671 .

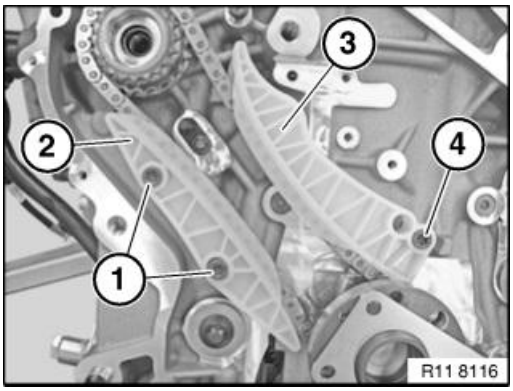
Screw special tool 11 8 740 in hand-tight.

Twist out central bolt of high pressure pump (1) until impeller has detached from taper of high pressure pump.



Using tensioning rail (1), press chain tensioner in direction of arrow until special tool 11 3 340 /11 4 120 can be positioned.

If necessary, remove chain tensioner.

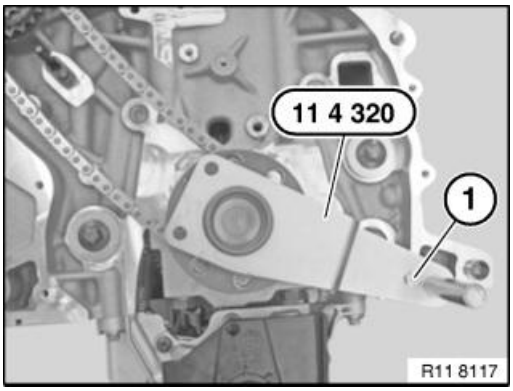


Release bearing journal (1).

Remove guide rail (2).

Release bearing journal (4).

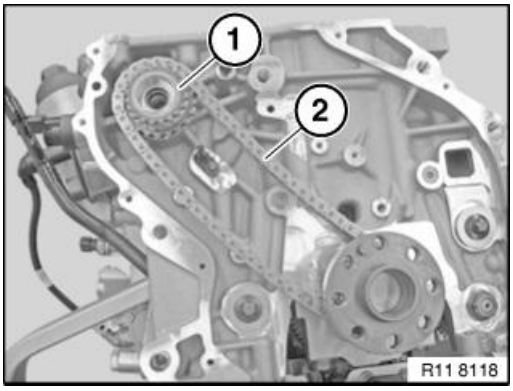
Remove tensioning rail (3).



Release screw (1).

Remove special tool 11 4 320 or 2 285 671 .

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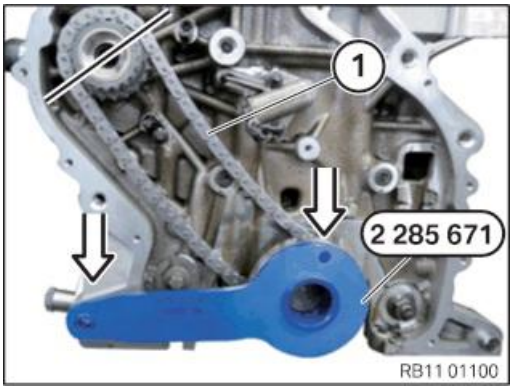


Remove camshaft sprocket of the oil pump and drive chain of the oil pump.

Remove impeller (1) with timing chain (2) from high pressure pump.

Remove timing chain (2).

Installation:



Important!

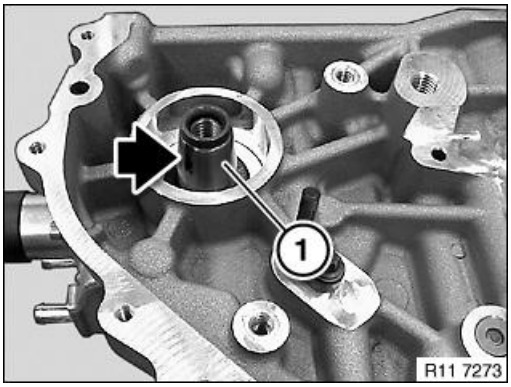
The high pressure pump and crankshaft must be positioned **to each other** with special tool 2 285 671 .

Fit timing chain (1).

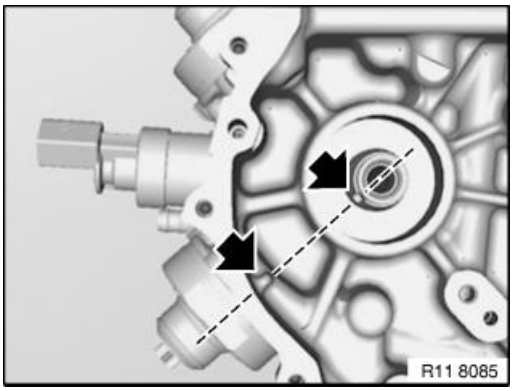
Lay drive chain for oil pump.

Position crankshaft with special tool 2 285 671 (crankshaft is in the **11° top dead centre**).

Fix special tool 2 285 671 via the fitting bush on the crankcase.

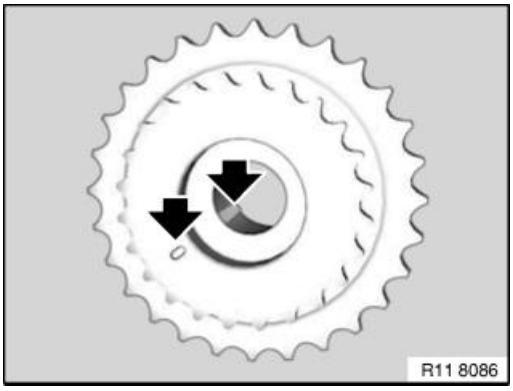


Pay attention to spline groove on high pressure pump (1).

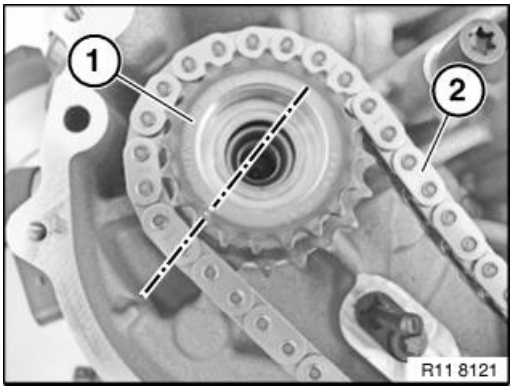


Installation note:
The marking on the crankcase and spline groove on the high pressure pump must be in line (graphic N57).

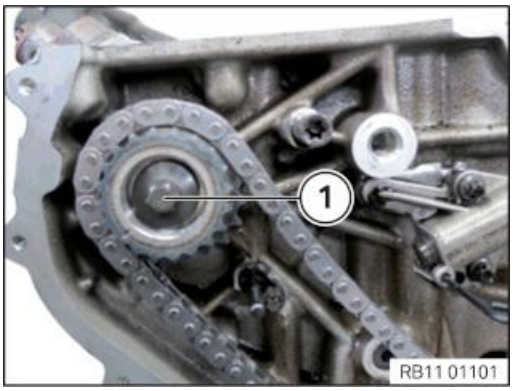
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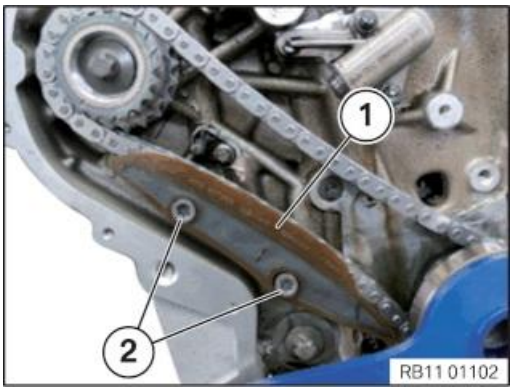
Installation note:
Groove and marking (0) on pinion are on a single plane.



Position impeller (1) with timing chain (2) on high pressure pump.
Marking (0) and cast lug must be in line.



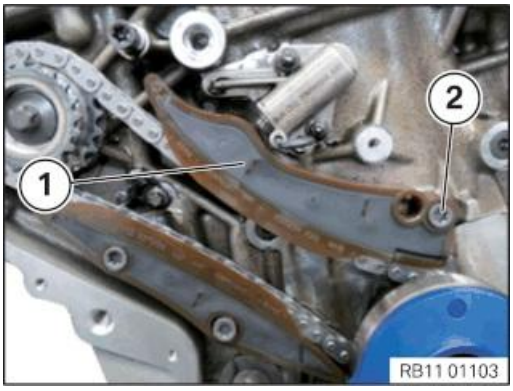
Insert central bolt (1) of high pressure pump.



Installation note:
Clean screw thread.
Renew all bearing journals.

Position guide rail (1).
Screw in bearing journals (2).
Tightening torque: 11 11 3AZ.

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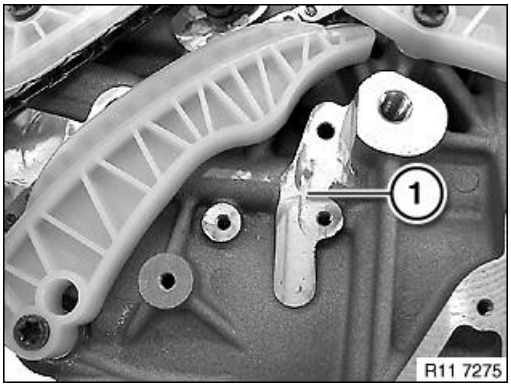
Installation note:
Clean screw thread.

Renew all bearing journals.

Position and tighten tensioning rail (3).

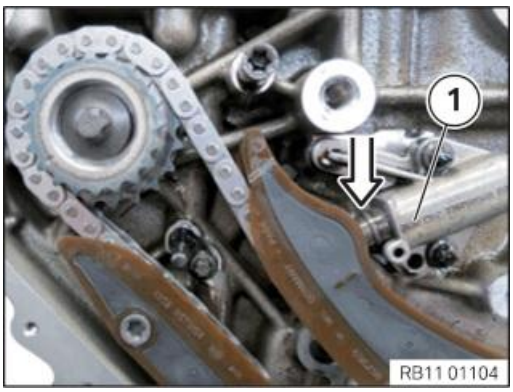
Screw in and tighten bearing journal (4).

Tightening torque: 11 11 3AZ.



Important!

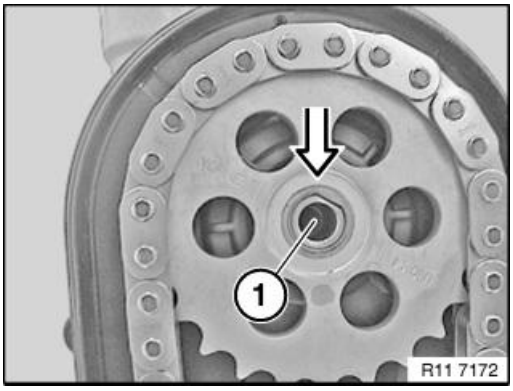
Clean sealing surfaces (1) with compressed air.



If applicable, once again screw in the hydraulic chain tensioner at the bottom (1).

Tightening torque: 11 11 4AZ .

Remove special tool 11 3 340 /11 4 120 .

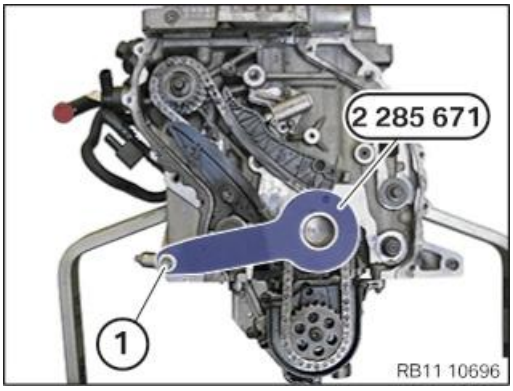


Position timing chain with secondary sprocket wheel for oil pump.

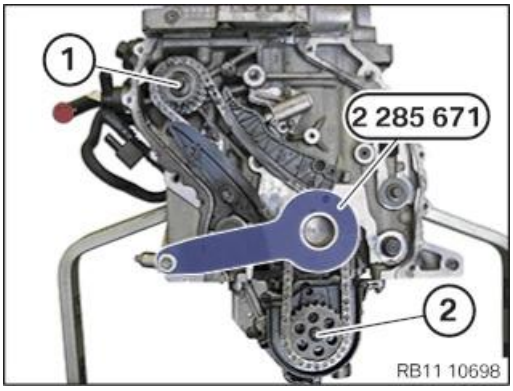
Screw in screw in oil pump shaft (1).

Installation note:
Pay attention to mounting flats on oil pump shaft (1) (see arrow).

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For better support of the special tool 2 285 671 screw in transmission bolt (1) slightly.



Tighten central bolt (1) of high pressure pump.

Tightening torque: 13 52 2AZ.

Important!

Left-hand threads.

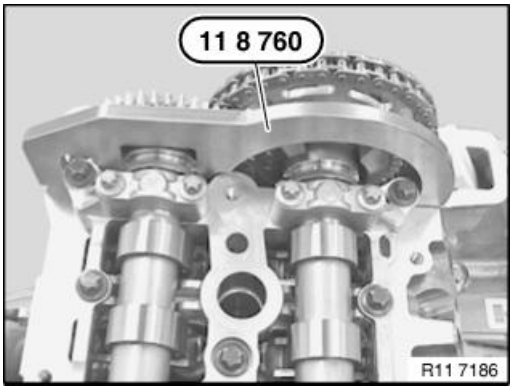
Replace screw.

Tighten screw (2) of oil pump.

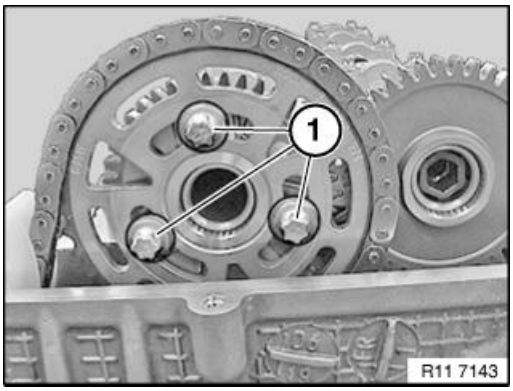
Tightening torque: 11 41 3AZ.

Note:

Do **not** remove special tool 2 285 671 yet.



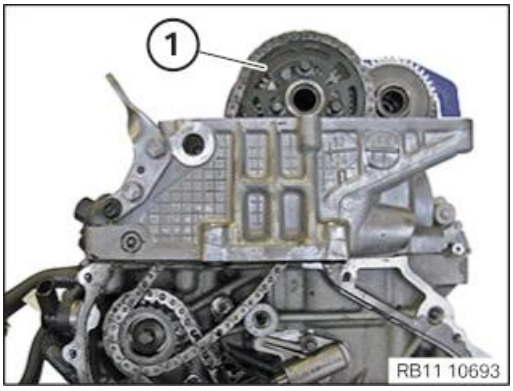
Special tool 11 8 760 must lie flush on cylinder head.



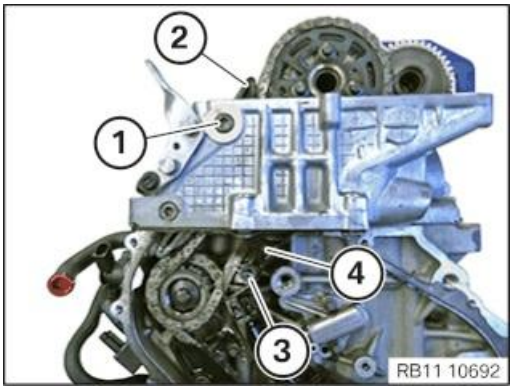
Installation note:

Place the camshaft sprocket with timing chain on the intake camshaft such that screws (1) are located in the centre of the elongated holes.

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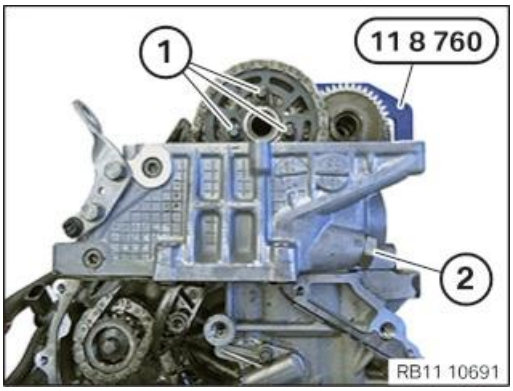


Lay timing chain on top with camshaft sprocket (1) and fix screws.



Installation note:
Clean all threads of bearing journals.
Renew all bearing journals.

Install guide rail (2).
Screw in and tighten bearing journal (1).
Tightening torque: 11 12 4AZ.
Install tensioning rail (4).
Screw in and tighten bearing journal (3).
Tightening torque: 11 11 3AZ.



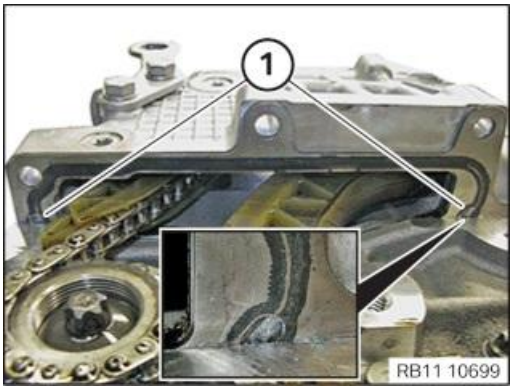
Installation note:
Renew chain tensioner.

Fix screws (1) with 10 Nm and release by 90°.
Install chain tensioner (2) and tighten.
Tightening torque: 11 12 3AZ.
Remove special tool 2 285 671 .

Important!

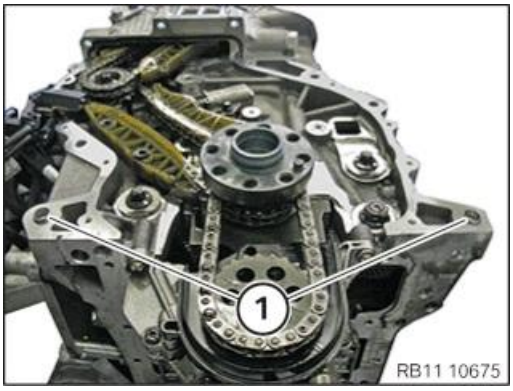
Engine is still found at 11° as per TDC.

In order to adjust the timings timing case cover and flywheel must be mounted.



If necessary remove the gasket residue at the cylinder head gasket (1).

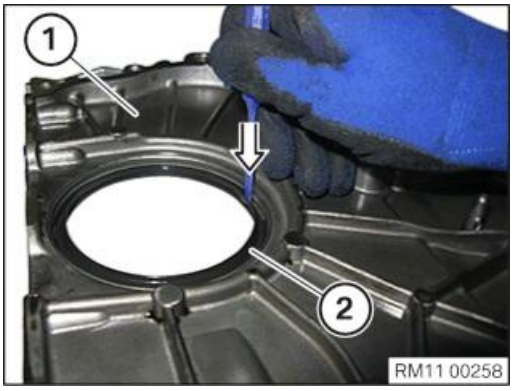
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Installation note:
Fitting sleeves (1) must be exchanged.

Use the fitting sleeves with 9 millimetre length (11 22 7 557 611, refer Electronic Parts Catalogue).

Mount the fitting sleeves (1) in the crankcase at the limit position.

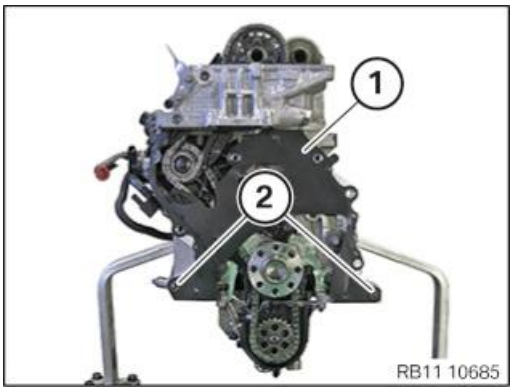


Installation note:
Mount the timing case cover without the crankshaft seal.

Support the timing case cover (1) from below.

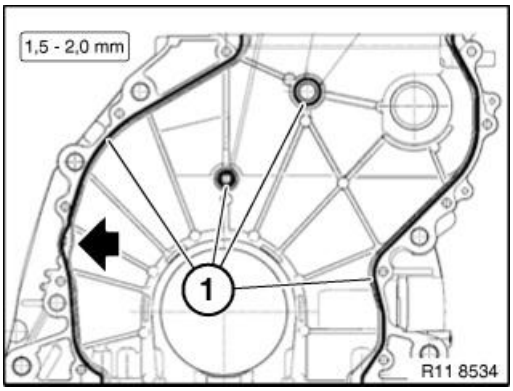
Set the inner punch in the crankshaft seal (2).

Drive the crankshaft seal (2) outwards.



Engines up to 11/2009:

Position the beaded metal gasket (1) on the fitting sleeves (2).



Engines from 11/2009:

Remove gasket remnants from crankcase and timing case cover using special tool 11 4 470 .

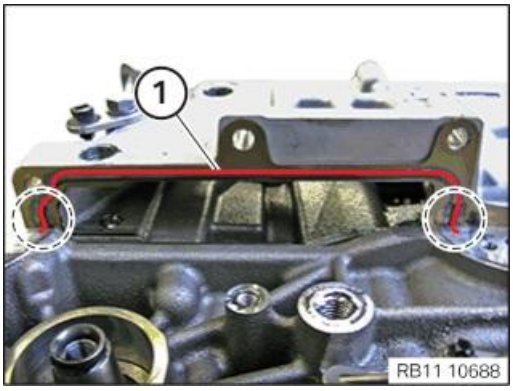
Apply sealing bead (1) at marked points.

Installation note:
Loctite 5970, (liquid sealing compound 2.2 under consumable)

Application time of sealing bead (1) max. 12 min.

Thickness of sealing bead: **1.5 to 2.0 mm.**

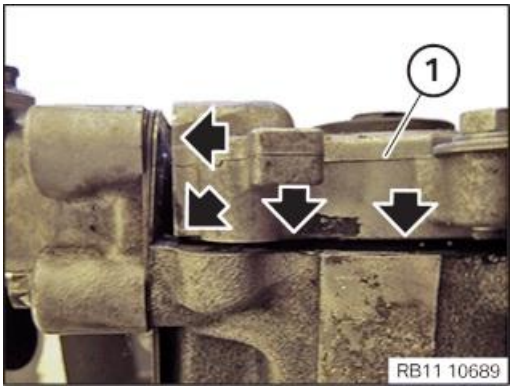
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All N47:

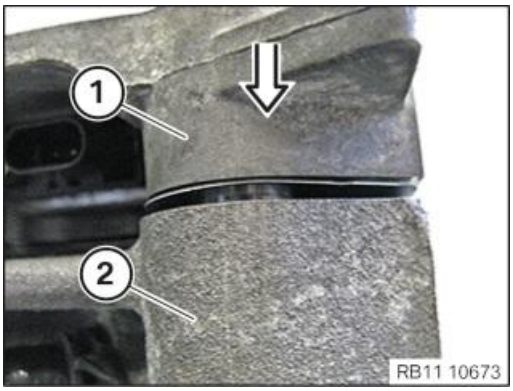
Installation note:
Loctite 5970, (liquid sealing compound 2.2 under consumable)
Application time of sealing bead (1) max. 12 min.

Apply sealing bead (1) as shown on the cylinder head gasket.
Thickness of sealing bead: **1.5 to 2.0 mm.**
Strength of the sealing bead on the ends (marked area): **2.5 to 3.0 mm.**

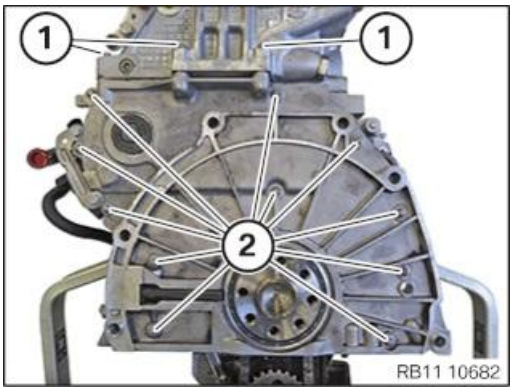


Important!
Do not shear off sealing beads.

Place the timing case cover (1) uniformly on the crankcase/cylinder head.

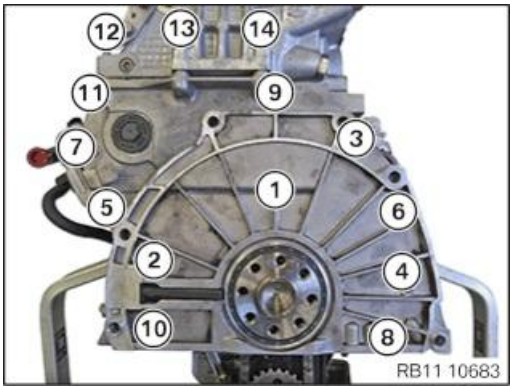


Place the timing case cover (1) on the fitting sleeves in the crankcase (2) in the center and attach with a rubber mallet in direction of arrow.



Insert screw (2) and tighten until it makes contact.
Insert bolts (1).

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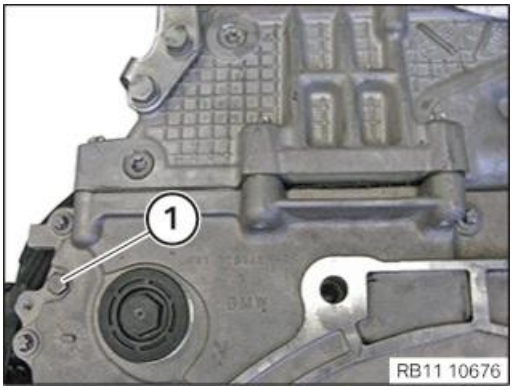
Installation note:
Replace screws 1 - 11.

Tighten screws in the sequence **1 - 11**.

Tightening torque: 11 14 2AZ.

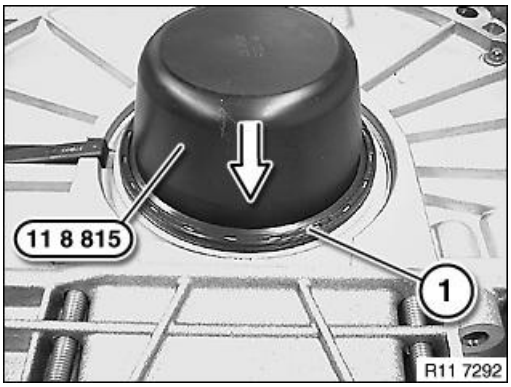
Tighten the screws **12 - 14**.

Tightening torque: 11 00 4AZ.



Tighten the screw of the high pressure pump (if installed).

Tightening torque: 11 14 3AZ.



Replace crankshaft seal (1).

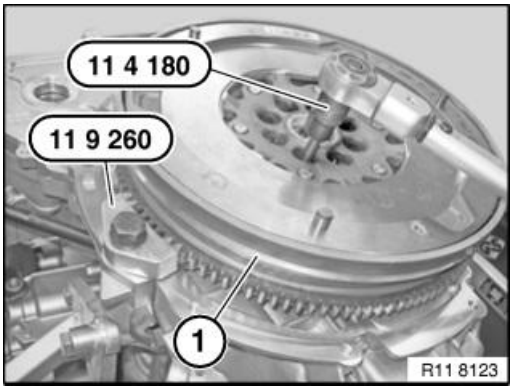


Attach oil sump with special tool 11 8 780 .

Position magnet wheel (1) on crankshaft.

Note:
Note the installation position of the magnet wheel.

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Installation note:
Flywheel must be installed to determined TDC.

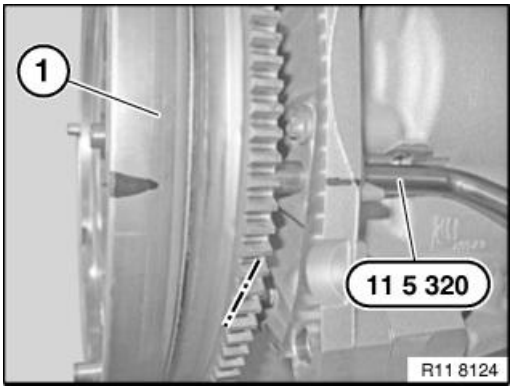
Important!

Clean thread in the crankshaft.

Replace screws.

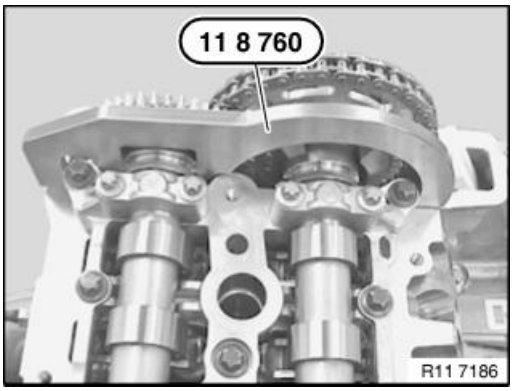
Position flywheel.

Install flywheel.

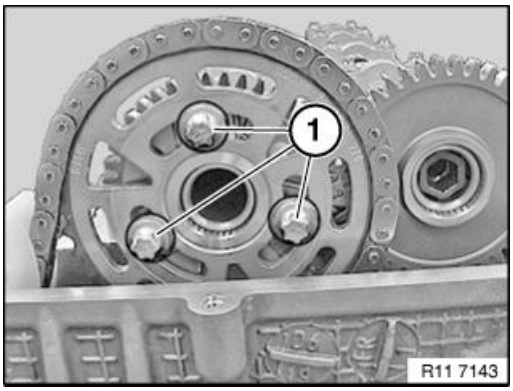


Turn back the flywheel (1) from the 11° to the OT-position.

Use special tool 11 5 320 to block the crankshaft in the TDC firing position Cylinder 1



Special tool 11 8 760 must lie flush on cylinder head.



Tighten camshaft bolts (1).

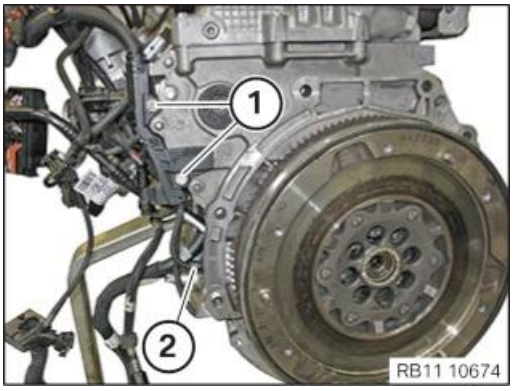
Tightening torque: 11 31 1AZ.

Spin engine twice in the direction of rotation.

Check timing and if necessary correct.

Remove all special tools.

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Tighten screws (1) of the wiring harness.

Tightening torque: 11 00 2AZ.

Connect the plug connection (2) of the pulse sensor of crankshaft.

Required follow-up work:

- Install cylinder head cover
- Attach clutch if necessary
- Remove engine from assembly stand
- Install engine

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11 31 540 Checking timing chain for elongation and replacing chain tensioner (N47 D/C K/U/O/T 0/1)

Special tools required:

- 2 353 281
- 11 6 480

Attention!

Measurement of timing chain is only possible during manual cranking (dynamic).

An engine start is **not** permissible.

Cranking the engine only with an installed special tool (chain tensioner) is permissible.

Attention!
Do not crank engine against direction of rotation, apply mark to vibration absorber.

Necessary preliminary tasks:

- Remove chain tensioner, remove sealing ring.
- Start diagnosis test module in:

  Activities

  Information search

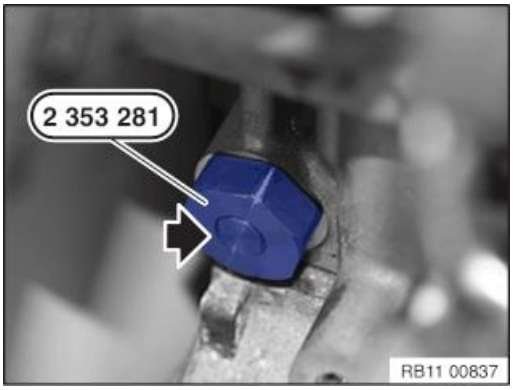
  Function structure

  Power train

  Diesel fuel electronics

  Engine mechanics

  Timing chain



Attention!

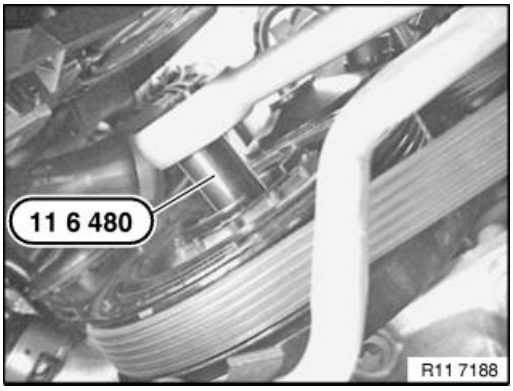
Cranking the engine only with an installed special tool (chain tensioner) is permissible.

Install special tool 2 353 281 **without** sealing ring.

Install special tool 2 353 281 **without** shim.

Tightening torque: 70 Nm.

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Attention!

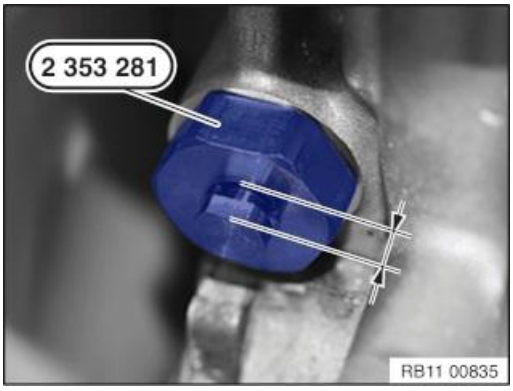
Do not crank engine against direction of rotation, apply mark to vibration absorber.

Crank engine with special tool 11 6 480 .

Measurement of timing chain.

Crank engine at constant speed in direction of rotation **4 times**.

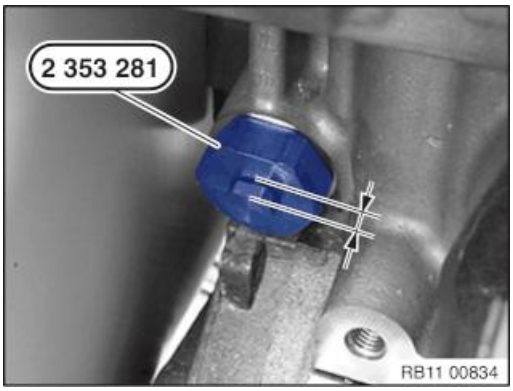
Determine minimum dimension on special tool 2 353 281 with the aid of a second person.



Determine protrusion or short length of the measuring pin on special tool 2 353 281 (see graphic).

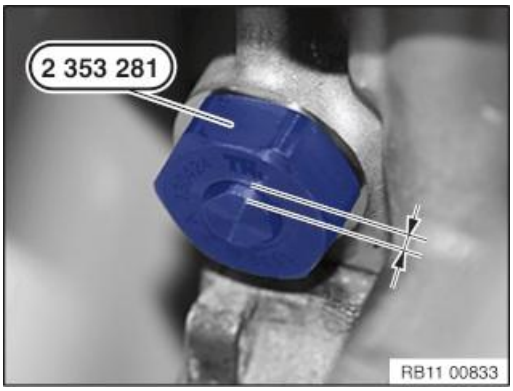
Graphic: **A**

Minimum protrusion greater than 4 mm (indentation visible).



Graphic: **B**

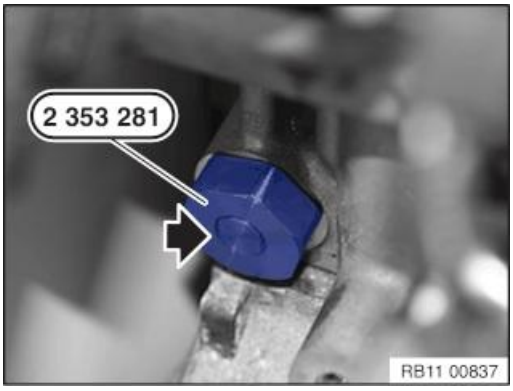
Minimum protrusion 4 mm (indentation not visible).



Graphic: **C**

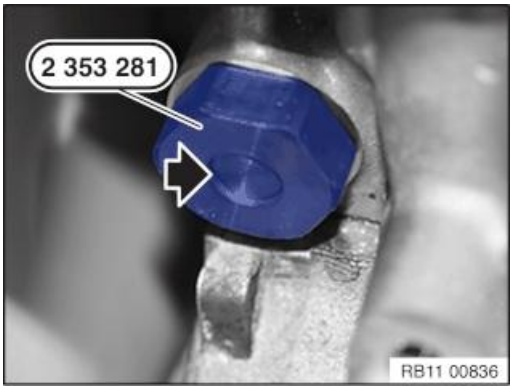
Minimum protrusion 2 mm.

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Graphic: **D**

Measuring pin flush with reference surface (see arrow).



Graphic: **E**

Short length to reference surface (see arrow).



Installation note:
Follow diagnosis instruction.

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11 31 544 Checking timing chain for elongation and replacing top timing chain (N47 D/C K/U/O/T 0/1)

Special tools required:

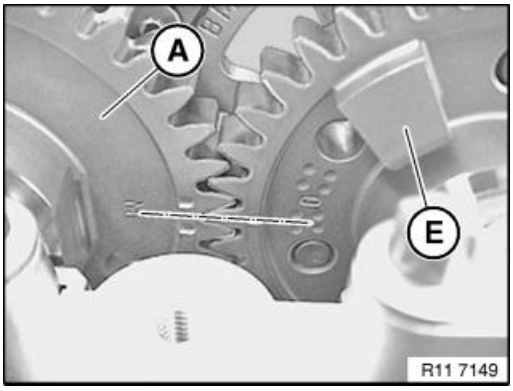
- 2 354 985
- 11 5 320
- 11 6 480
- 11 8 760
- 2 353 281

Installation note:
To remove and install the timing chain, special tool 2 354 985 is required.

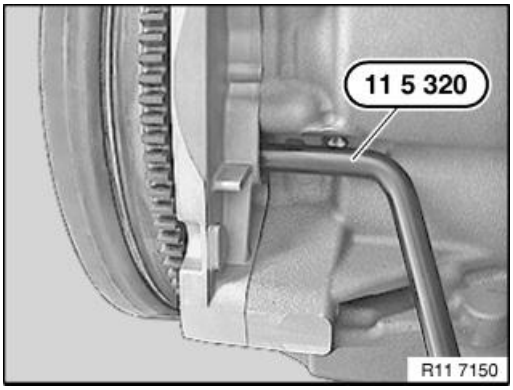
All the tools shown are available in tool set 2 354 985 .

Necessary preliminary tasks:

- Check top timing chain
- Remove cylinder head cover.



The marking on exhaust sprocket wheel (A) must be aligned with the marking on intake sprocket wheel (E).*Note:*
See illustration.



Installation note:
It is not permitted to turn the engine back, measured values are distorted.

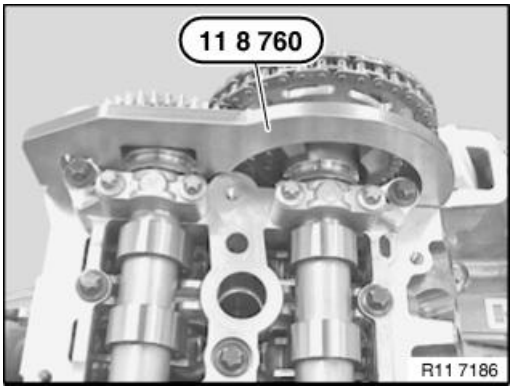
Special tool 11 5 320 must be exactly in the alignment position.

Remove protective cap of gear case cover.

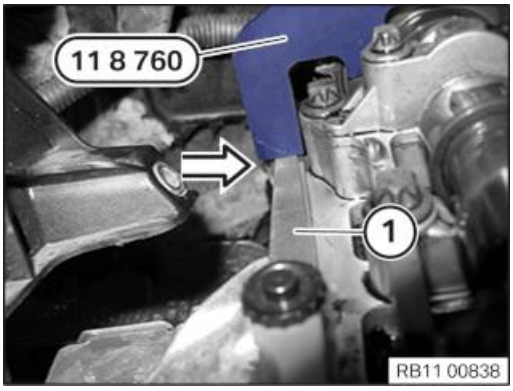
Turn engine with special tool 11 6 480 .

Use special tool 11 5 320 to block the crankshaft in the TDC firing position Cylinder 1

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Place special tool 11 8 760 on exhaust camshaft.



Determine gap dimension.

Slide feeler gauge (1) between cylinder head and special tool 11 8 760 without jamming (see arrow).

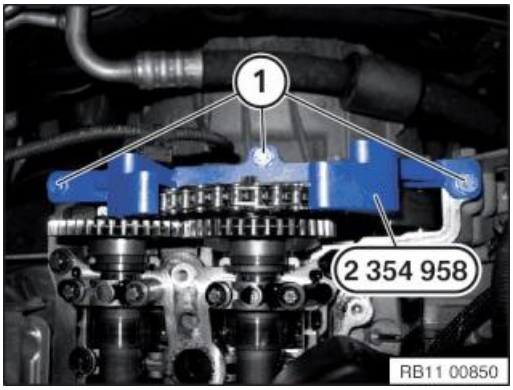


Follow diagnosis instruction.



Important!

Loose chain sections can fall into the engine!



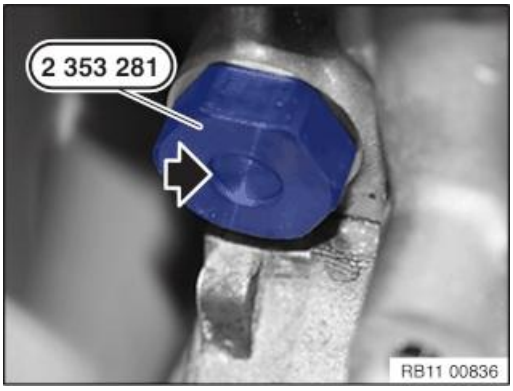
Important!

Screws (1) can fall into the chain drive **risk of damage!**

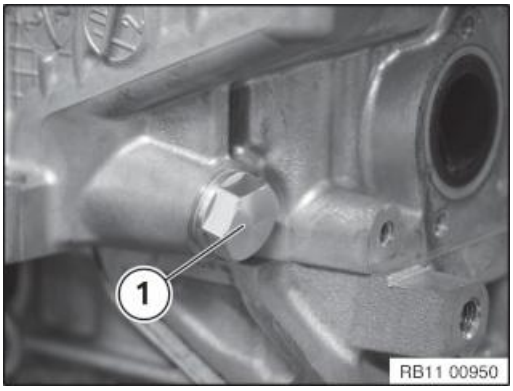
Secure special tool 2 354 958 to cylinder head with screws (1).

Tightening torque. 11 00 2AZ.

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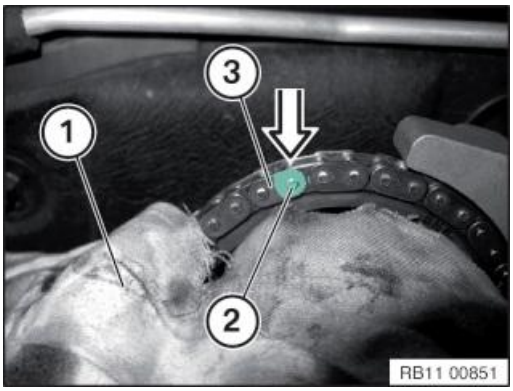


Remove special tool 2 353 281 .

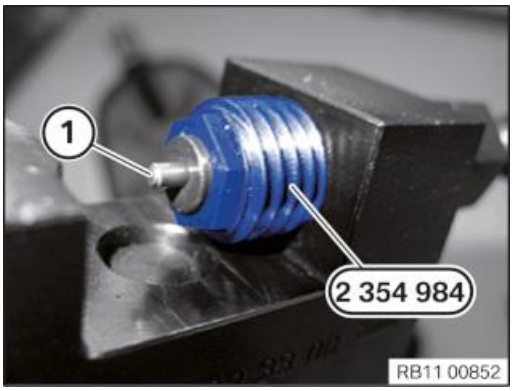


Installation note:
Install chain tensioner with part number 8 576 201 (AF 24).
Replace sealing ring.

Tightening torque: 11 12 3AZ.

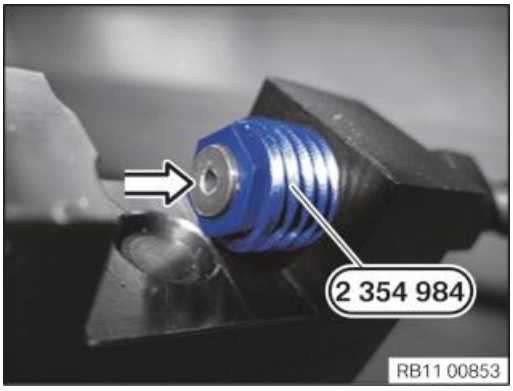


Cover cylinder head (1) at chain drive with a suitable cleaning cloth.
Mark right rivet (2) at cover tab (3) (see arrow).



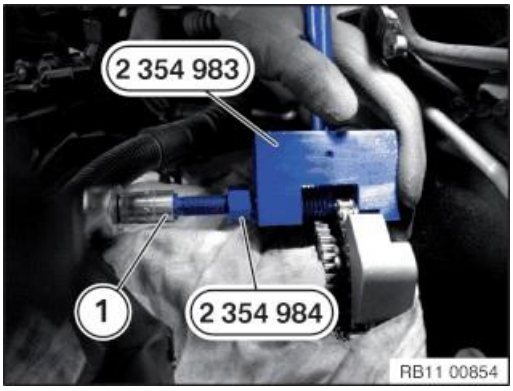
Opening the timing chain:
Turn back pressing-off bolt (1) on special tool 2 354 984.

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Installation note:
Bore hole (centring aid)

Turn back pressing-off bolt on special tool 2 354 984 up to short length (see arrow).



Important!

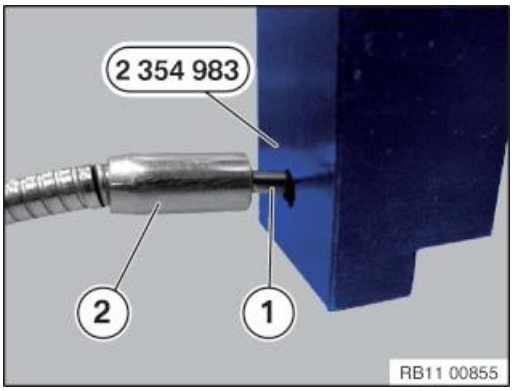
Loose rivet can fall in the engine compartment.

Seal bore hole on special tool 2 354 983 with suitable auxiliary materials.

Position special tool 2 354 983 on timing chain (rivet) (centre).

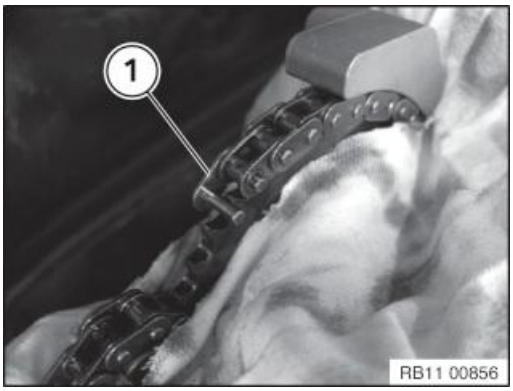
Pretension spindle 2 354 984 up to bolt/limit position of timing chain by hand.

Press off rivet with pressing-off bolt (1), screw in special tool up to limit position.



Remove rivet (1) from special tool 2 354 983 with a magnet (2).

Remove special tool 2 354 983.



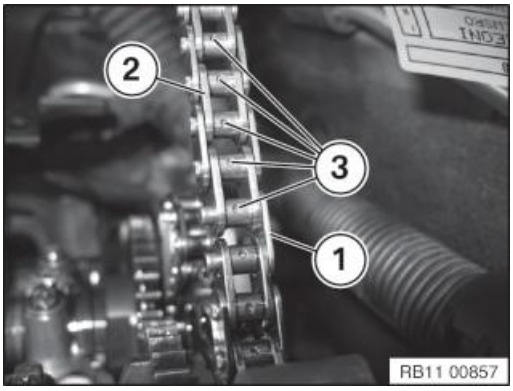
Installation note:
Coat ends of chain lock (1) with grease.

Tightening the timing chain:

Attach chain lock (1) in the open timing chain.

Check camshaft sprocket for wear.

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Important!

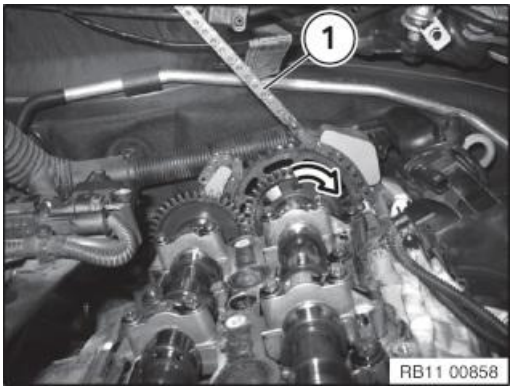
Observe direction of installation!

Oil holes (3) must be visible from the outside.

Attach timing chain (2) in the chain lock (1).

Both timing chains must be aligned with each other.

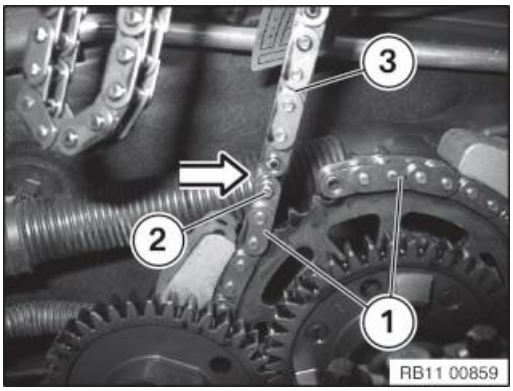
Outer tab on lock (1) must be aligned with the outer tabs of the timing chains (see graphic).



Note:
Turn engine in direction of engine rotation until the run-through timing chain can be removed.

Keep timing chains (1) under tension.

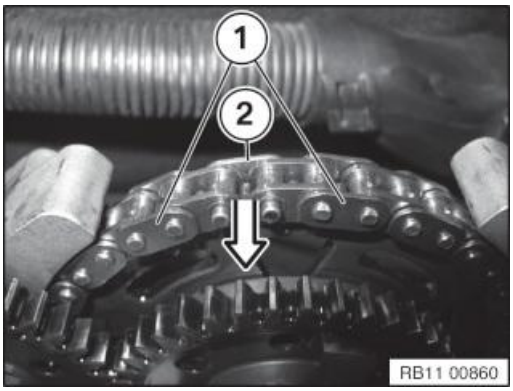
Do not crank engine too far under any circumstances.



Important!

Loose components can fall into the chain drive **risk of damage!**

Remove timing chain (3) with chain lock (2).



Pressing in the timing chain:

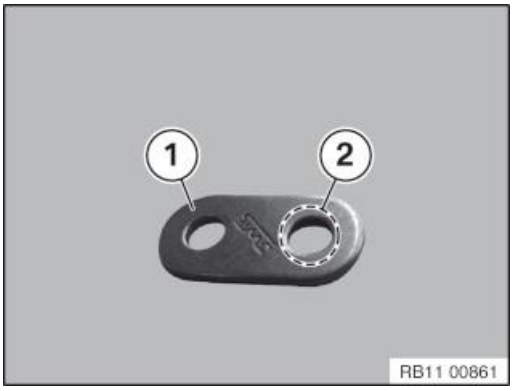
Important!

Loose components can fall into the chain drive **risk of damage!**

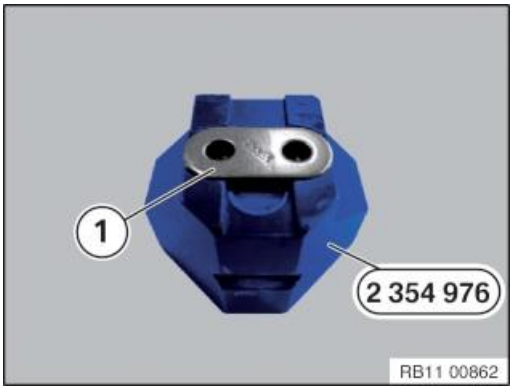
Press in both end of timing chain (1) on camshaft sprocket.

Insert chain lock (2) from the rear through both ends of new timing chain (1).

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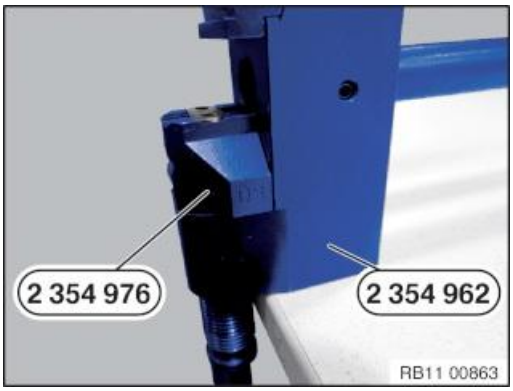


Installation note:
Rounded sides (2) of cover tab (1) must point towards timing chain.



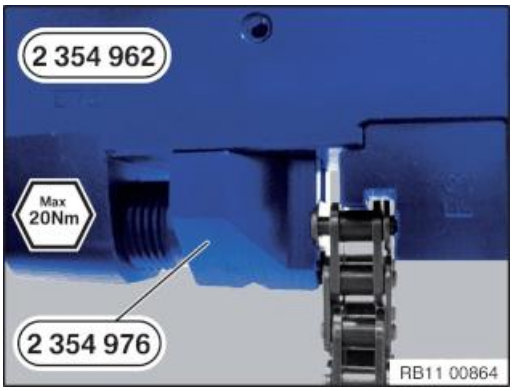
Prepare special tool 2 354 976 with cover tab (1) using the rounded side (see graphic).

Fasten cover tab (1) on magnets of special tool 2 354 976.



Important!
Loose components.

Prepare special tool 2 354 976 with cover tab on special tool 2 354 962.



Important!
Maximum 20 Nm
Do not increase torque, risk of damage on chain lock.

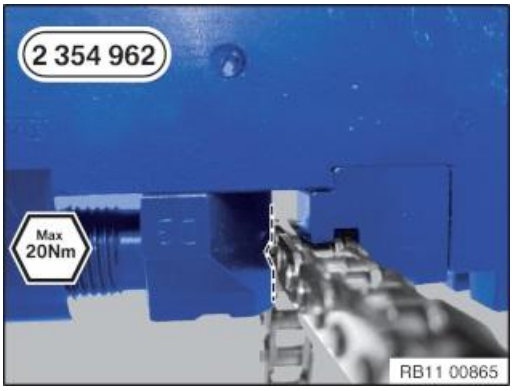
Manually join cover tab on chain lock to spindle on special tool 2 354 962.

Make sure chain locks and special tool 2 354 976 are positioned exactly
risk of damage!

Press on cover tabs with 20 Nm.

Graphic shows removed chain drive.

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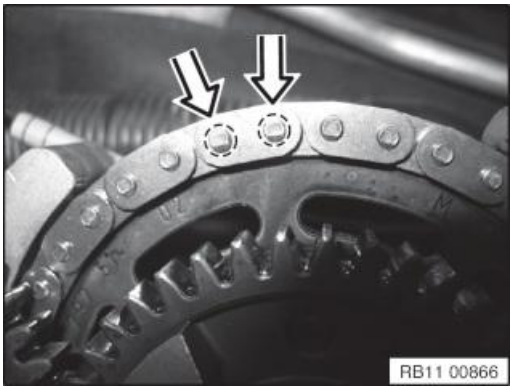
Important!

Do not exceed maximum **20 Nm** torque on chain lock not **risk of damage!**

For safety purposes, the chain lock must be pressed in again.

Remount special tool 2 354 976 on special tool 2 354 962 (see graphic).

Press in both rivets individually on chain lock with special tool 2 354 962 to maximum **20 Nm**.



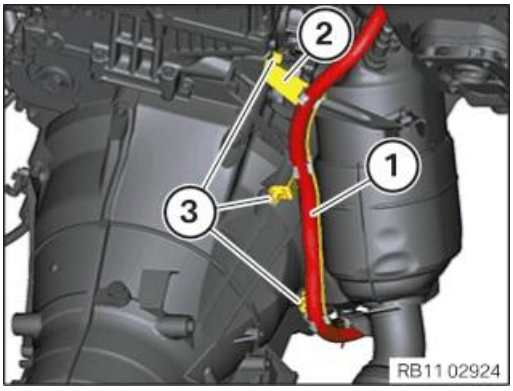
Check both rivets (see graphic).



Follow diagnosis instruction.

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11 31 090 Installing and removing/replacing chain tensioner piston (N47 D20 O1)



This additional work 1252500 that is not included in the flat rate 1131090 applies only to vehicles that have holder (2) installed:

- E90 and E91 after life cycle impulse: 320xd,
- E92: 320xd
- E84: 18xd, 20d, 20xd

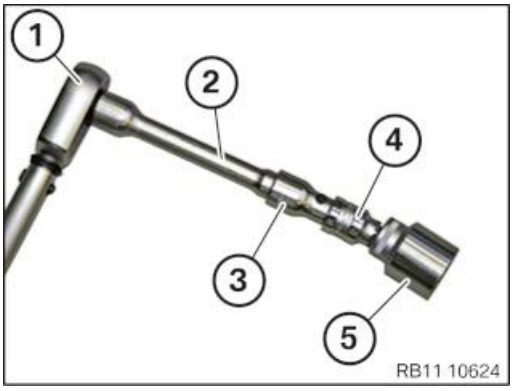
Necessary preliminary work:

- Remove front underbody protection

Detach cable (1) from the holder (2).

Loosen screws (3).

Feed out holder (2).

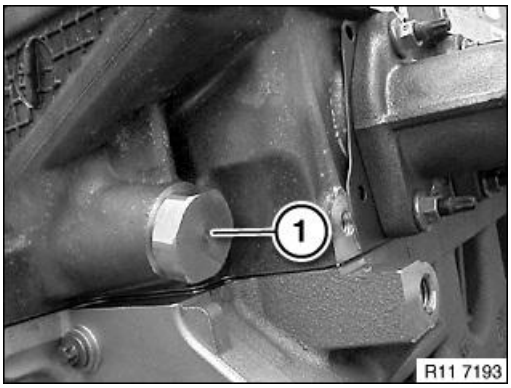


Note:
For better disassembly and installation of the chain tensioner, it is recommended to arrange the tools (1 to 5).

Connect torque wrench (1) to an extension (2) 1/2 inch with 130 mm and (3) 52 mm.

For better accessibility to the chain tensioner, a swivelable extension (4) with 12° can be used.

Connect nut (5) 24 mm or 27 mm to the swivelling extension (4).



Release chain tensioner (1).

Tightening torque: 11 12 3AZ.

Attention!

Have a cleaning cloth ready. A small quantity of engine oil will emerge after the screw connection has been released.

Make sure no oil runs into the clutch housing.

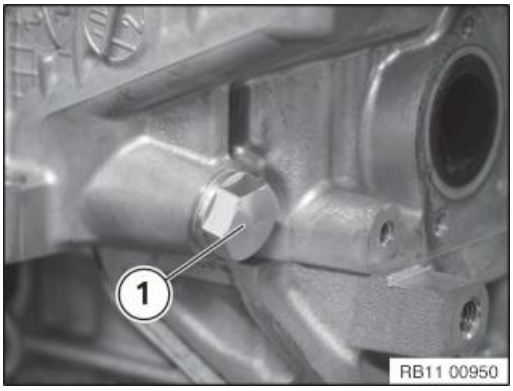
Installation note:
Renew the sealing ring.



If the chain tensioner is reused, its oil chamber must be drained. Place chain tensioner on a level support and slowly compress.

Repeat process twice.

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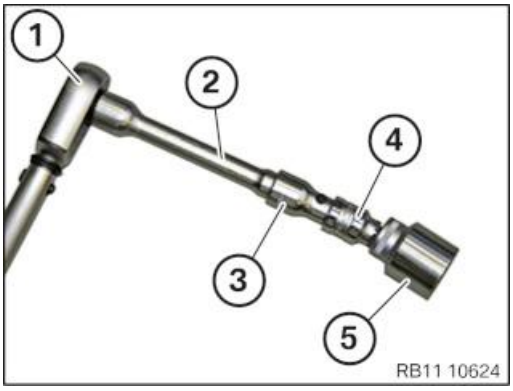


Installation note:
Install new chain tensioner (1) with AF 24 mm.

Assemble engine.

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11 31 090 Installing and removing/replacing chain tensioner piston (N47, N47S)

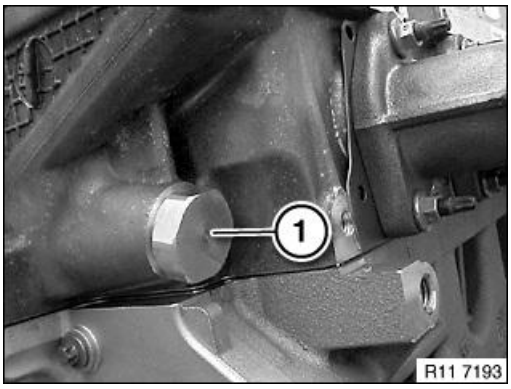


Note:
To make it easier to remove and install the chain tensioner, it is advisable to arrange the tools (1 to 5).

Connect torque wrench (1) to an extension (2) 1/2 inch with 130 mm and (3) 52 mm.

For better accessibility to the chain tensioner, a swivelable extension (4) with 12° can be used.

Connect nut (5) 24 mm or 27 mm to the swivelling extension (4).



Release chain tensioner (1).

Tightening torque: 11 12 2AZ.

Important!

Have a cleaning cloth ready. A small quantity of engine oil will emerge after the screw connection has been released.

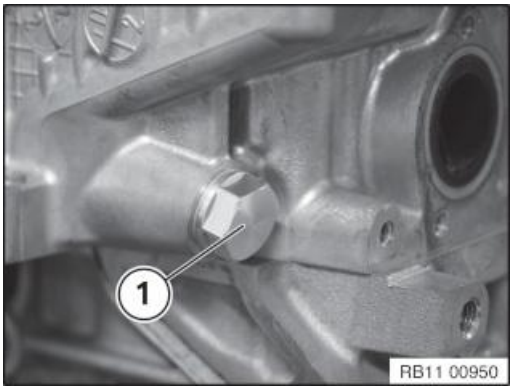
Make sure no oil runs into the clutch housing.

Installation note:
Renew the sealing ring.



If the chain tensioner is reused, its oil chamber must be drained. Place chain tensioner on a level support and slowly compress.

Repeat process twice.



Installation note:
Install new chain tensioner (1) with AF 24 mm.

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Assemble engine.

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11 14 110 Removing and installing, sealing/replacing gear case cover at rear (N47, N47S)

Special tools required:

- 00 9 120
- 11 4 470
- 11 8 815

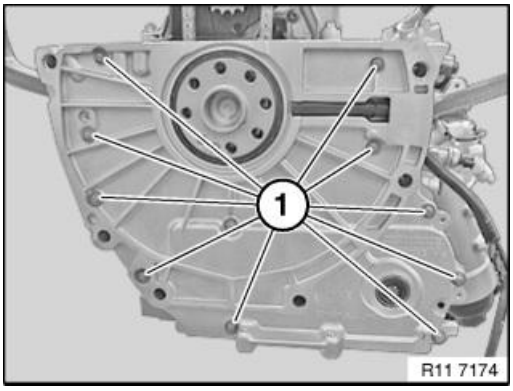
Important!

Engines with surface sealant:

Application time of sealing bead max. 12 minutes.

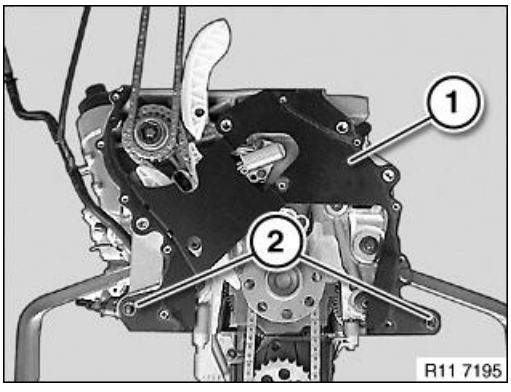
Necessary preliminary tasks:

- Remove engine.
- Remove flywheel.
- Remove cylinder head.
- Removing oil sump.



Release screws (1).

Release screw of high pressure pump (if fitted).

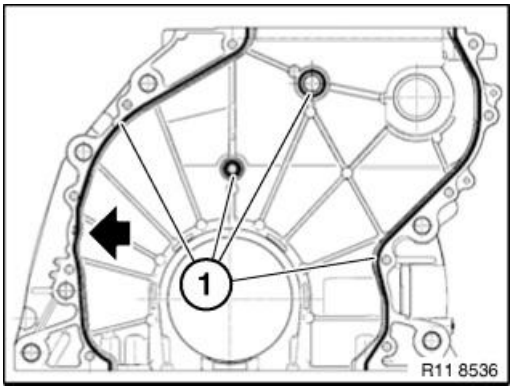


N47 and N47Top engines up to 11/2009.

Remove beaded metal gasket (1).

Check fitting sleeves (2) for damage, replace if necessary.

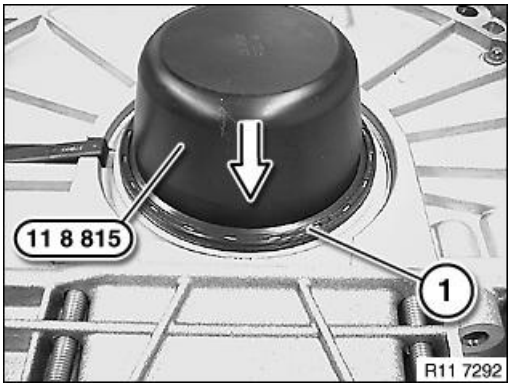
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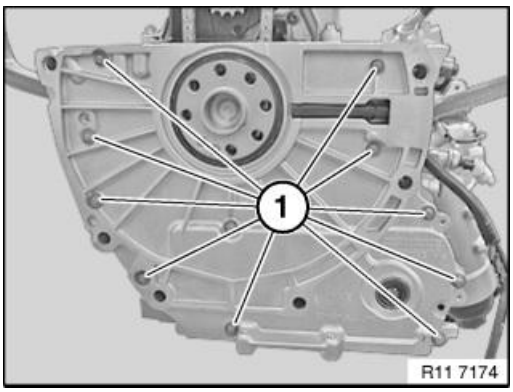
N47Top engines from 11/2009.

Installation note:
Application time of sealing bead (1) max. 12 min.

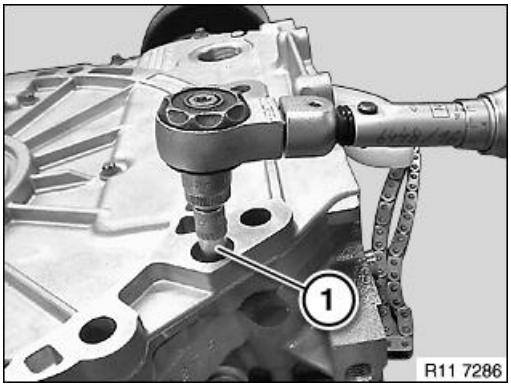
Remove gasket remnants with special tool 11 4 470 .
Apply sealing bead (1) at marked points.
Thickness of sealing bead: **1.5 to 2.0 mm.**



Preassemble special tool 11 8 815 on crankshaft.
Fit FPM ring (1) with lid dry and without lubricant.

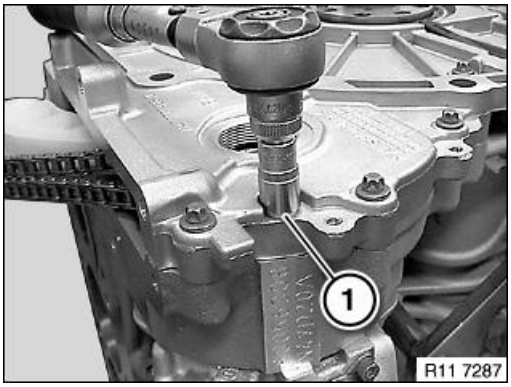


Insert bolts (1).



Secure special tool 00 9 120 with bolts (1).
Tightening torque: 11 14 2AZ.

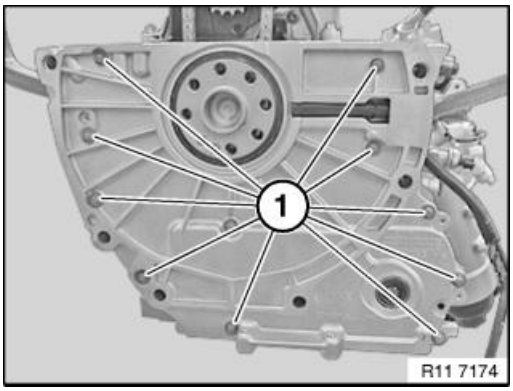
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Insert screw (1) of high pressure pump (if fitted).

Tightening torque: 11 14 3AZ.

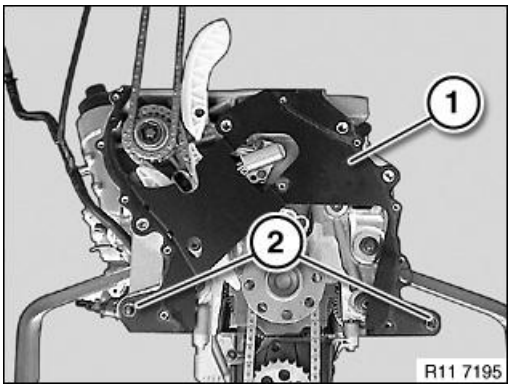
Assemble engine.



Procedure for replacing gear case.

Release screws (1).

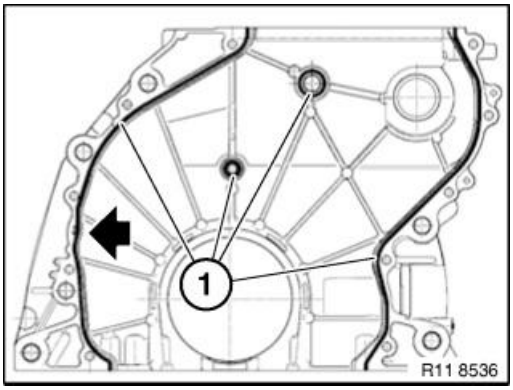
Release bolt holding high pressure pump.



N47 and N47Top engines up to 11/2009.

Remove beaded metal gasket (1).

Check fitting sleeves (2) for damage, replace if necessary.



N47Top engines from 11/2009.

Installation note:
Application time of sealing bead (1) max. 12 minutes.

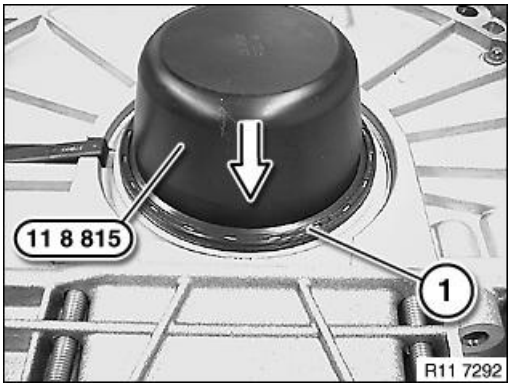
Remove gasket remnants from gear case cover and from crankcase with special tool 11 4 470 .

Apply sealing bead (1) at marked points.

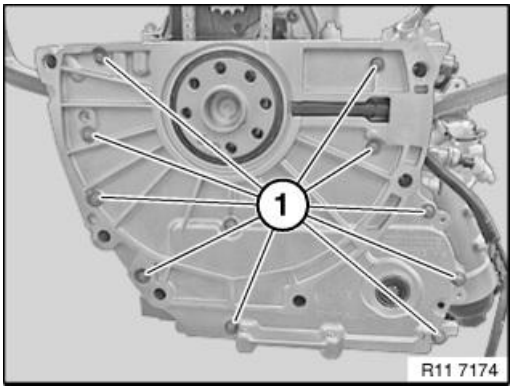
Position sealing bead (1) at marked point (see arrow) on inside on gear case cover.

Thickness of sealing bead: **1.5 to 2.0 mm.**

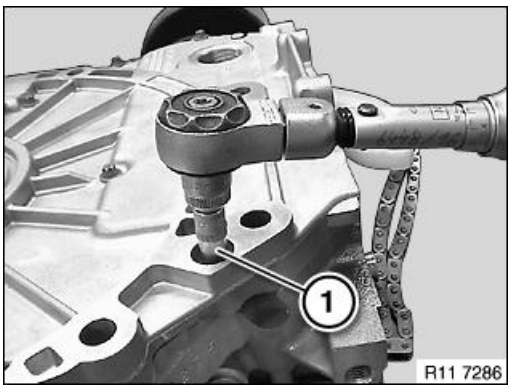
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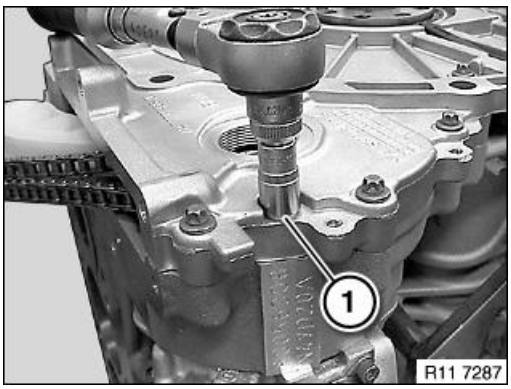
Preassemble special tool 11 8 815 on crankshaft.
Fit FPM ring (1) with lid dry and without lubricant.



Insert bolts (1).



Secure special tool 00 9 120 with bolts (1).
Tightening torque: 11 14 2AZ.



Insert screw (1) of high pressure pump (if fitted).
Tightening torque: 11 14 3AZ.

Assemble engine.

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11 14 110 Removing and installing, sealing/replacing rear timing case cover (N47, D20O1)

Special tools required:

- 00 9 120
- 11 4 470
- 11 8 815

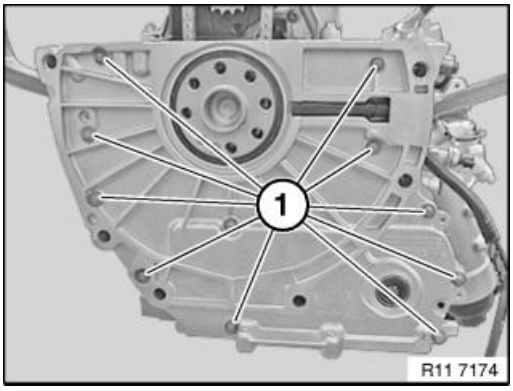
Important!

Engines with surface sealant:

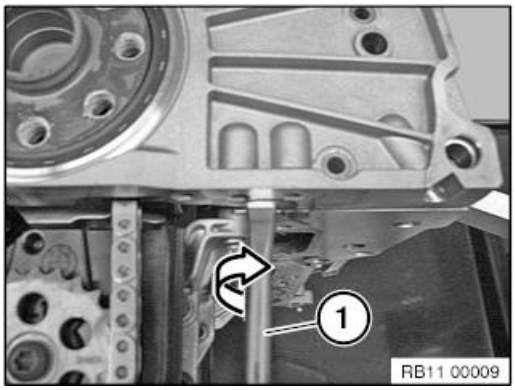
Application time of sealing bead max. 12 minutes.

Necessary preliminary tasks:

- Remove engine.
- Remove flywheel.
- Remove cylinder head.
- Removing oil sump.

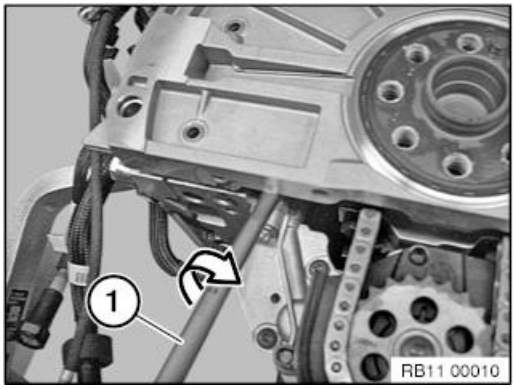


Release screws (1).



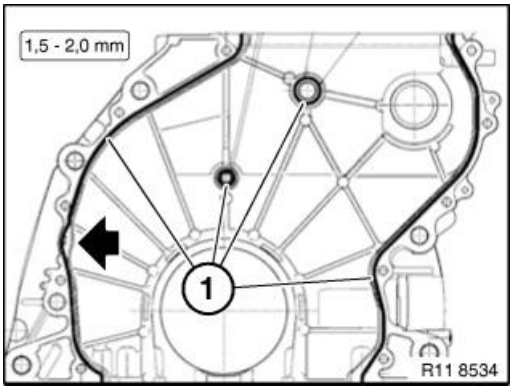
Loosen the timing case cover with a screwdriver (1) in direction of arrow.

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Loosen the timing case cover with a screwdriver (1) in direction of arrow.

Remove the timing case cover.



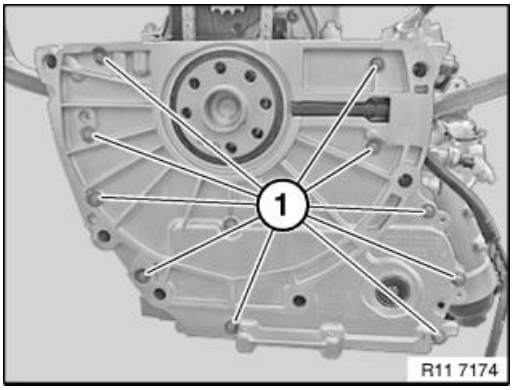
Remove gasket remnants from crankcase and timing case cover using special tool 11 4 470 .

Apply sealing bead (1) at marked points.

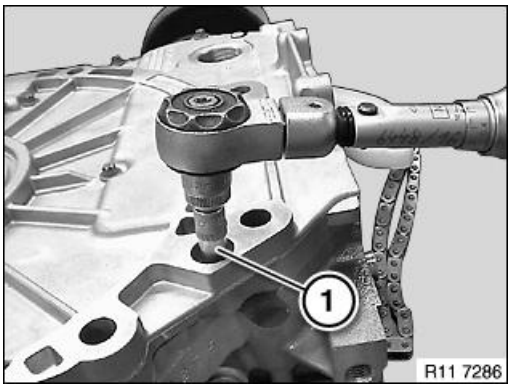
Installation note:
Application time of sealing bead (1) max. 12 minutes.

Position sealing bead (1) at marked point (see arrow) on outside of timing case cover.

Thickness of sealing bead: **1.5 to 2.0 mm.**



Insert bolts (1).



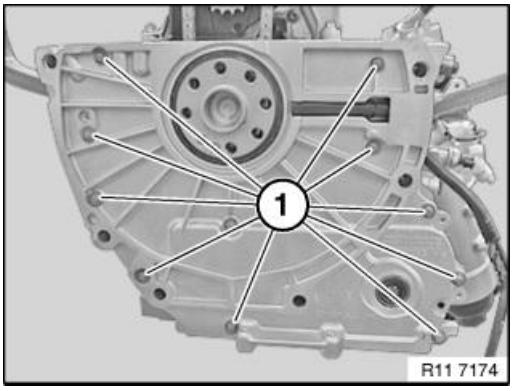
Secure special tool 00 9 120 with bolts (1).

Tightening torque: 11 14 2AZ.

Replace radial shaft seal at front.

Assemble engine.

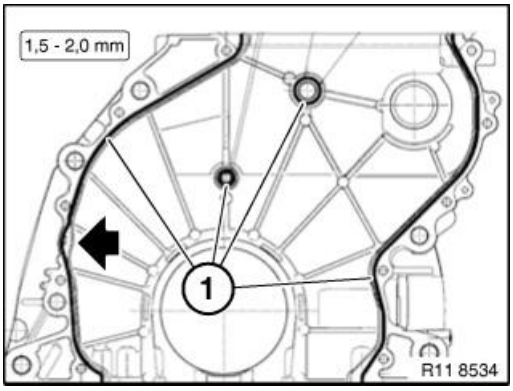
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Procedure for renewing timing case cover.

Release screws (1).

Release bolt holding high pressure pump.



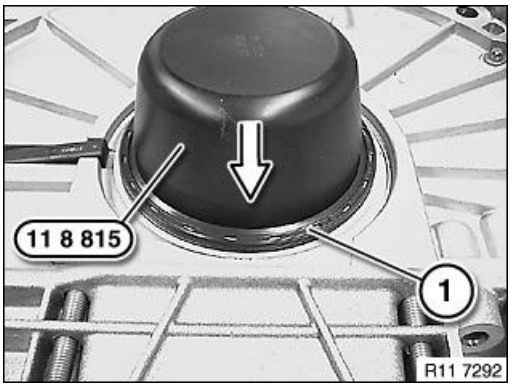
Remove gasket remnants from the crankcase with special tool 11 4 470 .

Apply sealing bead (1) at marked points.

Installation note:
Application time of sealing bead (1) max. 12 minutes.

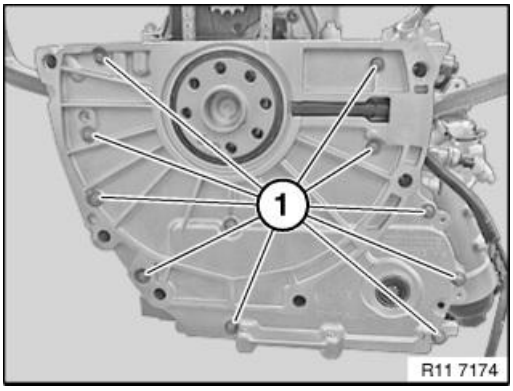
Position sealing bead (1) at marked point (see arrow) on inside of timing case cover.

Thickness of sealing bead: **1.5 to 2.0 mm.**



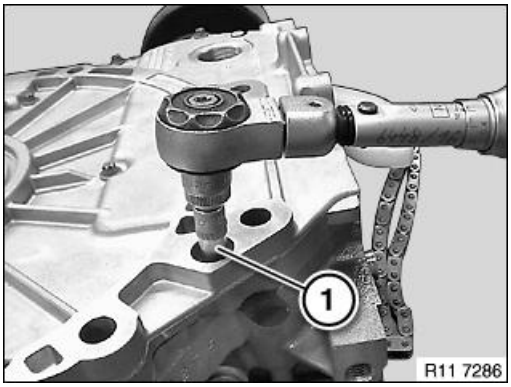
Preassemble special tool 11 8 815 on crankshaft.

Mount radial shaft seal (1) with timing case cover without lubricant.



Insert bolts (1).

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Secure special tool 00 9 120 with bolts (1).
Tightening torque: 11 14 2AZ.

Assemble engine.

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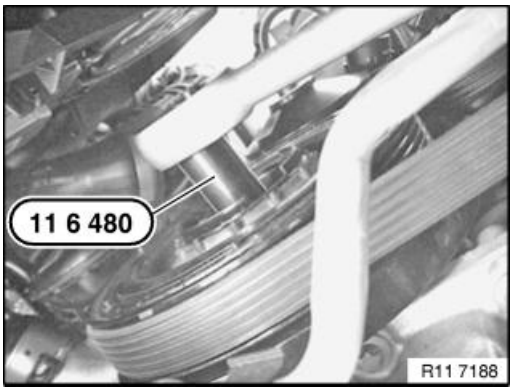
11 31 028 Replace exhaust camshaft (N47, N47S)

Special tools required:

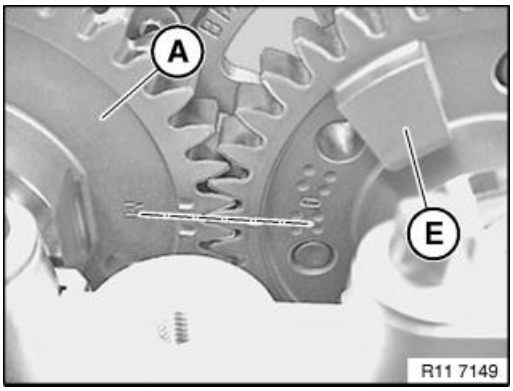
- 11 6 480

Necessary preliminary tasks:

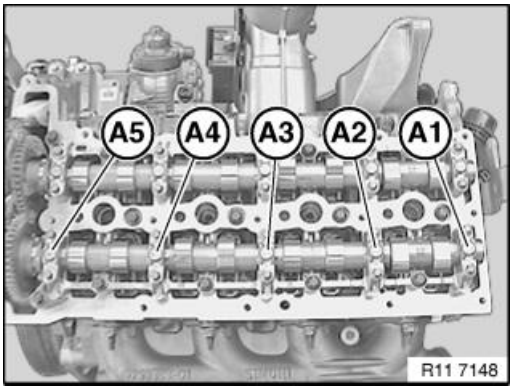
- Remove cylinder head cover.



Crank engine with special tool 11 6 480 to firing TDC position of cylinder no. 1.**Important!**
Do not crank the engine back!



Check the position of the exhaust and intake camshafts (see graphic).



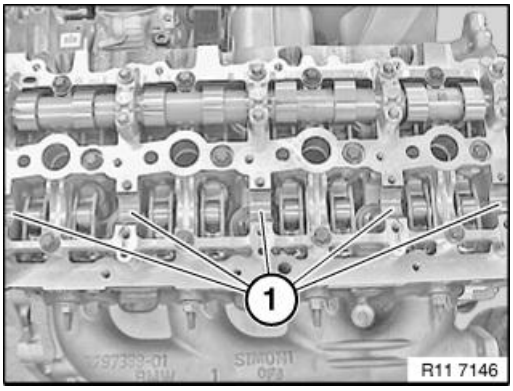
Remove exhaust camshaft.

Note:
It is not necessary to adjust the engine timing in order to remove the exhaust camshaft.

Release bearing caps A1 to A5 by 1/2 a turn at a time, working from the outside inwards.

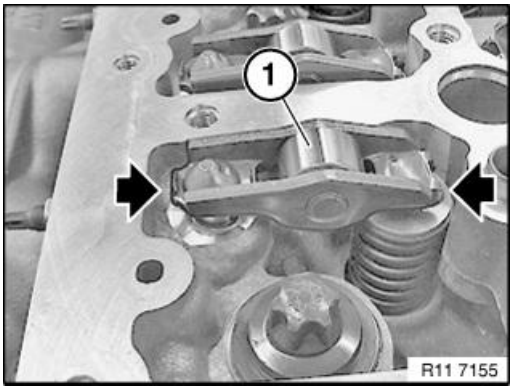
Feed exhaust camshaft upwards to remove.

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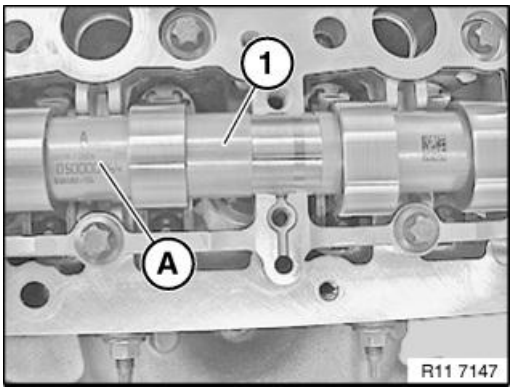


Preparation for installation:

Oil all bearing positions (1).

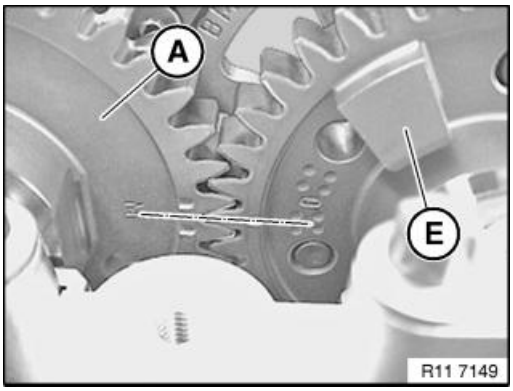


Check installation position of the roller cam followers **(risk of damage!)**.



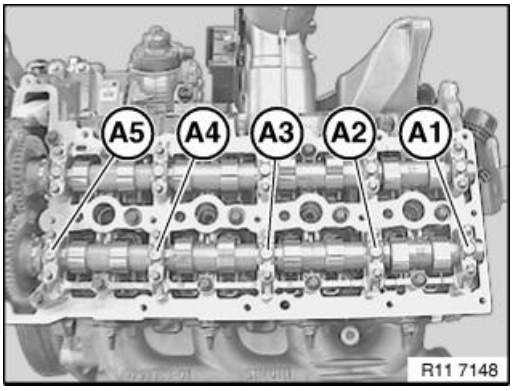
Installing exhaust camshaft.

Insert exhaust camshaft (1) marked with (A).



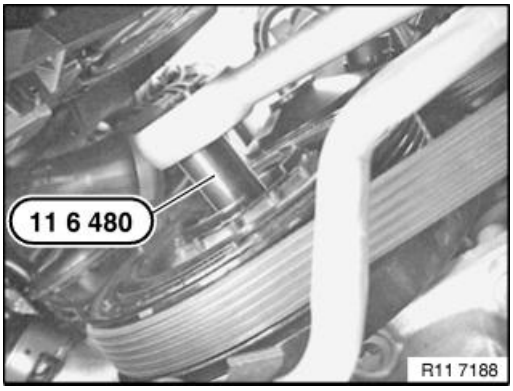
When inserting the exhaust camshaft (A), the mark of both camshafts (A and E) must be aligned (see graphic).

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Tighten bearing caps A1 to A5 by 1/2 a turn at a time on the camshaft carrier, working from the inside outwards.

Tightening torque: 11 31 2AZ.



Using special tool 11 6 480 , crank engine twice in direction of rotation until cylinder no.1 is back in TDC firing position.

Check camshaft adjustment.

Important!

Do not crank the engine back!

Assemble engine.

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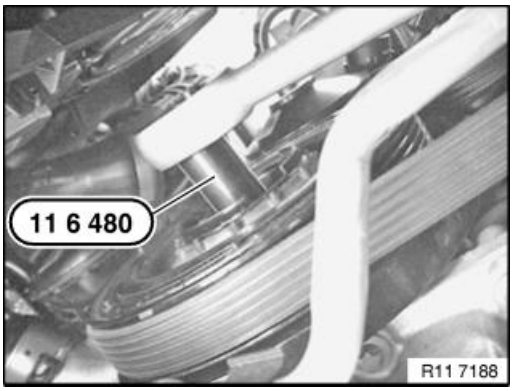
11 31 025 Replace intake camshaft (N47, N47S)

Special tools required:

- 11 5 320
- 11 6 480
- 11 8 760

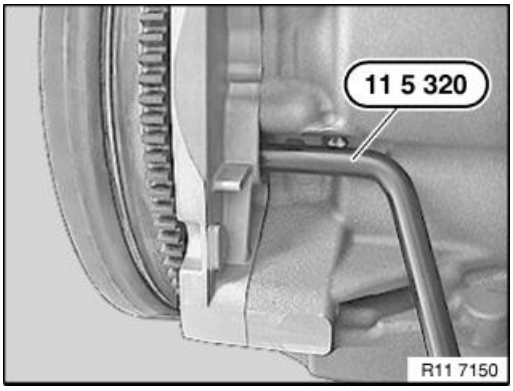
Necessary preliminary tasks:

- Remove cylinder head cover.



Crank engine with special tool 11 6 480 to TDC firing position of first cylinder.**Important!**

Do not crank the engine back!

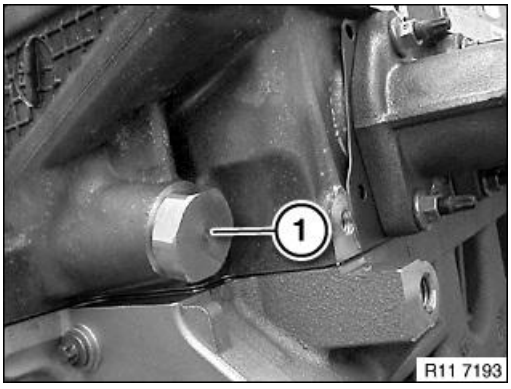


Remove protective cap of gear case cover.

Block crankshaft with cylinder no. 1 in TDC firing position with special tool 11 5 320 .

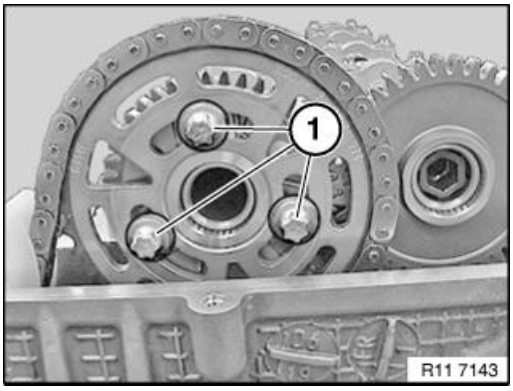
Important!

Do not crank the engine back!



Release chain tensioner (1).

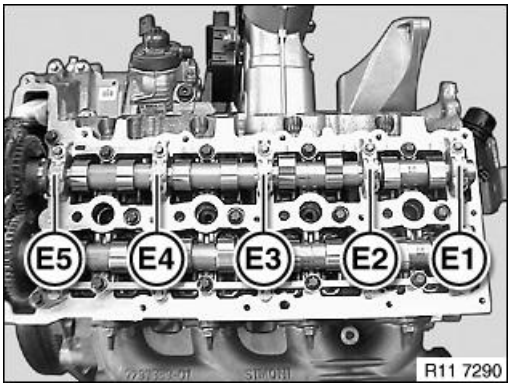
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Release screws (1).

Remove camshaft sprockets from camshaft and feed out of timing chain.

Place timing chain in cylinder head.

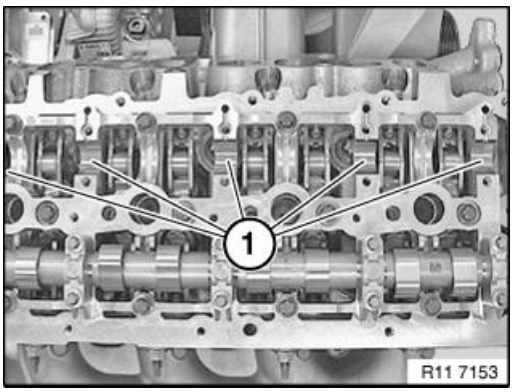


Remove intake camshaft.

Note:
It is necessary to adjust the engine timing in order to remove the intake camshaft.

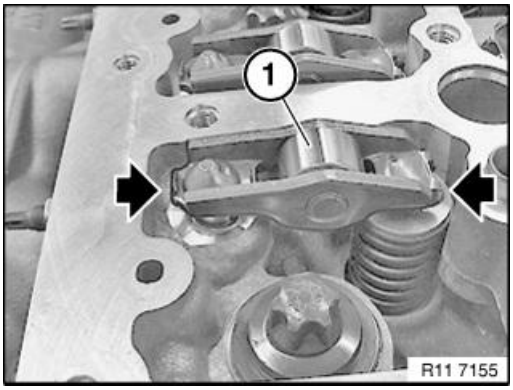
Release bearing caps E1 to E5 by 1/2 a turn at a time, working from the outside inwards.

Feed intake camshaft upwards to remove.



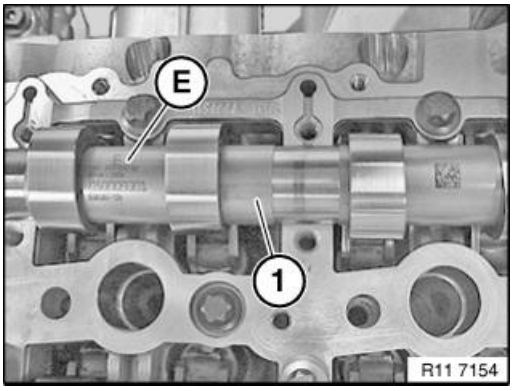
Preparation for installation:

Oil all bearing positions (1).



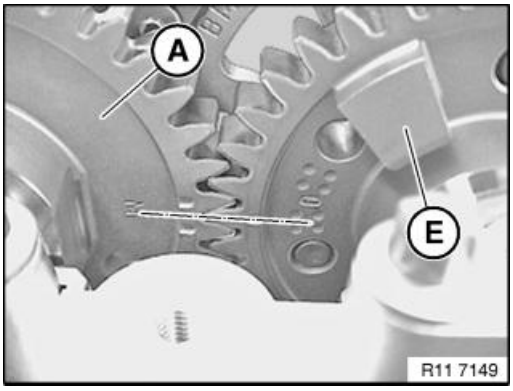
Check installation position of the roller cam followers **(risk of damage!)**.

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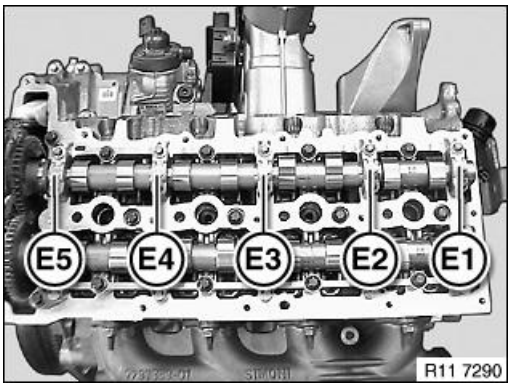


Install intake camshaft.

Install intake camshaft (1) marked with (E).

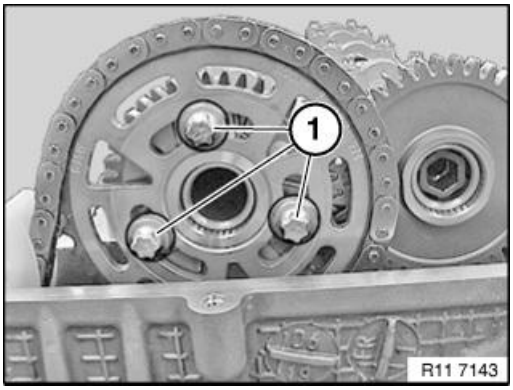


The marks on both camshafts (A and E) must match when installing the intake camshaft (E) (see graphic).



Tighten bearing caps E1 to E5 by 1/2 a turn at a time on the camshaft carrier, working from the inside outwards.

Tightening torque: 11 31 2AZ.



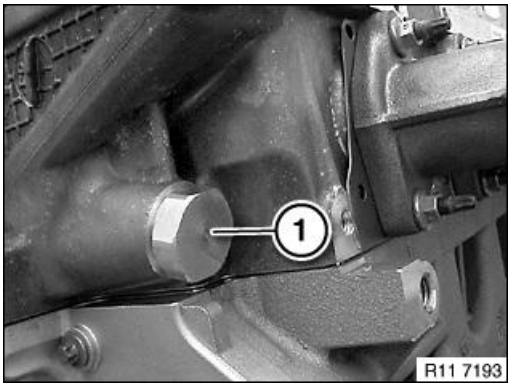
Place the camshaft sprocket with timing chain on the intake camshaft such that bolts (1) are located in the centre of the elongated holes.

Insert bolts (1).

Tighten bolts (1) to 10 Nm.

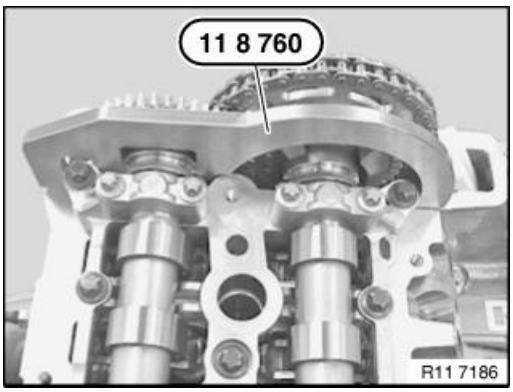
Release bolts (1) again by a 90° turn.

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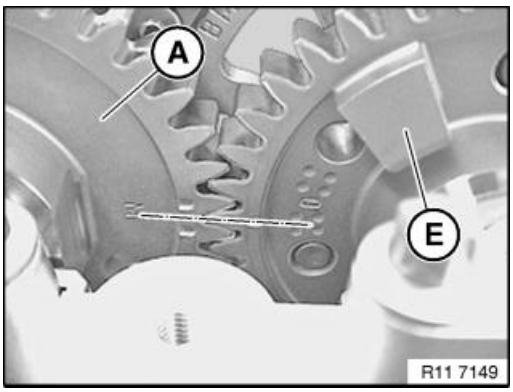


Install chain tensioner (1).

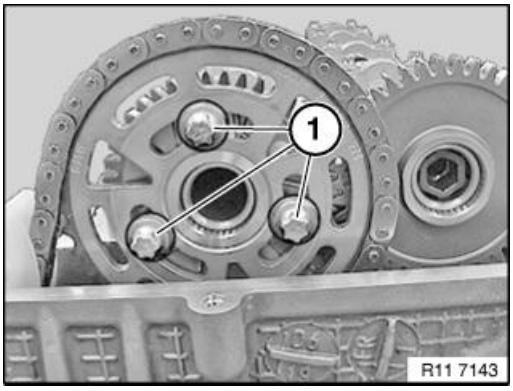
Tightening torque: 11 12 2AZ.



Place special tool 11 8 760 on exhaust camshaft.**Note:**
Special tool 11 8 760 must lie flush on cylinder head.



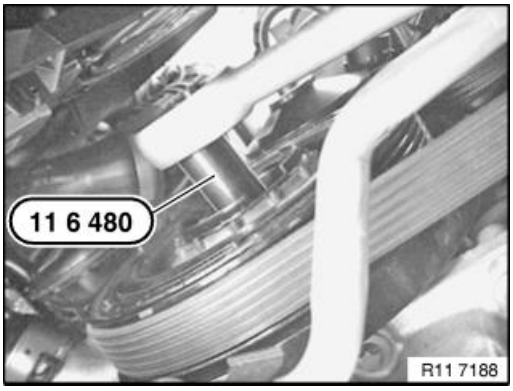
Marks on both camshafts (A and E) must match up (see graphic).



Tighten camshaft bolts (1).

Tightening torque: 11 31 1AZ.

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Crank engine twice in direction of rotation with special tool 11 6 480 up to TDC firing position of cylinder no. 1.

Check camshaft adjustment.

Important!

Do not crank the engine back!

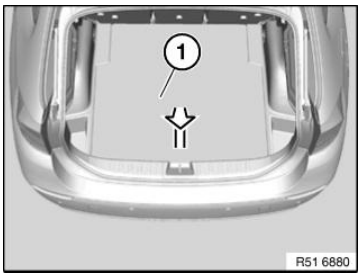
Assemble engine.

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11 31 560 Replacing both timing chains

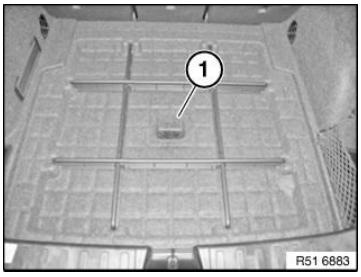
PRELIMINARY WORK

1 – Removing the luggage compartment floor trim panel



- Lift the luggage compartment floor trim panel (1) at the rear and remove it in the direction of the arrow.

2 – Removing the spare wheel well trim panel



- Remove the trim panel of the luggage compartment well (1) towards the top.

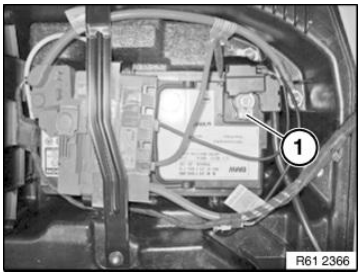
3 – Disconnecting the battery earth lead

Prerequisite

Ignition is switched off.

TECHNICAL INFORMATION

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



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.
- Slacken nut (1).
- Pull off the intelligent battery sensor (IBS) towards the top and put to one side.

4 – Draining the engine oil

WARNING

Hot fluids.

Risk of scalding!

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

TECHNICAL INFORMATION

Make sure the vehicle is at operating temperature for engine oil service (engine oil temperature > 70 °C).

TECHNICAL INFORMATION

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

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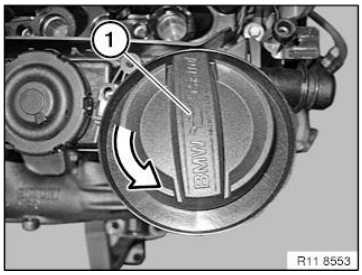
RISK OF DAMAGE

Contaminant or foreign body.

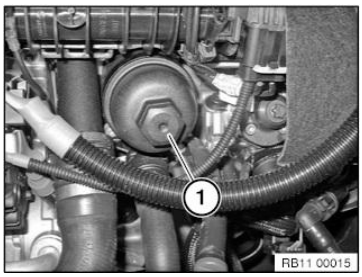
Contamination can result in malfunctions, operating failure or leaks.

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

- Protect the alternator from contamination and any ingress of oil.



- Open the oil filler plug (1).
- Position a collecting vessel under the engine.

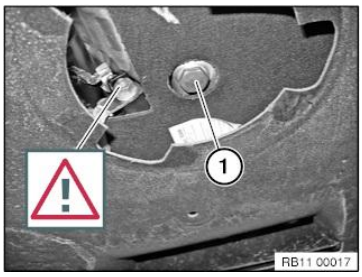


- Loosen the oil filter cover (1).

  As a result, the engine oil can flow back from the oil filter housing into the oil sump.

NOTICE

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



- If necessary open opening in the underbody protection.
- Loosen the oil drain plug (1) and allow the oil to drip off. In this process, ensure not to create a short circuit to the positive battery cable.

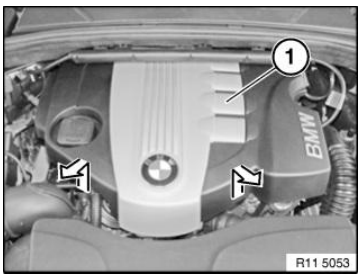
5 – Remove acoustic cover at top.

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.

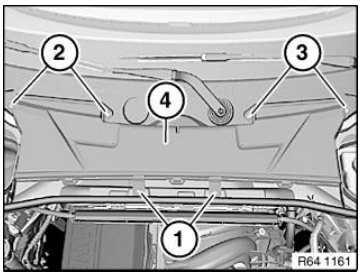
- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Detach the acoustic cover top (1) upwards from rubber mounts and remove it in the direction of travel.

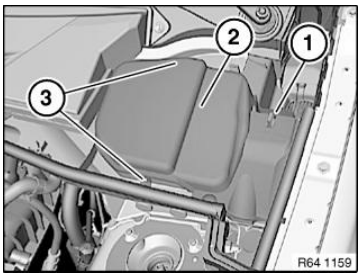
6 – Remove the top section of the microfilter housing

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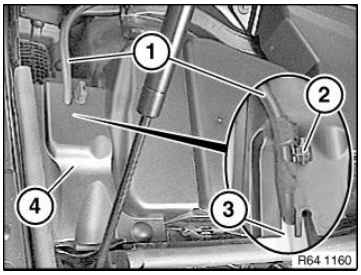


- Loosen screws (1), (2) and (3).
- Remove the upper section of the microfilter housing (4).

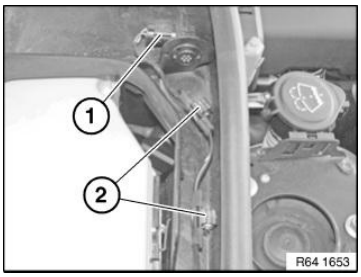
7 – Remove the lower section of the microfilter housing



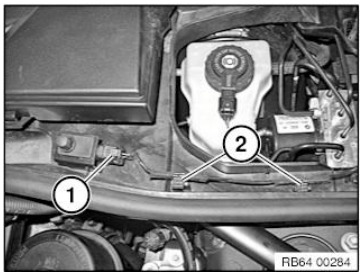
- Release the retaining tab (1).
- Loosen the latch mechanisms (3).
- Remove the cover (2) on the left.



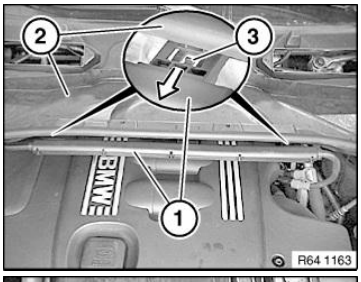
- The procedure for the removal of the right cover (4) is identical to the removal of the left cover.
- Loosen the hose support (2) and remove the hose (1) from the cover on the right (4).
- Detach the hose (1) from the recess (3).



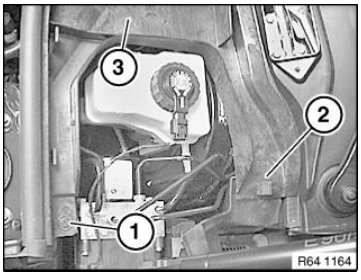
- Unlock plug connection (1) and disconnect.
- Unclip the cable from the guides (2).



- Unlock plug connection (1) and disconnect.
- Unclip the cable from the guides (2).

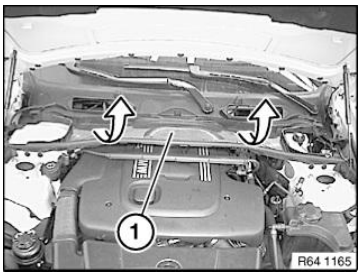


- Press the retaining lugs (3).
- Detach the cable strip (1) from the lower section of the microfilter housing (2) in the direction of the arrow.



- Detach the retaining tab (2) on both sides.
- Unscrew the bolt (1) on the lower section of the microfilter housing (3) on both sides.

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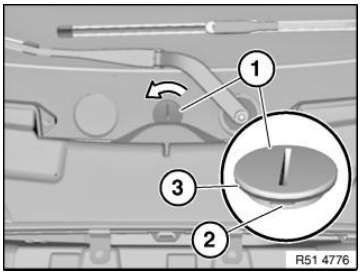


- Guide out the lower section of the microfilter housing (1) and remove it in the direction of the arrow.

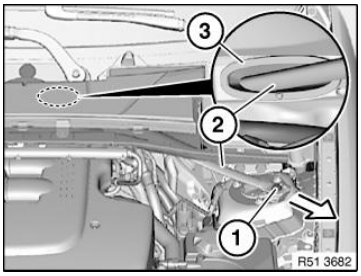
8 – Remove tension strut from left and right spring strut dome

TECHNICAL INFORMATION

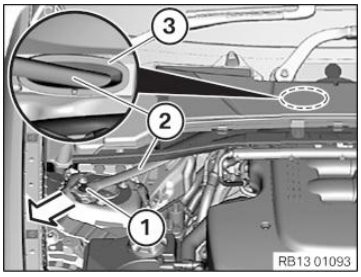
Driving without the strut brace/front end or tension strut is not permitted.



- Carefully remove the cover (1) as follows and loosen the underlying screw.
  For a cover (1)**with** notch: turn cover(1) approx. 45° anticlockwise.
  For a cover (1)**without** notch: Unclip the cover.
  The cover (1) must not be damaged.



- Loosen screw (1).
- Hold the grommet (3) down and **do not pull it out of the bulkhead**.
  If the grommet is pulled out, it can only be installed with major efforts.
- Pull the left tension strut (2) out in the direction of the arrow.



- Loosen screw (1).
- Hold the grommet (3) down and **do not pull it out of the bulkhead**.
  If the grommet is pulled out, it can only be installed with major efforts.
- Pull the right tension strut (2) out in the direction of the arrow.

9 – Remove both wiper arms.

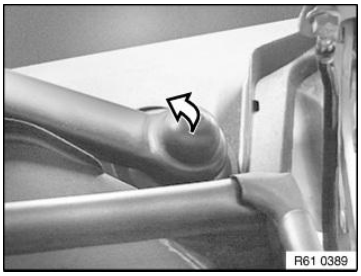
NOTICE

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

▸ **Remove wiper arm**

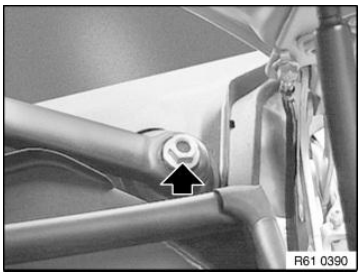
Prerequisite

Engine compartment lid is open.

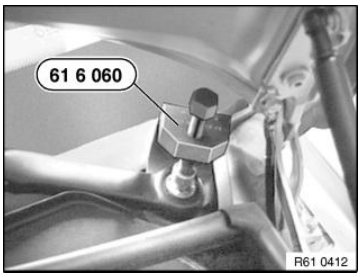


- Remove the protective cap in the direction of the arrow.

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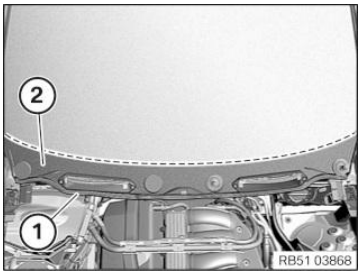


- Unscrew the nut (arrow).



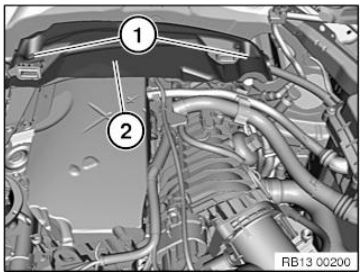
- Pull off and remove the wiper arm with the help of the special tool **0 493 441 (61 6 060)**.

10 – Remove cowl panel cover



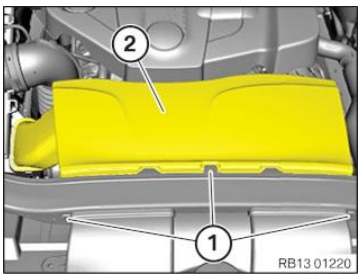
- Loosen the edge protection (1).
- Remove the cowl panel cover (2).

11 – Removing acoustic cover at rear

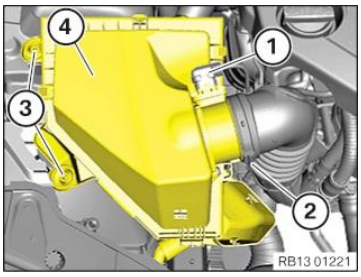


- Loosen the expanding rivet (1).
- Toward the top, feed out and remove rear acoustic cover (2).

12 – Removing intake silencer housing



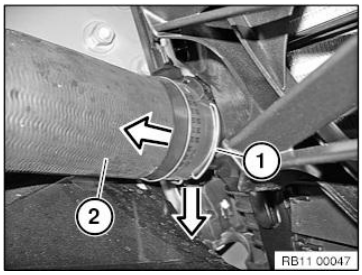
- Loosen screws (1).
- Remove intake port (2).



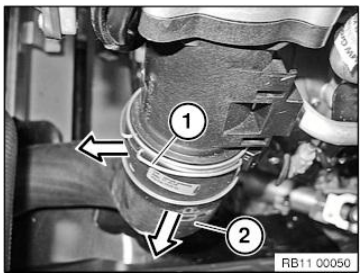
- Unlock connector (1) on hot film air mass meter and pull off.
- Unfasten clamp (2).
- Loosen screws (3).
- Remove intake filter housing (4).

13 – Remove pressure pipe at throttle valve assembly

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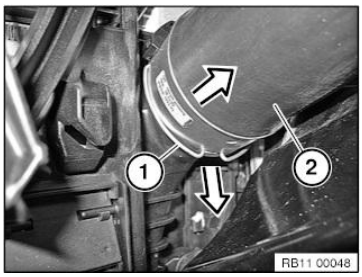


- Unlock the lock (1).
- Pull off pressure pipe (2) from charge air cooler.

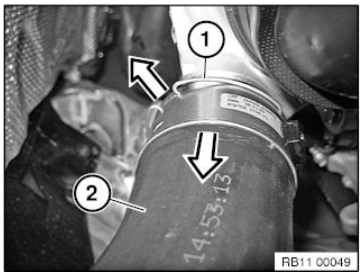


- Unlock the lock (1).
- Pull off pressure pipe (2) from throttle body.

14 – Remove pressure pipe between exhaust turbocharger and charge air cooler



- Unlock the lock (1).
- Pull off pressure pipe (2) from charge air cooler.

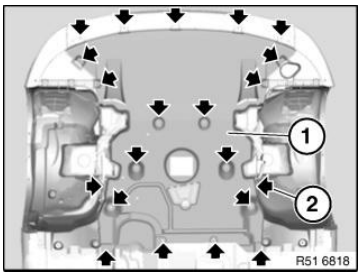


- Unlock the lock (1).
- Pull off pressure pipe (2) from exhaust turbocharger.

15 – Removing the front underbody protection

NOTICE

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

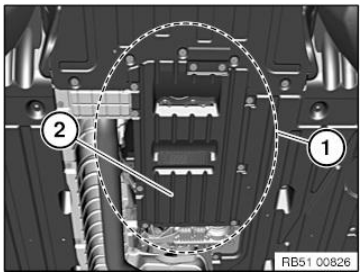


- Remove the screws (arrows) (2).
- Remove the front underbody protection (1).

16 – Removing rear underbody protection

NOTICE

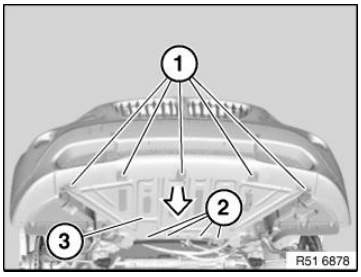
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Loosen screws in the area (1).
- Remove the rear underbody protection (2).

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17 – Remove pedestrian protection



- Loosen screws (1).
- Loosen screws (2).
- Remove the pedestrian warning (3) at an angle towards the bottom rear.

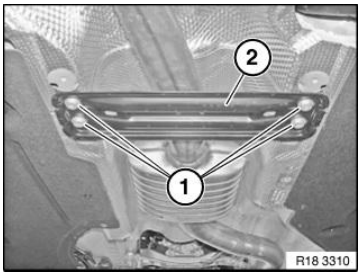
- **When replacing the pedestrian warning:**

  Remount sheet metal nuts.

18 – Removing the reinforcement

- **For equipment specification without panorama glass roof:**

▸ **Remove reinforcement plate**



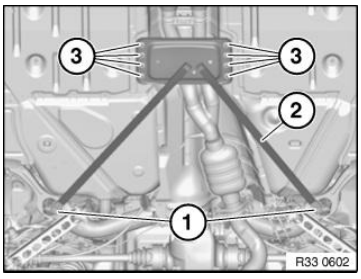
- Loosen the screws (1) and remove the reinforcement plate (2).

- **For equipment specification with panorama glass roof:**

▸ **Remove trailing link**

TECHNICAL INFORMATION

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



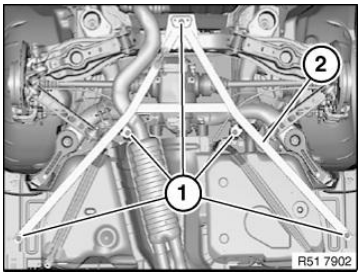
- Loosen screws (1).
- Loosen screws (3).
- Remove the tension struts (2).

- **For equipment specification with panorama glass roof:**

▸ **Removing the tension strut of the rear axle**

TECHNICAL INFORMATION

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



- Loosen the screws (1) and remove the tension strut (2).

19 – Removing the exhaust system (without diesel particulate filter)

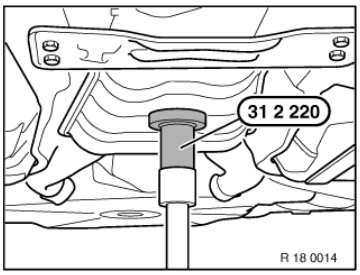
WARNING

Hot surfaces.

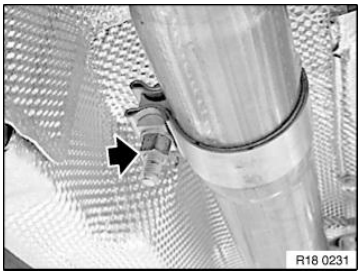
Risk of burning!

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

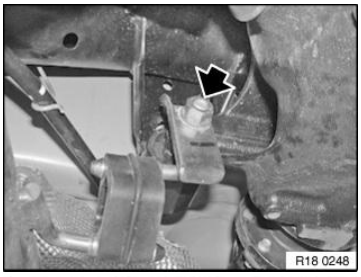
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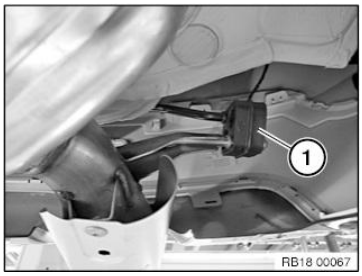
- Support the exhaust system using the special tool **0 491 932 (31 2 220)** and secure against dropping.
  The exhaust system may weigh up to 40 kg.



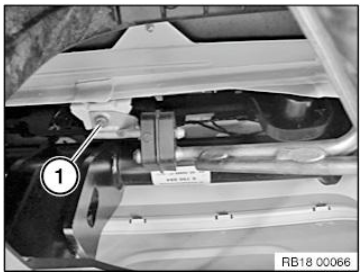
- Unscrew the nut (arrow).



- Unscrew the nut (arrow).



- Pull off the rubber mount (1) from the rear silencer.



- Loosen screw (1).
- Remove exhaust system.

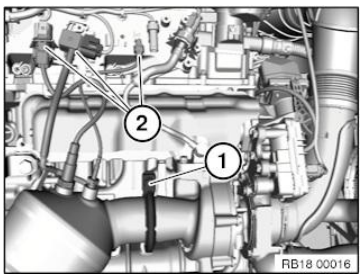
20 – Removing the diesel particulate filter

WARNING

Hot surfaces.

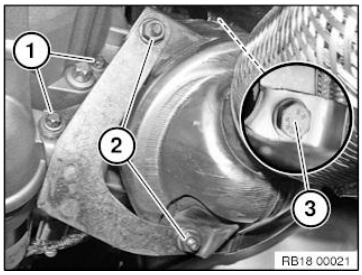
Risk of burning!

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



- Unfasten clamp (1).
- Loosen the plug connections (2) from the brackets.
- Unlock and disconnect plug connections (2).

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- Loosen screws (1).
- Loosen nuts (2).
- Loosen the screw (3) above the diesel particulate filter.
- Remove diesel particle filter in downward direction.

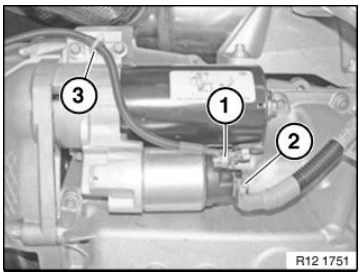
21 – Remove heat shields

- Remove the heat shields around the propeller shaft.

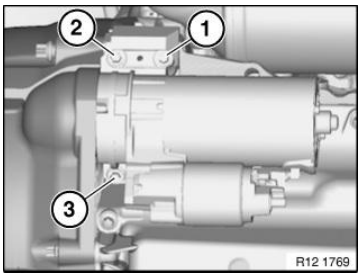
22 – Removing starter motor

Prerequisite

Battery earth lead is disconnected.

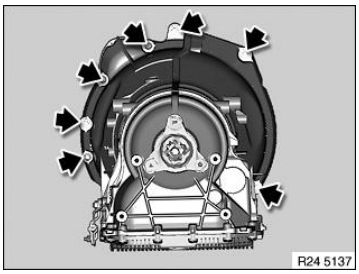


- Loosen the nut (1) and remove the cable.
- Loosen the nut (2) and remove the positive battery cable.
- Loosen the cable on the clamp (3) from the starter motor.



- Loosen screw (1).
- Loosen screw (2).
- Loosen screw (3).
- Remove starter motor.

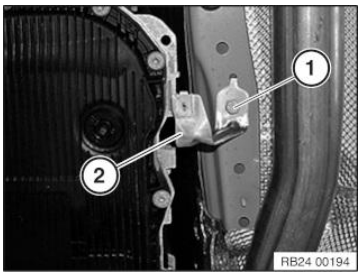
23 – Remove automatic transmission



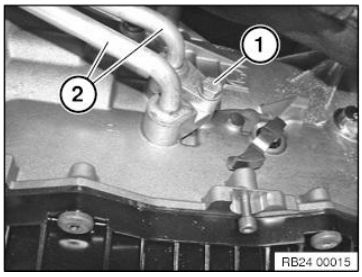
TECHNICAL INFORMATION

To prevent damage to the engine and transmission, check the thread before removal. If the threads are corroded, you must remove rust and clean them before removal.

- Check the threads (arrows) for corrosion, if necessary, remove rust and clean them.

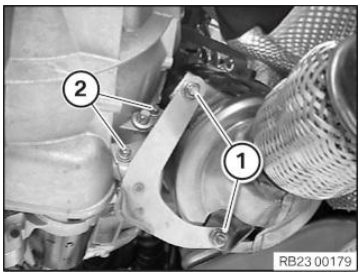


- Loosen the screw (1) and remove the holder (2).

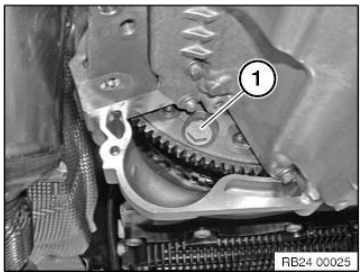


- Loosen screw (1).
- Remove the hydraulic lines (2).

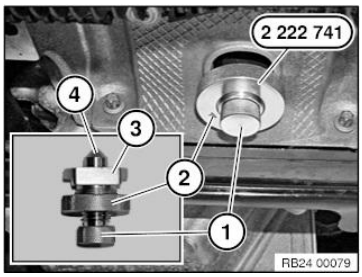
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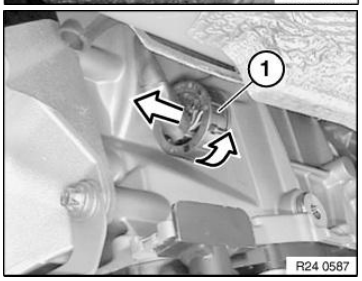
- If necessary, loosen the screws (1) and (2) and remove the holder.



- Crank the engine using special tool **0 493 380 (11 6 480)** on the vibration damper in the direction of rotation until the screw (1) becomes visible in the recess.
- Loosen all four screws of the torque converter using special tool **0 491 667 (24 1 110)**.



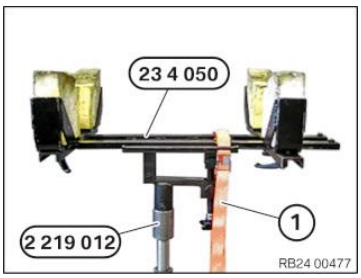
- Unscrew the screw (1) of special tool **2 222 741**.
- Insert special tool **2 222 741** including the shaped element (3) into the recess.
- Tighten the nut (2) hand-tight, but do not fully tighten it.
- Completely screw in the screw (1).
- Make sure that the bolt (4) is located between the torque converter and the engine.
- Push the special tool **2 222 741** towards the rear until it is fully in contact with the torque converter.
- Tighten nut (2).



TECHNICAL INFORMATION

Notes on mechatronics are a fundamental requirement for these repair instructions and must be complied with at all times.
For more information see: 24 34 ... Notes on mechatronics (GA8HP45Z,GA8HP70Z,GA8HP90Z)

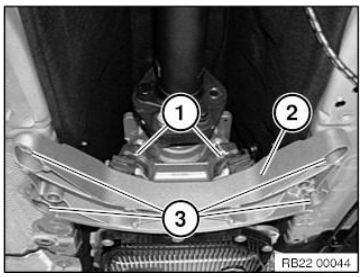
- Twist the connector (1) anticlockwise and pull it off in the direction of the arrow.
- Loosen the cable from the bracket.
- Insert special tool **0 494 213 (24 2 390)** into the connector (1).



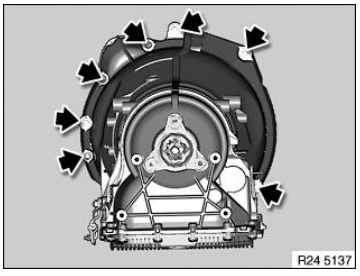
TECHNICAL INFORMATION

Notes on universal transmission support are a fundamental requirement for these repair instructions and must be complied with at all times.
For additional information see: 24 ... Universal transmission support

- Connect special tool fixture **0 495 498 (23 4 050)** to special tool universal jack **2 219 012**.
- Support the transmission using special tool fixture **0 495 498 (23 4 050)** and special tool universal jack **2 219 012**.
- Secure the transmission with the tensioning strap (1).



- Leave the screws (1) mounted because the transmission cross member (2) must not be removed from the automatic transmission.
- Loosen screws (3).



- Remove screws (arrows).
- Remove and lower the transmission.

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WARNING

Hot fluids.

Risk of scalding!

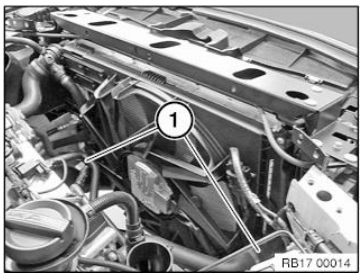
- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

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

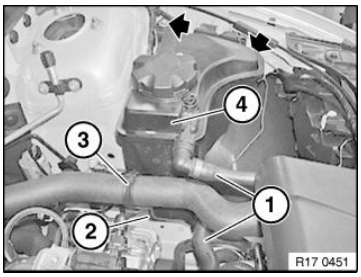
TECHNICAL INFORMATION

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



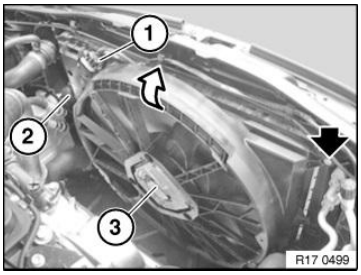
- Release sealing cap on the coolant expansion tank.
- Unlock and pull off coolant hoses (1) from radiator.
- Drain, catch and dispose of coolant.

25 – Remove coolant expansion tank



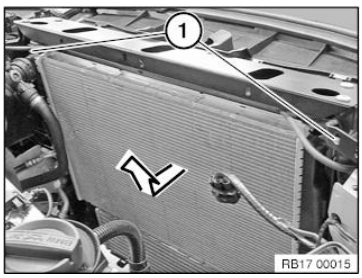
- Unlock and pull off the coolant hoses (1).
- Unlock and disconnect the connector (2) of the coolant level sensor.
- If necessary, unlock the holder (3).
- Remove the coolant expansion tank (4) towards the top.

26 – Removing the fan cowl with electric fan



- Unlock connector (1).
- Release screw (arrow).
- Unlock the latch mechanism (2) and remove the fan cowl (3) towards the top.

27 – Removing the radiator

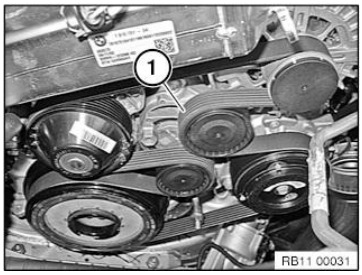


- Loosen screws (1).
- If necessary, unlock and pull off the coolant hoses.
- Feed out radiator towards rear and remove by pulling upwards.

28 – Removing the drive belt for alternator

Check

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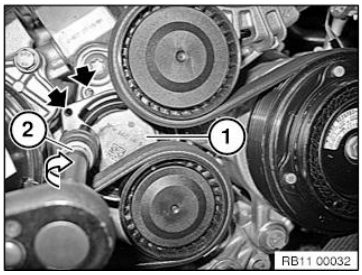
- Check drive belt for alternator (1) for coolant residue and oil residue.

Result

» Drive belt for alternator (1) is contaminated with coolant or oil.

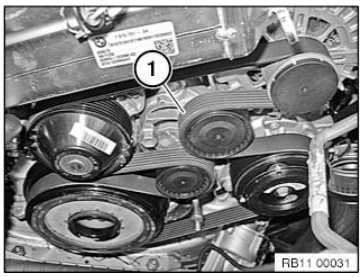
Measure

- Renew drive belt for alternator (1).



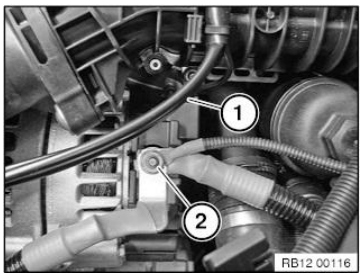
- Increase the preload on the belt tensioner (1) using a tool (2) until special tool **0 490 973 (11 3 340)** can be inserted into the belt tensioner (1).

  Both bore holes of the belt tensioner must line up.

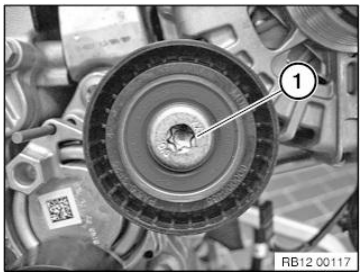


- Remove the drive belt for alternator (1).

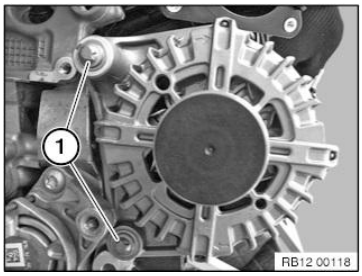
29 – Removing the alternator



- Unlock and disconnect connector (1).
- Loosen the nut (2) and remove the positive battery cable from the alternator.



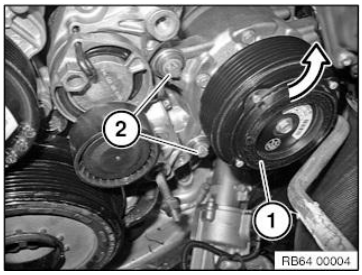
- Remove the cover from the deflecting element.
- Loosen the screw (1) and remove the deflecting element.



- Loosen screws (1).
- Remove the alternator towards the top.

30 – Releasing air conditioning compressor

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- Unlock and disconnect the connector on the air conditioning compressor.
- Loosen the screws (2) on the air conditioning compressor (1).
- Remove the air conditioning compressor (1) and allow it to hang to the side of the refrigerant lines.

31 – Loosening the engine wiring harness from the electronics box

Prerequisite

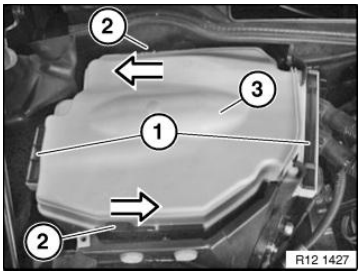
Ignition is switched off.

RISK OF DAMAGE

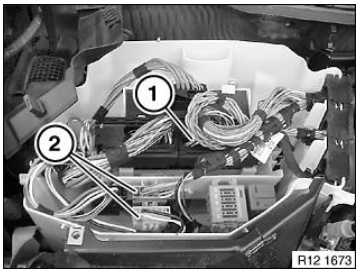
Electrostatic discharge.

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 the locks (1) and push them upwards by approximately 10 mm.
- Unlock the locks (2).
- Remove the lid of the electronics box (3).



- Unlock and disconnect all connectors (1) and (2) from the electronics box.
- Loosen all cables from the electronics box and put to one side.

32 – Loosening the engine wiring harness from the electronics box

Prerequisite

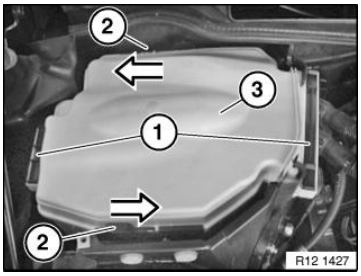
Ignition is switched off.

RISK OF DAMAGE

Electrostatic discharge.

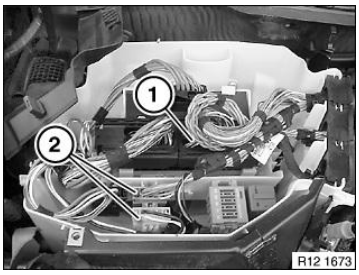
Damage to or destruction of electrical components.

- 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.



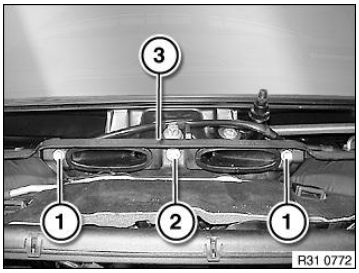
- Unlock the locks (1) and push them upwards by approximately 10 mm.
- Unlock the locks (2).
- Remove the lid of the electronics box (3).

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- Unlock and disconnect all connectors (1) and (2) from the electronics box.
- Loosen all cables from the electronics box and put to one side.

33 – Removing the heater end panel

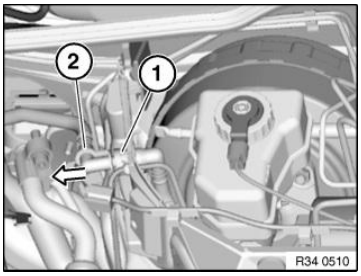


- Loosen screws (1) and (2).
- Remove the heater end panel (3).

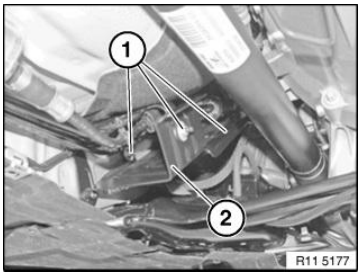
34 – Removing engine

NOTICE

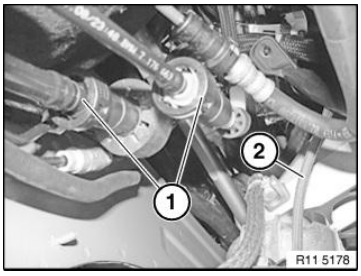
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Disconnect snap fastener (1) of the vacuum line (2).



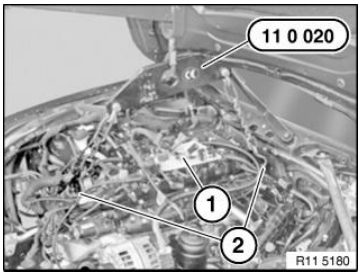
- Loosen the screws (1) and remove the protective plate (2).



TECHNICAL INFORMATION

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

- Unlock and disconnect fuel lines (1).
- Pull off vacuum hose (2) for the engine mount.



- Secure engine wiring harness (1) against falling down.

CAUTION

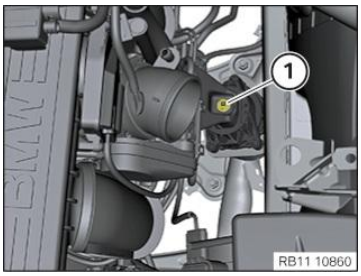
Components connected to the engine joint or cross member.

Danger of injury!

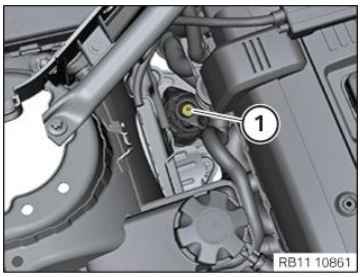
- Check lifting eyes and engine mounting brackets for damage, e.g. cracks.
- Attach the component to correctly mounted engine joints or cross members only.
- Exclusively lift the component, do not move it forwards, backwards or in transverse direction.

- Secure special tool **2 220 718** with special tool **0 490 567 (11 0 020)** to the lifting eyes of the engine.
- Slightly lift special tool **2 220 718** and apply preload.

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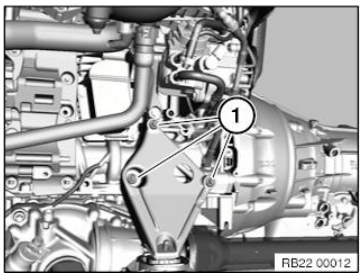


- Loosen the screw (1) on the left engine mount.
- Loosen ground strap on the left engine mount.



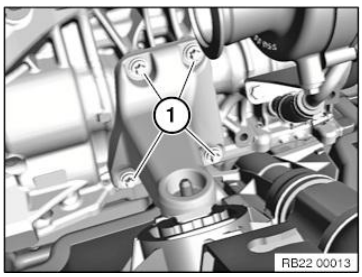
- Loosen the screw (1) on the right engine mount.
- Pull engine out upward.

35 – Remove left engine support arm



- Loosen screws (1).
- Remove left engine support arm.

36 – Remove right engine support arm

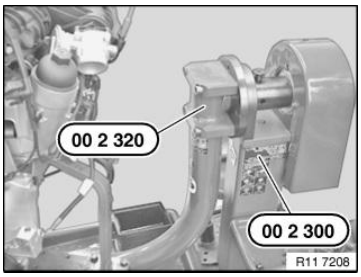


- Loosen screws (1).
- Remove right engine support arm.

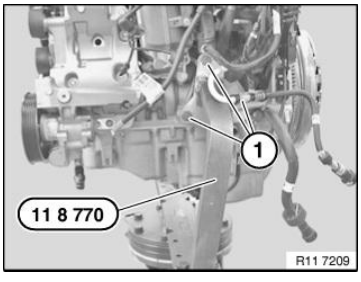
37 – Install the engine on the assembly stand

TECHNICAL INFORMATION

Observe manufacturer's specifications.

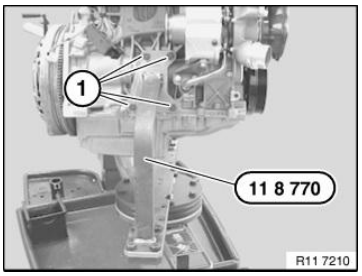


- Fit special tool **0 495 196 (00 2 320)** on special tool **0 495 187 (00 2 300)**.



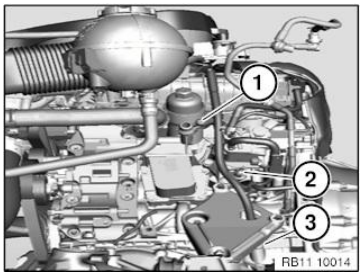
- Fit special tool **0 496 117 (11 8 770)** on special tool **0 495 196 (00 2 320)**.
- Install special tool **0 496 117 (11 8 770)** on the mounting of the left-hand engine support arm using the screws (1).

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- Install special tool **0 496 117 (11 8 770)** on the mounting of the right-hand engine support arm using the screws (1).

38 – Removing guide tube for oil dipstick

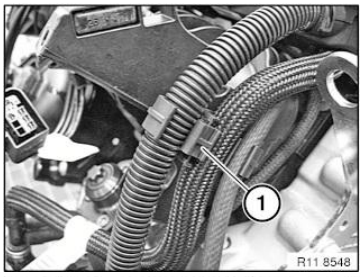


- Loosen screw (1) on the oil filter housing.
- Release engine wiring harness and the vacuum lines on guide tube for the oil dipstick (2).
- Pull guide tube for the oil dipstick (2) out of the oil sump (3).

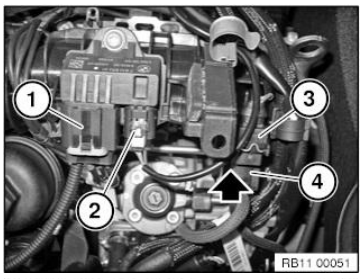
39 – Release engine wiring harness

- Unlock and disconnect all plug connections around the cylinder head cover.
- Unclip engine wiring harness in area of cylinder head cover and put to one side.

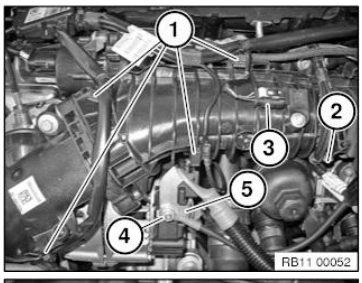
40 – Removing the intake plenum



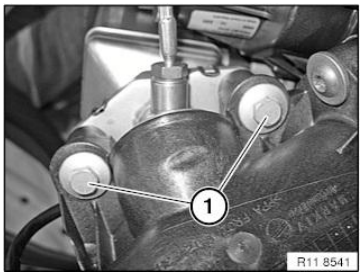
- Press the cable clips (1) towards the outside and remove the cable.



- Disconnect the plug connections (1) and (2) on the preheating control unit.
- Disconnect the plug connection (3) on the electric changeover valve (4) of the engine mount.
- Pull off the electric changeover valve (4) and put to one side.

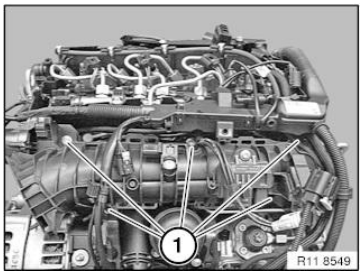


- Loosen all cable clips (1) and (2) on the intake plenum.
- Unlock and disconnect the plug connection (3) on the charging pressure sensor.
- Loosen the nut (4) on the alternator.
- Put the positive battery cable (5) to one side.

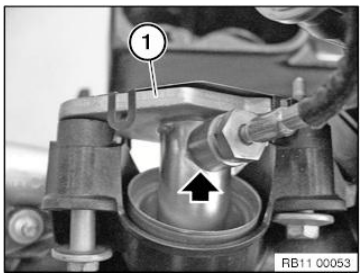


- Loosen the screws (1) on the exhaust-gas recirculation cooler.

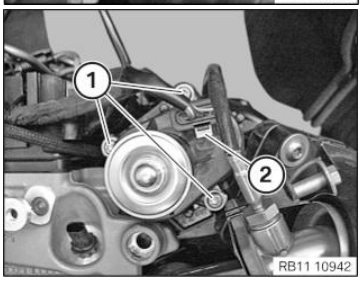
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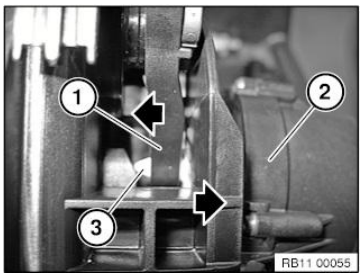
- Loosen screws (1).
- Remove intake system upwards.



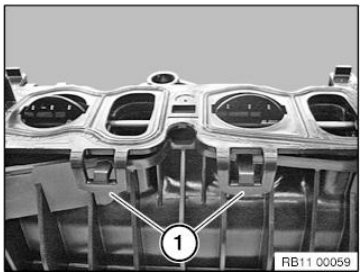
- Remove the exhaust-gas recirculation pipe (1).



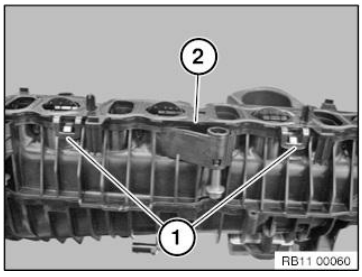
- Loosen screws (1).
- Remove the swirl-flap controller (2).



- Push the swirl-flap controller (2) towards the front.
- Lever out the adjustment plate (1) using a screwdriver until the drive arm (3) loosens from the adjustment plate (1).



- Unclip the retaining clips (1) of the gasket support.



- Unclip the retaining clips (1) of the gasket support.
- Remove the gasket support (2) including swirl flaps.

41 – Remove all high pressure lines

WARNING

Contact with hazardous fluids.

Hazardous to health!

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

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CAUTION

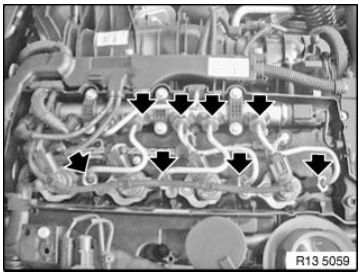
On releasing high pressure line, fuel may emerge at high speed.

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.



TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Unscrew all union nuts of the high pressure lines with the special tool **0 495 910 (37 1 152)**.
- Remove all high pressure lines.

42 – Remove the high pressure line between the high pressure pump and the rail

TECHNICAL INFORMATION

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

NOTICE

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

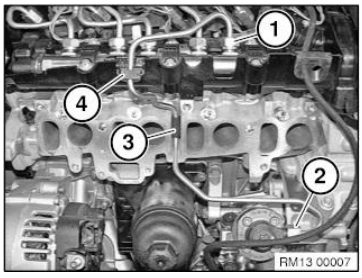
RISK OF DAMAGE

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.

- Before removing the high pressure lines: Protect the alternator from contamination and any ingress of oil.



- Release the union nuts (1) and (2) of the high pressure line using the special tool **0 495 910 (37 1 152)**.
- Feed out the high pressure line without changing the position of the rubber mount (4) and the rubber grommet (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.

- Seal all exposed cable connections with seal plugs.

43 – Detaching leakage oil lines from the injectors

WARNING

Contact with hazardous fluids.

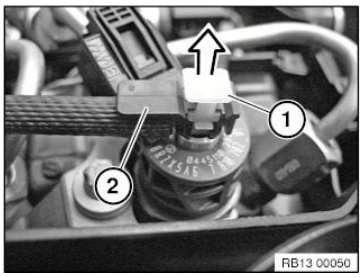
Hazardous to health!

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

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TECHNICAL INFORMATION

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

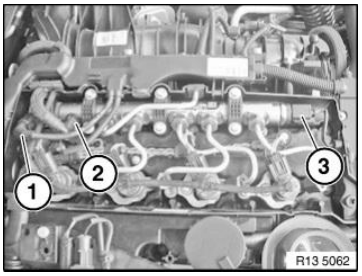


NOTICE

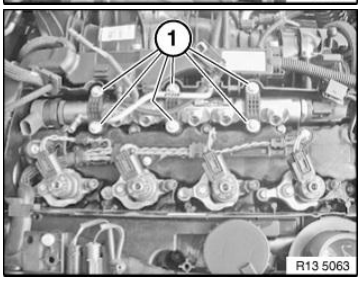
The description is for one component only. The procedure is identical for all further components.

- Unlock the lock (1) upward. Detach leakage oil line (2) from injector.
- Detach leakage oil line from all injectors.

44 – Remove high-pressure rail



- Unlock and disconnect the connector (1) from the fuel pressure regulator.
- Unlock and pull off the return line (2) from the rail.
- Unlock and pull off connector (3) from fuel pressure sensor.

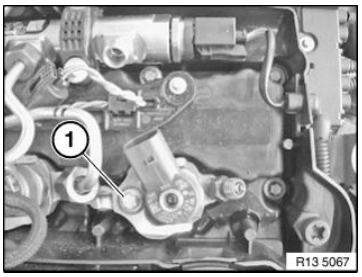


- Loosen screws (1).
- Remove high pressure rail.

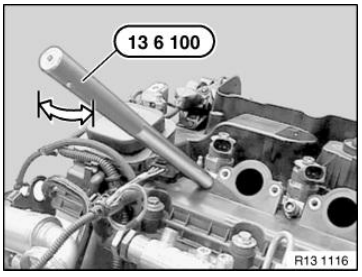
45 – Removing all injectors of the diesel injection systems

NOTICE

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



- Release screw (1) of clamping claw.
- Remove clamping claw, screw and centring ring.
- Pull out injector with light rotational movements.
  If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder).
- Mark injectors.



NOTICE

The figure shows the engine M47T2. The procedure for the engine N47T is identical.

- If injectors are stuck, fit special tool **0 494 279 (13 6 100)** to injector connection.
- Move injector with special tool **0 494 279 (13 6 100)** only by a few degrees only.
- Pull out injector by means of short back and forth movements.

46 – Removing cylinder head cover

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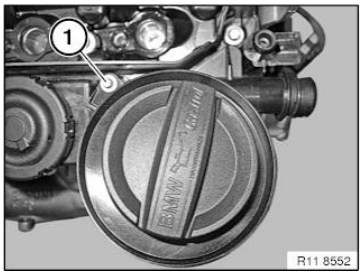
RISK OF DAMAGE

Contaminant or foreign body.

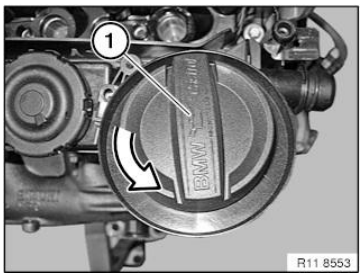
Contamination can result in malfunctions, operating failure or leaks.

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

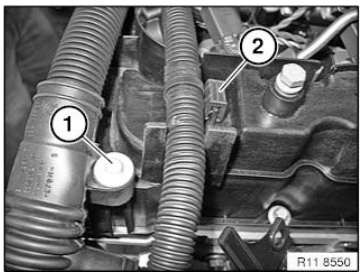
- Before removing the cylinder head cover, protect alternator against contamination and ingress of oil.



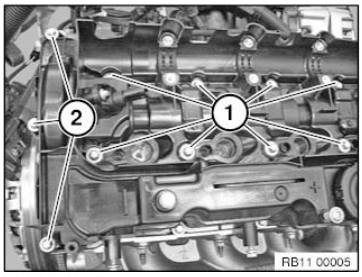
- Loosen screw (1).



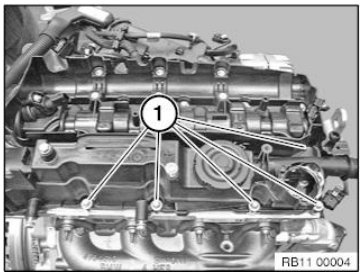
- Twist complete oil filler neck (1) by approx. 25° anticlockwise.
- Remove oil filler neck (1) towards top.



- Loosen screw (1).
- Unclip cable clip (2) and lay to one side.

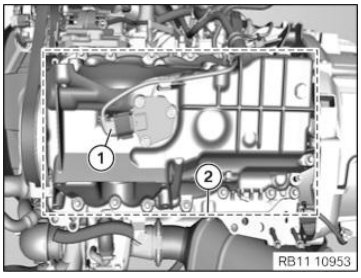


- Loosen screws (1) and (2).



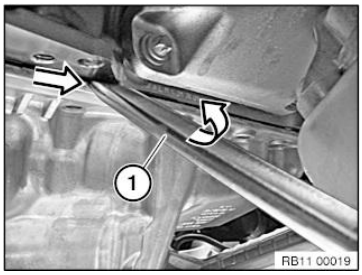
- Loosen screws (1).
- Remove cylinder head cover by lifting it out.

47 – Remove the oil sump (transmission removed)



- Disconnect the connector (1) of the oil-level sensor.
- Unclip the cable in the area of the oil sump.
- Loosen all screws along the line (2).

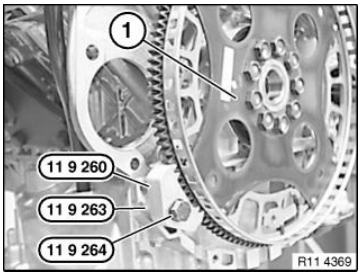
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- Detach oil sump downward.
- If applicable, detach the oil sump in the designated area (arrow) in the direction of the arrow with a mounting lever (1).

MAIN WORK

48 – Removing flywheel



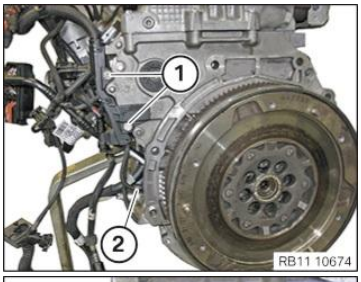
- Fix the flywheel (1) with special tools **0 493 938 (11 9 260)**, **0 494 129 (11 9 263)** and **0 494 130 (11 9 264)**.
- Unfasten flywheel bolts.
- If necessary, remove special tools.

49 – Removing the magnet wheel

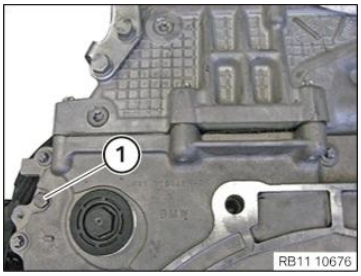


- Remove the magnet wheel (1) from the crankshaft.
- Protect the magnet wheel (1) from metal chips by a plastic bag.

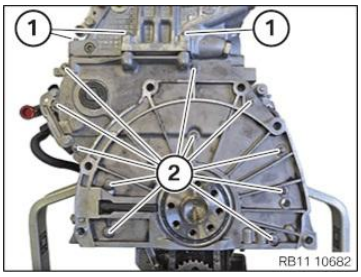
50 – Removing the timing case cover (cylinder head installed)



- Loosen the screws (1) of the wiring harness.
- Unlock plug connection (2) of the crankshaft sensor and disconnect.

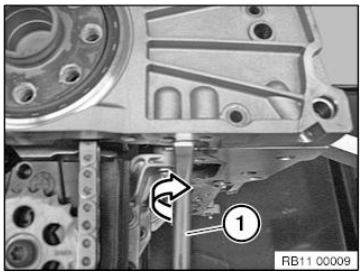


- If applicable, loosen the screw (1) of the high pressure pump.
  The screw (1) may not be installed depending on the equipment specification.

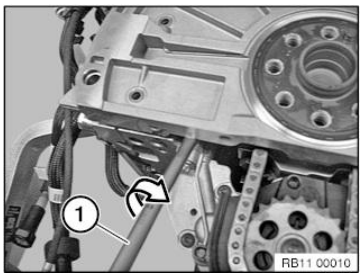


- Loosen screws (1).
- Loosen screws (2).

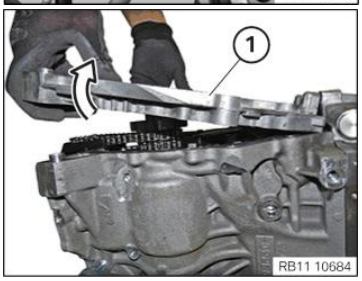
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- Loosen the timing case cover using a screwdriver (1).

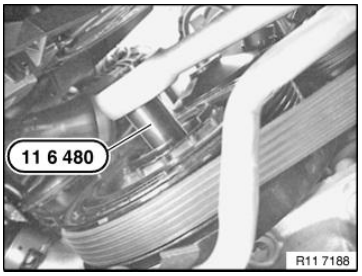


- Loosen the timing case cover using a screwdriver (1).



- Remove the timing case cover (1).

51 – Adjusting the TDC firing position (without disconnecting by means of alignment pin)



RISK OF DAMAGE

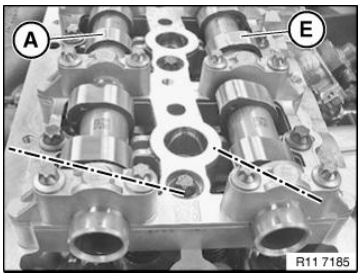
Damage to the engine.

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 crankshaft with special tool **0 493 380 (11 6 480)** to the TDC firing position at the first cylinder.

Check



- Check whether the cam of exhaust camshaft (A) and of intake camshaft (E) of first cylinder point upward at an angle.

Result

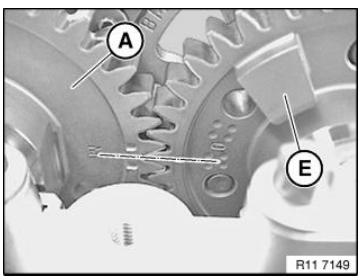
» The cams of exhaust camshaft (A) and of intake camshaft (E) of first cylinder do not point upward at an angle.

» The TDC firing position is not correctly adjusted at the first cylinder.

Measure

- Turn crankshaft until the TDC firing position is adjusted correctly.

Check



- Check whether the marks on the exhaust camshaft (A) and the intake camshaft (E) match up.

Result

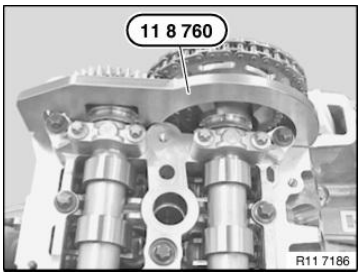
» The marks of exhaust camshaft (A) and of intake camshaft (E) do not match up.

» The TDC firing position is not correctly adjusted at the first cylinder.

Measure

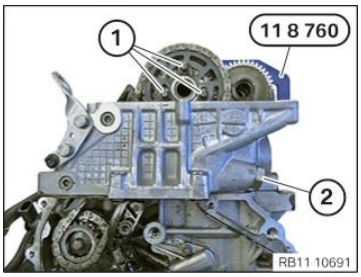
- Turn crankshaft until the TDC firing position is adjusted correctly.

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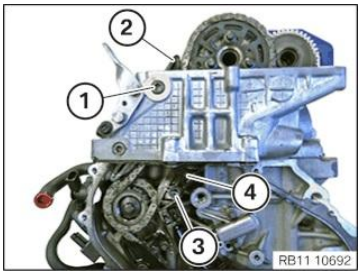


- Place special tool **0 496 112 (11 8 760)** on camshaft.
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

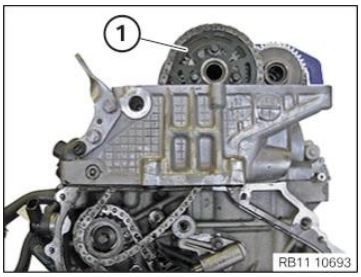
52 – Removing the top timing chain



- Special tool **0 496 112 (11 8 760)** must continue to block the camshafts.
- Loosen the screws (1), but do not remove.
- Loosen and remove the chain tensioner (2).

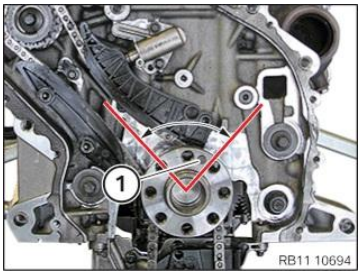


- Loosen the bearing journals (1).
- Remove the guide rail (2) towards the top.
- Loosen the bearing journals (3).
- Remove the tensioning rail (4) towards the bottom.

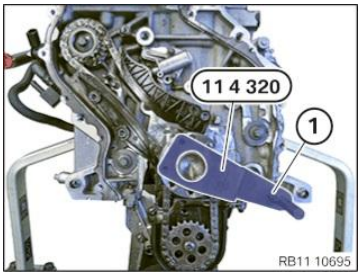


- Remove the camshaft sprocket (1) and the upper timing chain.

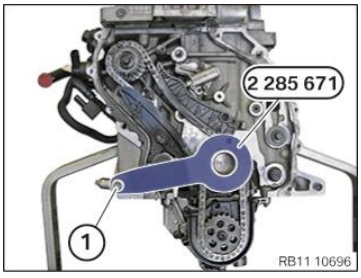
53 – Removing the bottom timing chain



- Hold the guide pin (1) in the highlighted area during the entire repair.
  The crankshaft must only be cranked after having assembled the engine.



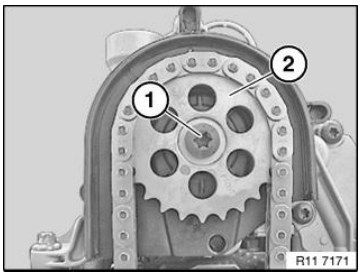
- **Engine versions up to 5/2013:**
  Install special tool **0 496 442 (11 4 320)** on the crankshaft and secure using a screw (1).



- **Engine versions from 5/2013:**
  Attach special tool **2 285 671** to the crankshaft and fix with the transmission bolt (1).

▸ **Loosening the oil pump camshaft sprocket**

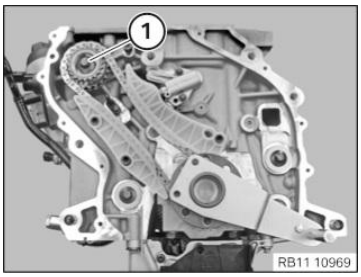
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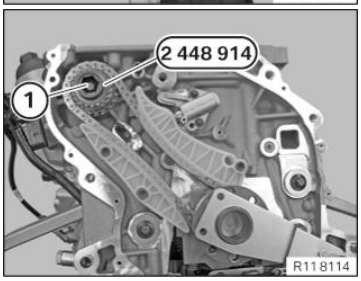
TECHNICAL INFORMATION

Observe the specified direction of rotation to prevent component damage.

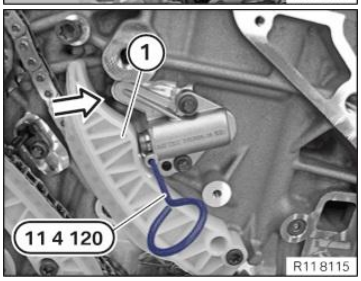
- Turn the screw (1) of the oil pump camshaft sprocket (2) clockwise to loosen it.



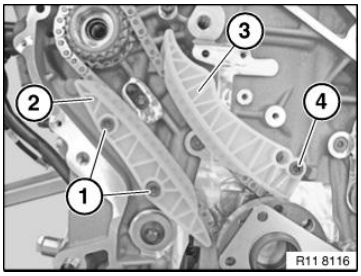
- Loosen the central bolt (1), but do not remove it.



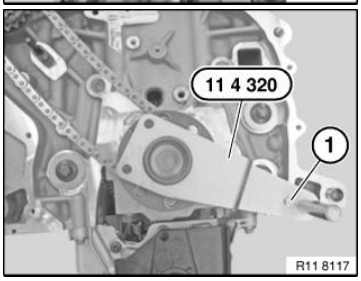
- Screw special tool **2 448 914** in hand-tight.
- Unscrew the central bolt (1) until the impeller comes loose from the high pressure pump taper. However, do not fully remove the impeller.



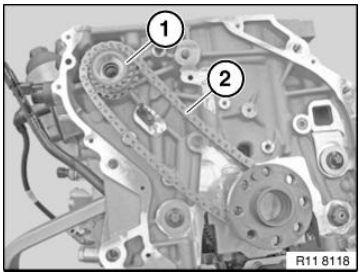
- Press in the tensioning rail (1) and the chain tensioner until it is possible to insert special tool **0 491 012 (11 4 120)** into the chain tensioner.
- If necessary, remove chain tensioner.



- Loosen the bearing journals (1).
- Remove the guide rail (2).
- Loosen the bearing journals (4).
- Remove the tensioning rail (3).



- Loosen screw (1).
- Remove special tool **2 285 671** or **0 496 442 (11 4 320)**.

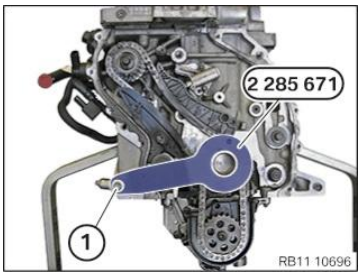


- Remove the camshaft sprocket and the drive chain of the oil pump.
- Remove the impeller (1) and the bottom timing chain (2) from the high pressure pump.

54 – Installing the bottom timing chain

- Place bottom timing chain onto the crankshaft.
- Place drive chain of the oil pump onto the crankshaft.

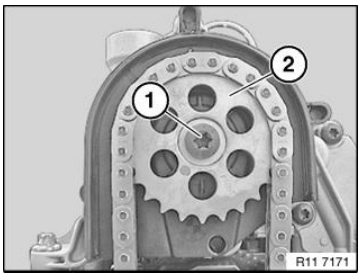
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- **For all engines, independent of version:**

  Attach special tool **2 285 671** to the crankshaft and fix with the transmission bolt (1).

▸ **Installing the camshaft sprocket of the oil pump**



- Connect the camshaft sprocket of the oil pump (2) to the oil pump.
- Renew the screw (1).

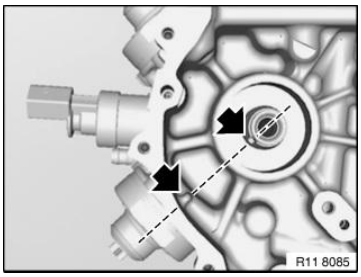
TECHNICAL INFORMATION

Observe the specified direction of rotation to prevent component damage.

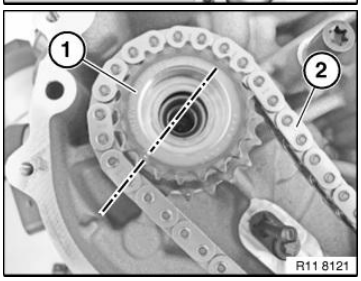
- Tighten the screw (1) by turning it in anti-clockwise direction.

Camshaft sprocket to oil vacuum pump

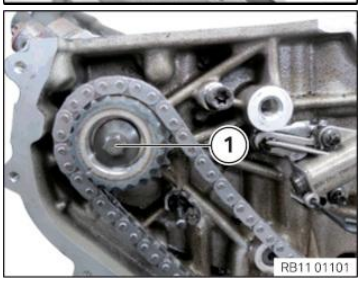
M8x35	The screw features a left-hand thread. Renew screw.	Jointing torque Angle of rotation	5 Nm 90 °



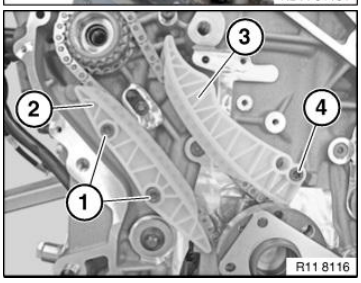
- Align spline groove on the high pressure pump with the mark on the crankcase.



- Place bottom timing chain (2) onto the impeller (1) and connect to the high pressure pump.
- Align the mark of the impeller (1) to the spline groove of the high pressure pump.



- Apply central bolt (1) of the high pressure pump, but do not tighten completely.



- Clean all threads of the screw connections (1) and (4).
- Renew all bearing journals (1) and (4).
- Position the guide rail (2).
- Tighten the bearing journals (1).

Tensioning rail/guide rail on the engine

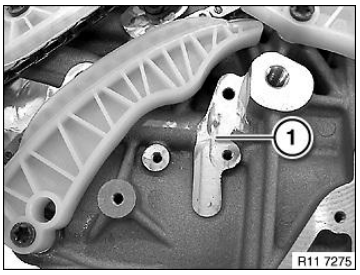
Bearing journal	Replace bearing journal.	20 Nm

- Position tensioning rail (3).
- Tighten the bearing journals (4).

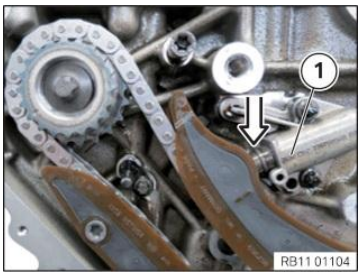
Tensioning rail/guide rail on the engine

Bearing journal	Replace bearing journal.	20 Nm

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- Clean the sealing surface (1) using compressed air if the chain tensioner has been removed.



- If necessary, position the chain tensioner (1) and tighten the screws.

Hydraulic chain tensioner (bottom) on the engine block

M6		10 Nm

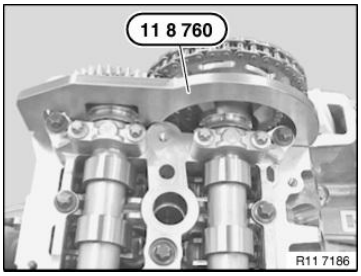
- Remove special tool **0 491 012 (11 4 120)** to relieve the chain tensioner.

- Tighten central bolt of high pressure pump.

Central bolt on the high pressure pump

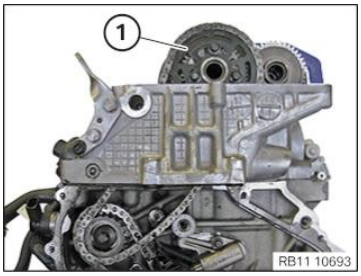
M12		65 Nm

▸ **Installing the top timing chain**

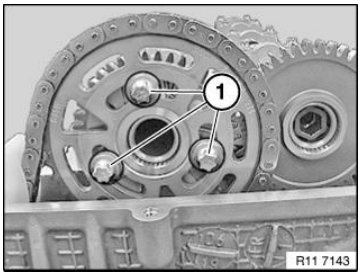


- Place special tool **0 496 112 (11 8 760)**on camshaft.

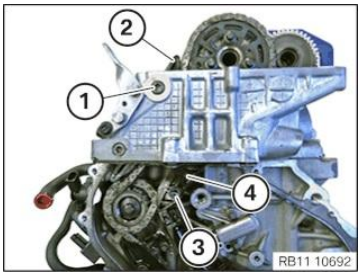
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Insert the timing chain and the camshaft sprocket through the cylinder head and position on the high pressure pump impeller.



- Position the camshaft sprocket including the timing chain on the intake camshaft so that the screws (1) are inserted in the centre of the elongated holes.
- Tighten the screws (1), but do not tighten fully.



- Clean the screw connections (1) and (3).
- Renew the bearing journals (1) and (3).
- Install the guide rail (2).
- Tighten the bearing journals (1).

Tensioning rail/guide rail on the engine

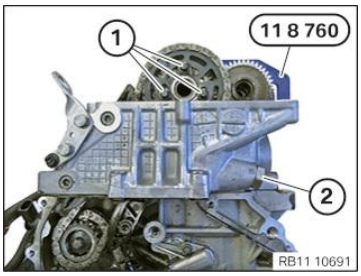
Bearing journal	Replace bearing journal.	20 Nm

- Install the tensioning rail (4).
- Tighten the bearing journals (3).

Tensioning rail/guide rail on the engine

Bearing journal	Replace bearing journal.	20 Nm

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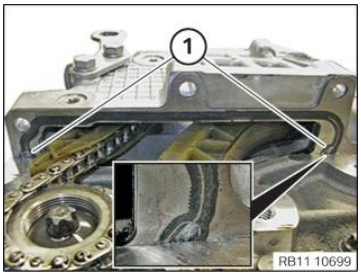
- Special tool **0 496 112 (11 8 760)** must continue to block the camshafts.
- Tighten the screws (1) to approximately 10 Nm.
- Loosen the screws (1) by approximately 90°.
- Renew the chain tensioner (2) and the sealing ring.
- Insert and tighten the chain tensioner (2).

Chain tensioner (top) in the cylinder head

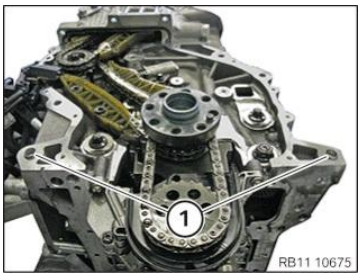
Renew the sealing ring.	70 Nm

- Remove special tool **2 285 671**.

55 – Installing the timing case cover (cylinder head installed)

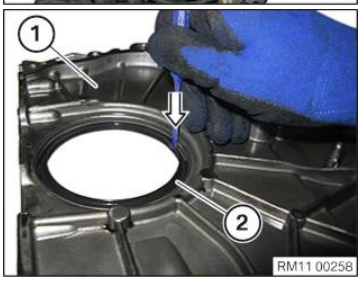


- Remove the cylinder head gasket residue (1).

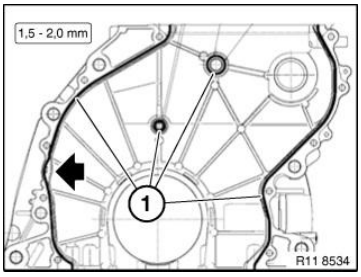


- Remove the fitting sleeves (1) and replace with shorter fitting sleeves. Use fitting sleeves with a length of 9 mm.

  Parts: Fitting sleeves
- Insert the shorter fitting sleeves into the crankcase up to the limit position.



- Position the timing case cover (1) on a support with the inside facing upwards.
- Position the punch on the inside of the crankshaft seal (2).
- Drive out the crankshaft seal (2) towards the bottom.



- Remove any gasket residue on the crankcase and the timing case cover using special tool **0 495 102 (11 4 470)**.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

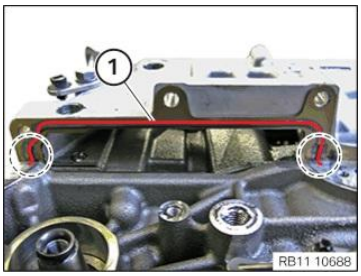
- Apply a sealing bead (1) on the crankcase with a thickness of approximately 1.5 mm to 2.0 mm.

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

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TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

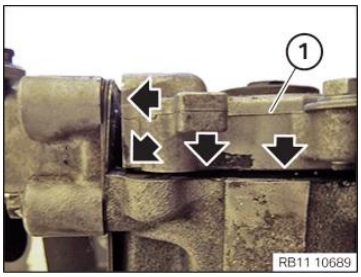
- Apply a sealing bead (1) on the cylinder head with a thickness of approximately 1.5 mm to 2.0 mm.

Sealing compound

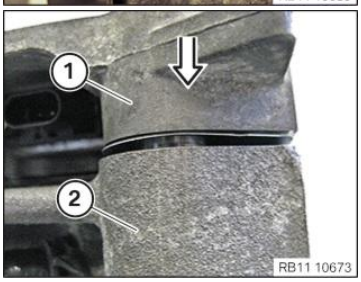
Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

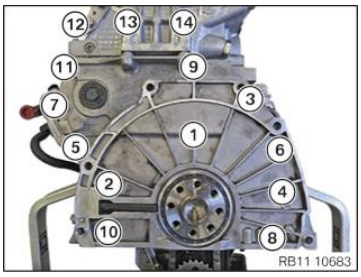
- Apply a sealing bead (1) with a thickness of approximately 2.5 mm to 3.0 mm at the transition from the crankcase to the cylinder head.



- Evenly position the timing case cover (1) on the crankcase and the cylinder head without shearing off the sealing bead.



- Centre the timing case cover (1) on the fitting sleeves.
- Insert the timing case cover into the crankcase (2) using a rubber mallet.

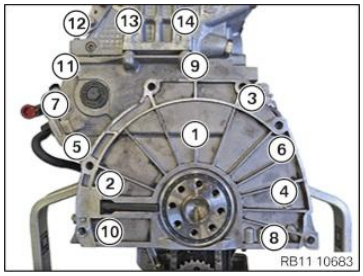


- Renew screws (1) to (11).
- Tighten all screws (1) to (14), but do not tighten fully.
- Tighten screws in the order (1) to (11).

Timing case cover to crankcase

Tighten screws in the following sequence: (1) - (11).

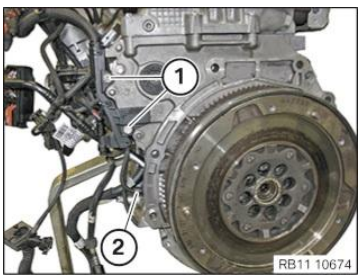
Renew screws.	Jointing torque	8 Nm
	Angle of rotation	90 °



- Tighten screws in the order (12) to (14).

Standard screw connection M8

M8		Tightening torque	19 Nm

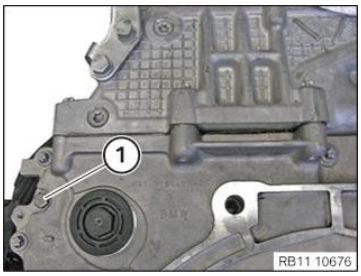


- Connect the plug connection (2) to the crankshaft sensor.
- Tighten the screws (1) of the wiring harness.

Standard screw connection M6

M6			8 Nm

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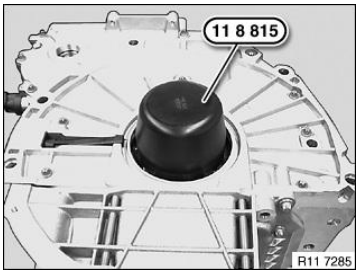


- If applicable, tighten the screw (1) of the high pressure pump.
  The screw (1) may not be installed depending on the equipment specification.

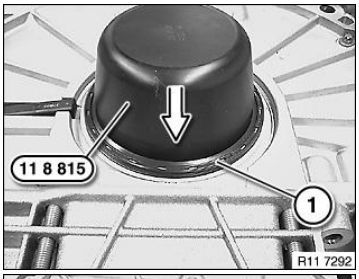
Standard screw connection M6

M6		8 Nm

56 – Installing the rear crankshaft seal



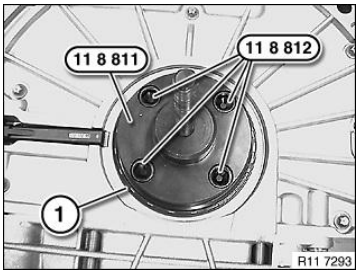
- Connect special tool **0 496 137 (11 8 815)** to the crankshaft to be able to mount the crankshaft seal without damaging it.



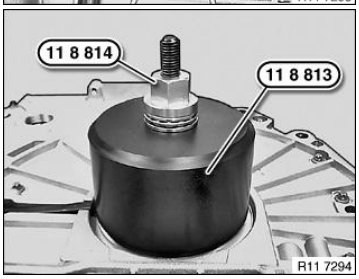
TECHNICAL INFORMATION

The radial shaft seal must be installed dry. Do not use engine oil or lubricant.

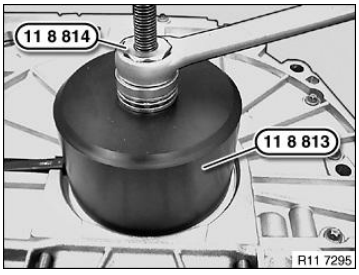
- Connect the crankshaft seal (1) to special tool **0 496 137 (11 8 815)** and push down to the timing case cover.
- Remove special tool **0 496 137 (11 8 815)**.



- Secure special tool **0 496 133 (11 8 811)** with special tool **0 496 134 (11 8 812)** on the crankshaft and position it on the crankshaft seal (1).

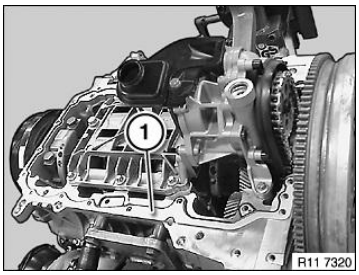


- Connect the special tool **0 496 135 (11 8 813)**.
- Screw on special tool **0 496 136 (11 8 814)**.



- Tighten special tool **0 496 136 (11 8 814)** to press in the crankshaft seal using special tool **0 496 135 (11 8 813)**.
- Press in the crankshaft seal until special tool **0 496 135 (11 8 813)** comes into contact with the timing case cover.

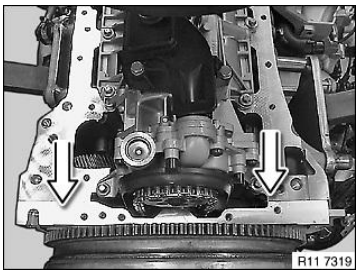
57 – Install the oil sump (transmission removed)



▸ **Install the oil sump (equipment specification with seal)**

- Remove the seal (1).
- Remove gasket residue and contamination from the sealing surface.

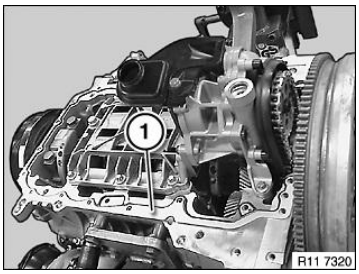
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- Apply a thin and even coat of liquid sealing compound on the end cover to the engine block (arrows).

Sealing compound

Sealant Drei Bond 1209	30 ml, Tube	07 58 9 062 376



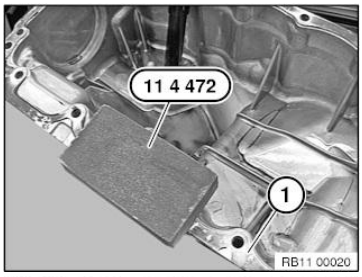
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

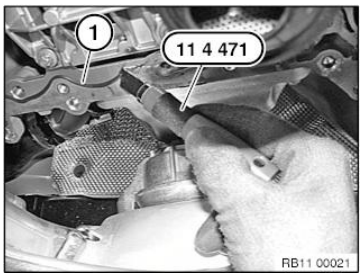
- Renew and position the gasket (1) of the oil sump.

  Parts: Gasket

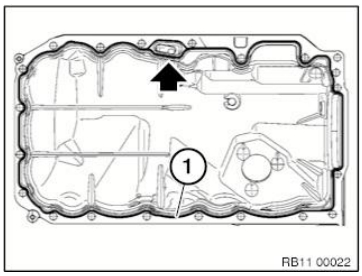
▸ **Install the oil sump (equipment specification with liquid sealing compound)**



- Clean the sealing surface (1) using special tool **0 495 104 (11 4 472)**.



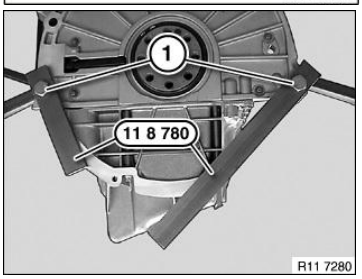
- Clean the sealing surface (1) using special tool **0 495 103 (11 4 471)**.



TECHNICAL INFORMATION

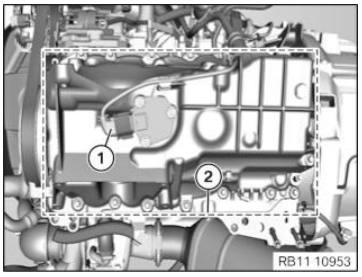
The maximum application time of the liquid sealing compound is 12 minutes.

- Apply liquid sealing compound in the area (1) approx. 2 mm high; while doing so, apply the sealing bead along the inner edge.
- Make sure that the oil return orifice (arrow) is completely surrounded by a sealing bead.



- Install special tool **0 496 120 (11 8 780)** with the transmission bolts (1).

  The special tool **0 496 120 (11 8 780)** is required if the transmission has been removed to be able to accurately position the oil sump.
- Position the oil sump on the engine and push towards the rear until the oil sump is in contact with the special tool **0 496 120 (11 8 780)**.



- Tighten all screws along line (2).

Oil sump to crankcase

M8		Tightening torque	24 Nm

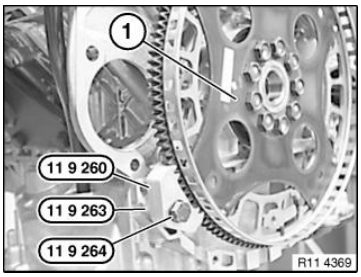
- Connect the connector (1) to the oil-level sensor.
- Clip in the cable in the area of the oil sump.

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- Correctly connect magnet wheel (1) to the crankshaft.

59 – Installing the flywheel



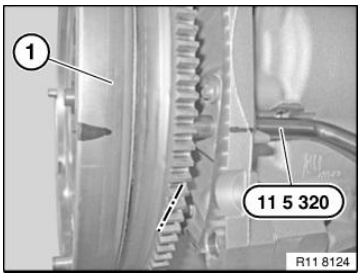
- If applicable, reinstall the special tools.
- Renew flywheel bolts.
- Position the flywheel (1) on the crankshaft.
- Tighten the flywheel bolts.

Flywheel to crankshaft

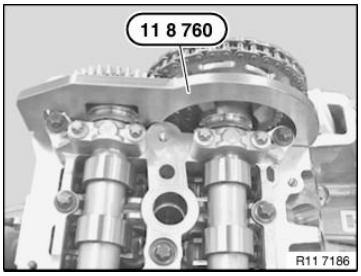
M12x1.5	Renew screws.	120 Nm

- Remove special tools **0 493 938 (11 9 260)**, **0 494 129 (11 9 263)** and **0 494 130 (11 9 264)** from the flywheel (1).

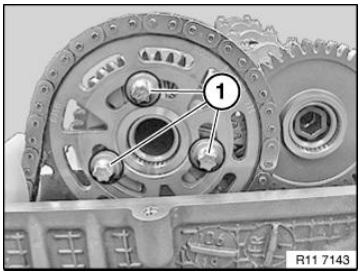
60 – Adjusting timings (after replacing the timing chain)



- Turn crankshaft back minimally until the flywheel (1) can be blocked with the special tool **0 495 126 (11 5 320)** in the TDC firing position of first cylinder.



- Ensure that the special tool **0 496 112 (11 8 760)** is positioned flush on the cylinder head.



- Tighten camshaft bolts (1).

Sprocket wheel to fitted camshaft

M7x17.		Tightening torque	17 Nm

- Remove all special tools.

RISK OF DAMAGE

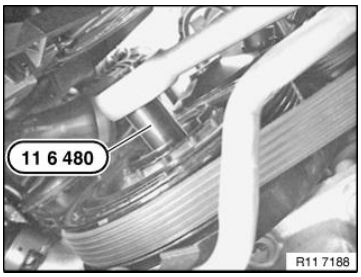
Damage to the engine.

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 engine with the special tool **0 493 380 (11 6 480)** twice in direction of rotation.

61 – Checking camshaft timing



RISK OF DAMAGE

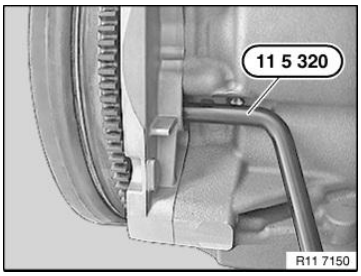
Damage to the engine.

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.

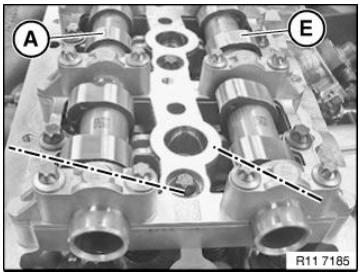
- Turn crankshaft with special tool **0 493 380 (11 6 480)** to the TDC firing position at the first cylinder.

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- If necessary, remove protective cap of timing case cover.
- Turn crankshaft until the crankshaft can be blocked with the special tool **0 495 126 (11 5 320)** in the TDC firing position of first cylinder.

Check



- Check whether the cam of exhaust camshaft (A) and of intake camshaft (E) of first cylinder point upward at an angle.

Result

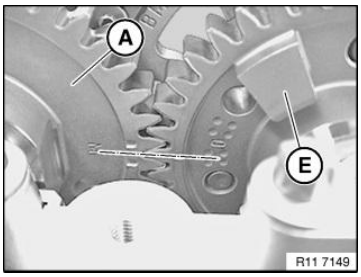
» The cams of exhaust camshaft (A) and of intake camshaft (E) of first cylinder do not point upward at an angle.

» The TDC firing position is not correctly adjusted at the first cylinder.

Measure

- Turn crankshaft until the TDC firing position is adjusted correctly.

Check



- Check whether the marks on the exhaust camshaft (A) and the intake camshaft (E) match up.

Result

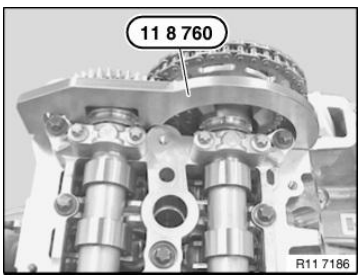
» The marks of exhaust camshaft (A) and of intake camshaft (E) do not match up.

» The TDC firing position is not correctly adjusted at the first cylinder.

Measure

- Turn crankshaft until the TDC firing position is adjusted correctly.

Check



- Place special tool **0 496 112 (11 8 760)** on camshaft.

  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

Result

» The special tool **0 496 112 (11 8 760)** cannot be put on flush.

» The TDC firing position does not match the specifications.

Measure

- Adjust timings correctly.

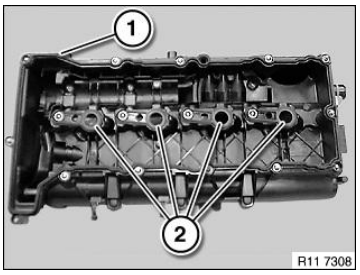
11 31 505 Adjusting camshaft timing (N47 D20 O1)

- Remove all special tools.
- Attach protective cap of timing case cover.

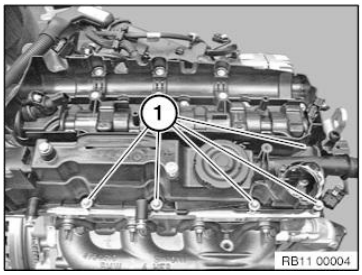
POSTPROCESSES

62 – Installing cylinder head cover

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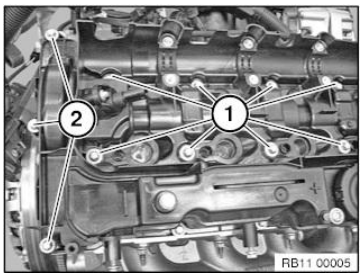
- Renew the profile seals (1) and (2).



- Position the cylinder head cover on the cylinder head.
- Tighten the screws (1).

Cylinder head cover to cylinder head

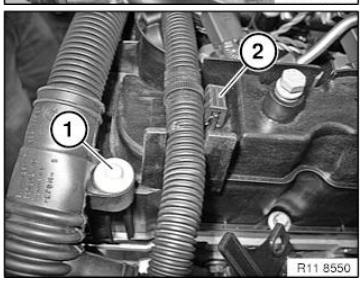
M6		10 Nm



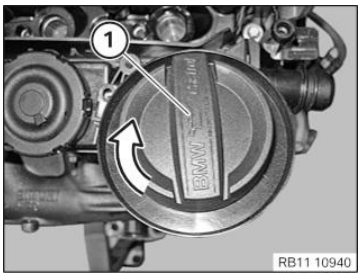
- Tighten down screws (1) and (2).

Cylinder head cover to cylinder head

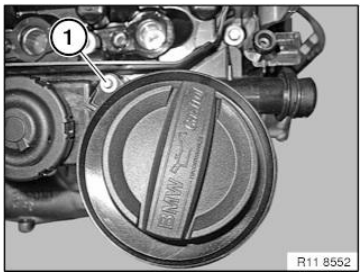
M6		10 Nm



- Tighten down screw (1).
- Clip in the cable clip (2).



- Check the O-ring for damage and replace if necessary.
- Insert the oil filler neck (1) into the cylinder head cover.
- Turn the complete oil filler neck (1) clockwise by approximately 25°.



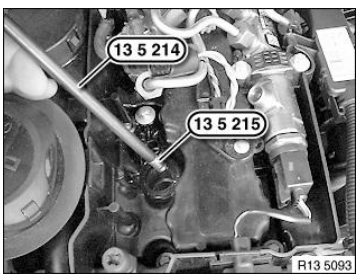
- Tighten down screw (1).

Oil filler neck on cylinder head cover

Plastic screw		3,6 Nm

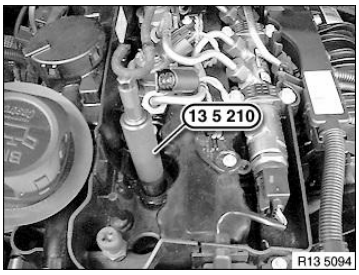
- Check engine for tightness.

63 – Cleaning the injector shafts

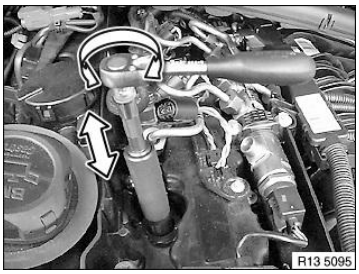


- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Place sealing cap **0 493 763 (13 5 215)** with mounting rod **0 493 762 (13 5 214)** into injector slot.
- Remove fitting rod.

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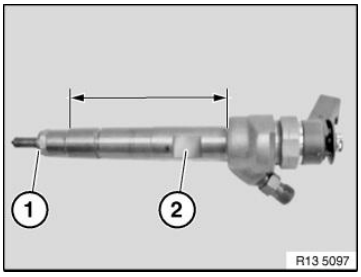


- Place the cleaning tool with brush head **0 493 758 (13 5 210)** into injector shaft.



- Move the brush head with a suitable tool (AF 8) up and down in the injector shaft with a rotational movement.
- Remove cleaning tools.
- Cover the injector shaft with a rag and blow out the injector shaft with compressed air.
- Remove seal plugs **0 493 763 (13 5 215)** again with mounting rod **0 493 762 (13 5 214)**.

64 – Renewing gaskets and sealing rings on injectors



TECHNICAL INFORMATION

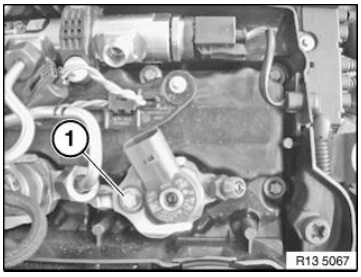
Lightly grease the injector shaft with high temperature-resistant grease.
For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Renew sealing ring (1) on the injector (2), mandatory.

65 – Installing all injectors of the diesel injection systems

NOTICE

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



- Install injector .
- Observe installation position of the high-pressure connection.
- Retighten screws of the cylinder head cover (clamping claw support).

Mounting, cylinder head cover (support, clamping jaw)

M6x35			10 Nm

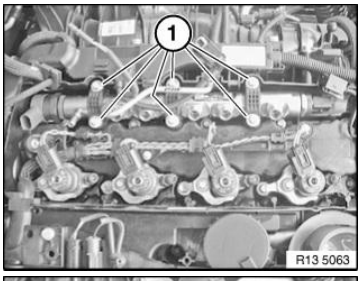
- Align clamping claw; pay attention to the correct positioning of the washer in order to place the screw in the center.
- Secure clamping claw in installation position with jointing torque and then tighten (1)the screw.

Injector to cylinder head

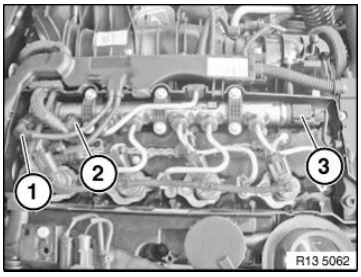
M8x95		Jointing torque	8 Nm
		Tightening torque	26 Nm

66 – Installing the rail

- Place the rail onto the cylinder head cover but do not screw it down.
- Position all high pressure lines on the rail and apply hand-tight.



- Tighten the screws (1).



- Connect the return line (2) to the rail.
- Connect the connector (1) to the fuel pressure regulator.
- Connect the connector (3) to the fuel pressure sensor.

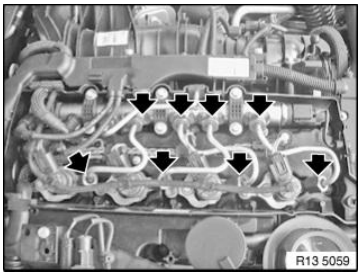
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TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- It is paramount to observe the following installation sequence and tightening sequence:
  - Install all high pressure lines
  - Install the high pressure line between the high pressure pump and the rail.

67 – Install all high pressure lines



TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten the union nuts on the injectors using special tool **0 495 910 (37 1 152)**.

High pressure line to injector and to rail

M14			24 Nm

- Tighten the union nuts on the rail with the special tool **0 495 910 (37 1 152)**.

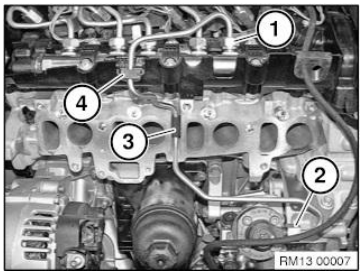
High pressure line to injector and to rail

M14			24 Nm

68 – Installing high pressure line between rail and high pressure pump

NOTICE

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



- Position the high pressure lines on the engine without changing the position of the rubber mount (4) and the rubber grommet (3).
- Tighten union nuts (1) and (2) hand tight.
- Tighten the union nut (1) on the rail with the special tool **0 495 910 (37 1 152)**.

High pressure line to injector and to rail

M14			24 Nm

- Tighten union nut (2) on the high pressure pump with the special tool **0 495 910 (37 1 152)**.

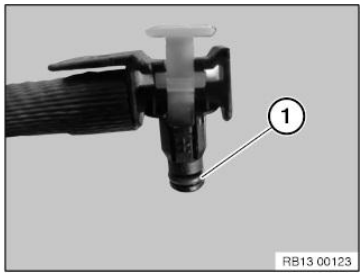
High pressure line to injector and to rail

M14			24 Nm

69 – Connecting the leakage oil lines to the injectors

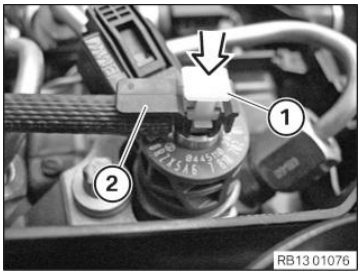
NOTICE

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



- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.
- Check sealing ring for damage.

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- For damaged sealing ring (1): Renew leakage oil line.



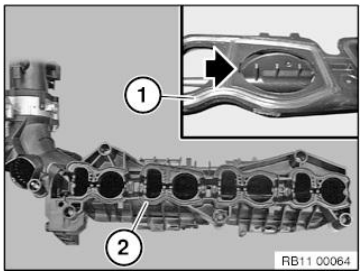
- Connect the leakage oil line (2) to the injectors.
- Lock the lock (1) downwards.

  The lock (1) must audibly engage.

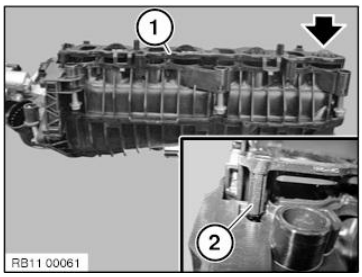
70 – Installing the intake plenum

- Renew the gasket support.

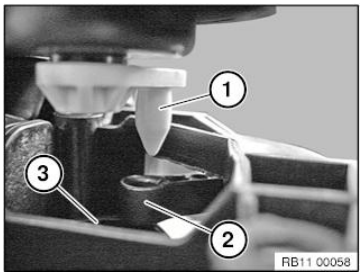
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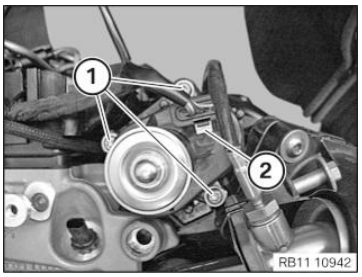
- Clean the sealing surface on the intake plenum (2).
- Completely open the swirl flaps of the gasket support (1).
- Position the gasket support (1) on the intake plenum (2) with open swirl flaps.



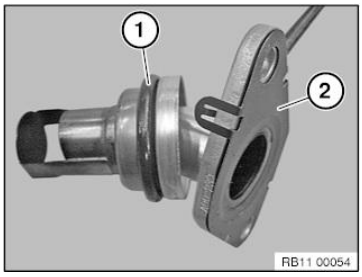
- Secure the gasket support (1) to the intake system using retaining clips.
- Make sure that the fixing (2) have been correctly positioned on the gasket support (1) and it locks correctly.



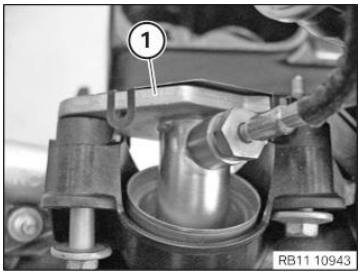
- Insert the drive arm (1) of the swirl-flap controller into the adjustment plate (2) of the gasket support.
- Additionally insert the drive arm (1) of the swirl-flap controller into the sickle-shaped guiding groove (3).



- Completely connect the swirl-flap controller (2) to the intake plenum.
- Tighten the screws (1).

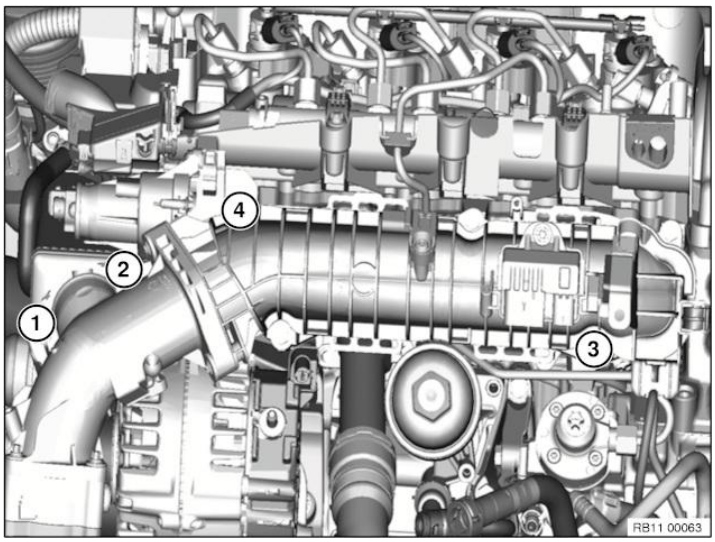


- Renew O-ring (1).
- Renew the beaded metal gasket (2).



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.

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- Position the intake system on the cylinder head.

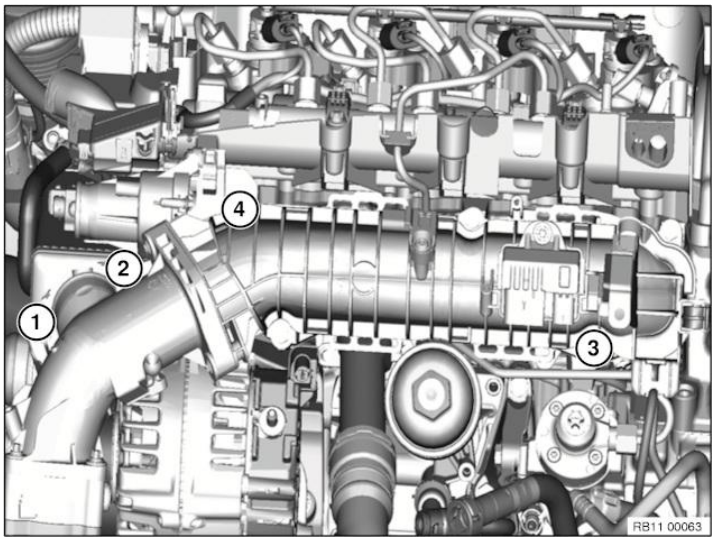
TECHNICAL INFORMATION

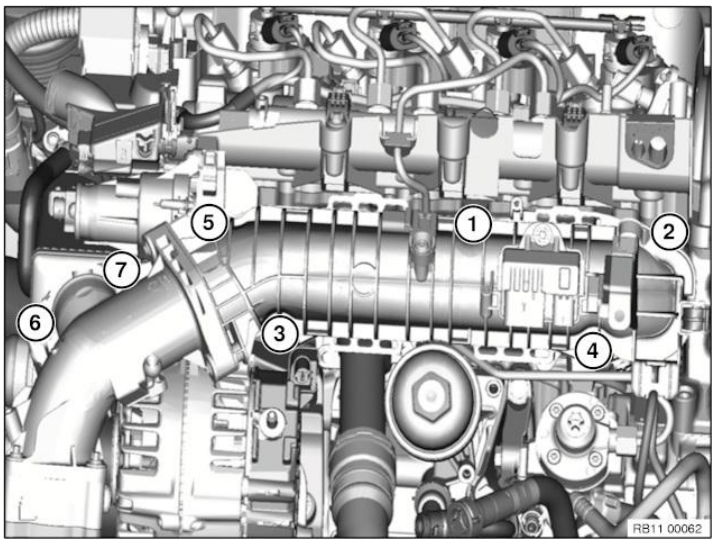
When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Pre-tighten the screws in the following sequence: (1), (2), (3), (4).

Intake plenum to cylinder head

M6	*Apply screws in sequence (1) to (4).*	Jointing torque	5 Nm





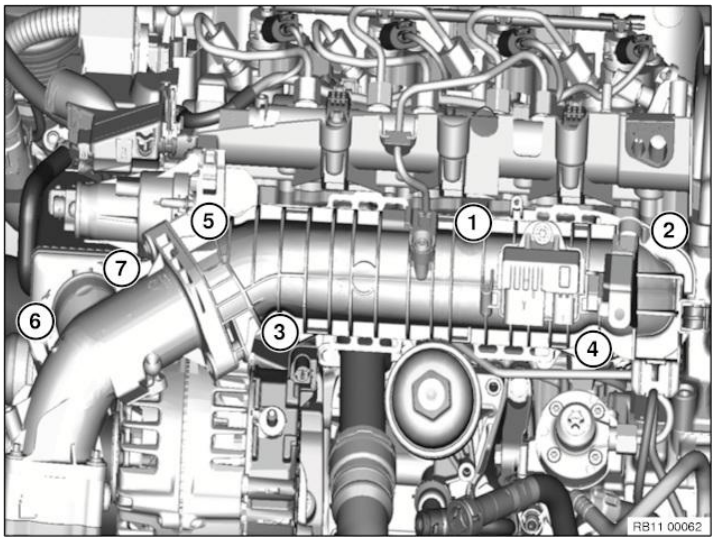
TECHNICAL INFORMATION

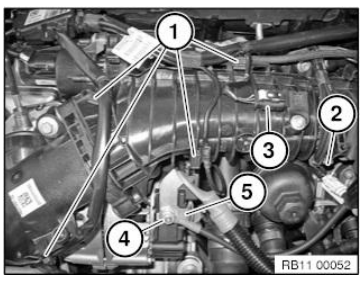
When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten screws in the order (1) to (7).

Intake plenum to cylinder head

M6	*Apply screws in sequence (1) to (7).*	Tightening torque	10 Nm





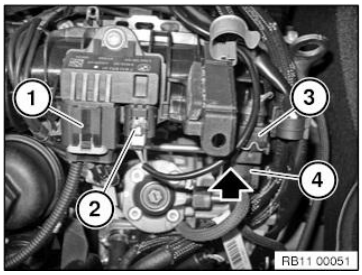
- Attach the positive battery cable (5) to the alternator.
- Tighten the nut (4) on the alternator.

Positive battery cable to alternator

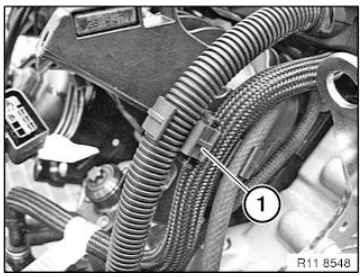
Nut		M5	13 Nm
		M8	19 Nm

- Connect the plug connection (3) to the charging pressure sensor.
- Secure all cable clips (1) and (2) to the intake plenum.

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- Insert the electric changeover valve (4) into the intake plenum.
- Connect the plug connection (3) to the electric changeover valve (4).
- Connect the plug connections (1) and (2) to the preheating control unit.

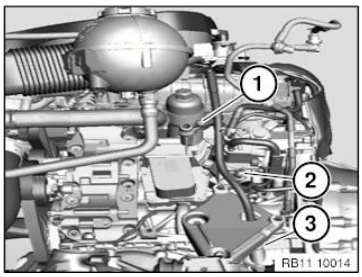


- Clip the cable into the cable clip (1).
- Check intake system for tightness.
- **Only if the intake plenum was renewed:**
  Delete the values for the end stop of the swirl flaps and teach-in again.
  Follow diagnosis instruction.

71 – Install engine wiring harness

- Position and clip in the engine wiring harness on the cylinder head cover.
- Connect all plug connections.

72 – Install guide tube for oil dipstick



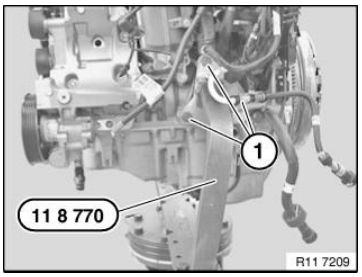
- Renew the O-ring in the oil sump (3).
- Insert the guide tube for the oil dipstick (2) into the oil sump (3).
- Secure the engine wiring harness and the vacuum lines to the guide tube for the oil dipstick (2).
- Tighten the screw (1) on the oil filter housing.

73 – Remove engine from assembly stand

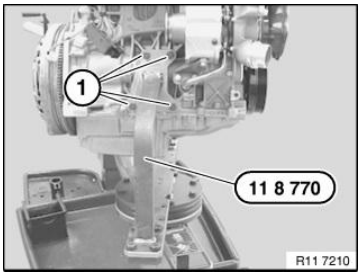
TECHNICAL INFORMATION

Observe manufacturer's specifications.

- Secure special tool **2 220 718** with special tool **0 490 567 (11 0 020)** to the lifting eyes of the engine.
- Slightly lift the engine using special tool **2 220 718** and tension the unit.



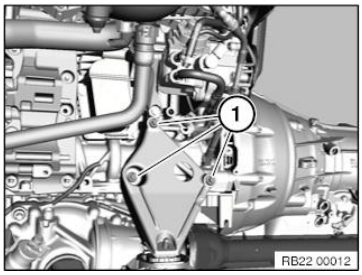
- Loosen the screws (1) from the special tool **0 496 117 (11 8 770)**.



- Loosen the screws (1) from the special tool **0 496 117 (11 8 770)** and remove the engine.

74 – Install left engine support arm

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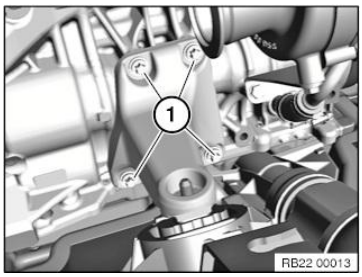


- Position the left engine support arm on the engine.
- Tighten the screws (1).

Engine support arm to engine

M10			38 Nm

75 – Install right engine support arm



- Position the right engine support arm on the engine.
- Tighten the screws (1).

Engine support arm to engine

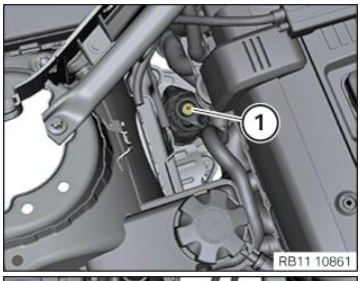
M10			38 Nm

76 – Install engine

NOTICE

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

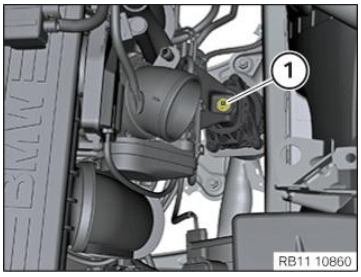
- Carefully lower the engine into the engine compartment.



- Tighten screw (1) from engine mount at right.

Left/right engine mount to engine support arm

M10			56 Nm
M12			68 Nm

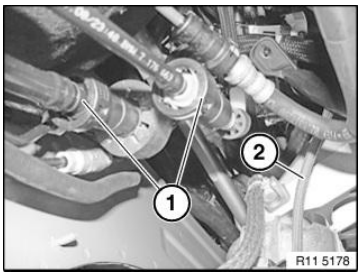


- Tighten screw (1) from engine mount at left.

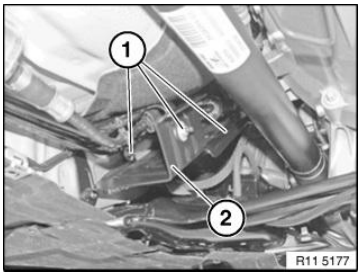
Left/right engine mount to engine support arm

M10			56 Nm
M12			68 Nm

- Secure the ground strap to the left-hand engine mount.
- Remove all special tools.

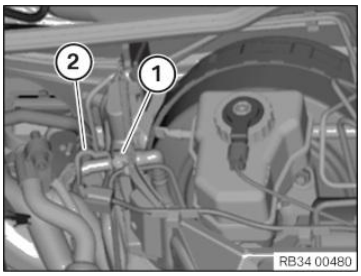


- Connect the fuel lines (1).
- Connect the vacuum hose (2) to the engine mount.



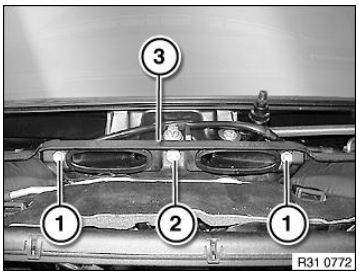
- Attach the protective plate (2) and tighten the screws (1).

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- Connect the snap fastener (1) of the vacuum line (2).

77 – Installing the heater end panel



- Install the heater end panel (3).
- Tighten down screws (1) and (2).

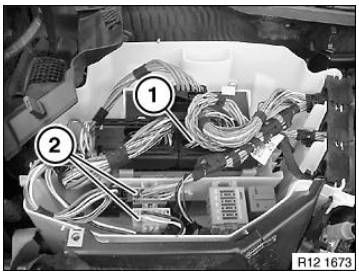
78 – Installing the engine wiring harness in the electronics box

RISK OF DAMAGE

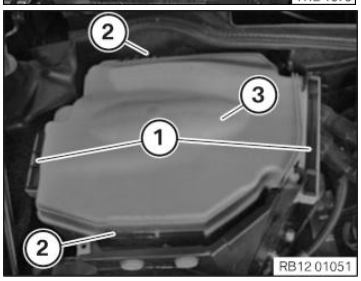
Electrostatic discharge.

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.

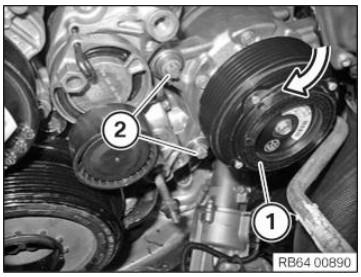


- Insert all cables into the electronics box.
- Connect all connectors (1) and (2) in the electronics box.



- Put on lid of the electronics box (3).
- Lock the locks (2).
- Lock closures (1).

79 – Installing air conditioning compressor



- Position air conditioning compressor (1) on the engine.
- Tighten screws (2) on the air conditioning compressor (1).

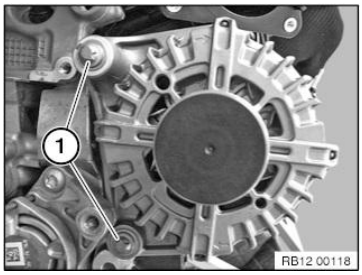
Air conditioning compressor on crankcase

M8			19 Nm
M10			38 Nm

- Connect connector on air conditioning compressor.

80 – Installing the alternator

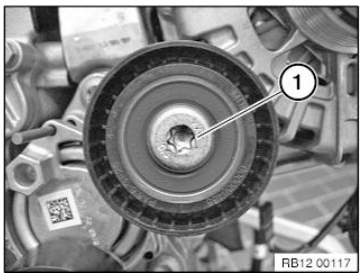
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- Install alternator.
- Tighten the screws (1).

Alternator to component carrier

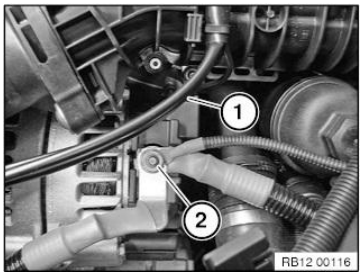
	38 Nm



- Attach cover to the deflecting element.
- Attach deflecting element to the belt tensioner and tighten the screw (1).

Deflecting element to belt tensioner

	55 Nm

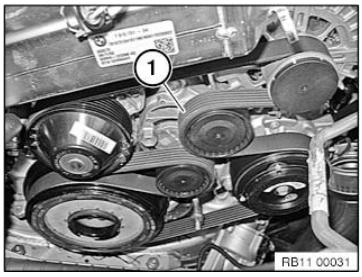


- Connect connector (1).
- Connect positive battery cable to alternator and tighten nut (2).

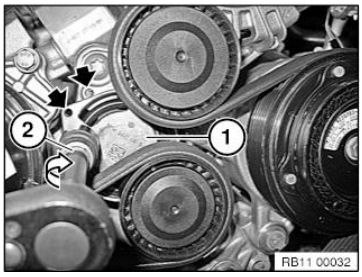
Positive battery cable to alternator

Nut		M5	13 Nm
		M8	19 Nm

81 – Installing the drive belt for alternator

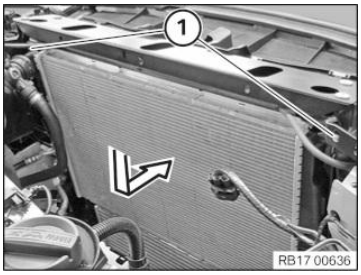


- Position the drive belt for alternator (1) on the rollers of the belt drive.



- Increase the preload on the belt tensioner (1) using a tool (2) until special tool **0 490 973 (11 3 340)** can be easily removed from the belt tensioner (1).
- Slowly relieve the tension on the belt tensioner (1) using a tool (2).

82 – Install radiator



- Insert the radiator from the top and towards the front.
- If necessary, insert and lock the coolant hose.
- Tighten the screws (1).

Radiator on module carrier

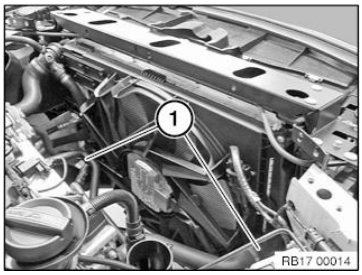
	4 Nm

83 – Connecting the coolant hoses

TECHNICAL INFORMATION

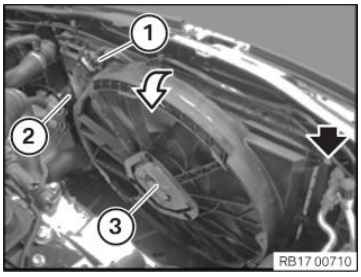
Make sure that the connections are locked correctly. The locks must engage audibly.

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- Connect and engage the coolant hoses (1) to the radiator.

84 – Installing fan cowl with electric fan



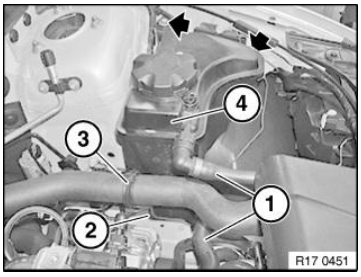
- Insert the fan cowl (3) from the top and engage with the latch mechanism (2).
- Tighten screw (arrow).

Fan cowl on radiator

	4 Nm

- Connect connectors (1) and lock.

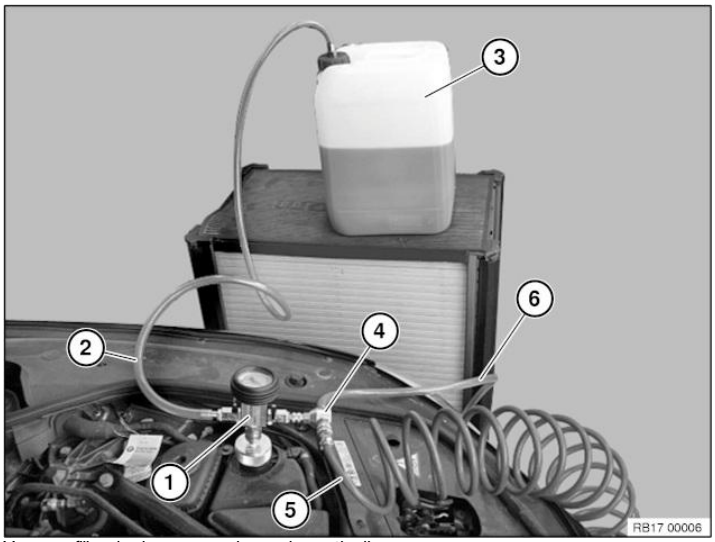
85 – Installing coolant expansion tank



- Install the coolant expansion tank (4). In this process, insert the centring pin of the coolant expansion tank (4) into the rubber grommet.
- If necessary, lock the holder (3).
- Connect the connector (2) of the coolant level sensor.
- Connect the coolant hoses (1).

86 – Bleed and fill the cooling system with the vacuum filler device

Vacuum filler device



Vacuum filler device - exemplary schematic diagram

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 6 bar)

6 Out-going hose (lead out-going hose into a collecting vessel)

Prerequisite

The coolant expansion tank is empty. Compressed air connection with pressure of 6 bar is available.

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

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TECHNICAL INFORMATION

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

Check

- Check all coolant hoses for damage.

Result

» Coolant hose are damaged or porous.

Measure

- Renew coolant hoses.
- Position the fluid tank of the vacuum filler device at the same height as the coolant expansion tank.

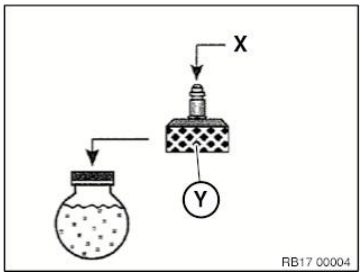
RISK OF DAMAGE

Contaminant or foreign body.

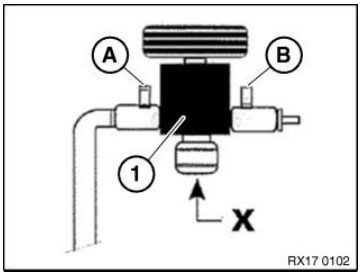
Contamination can result in malfunctions, operating failure or leaks.

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

- Cover alternator watertight.
- The fluid tank of the vacuum filler device must be filled with 1 l to 2 l more than the required capacity of coolant for the vehicle.
- Set heating to maximum temperature.

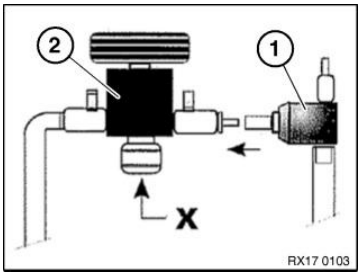


- Connect special tool **0 494 417 (17 0 100)** (Y) to the coolant expansion tank.
- Connect vacuum filler device to connection (X) of the adapter.



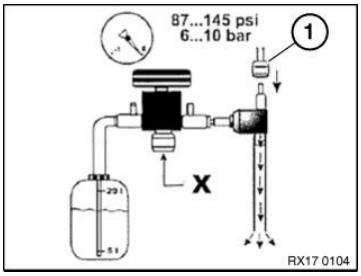
- Close shutoff valves (A) and (B) of the vacuum filler device (1).

  (X)is the connection on the coolant expansion tank.



- Connect Venturi nozzle (1) to the vacuum filler device (2).

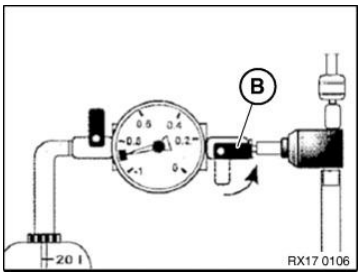
  (X)is the connection on the coolant expansion tank.



- Connect compressed air hose (1).

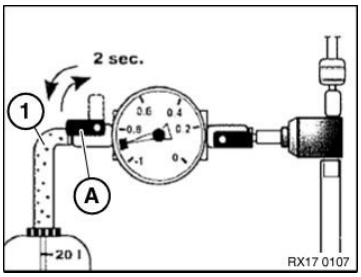
  (X)is the connection on the coolant expansion tank.

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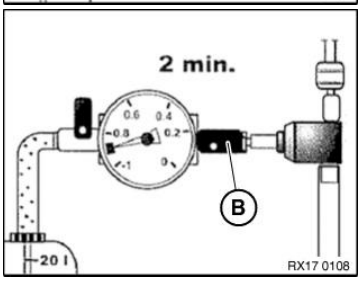
- Open shutoff valve (B).

  The Venturi nozzle generates a flow noise.



- Open shutoff valve (A) until the filling hose (1) is full without bubbles.
- Close shutoff valve (A) again.

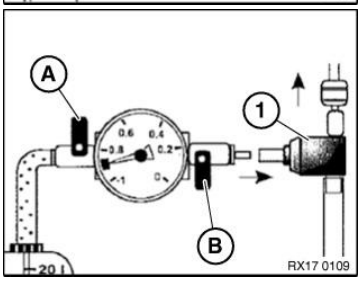
» The filling hose (1) has now been bled.



TECHNICAL INFORMATION

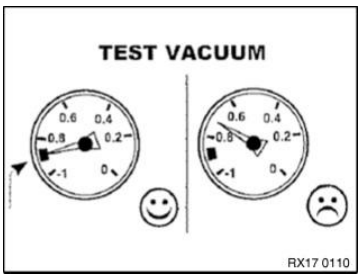
The coolant hoses contract during vacuum build-up.

- After a vacuum of -0.7 bar to -0.95 bar has been reached in the coolant circuit (duration approximately 2 minutes), close the shutoff 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 can be maintained for at least 30 seconds.

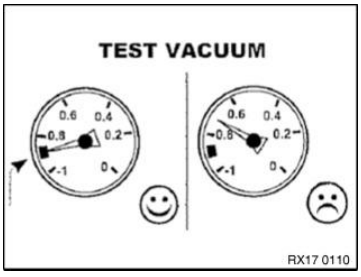
Result

» Vacuum drops.

Measure

- Look for leak, repair cooling system, start filling procedure from the beginning.

Check



- The vacuum in the coolant circuit must be maintained for at least 30 seconds.

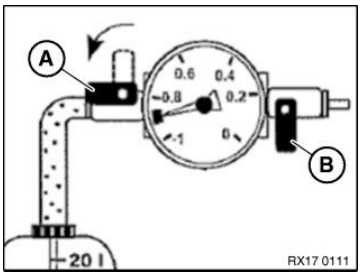
Result

» Vacuum remains constant.

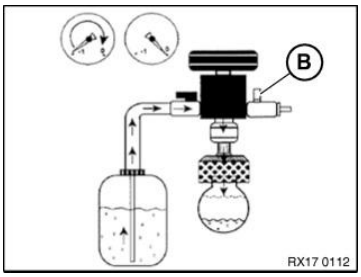
Measure

- Continue with the filling procedure.

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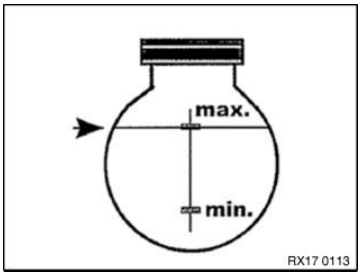


- Keep shutoff valve (B) closed during the filling process.
- To fill the cooling system, open the shutoff valve (A) to the fluid tank of the vacuum filler device.



- 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. Open the shutoff valve (B).

- Remove vacuum filler device and special tool **0 494 642 (17 0 113)** from the coolant expansion tank.



- Adjust the coolant level in the coolant expansion tank to the maximum mark.

87 – Check cooling system for leaks

WARNING

Hot fluids.

Risk of scalding!

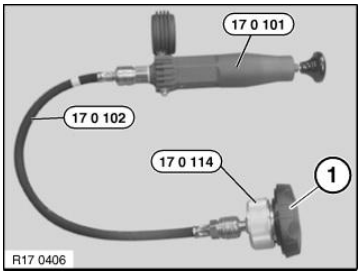
- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

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

TECHNICAL INFORMATION

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



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 the matching adapter from the set of special tools **0 494 417 (17 0 100)** (e.g. adapter **0 494 643 (17 0 114)**).
- Build up pressure using the hand pump from the special tools **0 494 418 (17 0 101)**. Observe on the pressure gauge when the opening pressure has been reached.

Check

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- Generate pressure.

  Compare measured values with setpoint values.

Opening pressure of coolant sealing cover

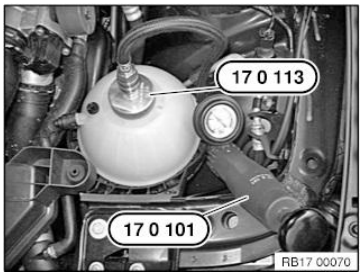
Pressure relief valve opens when the pressure exceeds the ambient pressure.	min. 1,4 bar
Electric changeover valve must open at latest when the pressure is lower than the ambient pressure	max. 0,1 bar

Result

» Measured values do not correspond with setpoint values.

Measure

- Exchange sealing cap.



- Release sealing cap on the coolant expansion tank.
- Place special tool **0 494 418 (17 0 101)** and the matching adapter from the set of special tools **0 494 417 (17 0 100)** on the coolant expansion tank (e.g. adapter **0 494 642 (17 0 113)**).

Check

- Build up excess pressure and wait approx. 2 minutes.

Cooling system test pressure

Test pressure for cooling system (gauge pressure)	1,5 bar
Pressure drop	max. 0,1 bar

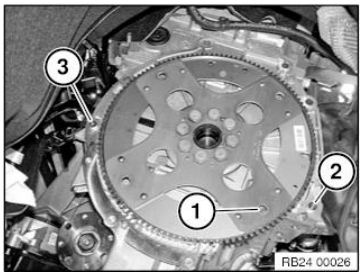
Result

» Measured values do not correspond with setpoint values.

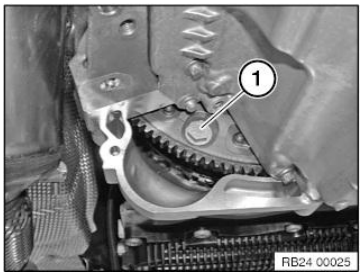
Measure

- Search cooling system for leakage.

88 – Install automatic transmission

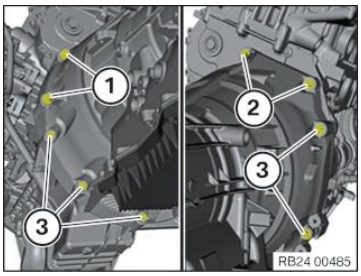


- Turn the drive plate so that the bore hole (1) becomes accessible through the recess on the transmission oil sump.
- Check that the fitting sleeves (2) and (3) are positioned correctly and are not damaged; renew if necessary.
- Turn the torque converter so that the bore hole of the torque converter and the bore hole of the drive plate (1) line up.



- Clean any adhesive residue on the threads of the screw connections (1) of the torque converter.

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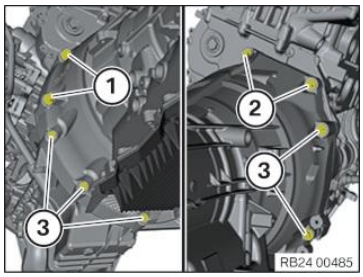


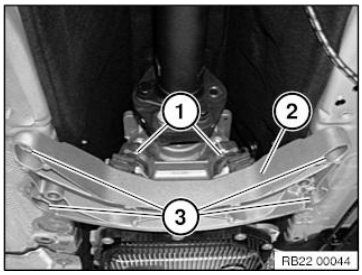
- Lift and flange-mount the transmission.
- Renew screws (1) to (3).

  Parts: Bolts
- Tighten the screws (1) to (3).

Transmission to engine

Screw (3) M12x100			66 Nm
Bolt (2) M12x75			66 Nm
Bolt (1) M8x50			19 Nm





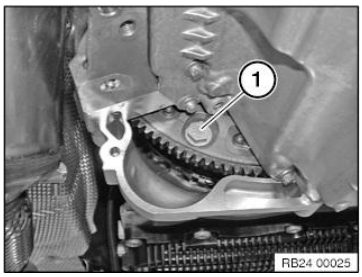
- Renew screws (3).

  Parts: Bolts
- Position transmission cross member (2) on vehicle underbody and tighten the screws (3).

Holder on the transmission

			19 Nm

- Make sure that the screws (1) were not loosened.
- Remove all special tools.

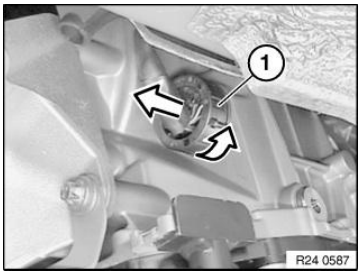


- Renew screws (1).

  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 four screws (1).
- Tighten all four screws (1) with special tool **0 491 667 (24 1 110)**.

Torque converter on the drive plate

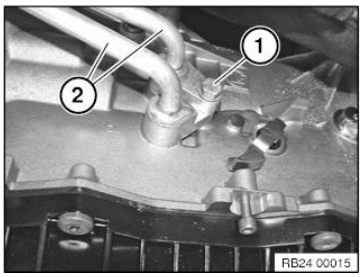
M10	Renew screws.		56 Nm



TECHNICAL INFORMATION

Notes on mechatronics are a fundamental requirement for these repair instructions and must be complied with at all times.
For more information see: 24 34 ... Notes on mechatronics (GA8HP45Z,GA8HP70Z,GA8HP90Z)

- Remove special tool **0 494 213 (24 2 390)**.
- Insert the connector (1) in contrary to the direction of the arrow and lock it by twisting it clockwise.
- Insert the cable into the bracket.



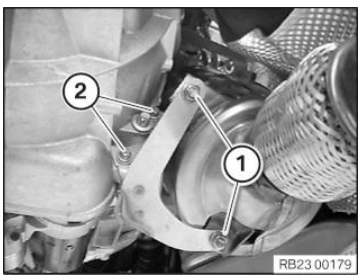
- Renew sealing rings.

  Parts: Sealing ring
- Position the hydraulic lines (2) on the transmission.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Transmission oil cooler line to transmission

M8			8 Nm



- Renew the screws (1) and (2) if necessary.
- If applicable, attach holder and tighten screws (2).

Holder on the transmission

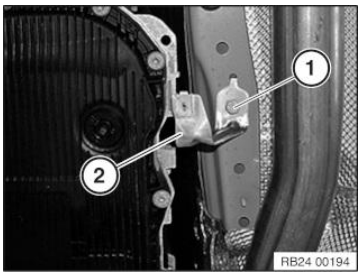
			19 Nm

- If applicable, tighten screws (1).

Holder on the diesel particulate filter

			21 Nm

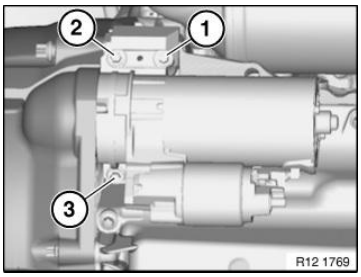
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- Attach the holder (2) and tighten the screw (1).

89 – Installing starter motor

- Check starter pinion and ring gear for damage. Replace starter motor if necessary.



- Position starter motor on oil sump.

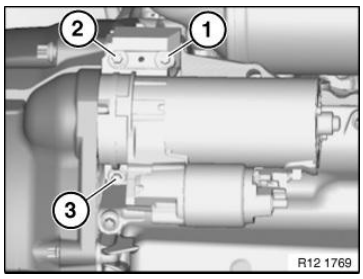
TECHNICAL INFORMATION

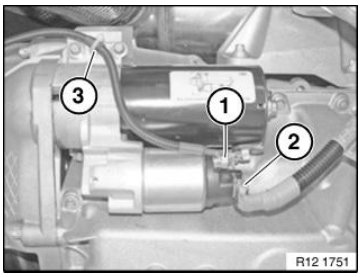
When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the screws (1), (2) and (3).

Starter motor

M8x60	*Tighten screws in the following sequence (1), (2), (3).*	19 Nm





- Attach cable to clamp (3) on starter motor.
- Attach positive battery cable and tighten nut (2).

Battery positive lead to starter

M8		13,4 Nm

- Attach cable and tighten nut (1).

Wiring harness to starter (terminal 50)

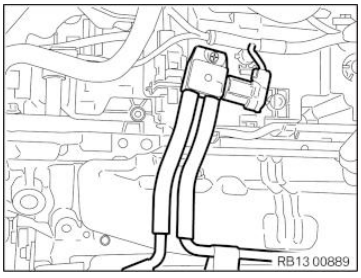
M6		7 Nm

- **Only during starter motor replacement or on vehicles with automatic engine start-stop function (MSA):**
  Reset start counter using BMW diagnosis system.

90 – Install the heat shields

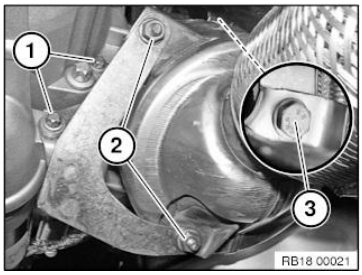
- Install the heat shields around the propeller shaft.

91 – Installing the diesel particulate filter



- Renew the pressure hoses between the diesel particulate filter and the exhaust gas pressure sensor.

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- Position the diesel particulate filter on the engine.
- Tighten the screw (3) above the diesel particulate filter.

Brace, top, to diesel particulate filter

M8x20		21 Nm

- Tighten nut (2).

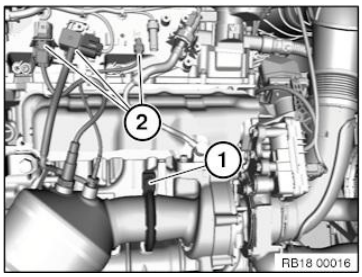
Diesel particulate filter to support

M8		21 Nm

- Tighten the screws (1).

Holder on the transmission

		19 Nm



- Renew the clamp (1) and the gasket.
- Tighten clamp (1).

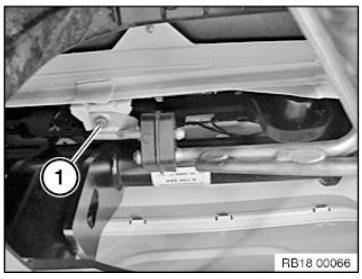
Exhaust system to turbocharger

M8	Renew flat band clip.	15 Nm

- Connect plug connections (2).
- Clip in the plug connections (2) at the brackets.

92 – Installing the exhaust system (diesel particulate filter installed)

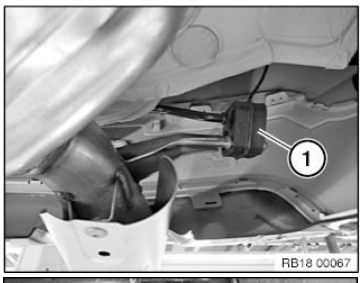
- Align the exhaust system with the vehicle underbody and attach to the front of the diesel particulate filter.



- Tighten down screw (1).

Rear silencer to body

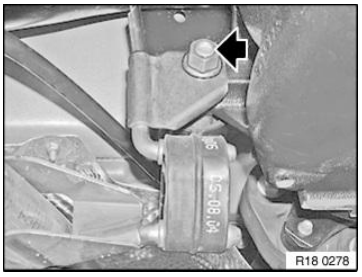
M8		21 Nm



TECHNICAL INFORMATION

Latch mechanisms, guides and mounting elements must not be damaged or missing.

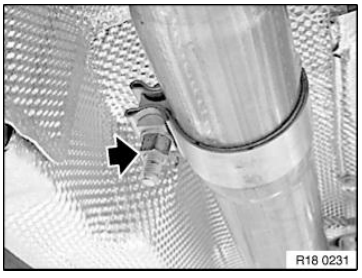
- Check the rubber mount (1) for damage and renew if necessary.
- Connect rubber mount (1) to the rear silencer.



- Tighten the nut (arrow).

Exhaust system bracket

M12x20		30 Nm



- Renew flat band clip.
- Tighten the nut (arrow).

Diesel particulate filter / primary catalytic converter to exhaust system

M8	Renew flat band clip.	26 Nm
M10	Renew flat band clip.	43 Nm

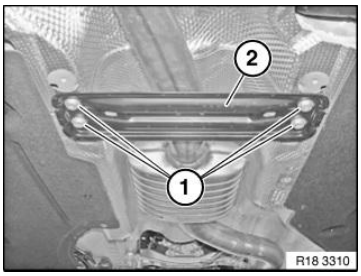
- Check exhaust system for leak tightness.

93 – Installing the reinforcement

- **For equipment specification without panorama glass roof:**

▸ **Installing the reinforcement plate**

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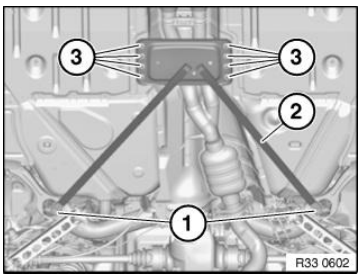
- Install the reinforcement plate (2) and tighten the screws (1).

Reinforcement plate to body

	19 Nm

- **For equipment specification with panorama glass roof:**

▸ **Install the tension strut**



- Install the tension struts (2).
- Tighten down screws (3).

Tension strut to body

M8			24 Nm

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

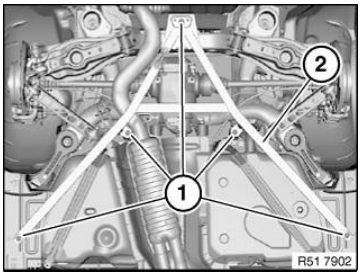
Tension strut to compression strut

Renew screws.

M12		Jointing torque	100 Nm
		Angle of rotation	90 °

- **For equipment specification with panorama glass roof:**

▸ **Installing the tension strut of the rear axle**

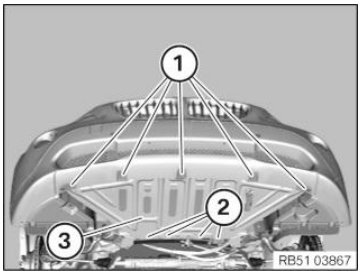


- Install the tension strut (2) and tighten the screws (1).

Trailing link to rear axle

M10		50 Nm

94 – Installing the pedestrian warning



- Install and correctly attach the pedestrian warning (3).
- Tighten down screws (1) and (2).

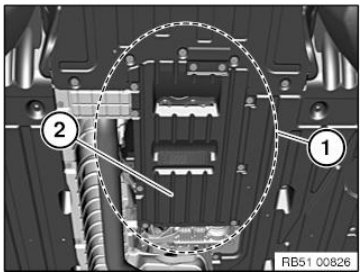
Pedestrian protection to front axle support

	25 Nm

95 – Installing underbody protection at rear

NOTICE

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



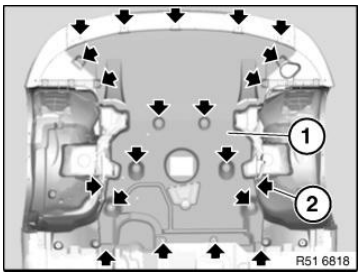
- Attach the rear underbody protection (2).
- Tighten the screws in this area (1).

Underbody panelling on body

Screw not metric			3 Nm
Screw M6			8.8 Nm
Nut			2.5 Nm

96 – Installing the front underbody protection

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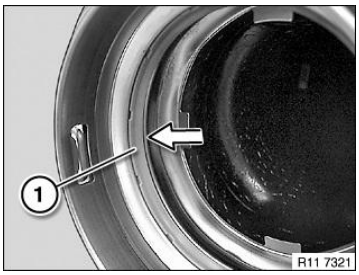


- Position the front underbody protection (1).
- Tighten the screws (arrows) (2).

Underbody panelling on body

Screw not metric			3 Nm
Screw M6			8.8 Nm
Nut			2.5 Nm

97 – Install pressure pipe between exhaust turbocharger and charge air cooler



RISK OF DAMAGE

Damage to the exhaust turbocharger.

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

- Replace the gaskets and pressure pipe if necessary.

- Check gasket (1) on the pressure pipe above for damage. Replace the gasket (1) if necessary.



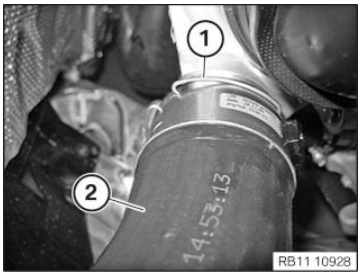
RISK OF DAMAGE

Damage to the exhaust turbocharger.

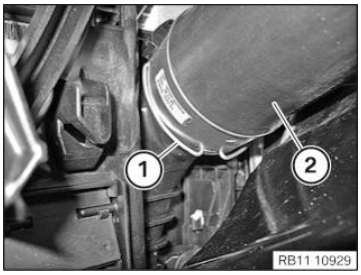
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

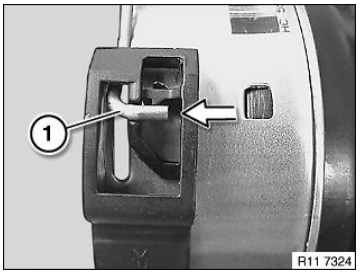
- Check gasket on the pressure pipe below, for damage. Replace the gasket as required.



- Unlock the lock (1).
- Connect and lock the pressure pipe (2) to the exhaust turbocharger.

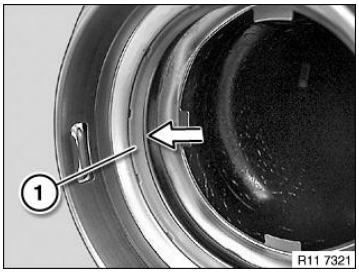


- Unlock the lock (1).
- Connect and lock the pressure pipe (2) to the charge air cooler.



- Check intake system for tightness.
- Make sure that the pressure pipe has been fully connected and all locks (1) engage correctly in the bracket.

98 – Installing pressure pipe on throttle body



RISK OF DAMAGE

Damage to the exhaust turbocharger.

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

- Replace the gaskets and pressure pipe if necessary.

- Check gasket (1) on the pressure pipe above for damage. Replace the gasket (1) if necessary.

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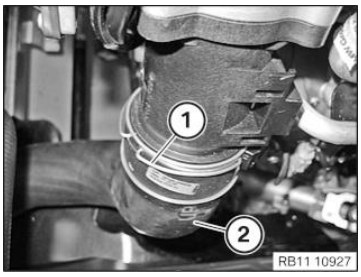
RISK OF DAMAGE

Damage to the exhaust turbocharger.

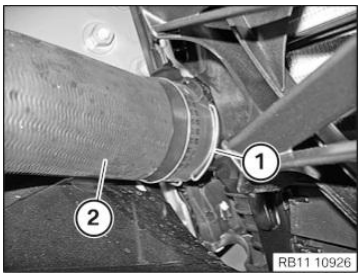
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

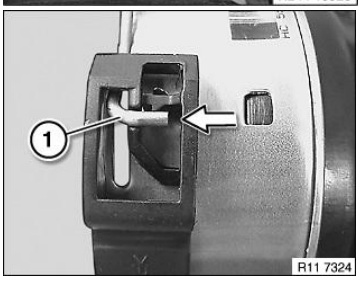
- Check gasket on the pressure pipe below, for damage. Replace the gasket as required.



- Unlock the lock (1).
- Connect pressure pipe (2) to the throttle body and lock.

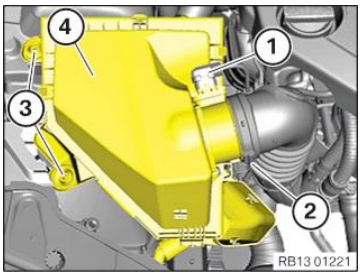


- Unlock the lock (1).
- Connect and lock the pressure pipe (2) to the charge air cooler.



- Check intake system for tightness.
- Make sure that the pressure pipe has been fully connected and all locks (1) engage correctly in the bracket.

99 – Installing intake silencer housing



- Position intake silencer housing (4).
- Connect the clean air pipe with the intake filter housing and tighten the clamp (2).

Clean air pipe to intake silencer housing

Clamp			2.5 Nm

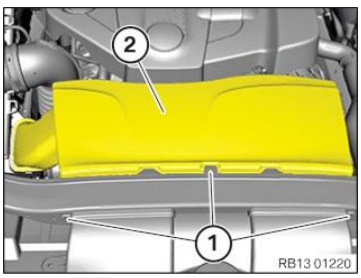
- Tighten down screws (3).

Intake silencer housing to the body

M6			8 Nm

- Connect the connector (1) to the hot film air mass meter.

  The connector (1) must engage audibly.

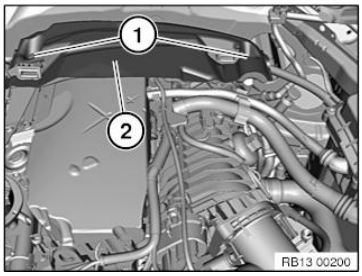


- Install the intake port (2).
- Tighten the screws (1).

Intake port to front panel

Screw with Torx socket, for plastic			1.5 Nm

100 – Installing acoustic cover at rear



- Guide in and install acoustic cover at rear (2).
- Secure acoustic cover with the expanding rivets (1).

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101 – Attaching cowl panel cover

Check

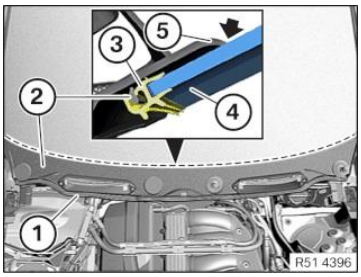
- Check the sealing lip of the cowl panel cover for damage.

Result

» Sealing lip faulty.

Measure

- Renew the complete cowl panel cover.



- Press on the supporting strip (3) onto the windscreen (4).
- Check whether the supporting strip (3) is sufficiently bonded to the windscreen (4). If necessary, replace the supporting strip (3).
- Install the cowl panel cover (2) and clip into the supporting strip (3).

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.

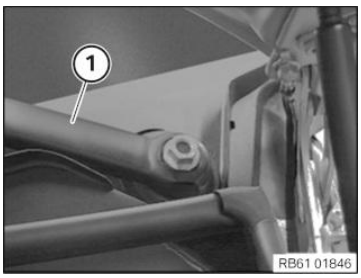
- Make sure that the sealing lip (5) is contact with the windscreen (4) across its entire length.

102 – Install both wiper arms

NOTICE

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

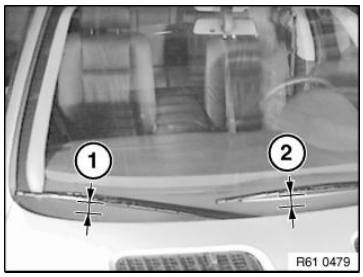
▸ **Installing the wiper arm**

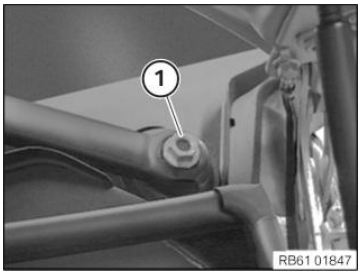


- Attach the wiper arm (1) and ensure that the wiper arm (1) is positioned correctly.

Windscreen wiper arm

Left wiper arm (2)	44 mm ... 50 mm
Right wiper arm (1)	51 mm ... 57 mm





- Tighten nut (1).

Windscreen wiper arm

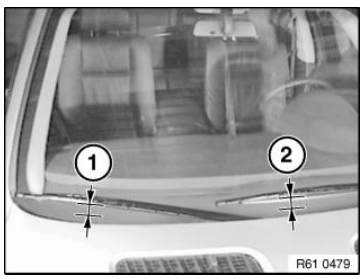
	35 Nm

Check

- Operate the wipers.
- Measure the distance between the wiper blade and cowl panel cover.

Windscreen wiper arm

Left wiper arm (2)	44 mm ... 50 mm
Right wiper arm (1)	51 mm ... 57 mm



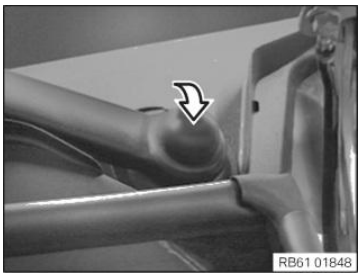
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Result

» The distance between the wiper blade and cowl panel cover is incorrect: The wiper arm has not been positioned correctly.

Measure

- Remove the wiper arm and install it correctly.

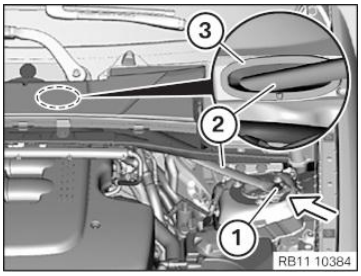


- Mount the protective cap (1).

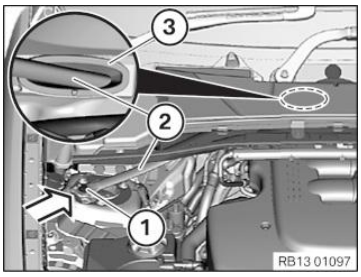
103 – Install tension strut on left and right spring strut dome

TECHNICAL INFORMATION

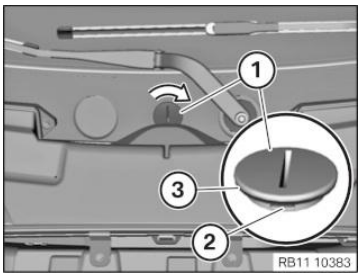
Driving without the strut brace/front end or tension strut is not permitted.



- Carefully insert the left-hand tension strut (2) into the grommet (3) in the direction of the arrow.
- Tighten down screw (1).
- Tighten the screw below the cowl panel.



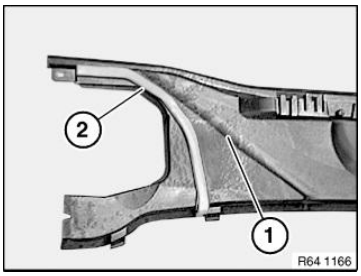
- Carefully insert the right-hand tension strut (2) into the grommet (3) in the direction of the arrow.
- Tighten down screw (1).



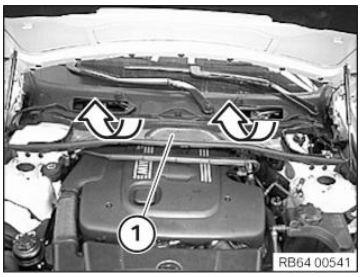
- Tighten the screw below the cover (1).
- For the cover with notch: Turn the cover (1) clockwise by approximately 45°.
- For the cover without notch: Clip in the cover .
- If the cover (1) is damaged: Replace the cover (1).

  The latch mechanism (2) and gasket (3) of the cover (1) must not be damaged. Even minor damage to the cover (1) may cause water ingress.

104 – Install the lower section of the microfilter housing

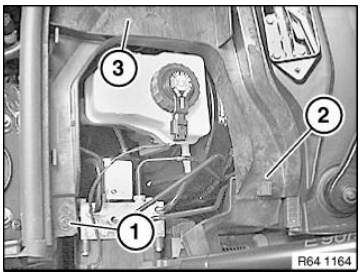


- Check the seal (2) on the lower section of the microfilter housing (1) for damage and replace missing or faulty seals as needed.

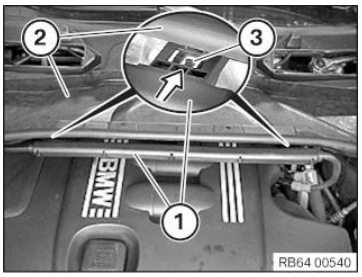


- Insert the lower section of the microfilter housing (1) in the direction of the arrow.
- Make sure the lower section of the microfilter housing (1) is fitted correctly.

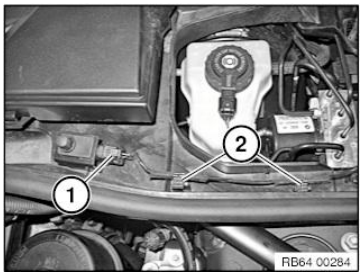
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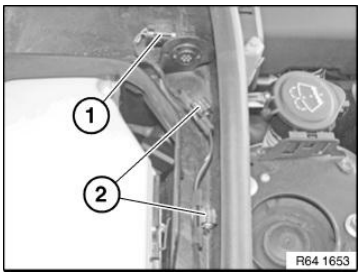
- Fasten the lower section of the microfilter housing (3) on both sides with the screw (1).
- Fasten the retaining tab (2) on both sides.



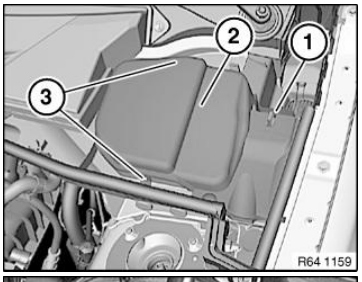
- Check all retaining lugs for damage; renew missing or faulty retaining lugs if necessary.
- Insert the cable strip (1) in the direction of the arrow into the lower section of the microfilter housing (2) until the retaining lugs (3) engage.
- Make sure cable strip is correctly seated.



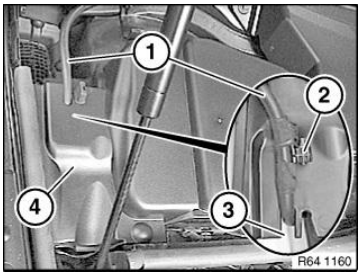
- Clip the cable into the guides (2).
- Close plug connection (1).



- Clip the cable into the guides (2).
- Close plug connection (1).

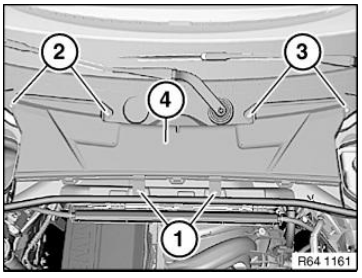


- Install the cover (2) on the left.
- Make sure left cover (2) is correctly seated.
- Engage the latch mechanisms (3).
- Secure the retaining tab (1).



- The procedure for the installation of the right cover (4) is identical to the installation of the left cover.
- Make sure the hose (1) is correctly fitted in the recess (3).
- Fasten the hose (1) with the hose support (2) on the right cover (4).

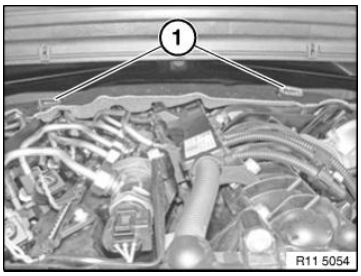
105 – Install the upper section of the microfilter housing



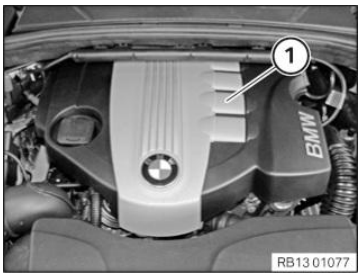
- Position the upper section of the microfilter housing (4).
- Make sure the upper section of the microfilter housing (4) is correctly positioned.
- Tighten the screws (1), (2) and (3).

106 – Installing the top acoustic cover

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- Push the top acoustic cover into both guides (1).



RISK OF DAMAGE

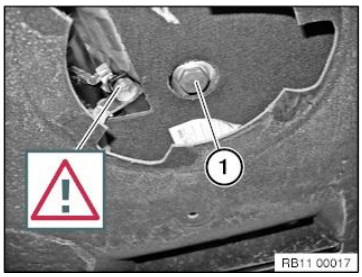
Damage to the acoustic cover.

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.

- Secure the top acoustic cover (1) to the rubber mounts.

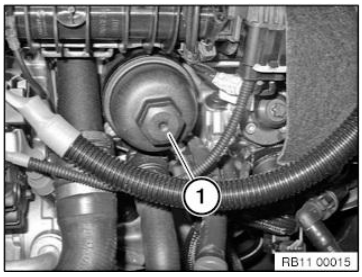
107 – Top up engine oil



- Tighten oil drain plug (1). In this process, ensure not to create a short circuit to the positive battery cable.

Oil drain plug

M12	Renew the sealing ring.	25 Nm



- Tighten the oil filter cover (1).

Oil filter cover to oil filter housing

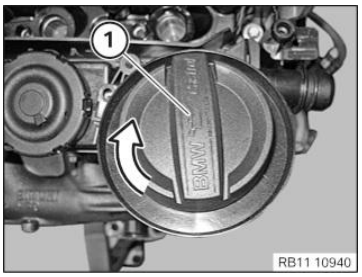
	25 Nm

- Top up engine oil.

Engine oil

Engine oil change fill quantity	min. 5,20 l

Engine oil: Technically suitable engine oils for BMW Group engines



- Tighten the oil filler plug (1).

Check

- Park vehicle on a horizontal surface.
- Bring engine up to operating temperature.
- Check the oil level using the oil dipstick after a waiting period of 5 minutes.

Result

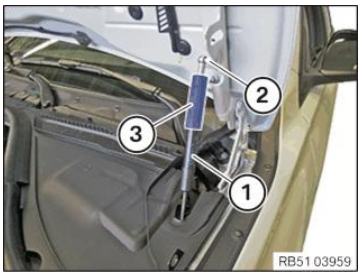
» The oil level is not within the specified marks.

Measure

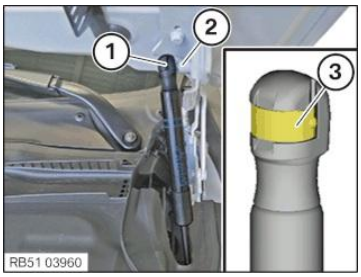
- Adapt the oil level.

108 – 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

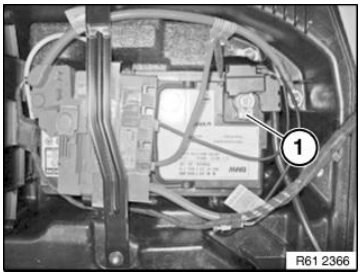
Shutting bonnet or tailgate.

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.

109 – Connecting the battery earth lead

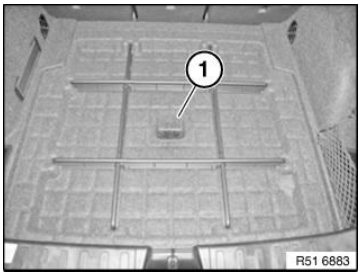


- Position the intelligent battery sensor (IBS) on the vehicle battery.
- Tighten nut (1).

Battery earth lead to battery

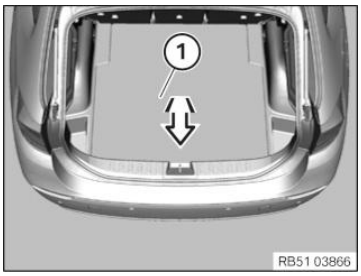
M6			5 Nm

110 – Installing the spare wheel well trim panel



- Install the trim panel of the luggage compartment well (1).

111 – Installing the luggage compartment floor trim panel



- Insert the luggage compartment floor trim panel (1) in the direction of the arrow.

112 – Charging battery

TECHNICAL INFORMATION

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

▸ **Charging lead-acid batteries and AGM batteries**

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- Connect to a charger approved by BMW.
- If the battery is charged while it is still installed: always connect the charger to the jump start terminal point in the engine compartment.
- Fully charge the battery.

  The battery is fully loaded once the charge current drops below a certain value:

Battery temperature	Charge current
15° C - 25° C	<2.5 A
< 15°C	<1.5 A

- Disconnect the charger after having completed charging.

▸ **Charging the lithium ion battery**

TECHNICAL INFORMATION

Comply with notes on handling lithium ion batteries.
For more information see:
08 08 14 (094) Charging parameters for lithium ion batteries
61 12 ... Notes regarding intelligent battery electronics (lithium ion battery)

- Adapt the charging voltage on the charger to the lithium ion batteries.

  Too high charging voltage can lead to opening of the electronic disconnect switch.
- Connect to a charger approved by BMW.
- Fully charge the battery.
- Disconnect the charger after having completed charging.

113 – Check/add transmission oil level (GA8HP45Z, GA8HP50Z, GA8HP70Z, GA8HP75Z, GAHP90Z)

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.

TECHNICAL INFORMATION

To set the correct oil level, it is mandatory that the service function "Transmission control unit: Oil-level adjustment" is carried out with the diagnosis system.

- Start the oil-level adjustment with the help of diagnosis system only when the transmission oil temperature lies between 30°C and 40°C.

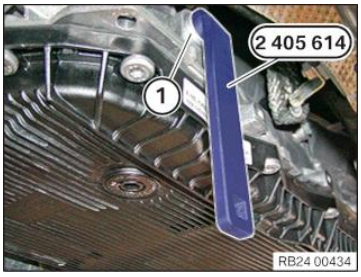
  The oil-level adjustment with the diagnosis system can only be successfully terminated if the transmission oil temperature is between 40°C and 50°C.
- Connect the diagnosis system to the vehicle.
- Call up the service function: Transmission control unit: Oil-level adjustment.
- Follow the instructions in the diagnosis system and run an oil-level adjustment.
- **If applicable, top up the oil level in the automatic transmission:**

▸ **Top up automatic transmission fluid**

CAUTION

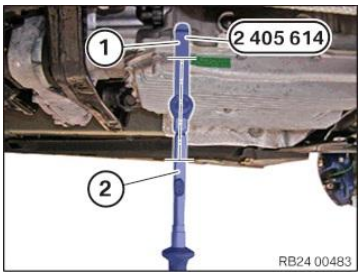
Materials harmful to health.

Contact with fluids harmful to health!
- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Stand vehicle on a level surface and secure against rolling off.
- Loosen the oil filler plug (1) using the special tool **2 405 614**.
- Top up automatic transmission fluid according to the instructions in the diagnosis system.

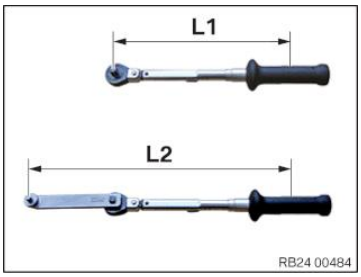
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- Renew the oil filler plug and the sealing ring.

  Parts: Oil filler plug, sealing ring
- Position the oil filler plug by hand.
- Align special tool **2 405 614** (1) and the torque wrench (2) in a line.
- Tighten the oil filler plug to the **calculated torque to be set**.

  The calculation of the torque to be set is as follows:



TECHNICAL INFORMATION

If an extension is used on the torque wrench, then the torque to be set and the specified tightening torque differ. The torque to be set on the torque wrench must be calculated before tightening.

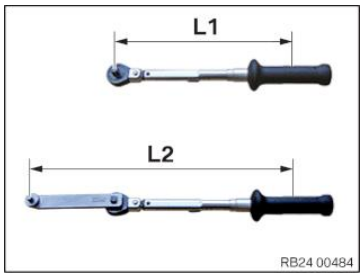
- Recalculate the torque prior to tightening when using special tool **2 405 614**:
- Measure the length (L1).

  (L1) represents the length from the centre of the handle to the square connector of the reversible ratchet.
- Measure the length (L2).

  (L2) represents the length from the centre of the handle to the square connector of special tool **2 405 614**.
- Calculate the torque to be set using the following calculation: (tightening torque * (L1)) : (L2) = torque to be set

Oil filler plug (GA6HP and GA8HP)

M18	The torque to be set deviates from the specified tightening torque due to the special tool. The torque to be set must be calculated depending on the used torque.	Tightening torque Torque to be set	35 Nm Torque to be set=(35 Nm * L1) : L2



114 – Carrying out vehicle test

- Connect diagnosis system.
- Switch the ignition on.
- Carry out vehicle identification.
- Carry out a vehicle test.
- Wait for the vehicle test to complete.
- Check identified faults and (if necessary) rectify these faults after consulting with customer.

Additional Information

Overview of Tightening Torques

Camshaft sprocket to oil vacuum pump — Used in step 54

M8x35	The screw features a left-hand thread. Renew screw.	Jointing torque Angle of rotation	5 Nm 90 °

Tensioning rail/guide rail on the engine — Used in step 54

Bearing journal	Replace bearing journal.	20 Nm

Hydraulic chain tensioner (bottom) on the engine block — Used in step 54

M6		10 Nm

Central bolt on the high pressure pump — Used in step 54

M12		65 Nm

Chain tensioner (top) in the cylinder head — Used in step 54

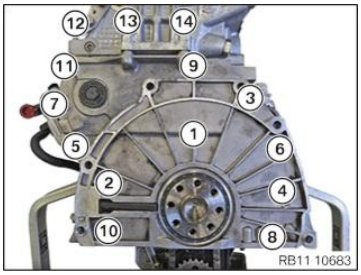
Renew the sealing ring.	70 Nm

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Timing case cover to crankcase — Used in step 55

Tighten screws in the following sequence: (1) - (11).

Renew screws.	Jointing torque	8 Nm
	Angle of rotation	90 °



Standard screw connection M8 — Used in step 55

M8		Tightening torque	19 Nm

Standard screw connection M6 — Used in step 55

M6			8 Nm

Oil sump to crankcase — Used in step 57

M8		Tightening torque	24 Nm

Flywheel to crankshaft — Used in step 59

M12x1.5	Renew screws.		120 Nm

Sprocket wheel to fitted camshaft — Used in step 60

M7x17.		Tightening torque	17 Nm

Cylinder head cover to cylinder head — Used in step 62

M6			10 Nm

Oil filler neck on cylinder head cover — Used in step 62

Plastic screw			3,6 Nm

Mounting, cylinder head cover (support, clamping jaw) — Used in step 65

M6x35			10 Nm

Injector to cylinder head — Used in step 65

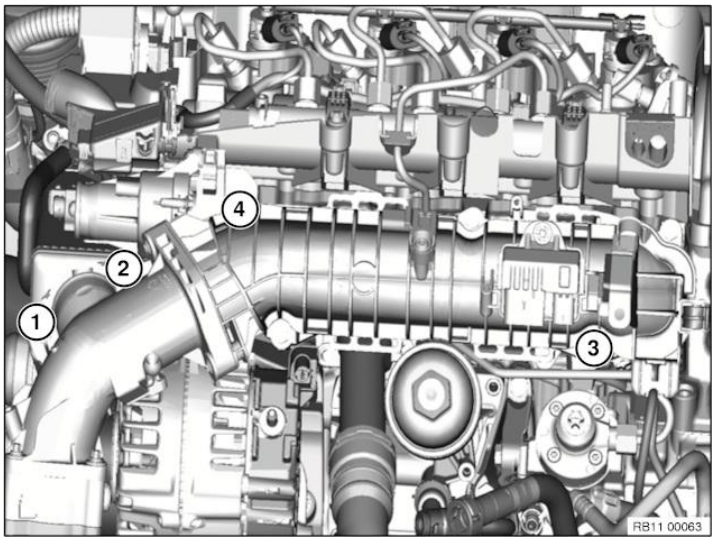
M8x95		Jointing torque	8 Nm
		Tightening torque	26 Nm

High pressure line to injector and to rail — Used in step 67 68

M14			24 Nm

Intake plenum to cylinder head — Used in step 70

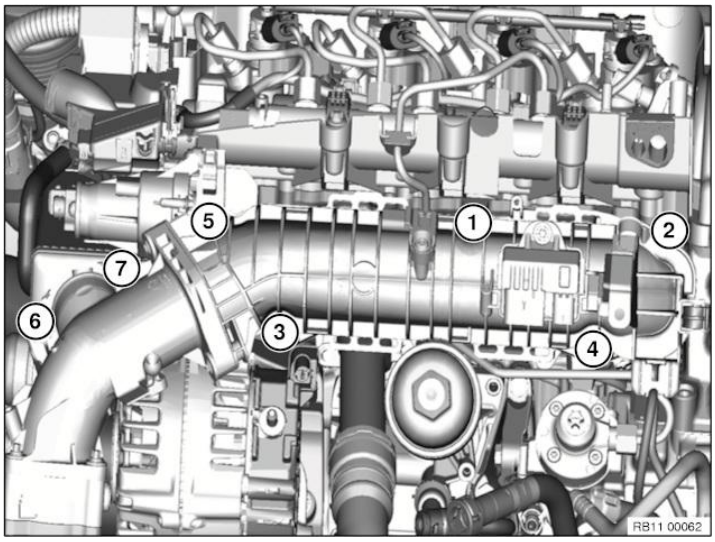
M6	*Apply screws in sequence (1) to (4).*	Jointing torque	5 Nm



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Intake plenum to cylinder head — Used in step 70

M6	*Apply screws in sequence (1) to (7).*	Tightening torque	10 Nm



Positive battery cable to alternator — Used in step 70 80

Nut		M5	13 Nm
		M8	19 Nm

Engine support arm to engine — Used in step 74 75

M10			38 Nm

Left/right engine mount to engine support arm — Used in step 76

M10			56 Nm
M12			68 Nm

Air conditioning compressor on crankcase — Used in step 79

M8			19 Nm
M10			38 Nm

Alternator to component carrier — Used in step 80

			38 Nm

Deflecting element to belt tensioner — Used in step 80

			55 Nm

Radiator on module carrier — Used in step 82

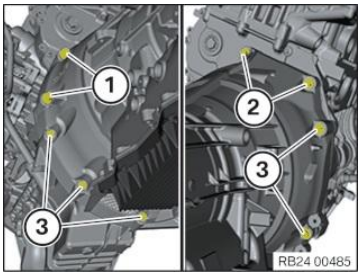
			4 Nm

Fan cowl on radiator — Used in step 84

			4 Nm

Transmission to engine — Used in step 88

Screw (3) M12x100			66 Nm
Bolt (2) M12x75			66 Nm
Bolt (1) M8x50			19 Nm



Holder on the transmission — Used in step 88 91

			19 Nm

Torque converter on the drive plate — Used in step 88

M10	Renew screws.		56 Nm

Transmission oil cooler line to transmission — Used in step 88

M8			8 Nm

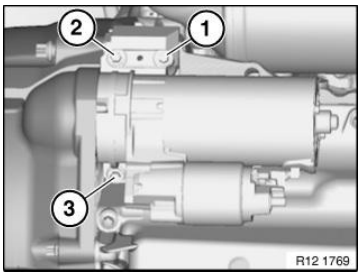
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Holder on the diesel particulate filter — Used in step 88

		21 Nm

Starter motor — Used in step 89

M8x60	*Tighten screws in the following sequence (1), (2), (3).*	19 Nm



Battery positive lead to starter — Used in step 89

M8		13,4 Nm

Wiring harness to starter (terminal 50) — Used in step 89

M6		7 Nm

Brace, top, to diesel particulate filter — Used in step 91

M8x20		21 Nm

Diesel particulate filter to support — Used in step 91

M8		21 Nm

Exhaust system to turbocharger — Used in step 91

M8	Renew flat band clip.	15 Nm

Rear silencer to body — Used in step 92

M8		21 Nm

Exhaust system bracket — Used in step 92

M12x20		30 Nm

Diesel particulate filter / primary catalytic converter to exhaust system — Used in step 92

M8	Renew flat band clip.	26 Nm
M10	Renew flat band clip.	43 Nm

Reinforcement plate to body — Used in step 93

		19 Nm

Tension strut to body — Used in step 93

M8		24 Nm

Tension strut to compression strut — Used in step 93

Renew screws.

M12		Jointing torque	100 Nm
		Angle of rotation	90 °

Trailing link to rear axle — Used in step 93

M10		50 Nm

Pedestrian protection to front axle support — Used in step 94

		25 Nm

Underbody panelling on body — Used in step 95 96

Screw not metric			3 Nm
Screw M6			8.8 Nm
Nut			2.5 Nm

Clean air pipe to intake silencer housing — Used in step 99

Clamp			2.5 Nm

Intake silencer housing to the body — Used in step 99

M6			8 Nm

Intake port to front panel — Used in step 99

Screw with Torx socket, for plastic			1.5 Nm

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Windscreen wiper arm — Used in step 102

	35 Nm

Oil drain plug — Used in step 107

M12	Renew the sealing ring.	25 Nm

Oil filter cover to oil filter housing — Used in step 107

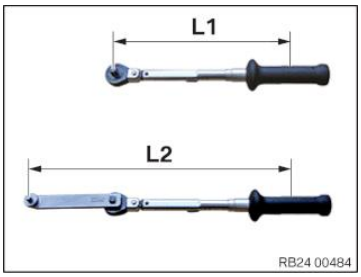
	25 Nm

Battery earth lead to battery — Used in step 109

M6			5 Nm

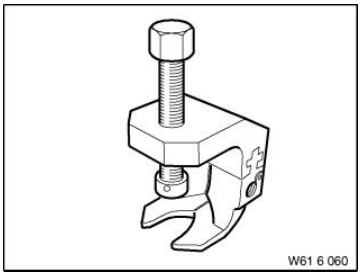
Oil filler plug (GA6HP and GA8HP) — Used in step 113

M18	The torque to be set deviates from the specified tightening torque due to the special tool. The torque to be set must be calculated depending on the used torque.	Tightening torque Torque to be set	35 Nm Torque to be set=(35 Nm * L1) : L2



Overview of Special Tools

0 493 441 (61 6 060) Extractor



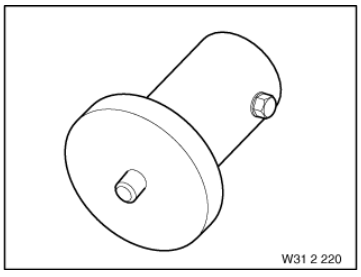
Common — Used in step 9

Usage	(Wiper arm puller, universal) To pull off wiper arm from drive shaft
Included in the tool or work	
Storage location	C3
Replaced by	
In connection with	
SI-Number	01 10 99 (433)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 704 (61 6 061)		**Basic body**	
2	0 494 705 (61 6 062)		**Claw** (Left / right claw)	
3	0 494 706 (61 6 063)		**Spindle**	
4	0 494 707 (61 6 064)		**Synchronising key**	

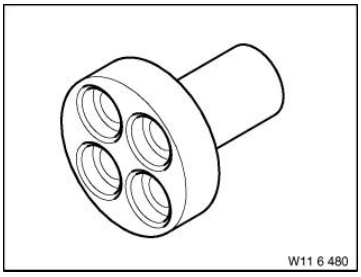
0 491 932 (31 2 220) Upholstery



Common — Used in step 19

Usage	(Support) For supporting the front axle support and the exhaust system during installation work
Included in the tool or work	
Storage location	B3
Replaced by	
In connection with	
SI-Number	01 06 94 (801)

0 493 380 (11 6 480) Connector

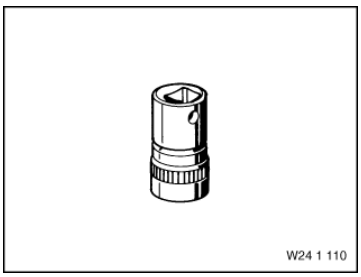


Common — Used in step 23 51 60 61 88

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)

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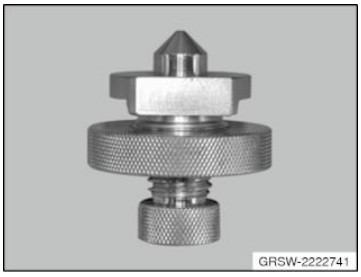
0 491 667 (24 1 110) Socket wrench insert



Common Used in step 23 88

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)

2 222 741 Device



Common Used in step 23

Usage	To secure the converter when removing and installing the transmission.
Included in the tool or work	
Storage location	B30
Replaced by	
In connection with	
SI-Number	01 27 11 (764)

0 494 213 (24 2 390) Cap

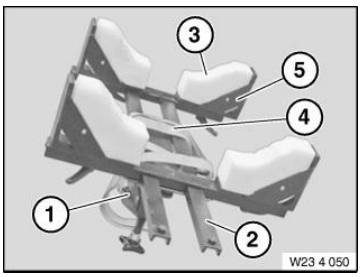


Common Used in step 23 88

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)

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0 495 498 (23 4 050) Support



Common Used in step 23

Usage	(universal gearbox holder) Support for removing and installing manual gearboxes and automatic transmissions for BMW & RR.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 06 (256)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
3	0 495 549 (23 4 053)		**Insert** (Foam material insert (1 set = 4 pieces)) deleted, can be ordered only via tool set	
1	0 495 547 (23 4 051)		**Joint** Available only as a complete tool set 23 4 050 (83 30 0 495 498) - as of 16.07.12.	
2	0 495 548 (23 4 052)		**Frame** (Basic frame) Available only as a complete tool set 23 4 050 (83 30 0 495 498) - as of 16.07.12.	
4	0 495 550 (23 4 054)		**Belt** (Tensioning strap) Available only as a complete tool set 23 4 050 (83 30 0 495 498) - as of 16.07.12.	
5	0 496 018 (23 4 055)		**Support** (Fixture for foam insert) Available only as a complete tool set 23 4 050 (83 30 0 495 498) - as of 16.07.12.	

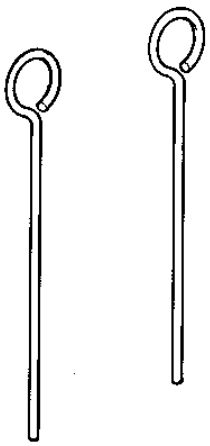
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2 219 012 Hydraulic lifter



Common	Used in step 23
Usage	For raising and lowering various vehicle components.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

0 490 973 (11 3 340) Pin



Common	Used in step 28 81
Usage	(lock pin (2 pieces)) For retaining the chain tensioner piston (e.g. when removing and installing the cylinder head) and to lock the drive belt tensioner
Included in the tool or work	
Storage location	B1
Replaced by	
In connection with	
SI-Number	01 09 91 (416)

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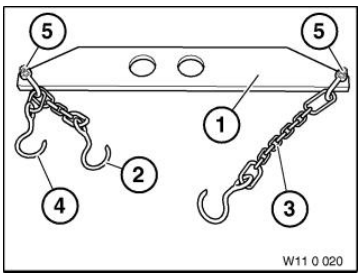
2 220 718 Workshop crane



Common	Used in step 34 73
Usage	WSK 1000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	06 01 11 (701)

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0 490 567 (11 0 020) Lifting gear



Common

Used in step 34 73

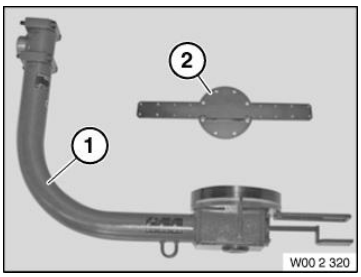
Usage	For removing and installing the engines. 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

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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0 495 196 (00 2 320) Support arm



Common Used in step 37

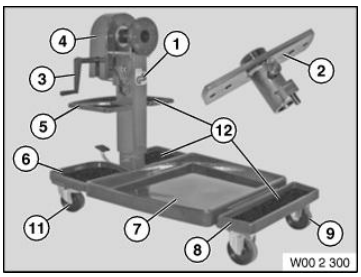
Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

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0 495 187 (00 2 300) Assembly stand



Common Used in step 37

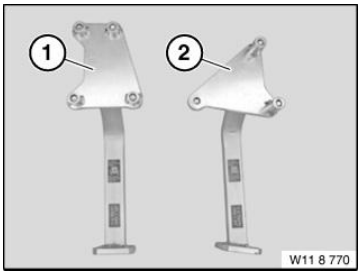
Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

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

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0 496 117 (11 8 770) Support



Common Used in step 37 73

Usage	(Fixture) For mounting engine on assembly stand.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300 = 0495187; 00 2 320 = 0495196
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 118 (11 8 771)		**Panel** (Engine fixture I) Deletion, only available via tool set	
2	0 496 119 (11 8 772)		**Panel** (Engine fixture II) Deletion, only available via tool set	
3	0 496 147 (11 8 773)		**Screw** (set of screws)	

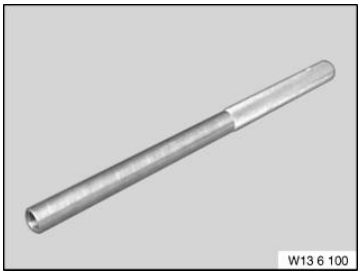
0 495 910 (37 1 152) Socket wrench



Common Used in step 41 42 67 68

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

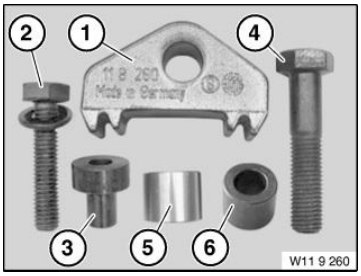
0 494 279 (13 6 100) Lever



Common Used in step 45

Usage	(Removal rod) For removing injectors
Included in the tool or work	
Storage location	A50
Replaced by	
In connection with	
SI-Number	01 15 01 (790)

0 493 938 (11 9 260) Holder



Common Used in step 48 59

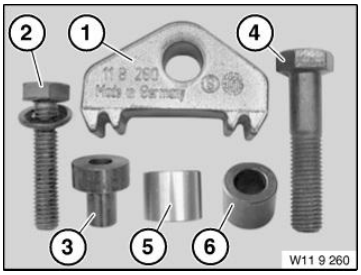
Usage	(Counter support with screw connection) For holding the flywheel when gearbox is removed
Included in the tool or work	
Storage location	A44
Replaced by	
In connection with	
SI-Number	01 01 01 (662)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 034 (11 9 261)		**Holder** (Individual counter support)	
2	0 494 035 (11 9 262)		**Screw** (Bolt (thread M10) with washer) For screwing counter support	
3	0 494 129 (11 9 263)		**Bush** (Bush for counter support) For counter support, for retaining flywheel when gearbox is removed Engine: N62, N73	
6	0 495 216 (11 9 266)		**Bush** For counter support, for retaining flywheel when gearbox is removed Engine: M57TU2	
4	0 494 130 (11 9 264)		**Screw** (Bolt (thread M12)) For counter support for retaining flywheel when gearbox is removed	
5	0 494 793 (11 9 265)		**Bush**	

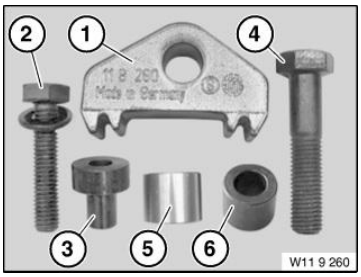
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0 494 129 (11 9 263) Bush



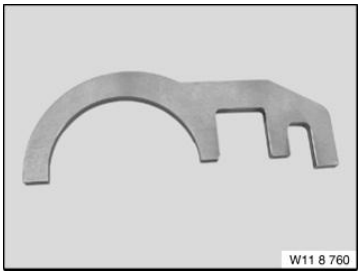
Common	Used in step 48 59
Usage	(Bush for counter support) For counter support, for retaining flywheel when gearbox is removed Engine: N62, N73
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

0 494 130 (11 9 264) Screw



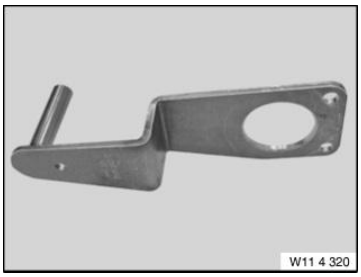
Common	Used in step 48 59
Usage	(Bolt (thread M12)) For counter support for retaining flywheel when gearbox is removed
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

0 496 112 (11 8 760) Gauge



Common	Used in step 51 52 54 60 61
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 442 (11 4 320) Device



Common	Used in step 53
Usage	(holding fixture) For removing and installing timing chains. Replaced by 83 30 2 318 429.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 08 08 (445)

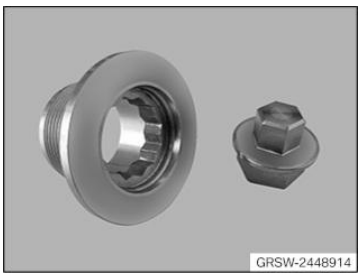
2 285 671 Device



Common	Used in step 53 54
Usage	For positioning the high-pressure pump relative to the crankshaft.
Included in the tool or work	
Storage location	B32
Replaced by	
In connection with	
SI-Number	01 53 13 (057)

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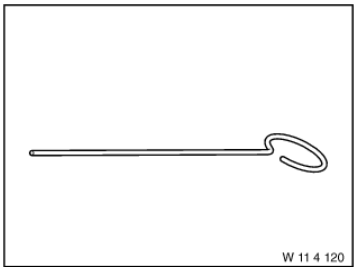
2 448 914 Extractor



Common Used in step 53

Usage	For removing and installing high pressure pump. 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	A49
Replaced by	
In connection with	
SI-Number	01 15 16 (411)

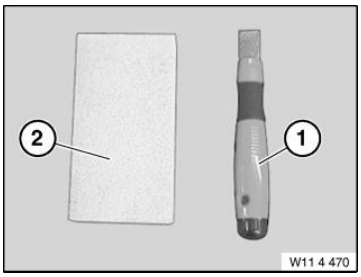
0 491 012 (11 4 120) Pin



Common Used in step 53 54

Usage	(lock pin) For chain tensioners, for locking the chain tensioner piston (e.g. during cylinder head removal and fitting)
Included in the tool or work	
Storage location	B1
Replaced by	
In connection with	
SI-Number	01 12 93 (701)

0 495 102 (11 4 470) Tool



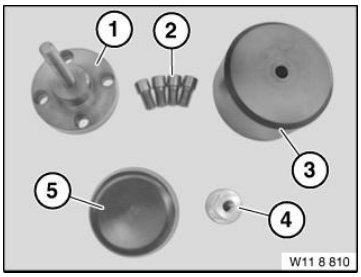
Common Used in step 55

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)	

0 496 137 (11 8 815) Holding sleeve

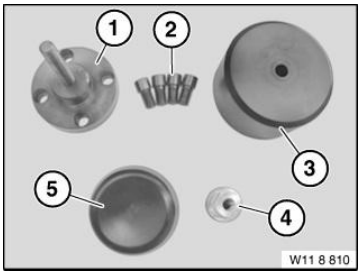


Common Used in step 56

Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

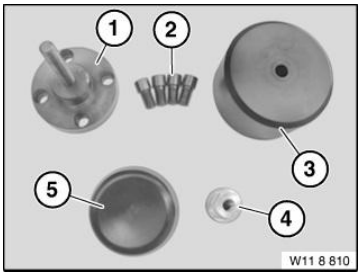
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0 496 133 (11 8 811) Basic body



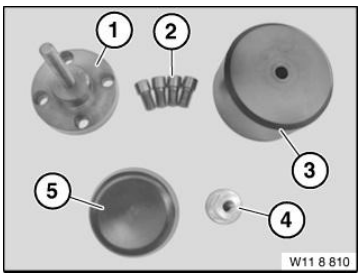
Common	Used in step 56
Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 134 (11 8 812) Screw



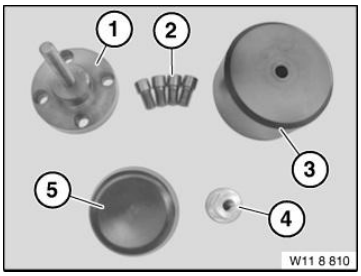
Common	Used in step 56
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 135 (11 8 813) Holding sleeve



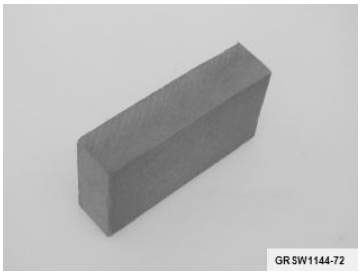
Common	Used in step 56
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 136 (11 8 814) Nut



Common	Used in step 56
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 495 104 (11 4 472) Extractor



Common	Used in step 57
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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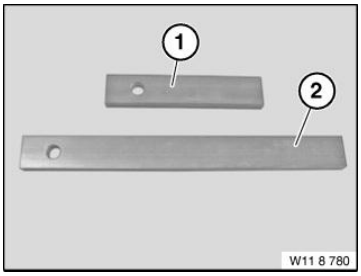
0 495 103 (11 4 471) Scraper



Common Used in step 57

Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 496 120 (11 8 780) Plate



Common Used in step 57

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

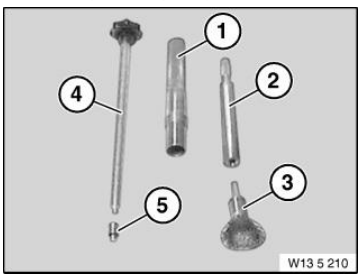
0 495 126 (11 5 320) Mandrel



Common Used in step 60 61

Usage	(Alignment pin) For locking crankshaft in TDC position.
Included in the tool or work	
Storage location	B53
Replaced by	
In connection with	
SI-Number	01 02 05 (173)

0 493 763 (13 5 215) Plug

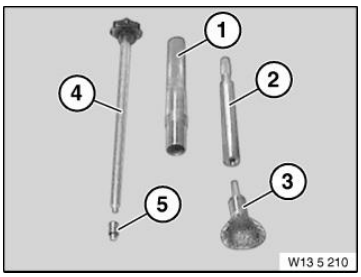


Common Used in step 63

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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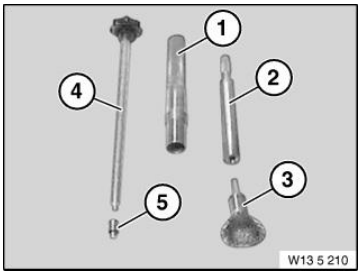
0 493 762 (13 5 214) Rod



Common Used in step 63

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 758 (13 5 210) Tool



Common Used in step 63

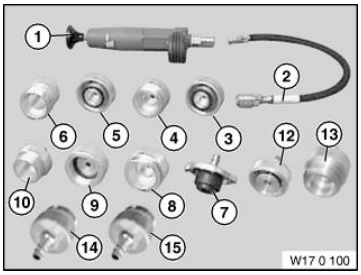
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

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0 494 417 (17 0 100) Tester



Common

Used in step 86 87

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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0 494 642 (17 0 113) Adapter



Common	Used in step 86 87
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 87
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	

0 494 418 (17 0 101) Pump



Common	Used in step 87
Usage	
Included in the tool or work	0 494 417
Storage location	
Replaced by	
In connection with	
SI-Number	

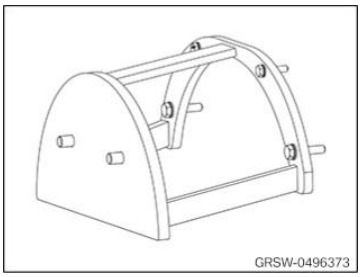
2 405 614 Socket wrench



Common	Used in step 113
Usage	For opening and closing the oil filler plug. 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). Replaced by 2455997
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 33 15 (305)

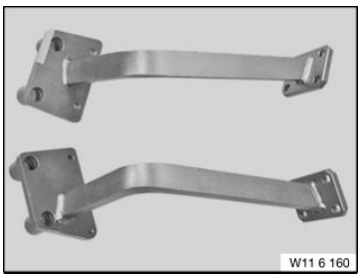
Replacement tools:

0 496 373 (11 5 420) Plate



Common	Used in step 37
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

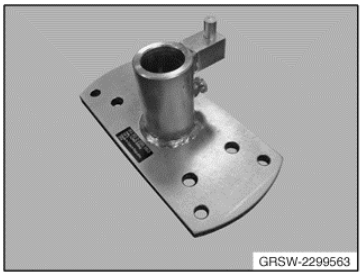
0 496 680 (11 6 160) Support



Common	Used in step 37
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

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2 299 563 Adapter



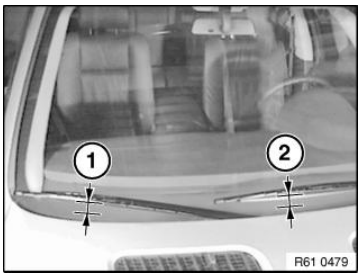
Common	Used in step 37
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Opening pressure of coolant sealing cover	Used in step 87
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

Cooling system test pressure	Used in step 87
Test pressure for cooling system (gauge pressure)	1,5 bar
Pressure drop	max. 0,1 bar

Windscreen wiper arm	Used in step 102
Left wiper arm (2)	44 mm ... 50 mm
Right wiper arm (1)	51 mm ... 57 mm



Engine oil	Used in step 107
Engine oil change fill quantity	min. 5,20 l
Engine oil: Technically suitable engine oils for BMW Group engines	

Links

General repair instructions	Used in step
12 00 ... Notes for disconnecting and connecting battery	3
61 00 ... Safety information for handling vehicle battery	3
61 12 ... Notes on intelligent battery sensor (IBS)	3 112
11 00 ... Overview of consumables (Electronic Parts Catalogue)	55 57 64
61 20 ... Notes on AGM battery	112
61 20 ... Notes regarding the lithium ion battery	112
61 12 ... Notes regarding the battery electronics (lithium ion battery)	112

Repair instructions	Used in step
24 34 ... Notes on mechatronics (GA8HP45Z,GA8HP70Z,GA8HP90Z)	23 88
23 .. Universal BMW transmission support	23 88
17 00 ... Instructions for repair work on cooling system	24 83 86 87
61 35 ... Notes on ESD protection (Electro Static Discharge)	31 32 78
11 31 505 Adjusting camshaft timing (N47 D20 O1)	61

Operating materials	Used in step
3.0 Technically appropriate engine oils for BMW Group engines	107
14.0 Automatic transmission fluid for ZF transmissions GA8HP45Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H	113

Operating materials	Used in step
Main group 17	86

Special tool service information	Used in step
Description of the manual Li parameter setting for DEUTRONIC DBL800/1200/1600	112
Description of the manual Li parameter setting for ELEKTRON HS-1000	112
Description of the manual Li parameter setting for ELTEK MultiCharger 750/900/1500	112

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Special tool service information	Used in step
Charging parameters for lithium ion batteries	112
Note for the workshop equipment catalogue BMW, MINI	112

Parts

Parts required

Designation	Used in step
Sealing ring	64

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11 31 560 Replacing both timing chains (N47D K/U/O/T 0/1)

Special tools required:

- 11 6 480
- 11 8 760
- 11 4 320
- 2 285 671
- 11 8 740
- 11 3 340
- 11 4 120
- 11 4 470
- 11 8 780
- 11 5 320

Follow diagnosis instruction.

Necessary preliminary tasks:

- Remove engine
- Mount engine on assembly stand
- Remove cylinder head cover
- Remove flywheel
- Remove oil sump

Note:
Cylinder head is **not** removed.

Removal:



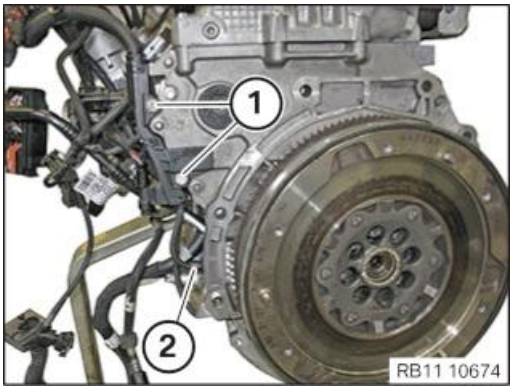
Important!

Magnet wheel (1) is magnetic.

Keep magnet wheel (1) in a plastic bag away from swarf.

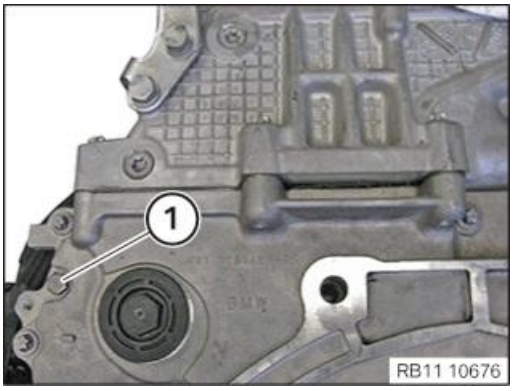
Remove magnet wheel (1) from crankshaft.

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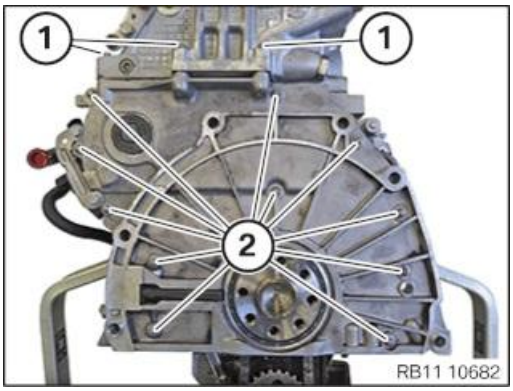


Release screws (1) of wiring harness.

Unlock plug connection (2) of the crankshaft pulse sensor and disconnect.

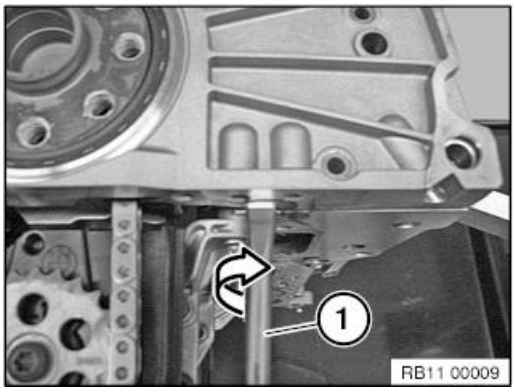


Release screw of high pressure pump (if fitted).



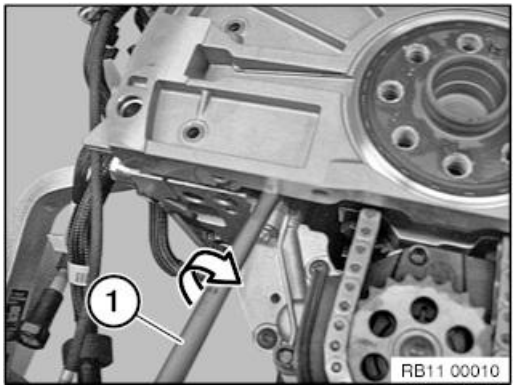
Release screws (1).

Unfasten screws (2).

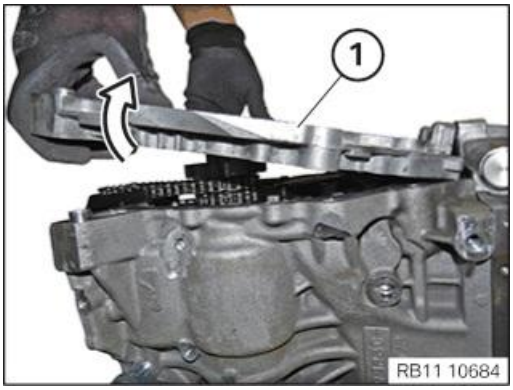


Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

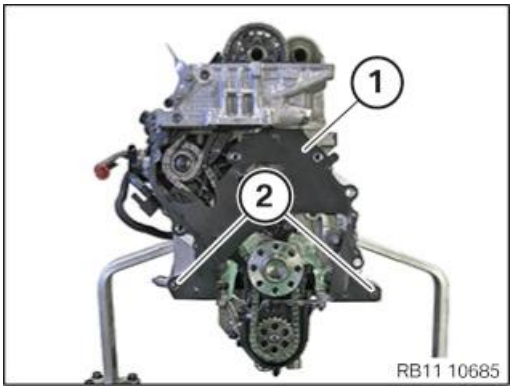
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Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

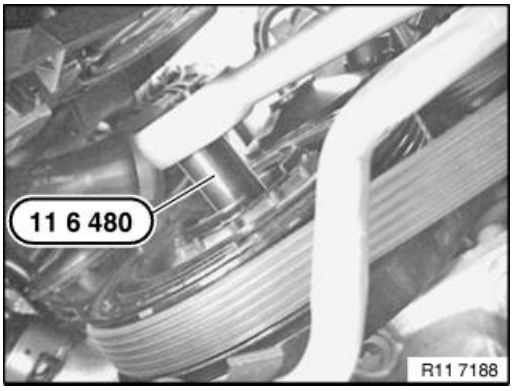


Carefully remove timing case cover (1) in direction of arrow.



On engines up to 11/2009:

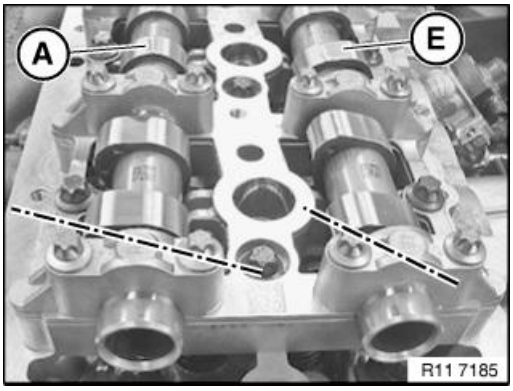
Remove beaded metal gasket (1).



Crank engine with special tool 11 6 480 to TDC firing position of cylinder no. 1.**Important!**

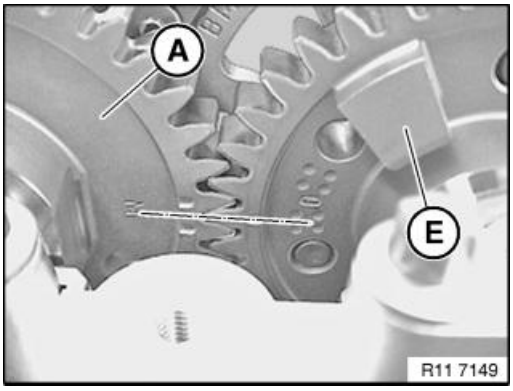
Do not turn the engine against the direction of travel.

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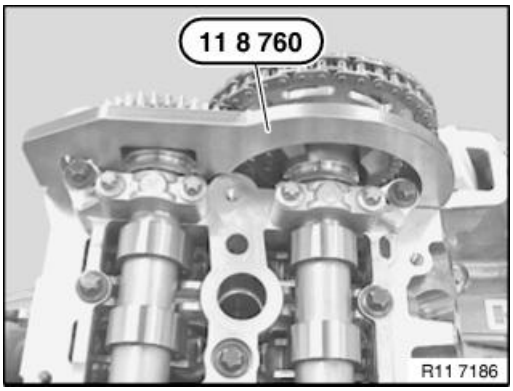


The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

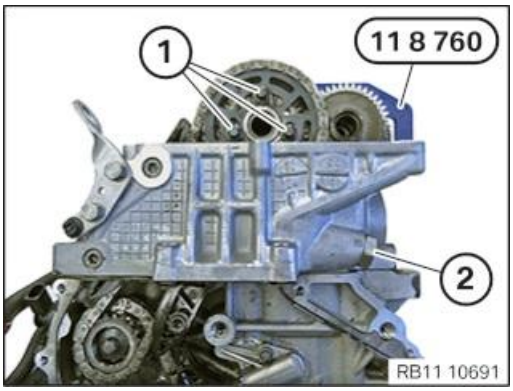
The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.



The mark on the exhaust camshaft (A) must correspond to the mark on the intake camshaft (E).*Note:*
See image.



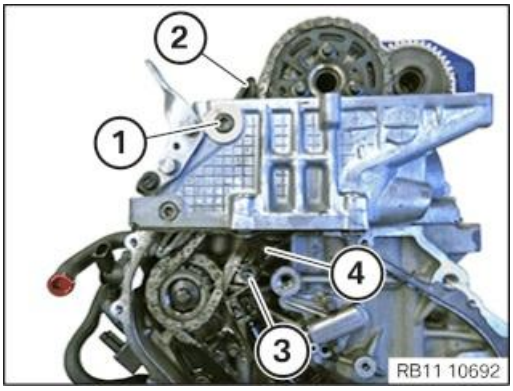
Place special tool 11 8 760 on exhaust camshaft.**Note:**
Special tool 11 8 760 must lie flush on cylinder head.



Only release screws (1).

Remove chain tensioner (2).

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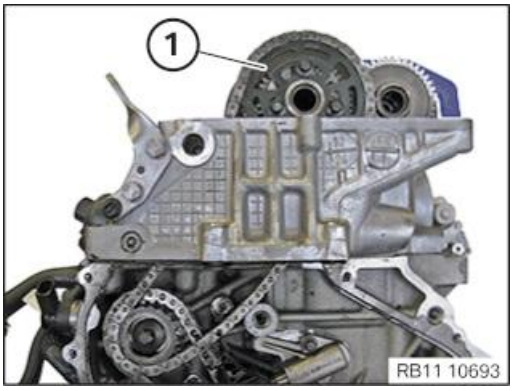


Release bearing journal (1).

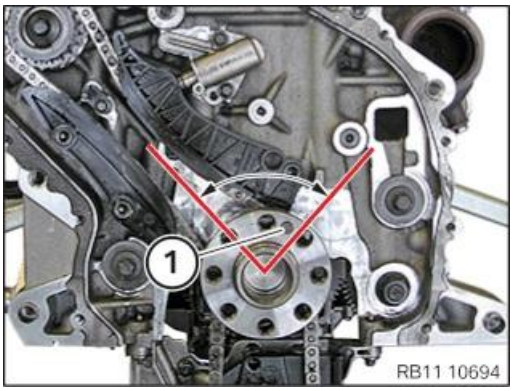
Remove guide rail (2) upwards.

Release bearing journal (3).

Remove tensioning rail (4) downwards.



Remove top timing chain with camshaft sprocket (1).



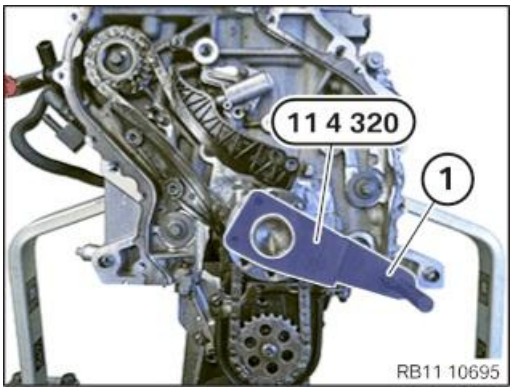
Important!

Risk of damage to the valve gear

The guide pin (1) of the crankshaft may not exit the marked area during the entire repair process.

Only after final setting of the timing the engine may be spun again.

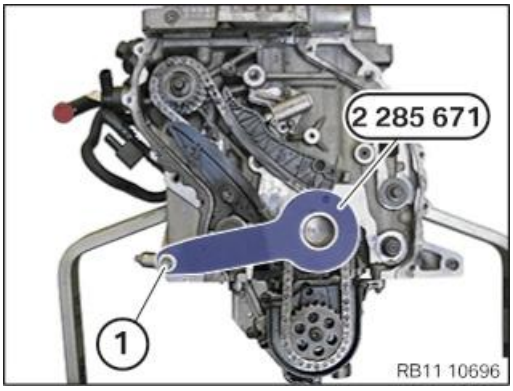
Note:
Cylinder head remains mounted.



Vehicles before 5/2013:

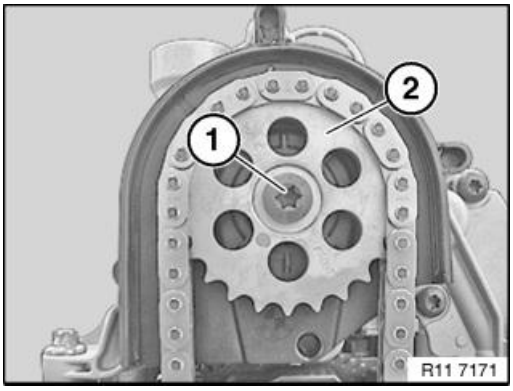
Fix special tool 11 4 320 on crankshaft and fix with a screw (1).

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Vehicles after 5/2013:

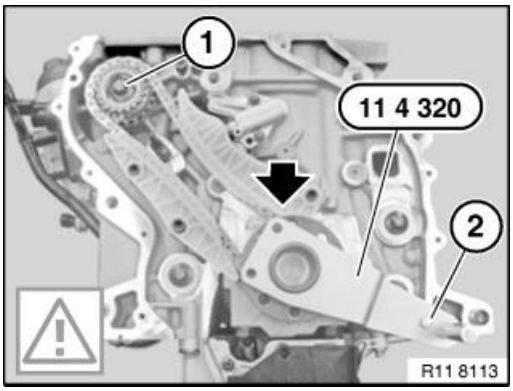
Mount special tool 2 285 671 on the crankshaft, screw in transmission bolt (1) somewhat.



Important!

Left-hand threads.

Release screw (1) on camshaft sprocket of oil pump.

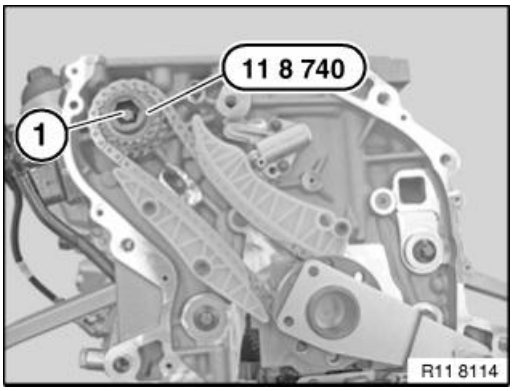


Note:
To loosen the central bolt on the high pressure pump, crankshaft must remain fixed with special tool 11 4 320 or 2 285 671 .

Release central bolt (1) of high pressure pump.**Important!**

Release central bolt only, do not remove.

Pistons of cylinder 1 and 4 are at 45° after TDC position.

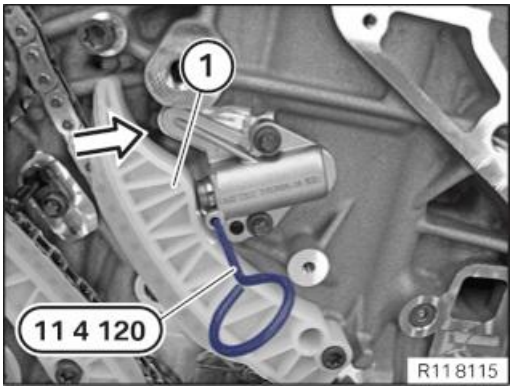


Note:
To loosen the central bolt on the high pressure pump, crankshaft must remain fixed with special tool 11 4 320 or 2 285 671 .

Screw special tool 11 8 740 in hand-tight.

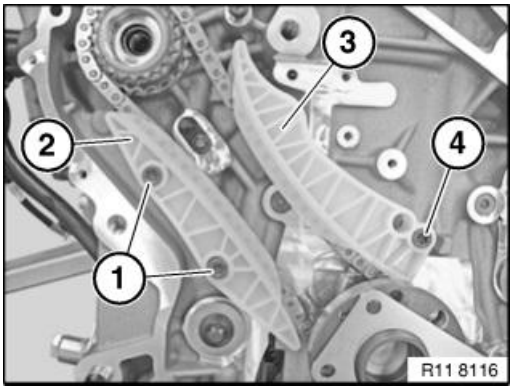
Twist out central bolt of high pressure pump (1) until impeller has detached from taper of high pressure pump.

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Using tensioning rail (1), press chain tensioner in direction of arrow until special tool 11 3 340 /11 4 120 can be positioned.

If necessary, remove chain tensioner.

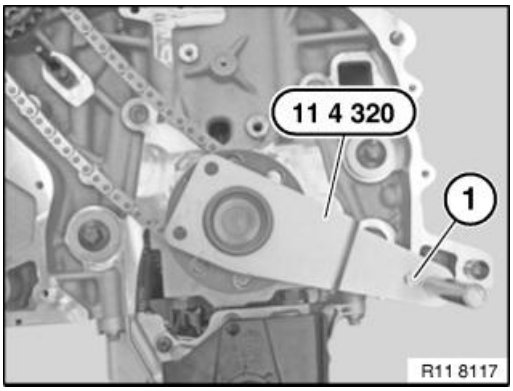


Release bearing journal (1).

Remove guide rail (2).

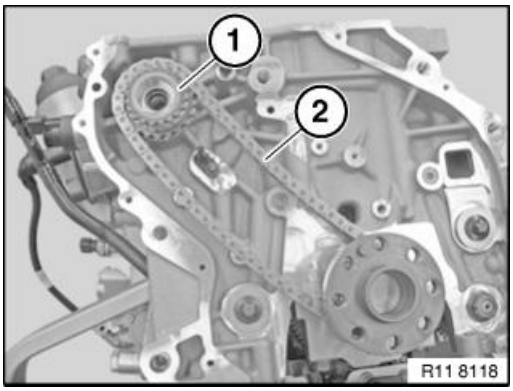
Release bearing journal (4).

Remove tensioning rail (3).



Release screw (1).

Remove special tool 11 4 320 or 2 285 671 .



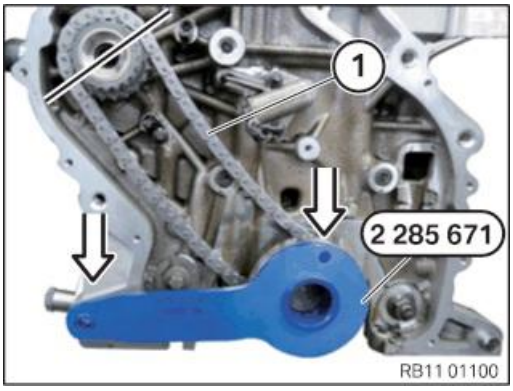
Remove camshaft sprocket of the oil pump and drive chain of the oil pump.

Remove impeller (1) with timing chain (2) from high pressure pump.

Remove timing chain (2).

Installation:

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Important!

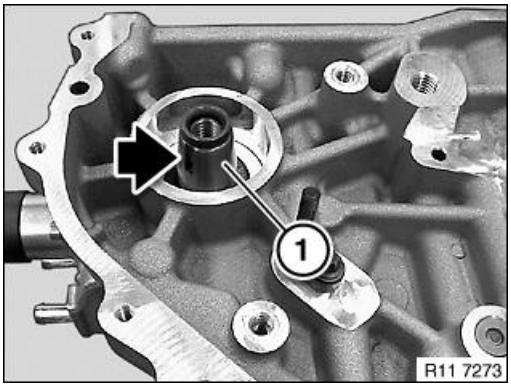
The high pressure pump and crankshaft must be positioned **to each other** with special tool 2 285 671 .

Fit timing chain (1).

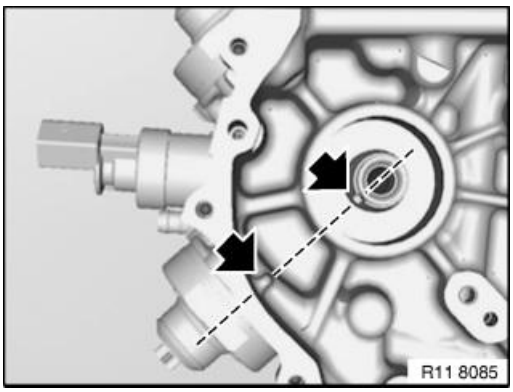
Lay drive chain for oil pump.

Position crankshaft with special tool 2 285 671 (crankshaft is in the **11° top dead centre**).

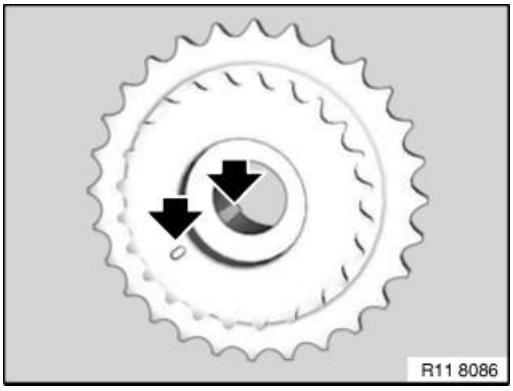
Fix special tool 2 285 671 via the fitting bush on the crankcase.



Pay attention to spline groove on high pressure pump (1).

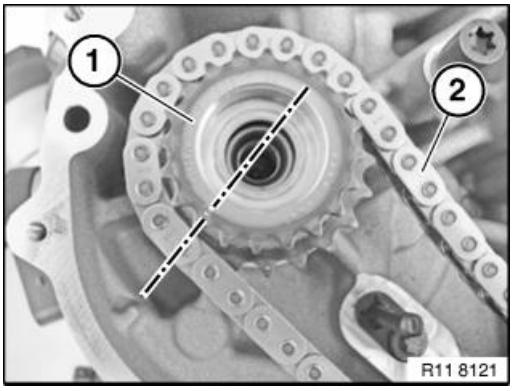


Installation note:
The marking on the crankcase and spline groove on the high pressure pump must be in line (graphic N57).

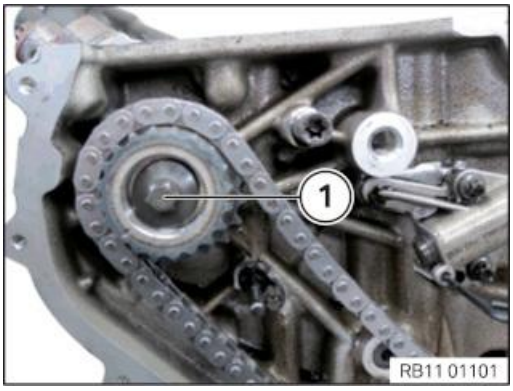


Installation note:
Groove and marking (0) on pinion are on a single plane.

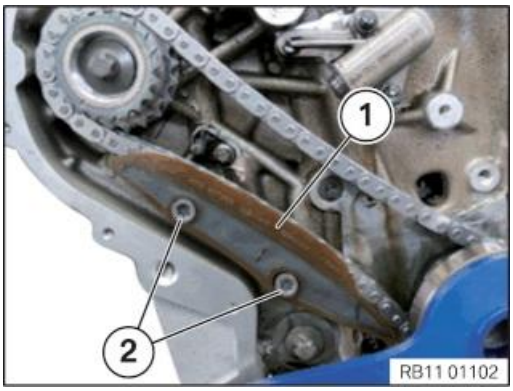
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Position impeller (1) with timing chain (2) on high pressure pump.
Marking (0) and cast lug must be in line.

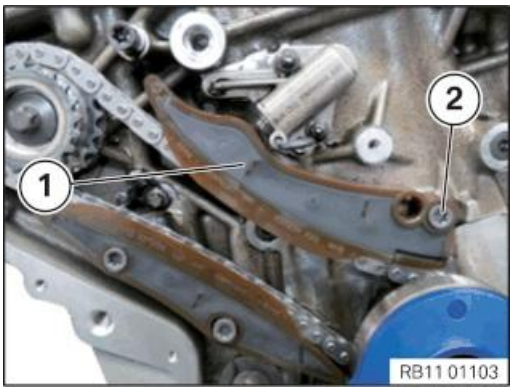


Insert central bolt (1) of high pressure pump.



Installation note:
Clean screw thread.
Renew all bearing journals.

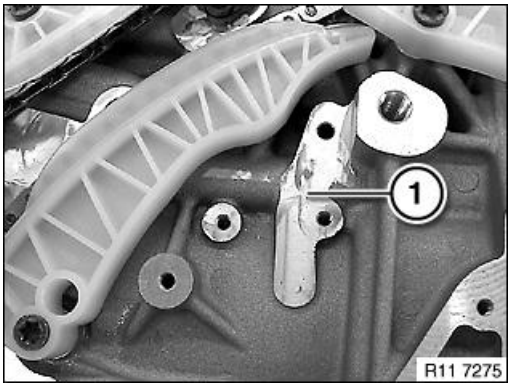
Position guide rail (1).
Screw in bearing journals (2).
Tightening torque: 11 11 3AZ.



Installation note:
Clean screw thread.
Renew all bearing journals.

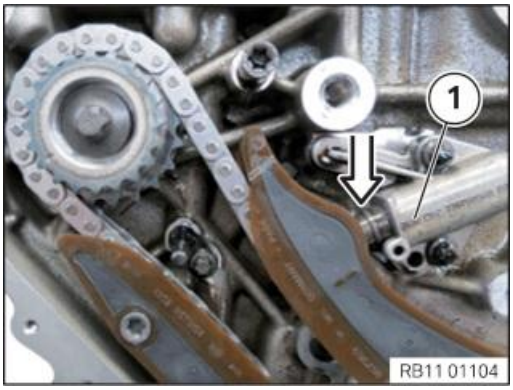
Position and tighten tensioning rail (3).
Screw in and tighten bearing journal (4).
Tightening torque: 11 11 3AZ.

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Important!

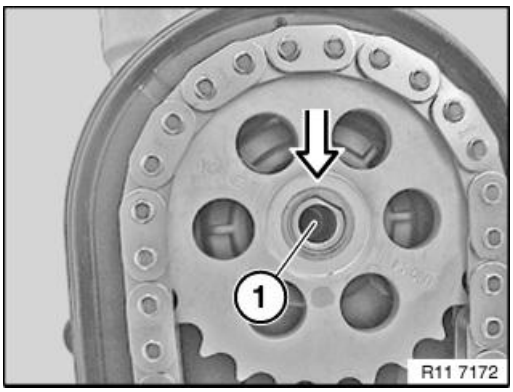
Clean sealing surfaces (1) with compressed air.



If applicable, once again screw in the hydraulic chain tensioner at the bottom (1).

Tightening torque: 11 11 4AZ .

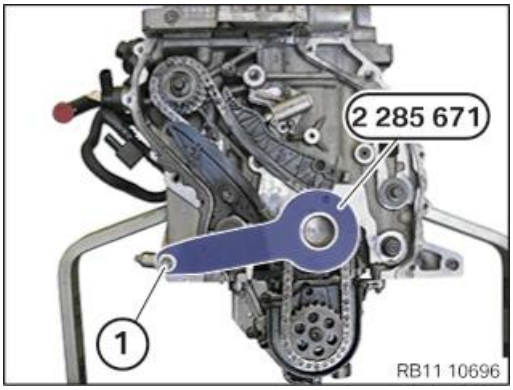
Remove special tool 11 3 340 /11 4 120 .



Position timing chain with secondary sprocket wheel for oil pump.

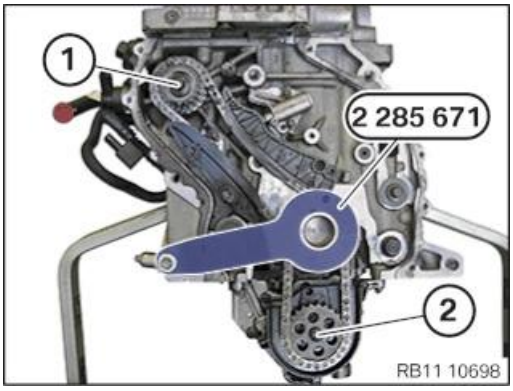
Screw in screw in oil pump shaft (1).

Installation note:
Pay attention to mounting flats on oil pump shaft (1) (see arrow).



For better support of the special tool 2 285 671 screw in transmission bolt (1) slightly.

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Tighten central bolt (1) of high pressure pump.

Tightening torque: 13 52 2AZ.

Important!

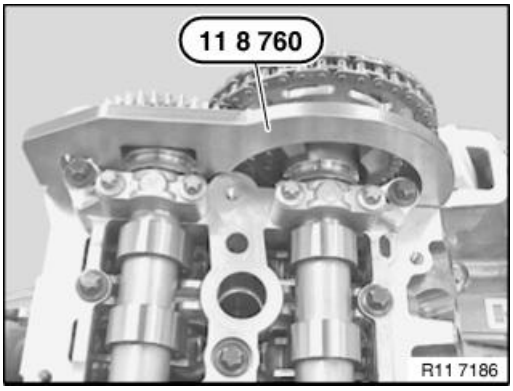
Left-hand threads.

Replace screw.

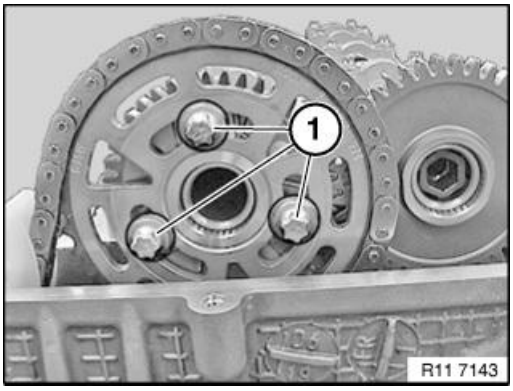
Tighten screw (2) of oil pump.

Tightening torque: 11 41 3AZ.

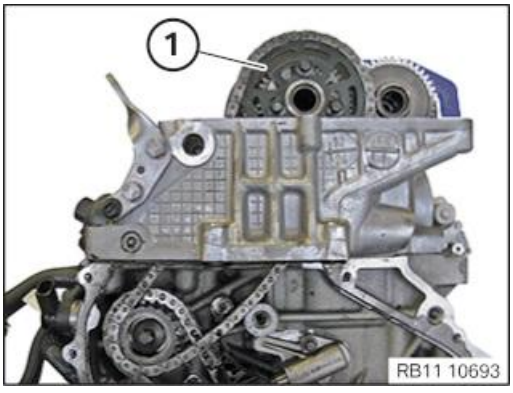
Note:
Do **not** remove special tool 2 285 671 yet.



Special tool 11 8 760 must lie flush on cylinder head.

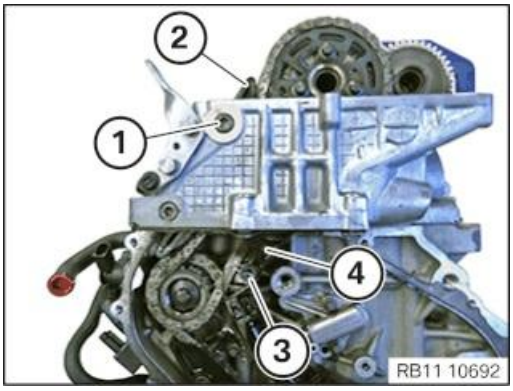


Installation note:
Place the camshaft sprocket with timing chain on the intake camshaft such that screws (1) are located in the centre of the elongated holes.



Lay timing chain on top with camshaft sprocket (1) and fix screws.

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Installation note:
Clean all threads of bearing journals.

Renew all bearing journals.

Install guide rail (2).

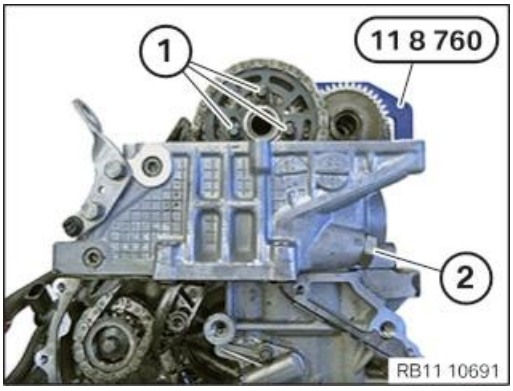
Screw in and tighten bearing journal (1).

Tightening torque: 11 12 4AZ.

Install tensioning rail (4).

Screw in and tighten bearing journal (3).

Tightening torque: 11 11 3AZ.



Installation note:
Renew chain tensioner.

Fix screws (1) with 10 Nm and release by 90°.

Install chain tensioner (2) and tighten.

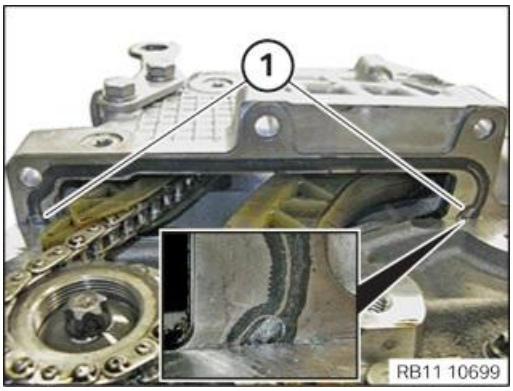
Tightening torque: 11 12 3AZ.

Remove special tool 2 285 671 .

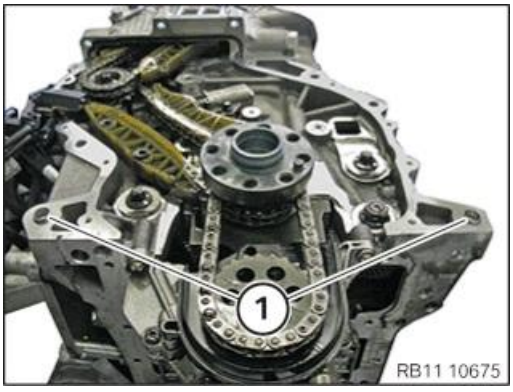
Important!

Engine is still found at 11° as per TDC.

In order to adjust the timings timing case cover and flywheel must be mounted.



If necessary remove the gasket residue at the cylinder head gasket (1).

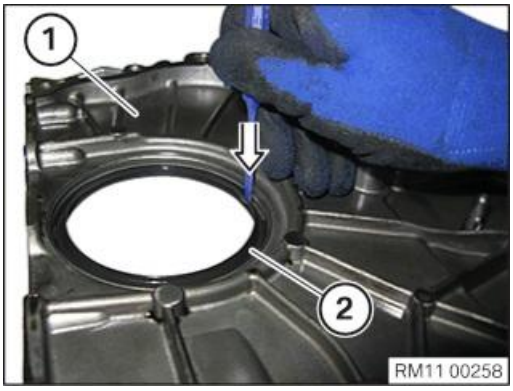


Installation note:
Fitting sleeves (1) must be exchanged.

Use the fitting sleeves with 9 millimetre length (11 22 7 557 611, refer Electronic Parts Catalogue).

Mount the fitting sleeves (1) in the crankcase at the limit position.

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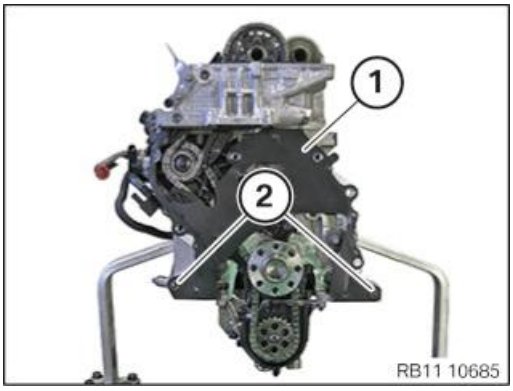


Installation note:
Mount the timing case cover without the crankshaft seal.

Support the timing case cover (1) from below.

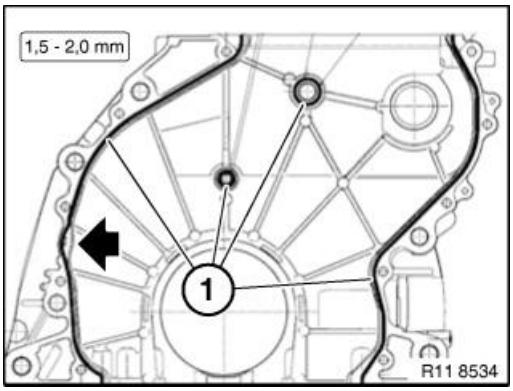
Set the inner punch in the crankshaft seal (2).

Drive the crankshaft seal (2) outwards.



Engines up to 11/2009:

Position the beaded metal gasket (1) on the fitting sleeves (2).



Engines from 11/2009:

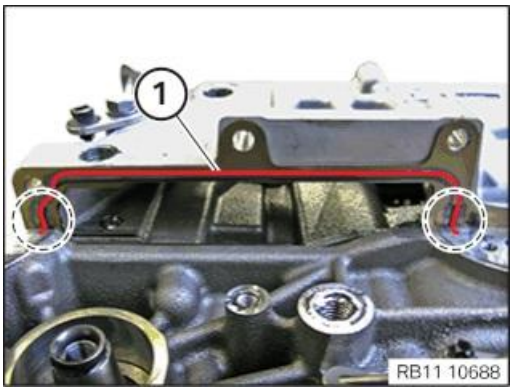
Remove gasket remnants from crankcase and timing case cover using special tool 11 4 470 .

Apply sealing bead (1) at marked points.

Installation note:
Loctite 5970, (liquid sealing compound 2.2 under consumable)

Application time of sealing bead (1) max. 12 min.

Thickness of sealing bead: **1.5 to 2.0 mm.**



All N47:

Installation note:
Loctite 5970, (liquid sealing compound 2.2 under consumable)

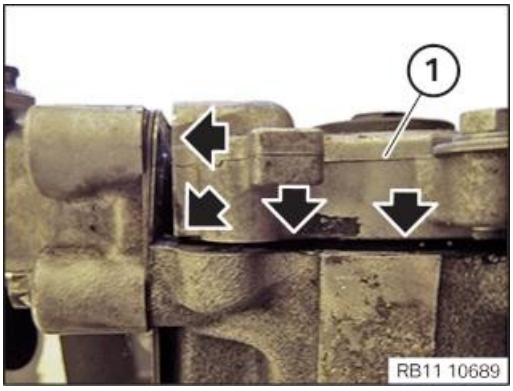
Application time of sealing bead (1) max. 12 min.

Apply sealing bead (1) as shown on the cylinder head gasket.

Thickness of sealing bead: **1.5 to 2.0 mm.**

Strength of the sealing bead on the ends (marked area): **2.5 to 3.0 mm.**

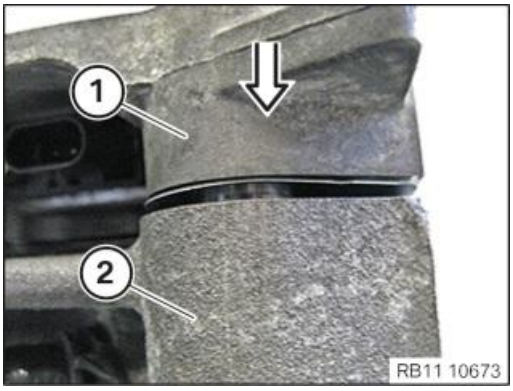
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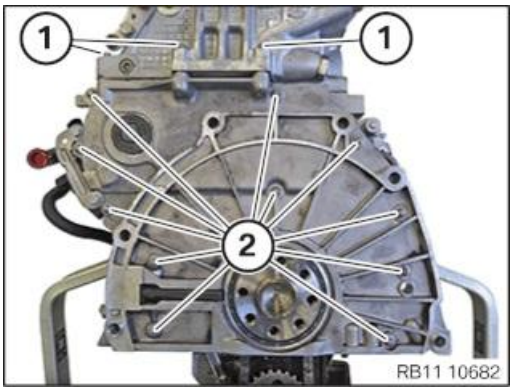
Important!

Do not shear off sealing beads.

Place the timing case cover (1) uniformly on the crankcase/cylinder head.

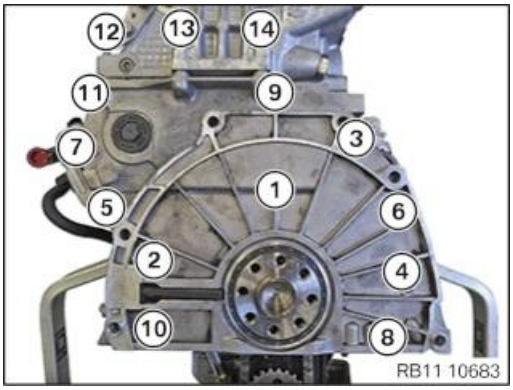


Place the timing case cover (1) on the fitting sleeves in the crankcase (2) in the center and attach with a rubber mallet in direction of arrow.



Insert screw (2) and tighten until it makes contact.

Insert bolts (1).



Installation note:
Replace screws 1 - 11.

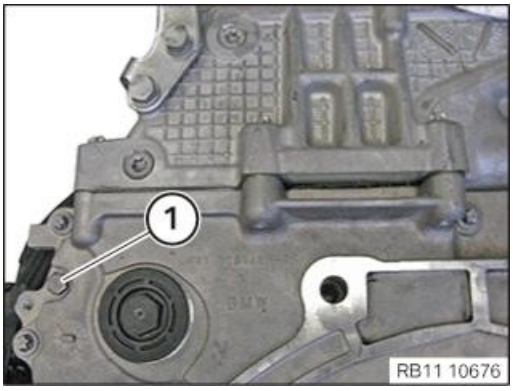
Tighten screws in the sequence **1 - 11**.

Tightening torque: 11 14 2AZ.

Tighten the screws **12 - 14**.

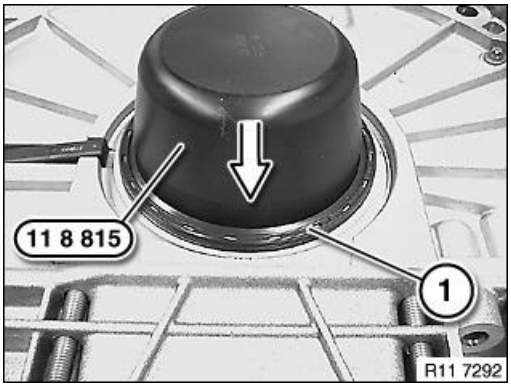
Tightening torque: 11 00 4AZ.

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Tighten the screw of the high pressure pump (if installed).

Tightening torque: 11 14 3AZ.



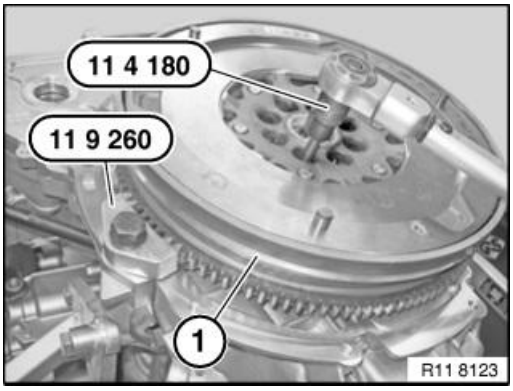
Replace crankshaft seal (1).



Attach oil sump with special tool 11 8 780 .

Position magnet wheel (1) on crankshaft.

Note:
Note the installation position of the magnet wheel.



Installation note:
Flywheel must be installed to determined TDC.

Important!

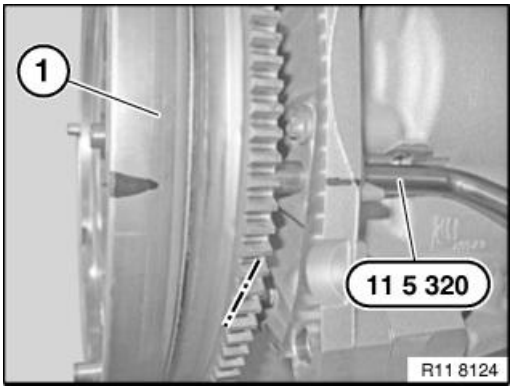
Clean thread in the crankshaft.

Replace screws.

Position flywheel.

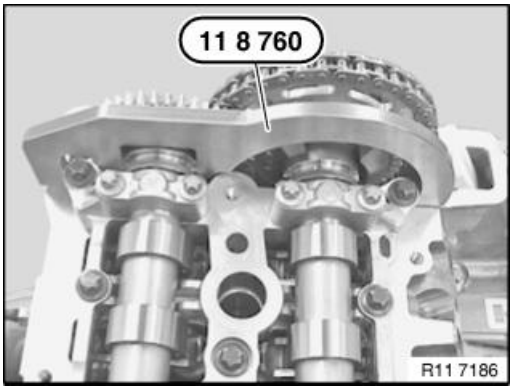
Install flywheel.

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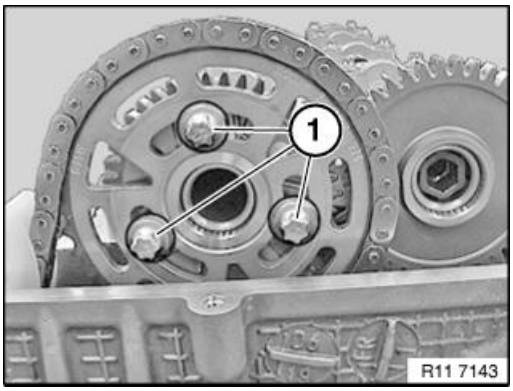


Turn back the flywheel (1) from the 11° to the OT-position.

Use special tool 11 5 320 to block the crankshaft in the TDC firing position Cylinder 1



Special tool 11 8 760 must lie flush on cylinder head.



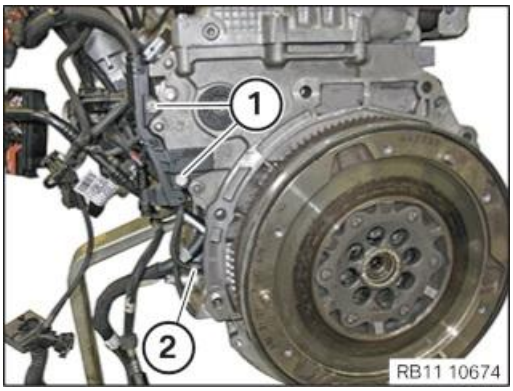
Tighten camshaft bolts (1).

Tightening torque: 11 31 1AZ.

Spin engine twice in the direction of rotation.

Check timing and if necessary correct.

Remove all special tools.



Tighten screws (1) of the wiring harness.

Tightening torque: 11 00 2AZ.

Connect the plug connection (2) of the pulse sensor of crankshaft.

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Required follow-up work:

- Install cylinder head cover
- Attach clutch if necessary
- Remove engine from assembly stand
- Install engine

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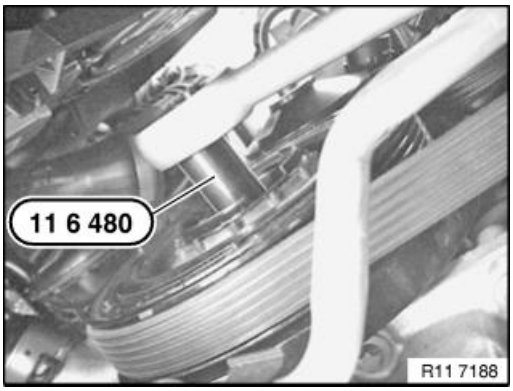
11 31 028 Replacing exhaust camshaft (N47D20 O1)

Special tools required:

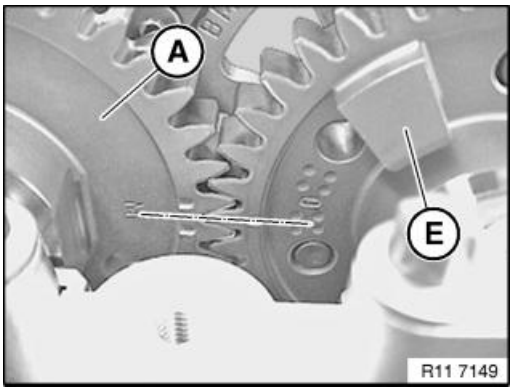
- 11 6 480

Necessary preliminary work:

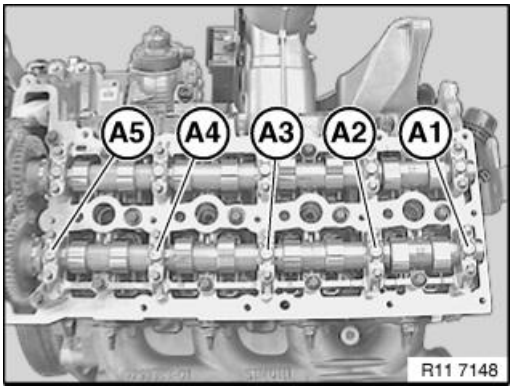
- Remove cylinder head cover.



Crank engine with special tool 11 6 480 to TDC firing position of cylinder no. 1.**Important!**
Do not turn the engine against the direction of travel.



Check position of exhaust and intake camshafts (see graphic).



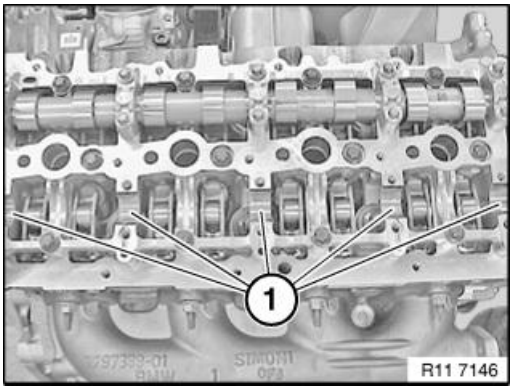
Remove exhaust camshaft.

Note:
It is not necessary to adjust the engine timing in order to remove the exhaust camshaft.

Release bearing caps A1 to A5 by 1/2 a turn at a time, working from the outside inwards.

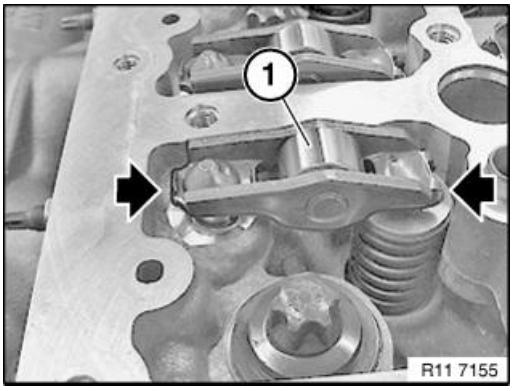
Feed exhaust camshaft upwards to remove.

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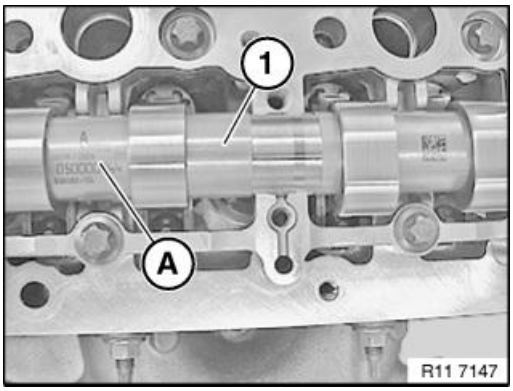


Preparation for installation:

Oil all bearing positions (1).

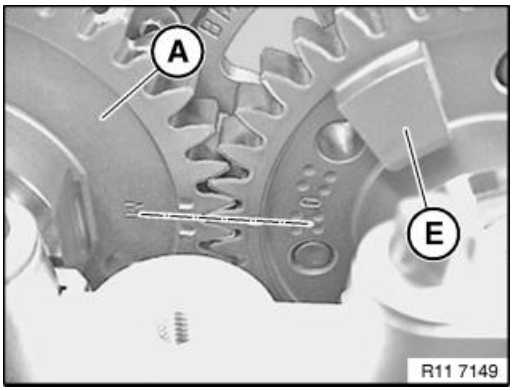


Check installation position of the roller cam followers **(risk of damage!)**.



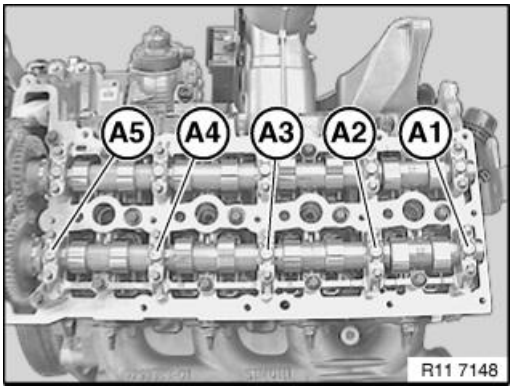
Installing exhaust camshaft.

Insert exhaust camshaft (1) marked with (A).



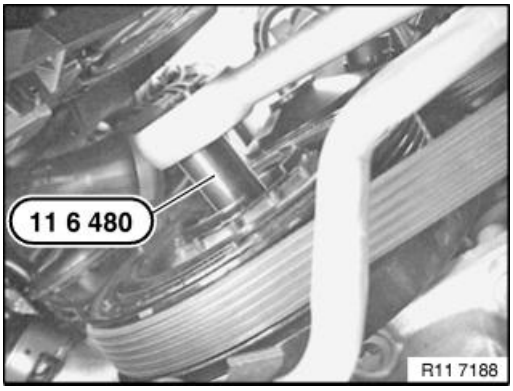
The marks on both camshafts (A and E) must agree when installing exhaust camshaft (A) (see graphic).

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Tighten bearing caps A1 to A5 by 1/2 a turn at a time on the camshaft carrier, working from the inside outwards.

Tightening torque: 11 31 2AZ.



Using special tool 11 6 480 , crank engine twice in direction of engine rotation until cylinder no.1 is back in TDC firing position.

Check camshaft adjustment.

Assemble engine.

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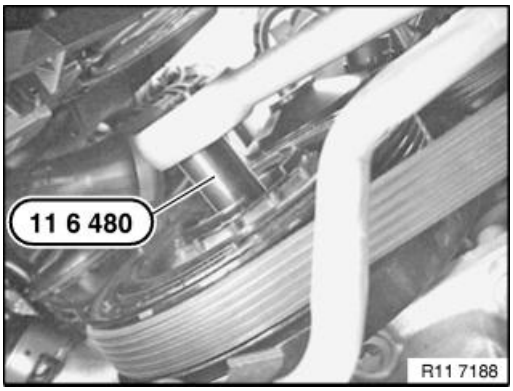
11 31 025 Replacing intake camshaft (N47 D20 O1)

Special tools required:

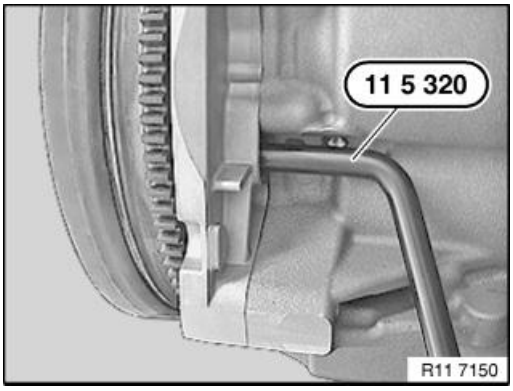
- 11 5 320
- 11 6 480
- 11 8 760

Necessary preliminary work:

- Remove cylinder head cover.

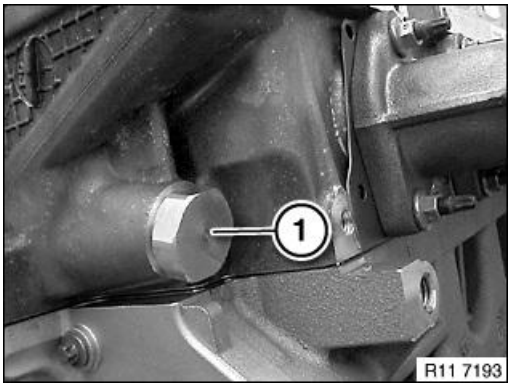


Crank engine with special tool 11 6 480 to TDC firing position of cylinder no. 1.**Important!**
Do not turn the engine against the direction of travel.



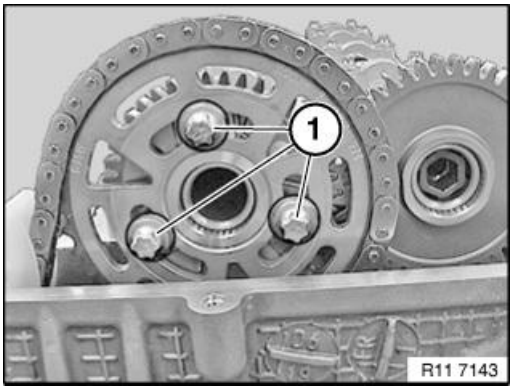
Remove protective cap of gear case cover.

Block crankshaft with cylinder no. 1 in TDC firing position with special tool 11 5 320 .



Release chain tensioner (1).

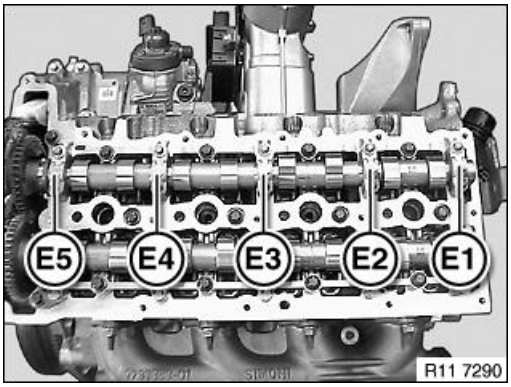
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Release screws (1).

Remove camshaft sprocket from the intake camshaft and feed out of timing chain.

Store timing chain in cylinder head.

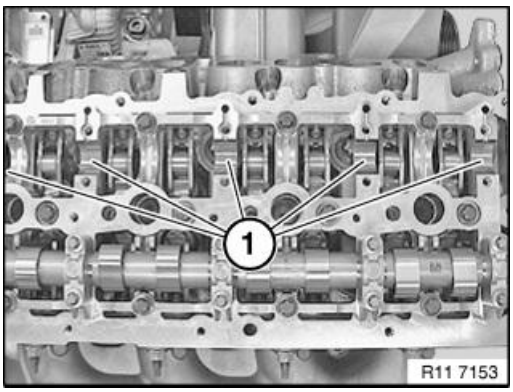


Remove intake camshaft.

Note:
It is necessary to adjust the engine timing in order to remove the intake camshaft.

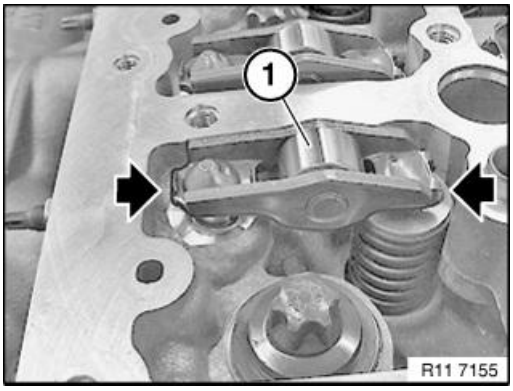
Release bearing caps E1 to E5 by 1/2 a turn at a time, working from the outside inwards.

Pull intake camshaft upwards to remove.



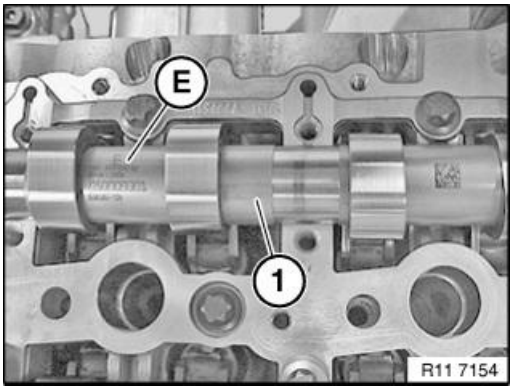
Preparation for installation:

Oil all bearing positions (1).



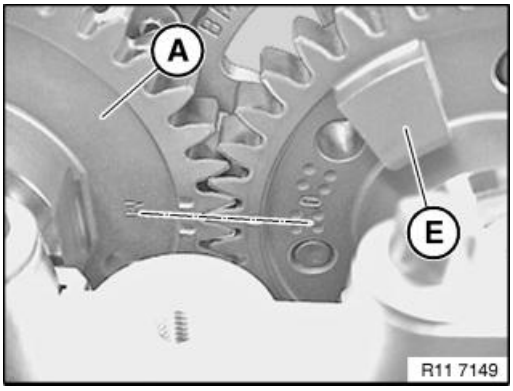
Check installation position of the roller cam followers **(risk of damage!)**.

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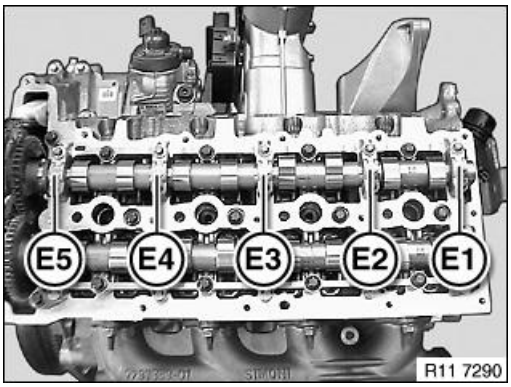


Install intake camshaft.

Install intake camshaft (1) marked with (E).

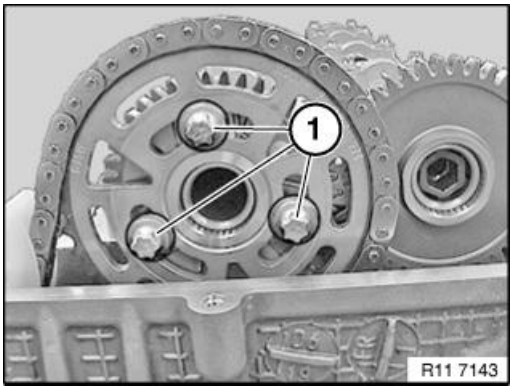


The marks on both camshafts (A and E) must agree when installing intake camshaft (E) (see graphic).



Tighten bearing caps E1 to E5 by 1/2 a turn at a time on the camshaft carrier, working from the inside outwards.

Tightening torque: 11 31 2AZ.



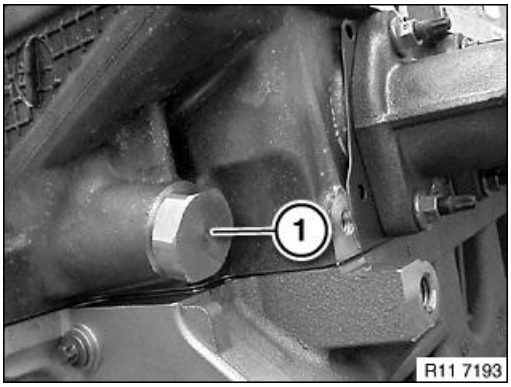
Place the camshaft sprocket with timing chain on the intake camshaft such that bolts (1) are located in the centre of the slots.

Insert bolts (1).

Tighten bolts (1) to 10 Nm.

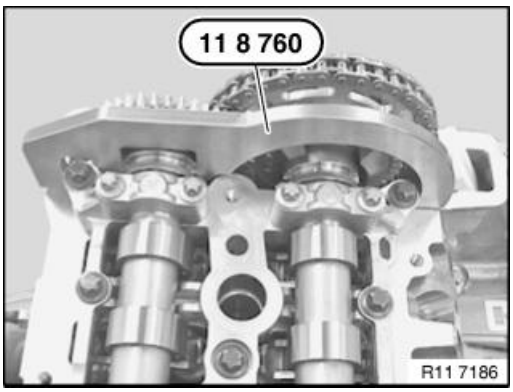
Release bolts (1) again by a 90° turn.

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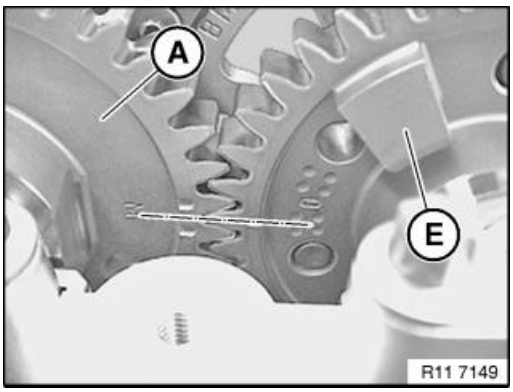


Install chain tensioner (1).

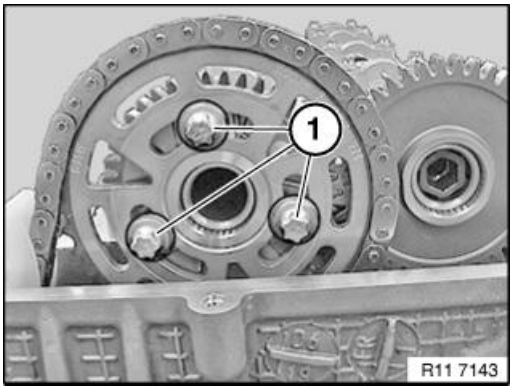
Tightening torque: 11 12 3AZ.



Place special tool 11 8 760 on exhaust camshaft.**Note:**
Special tool 11 8 760 must lie flush on cylinder head.



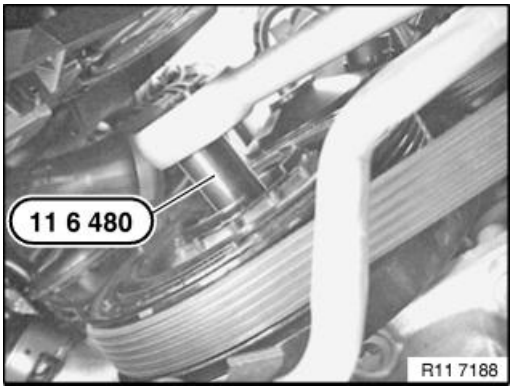
Marks on both camshafts (A and E) must agree (be aligned) (see graphic).



Tighten camshaft bolts (1).

Tightening torque: 11 31 1AZ.

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Crank engine twice in direction of rotation with special tool 11 6 480 up to TDC firing position of cylinder no. 1.

Check camshaft adjustment.

Important!

Do not crank the engine back!

Assemble engine.

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11 31 565 Replacing tensioning and guide rail of the lower timing chain (N47D K/U/OT 0/1)

Special tools required:

- 11 3 340
- 11 4 120
- 11 4 470
- 11 8 780

Follow diagnosis instruction.

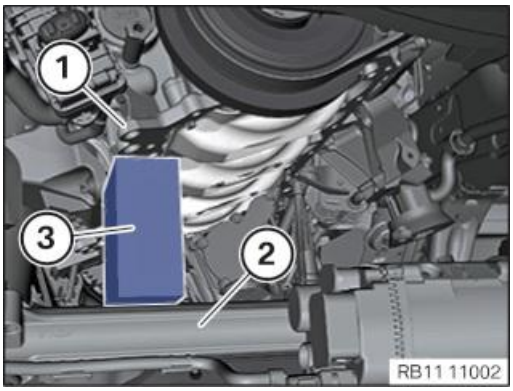
Note:
Do **not** remove engine.

Cylinder head is **not** removed.

Necessary preliminary tasks:

- Remove oil sump
- Lift and screw in front axle support.
- Screw in engine on front axle
- Remove cowl panel cover . (except for E60 / E61)
- Remove acoustic cover at rear
- Remove flywheel

Removal:



Support engine between the crankcase (1) and steering (2) with a suitable block (3).

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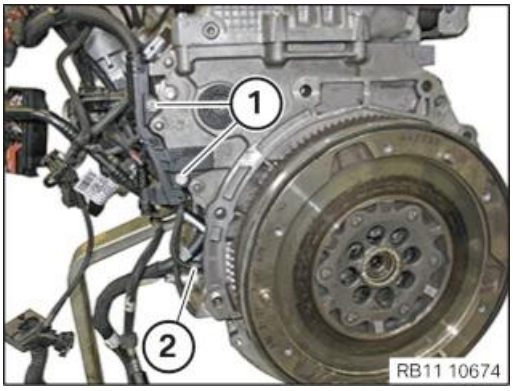


Important!

Magnet wheel (1) is magnetic.

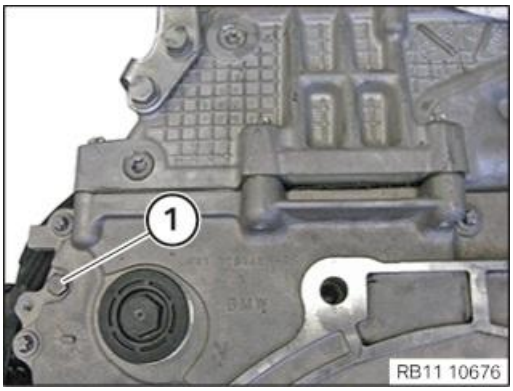
Keep magnet wheel (1) in a plastic bag away from swarf.

Remove magnet wheel (1) from crankshaft.

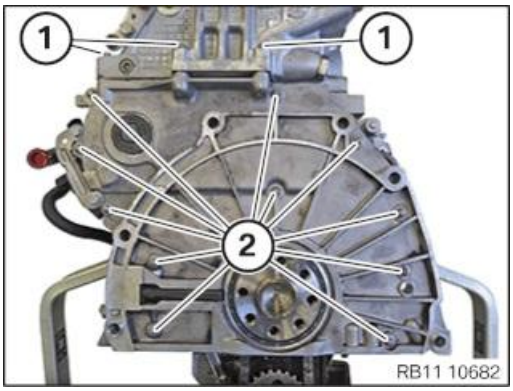


Release screws (1) of wiring harness.

Unlock plug connection (2) of the crankshaft pulse sensor and disconnect.



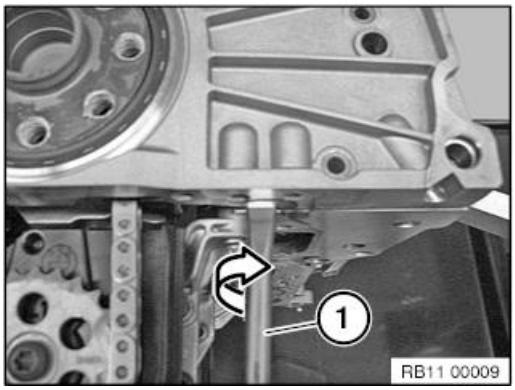
Release screw of high pressure pump (if fitted).



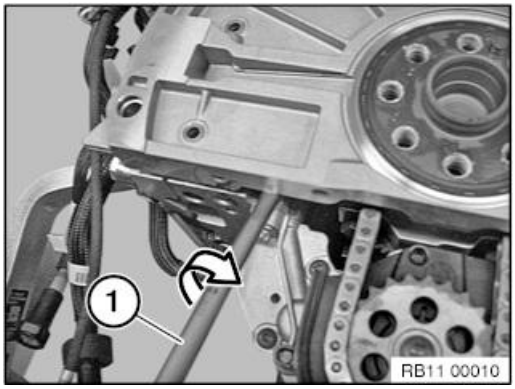
Release screws (1).

Unfasten screws (2).

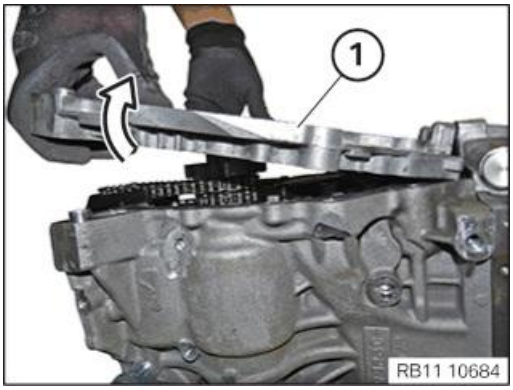
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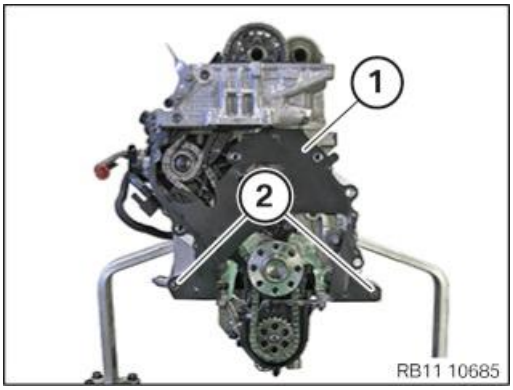
Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.



Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.



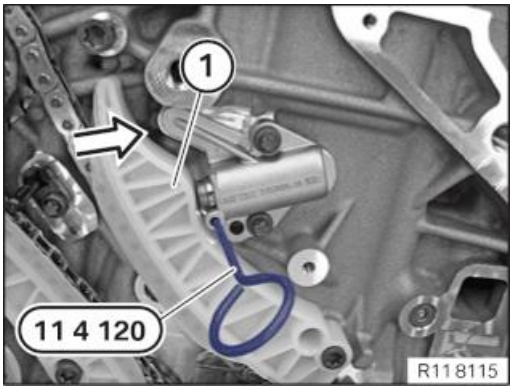
Carefully remove timing case cover (1) in direction of arrow.



On engines up to 11/2009:

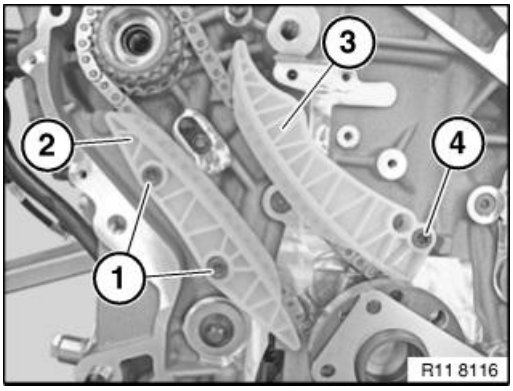
Remove beaded metal gasket (1).

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Using tensioning rail (1), press chain tensioner in direction of arrow until special tool 11 3 340 /11 4 120 can be positioned.

If necessary, remove chain tensioner.



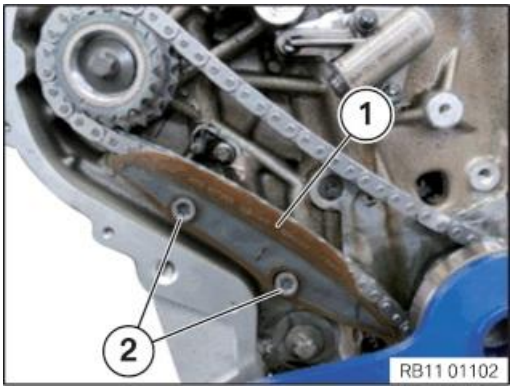
Release bearing journal (1).

Remove guide rail (2).

Release bearing journal (4).

Remove tensioning rail (3).

Installation:



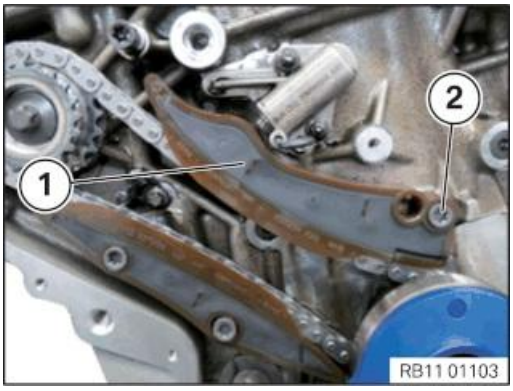
Installation note:
Clean screw thread.

Renew all bearing journals.

Position guide rail (1).

Screw in bearing journals (2).

Tightening torque: 11 11 3AZ.



Installation note:
Clean screw thread.

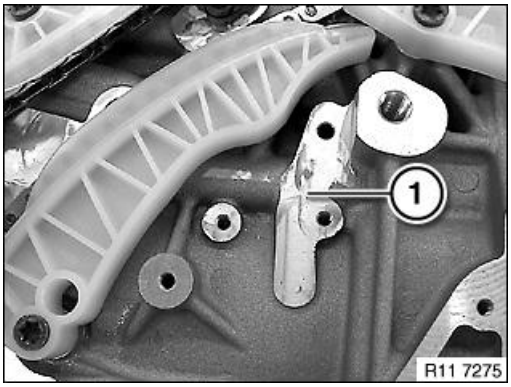
Renew all bearing journals.

Position and tighten tensioning rail (1).

Screw in and tighten bearing journal (2).

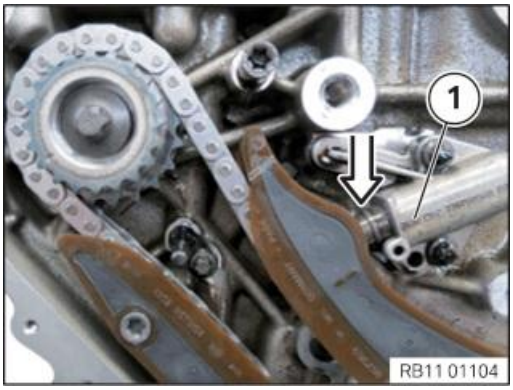
Tightening torque: 11 11 3AZ.

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Important!

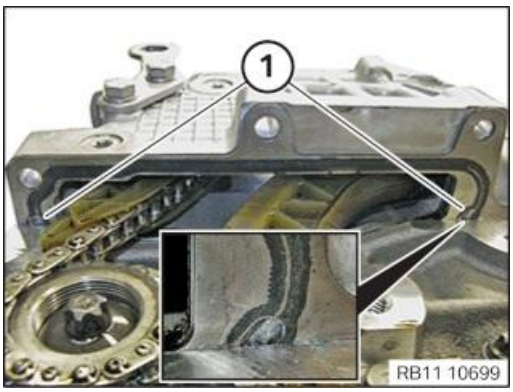
Clean sealing surfaces (1) with compressed air.



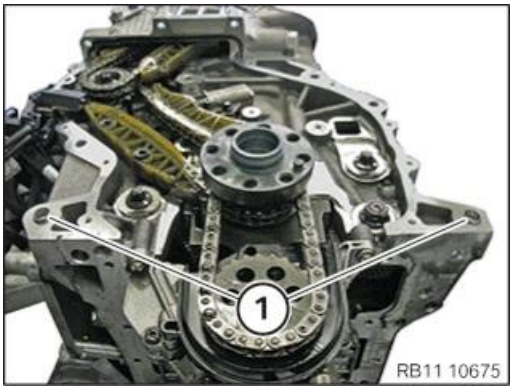
If applicable, once again screw in the hydraulic chain tensioner at the bottom (1).

Tightening torque: 11 11 4AZ .

Remove special tool 11 3 340 /11 4 120 .



If necessary remove the gasket residue at the cylinder head gasket (1).

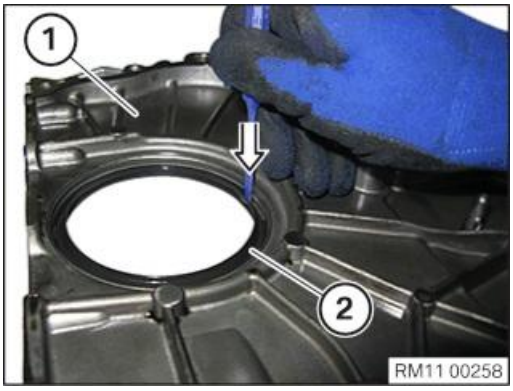


Installation note:
Fitting sleeves (1) must be exchanged.

Use the fitting sleeves with 9 millimetre length (11 22 7 557 611, refer Electronic Parts Catalogue).

Mount the fitting sleeves (1) in the crankcase at the limit position.

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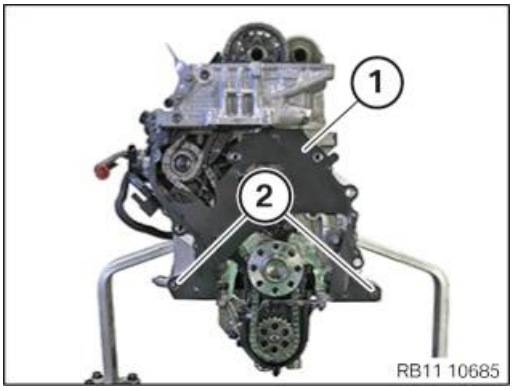


Installation note:
Mount the timing case cover without the crankshaft seal.

Support the timing case cover (1) from below.

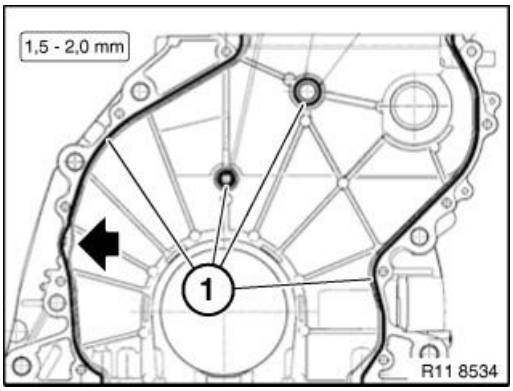
Set the inner punch in the crankshaft seal (2).

Drive the crankshaft seal (2) outwards.



Engines up to 11/2009:

Position the beaded metal gasket (1) on the fitting sleeves (2).



Engines from 11/2009:

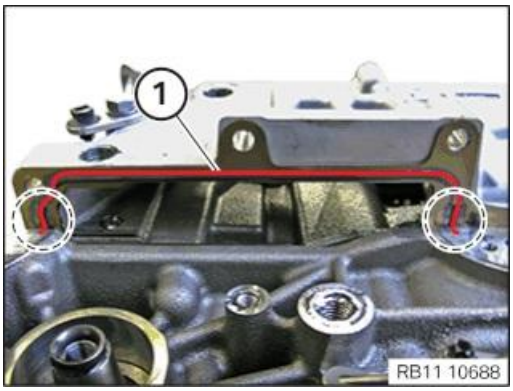
Remove gasket remnants from crankcase and timing case cover using special tool 11 4 470 .

Apply sealing bead (1) at marked points.

Installation note:
Loctite 5970, (liquid sealing compound 2.2 under consumable)

Application time of sealing bead (1) max. 12 min.

Thickness of sealing bead: **1.5 to 2.0 mm.**



All N47:

Installation note:
Loctite 5970, (liquid sealing compound 2.2 under consumable)

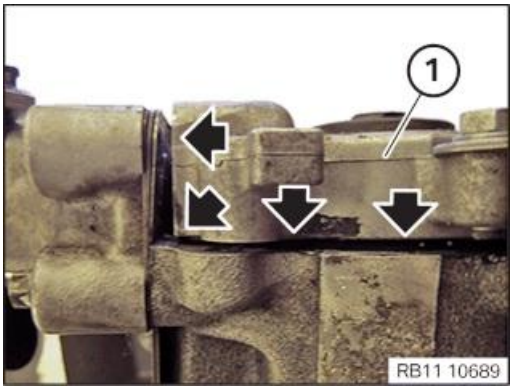
Application time of sealing bead (1) max. 12 min.

Apply sealing bead (1) as shown on the cylinder head gasket.

Thickness of sealing bead: **1.5 to 2.0 mm.**

Strength of the sealing bead on the ends (marked area): **2.5 to 3.0 mm.**

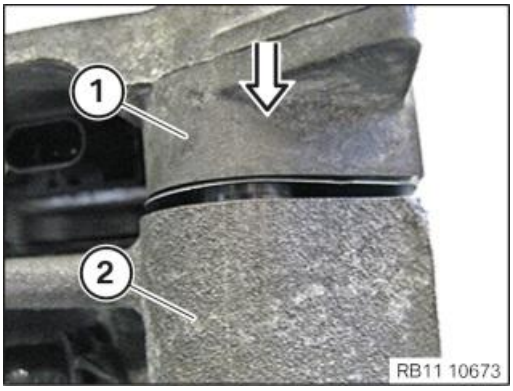
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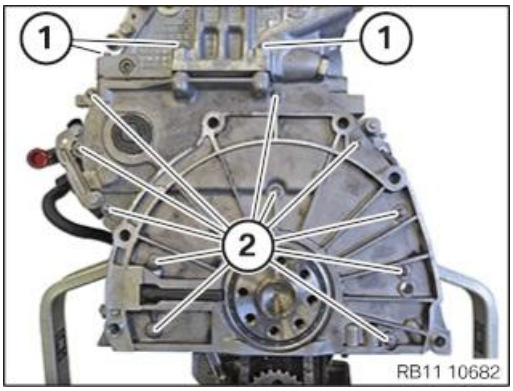
Important!

Do not shear off sealing beads.

Place the timing case cover (1) uniformly on the crankcase/cylinder head.

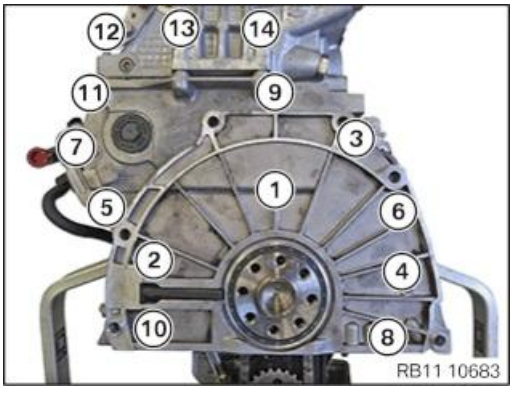


Place the timing case cover (1) on the fitting sleeves in the crankcase (2) in the center and attach with a rubber mallet in direction of arrow.



Insert screw (2) and tighten until it makes contact.

Insert bolts (1).



Installation note:
Replace screws 1 - 11.

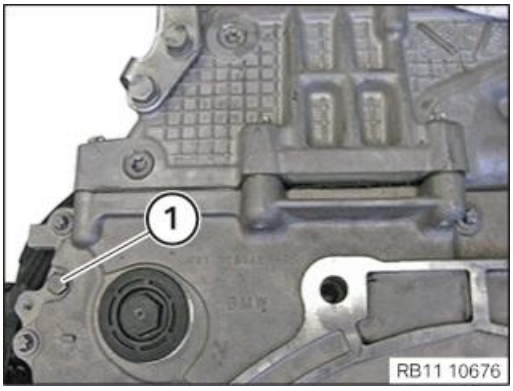
Tighten screws in the sequence **1 - 11**.

Tightening torque: 11 14 2AZ.

Tighten the screws **12 - 14**.

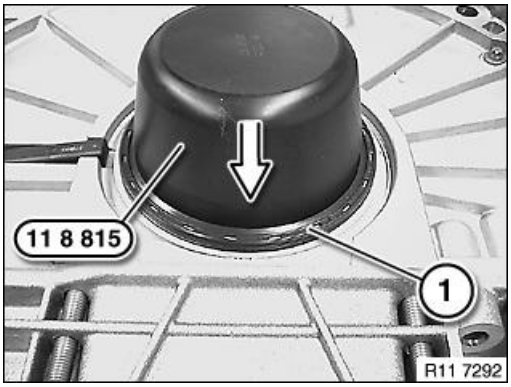
Tightening torque: 11 00 4AZ.

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Tighten the screw of the high pressure pump (if installed).

Tightening torque: 11 14 3AZ.



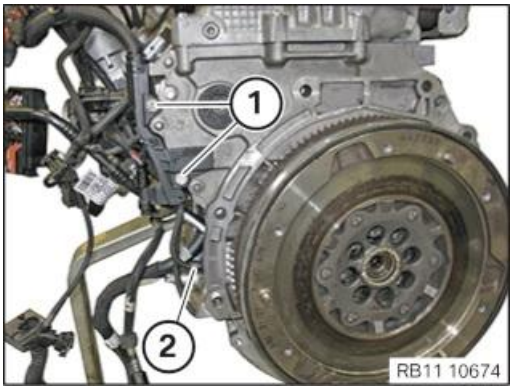
Replace crankshaft seal (1).



Attach oil sump with special tool 11 8 780 .

Position magnet wheel (1) on crankshaft.

Note:
Note the installation position of the magnet wheel.



Tighten screws (1) of the wiring harness.

Tightening torque: 11 00 2AZ.

Connect the plug connection (2) of the pulse sensor of crankshaft.

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Required follow-up work:

- Installing the flywheel
- Install clutch if necessary
- Install the transmission
- Install oil sump
- Install cowl panel cover. (except for E60 / E61)
- Install acoustic covers at the rear

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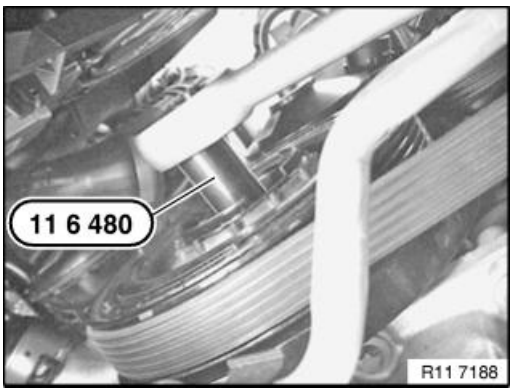
11 33 062 Removing and installing/replacing all hydraulic valve clearance compensating elements (N47 D20 O1)

Special tools required:

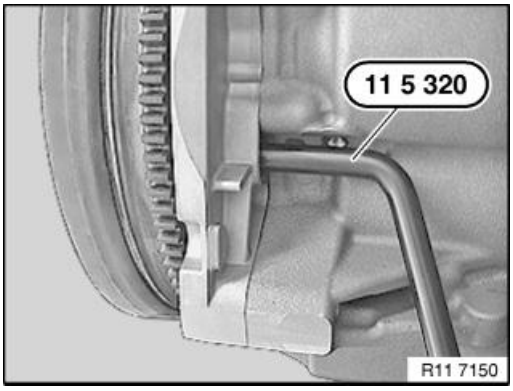
- 11 4 480
- 11 5 320
- 11 6 480

Necessary preliminary work:

- Remove cylinder head cover.

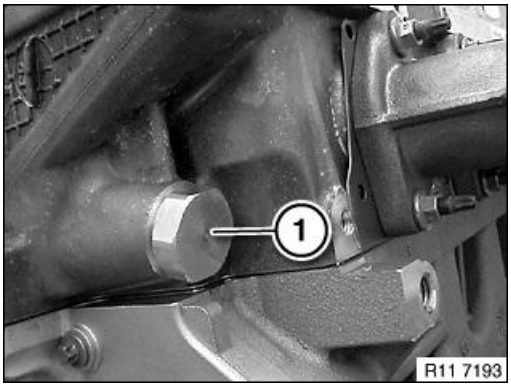


Use special tool11 6 480 to turn engine to TDC firing position of cylinder 1.**Important!**
Do not turn the engine against the direction of travel.



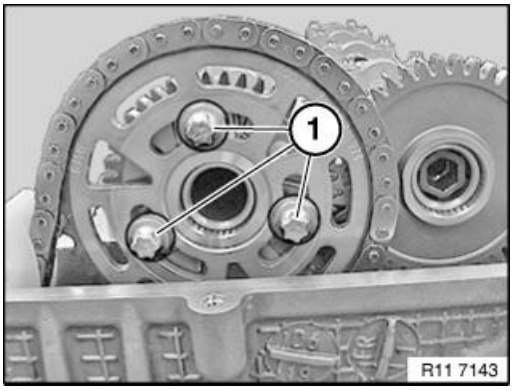
Remove protective cap of gear case cover.

Block crankshaft with cylinder no. 1 in TDC firing position with special tool11 5 320 .



Release chain tensioner (1).

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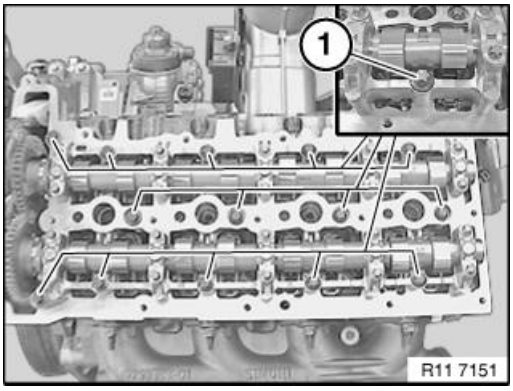


Release screws (1) on camshaft sprocket.

Remove camshaft sprocket from intake camshaft.

Pull camshaft sprocket out of timing chain and place it neatly on the special tool 11 4 480 .

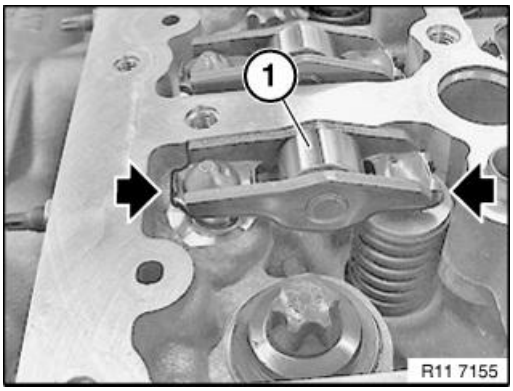
Place timing chain at the cylinder head.



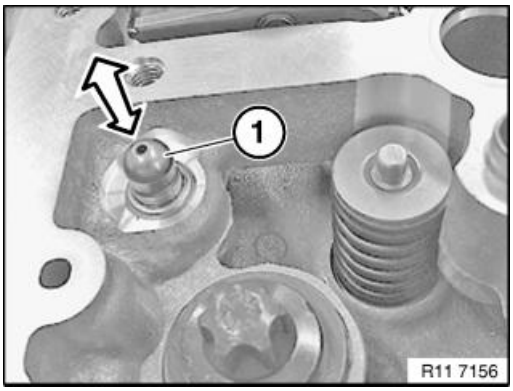
Note:
Both camshafts can be removed with the camshaft carrier.

Release all bolts (1) from outside inwards.

Take off camshaft carrier by lifting it upwards.



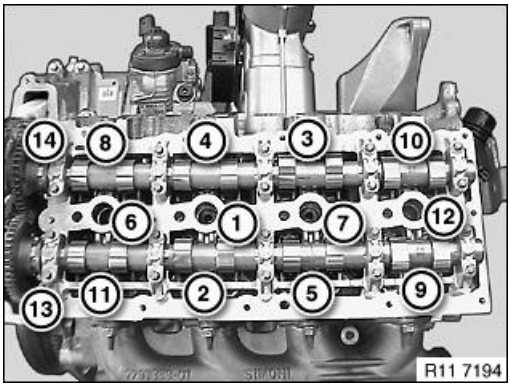
Set down all rocker arms (1) on special tool 11 4 480 in neat order.*Installation note:*
Already used rocker arms may be reused only in the same position.



Remove valve clearance compensating element (1) in direction of arrow.*Installation note:*
If reusing valve clearance compensating elements (1), store them in an orderly fashion on special tool 11 4 480 .

Reuse valve clearance compensating elements in the same positions.

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Installation note:
Make sure roller cam followers are in correct installation positions.

Place camshaft carrier on cylinder head.

Tighten bolts in sequence (1 to 14).

Tightening torque: 11 31 3AZ.

Note:
Picture shows N47.

Adjust valve timing.

Assemble engine.

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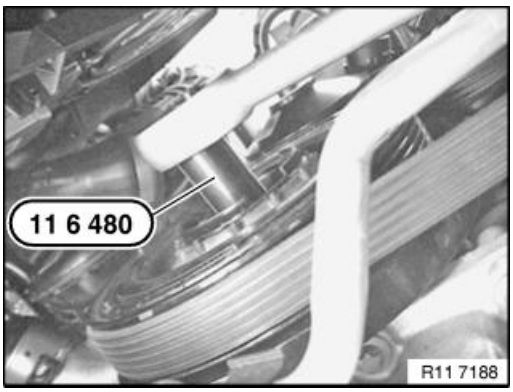
11 33 062 Removing and installing/replacing all hydraulic valve clearance compensating elements (N47, N47S)

Special tools required:

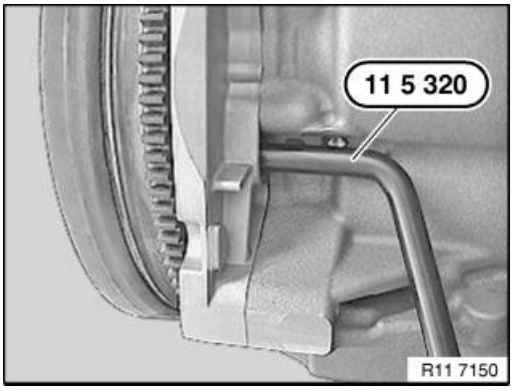
- 11 4 480
- 11 5 320
- 11 6 480

Necessary preliminary tasks:

- Remove cylinder head cover.

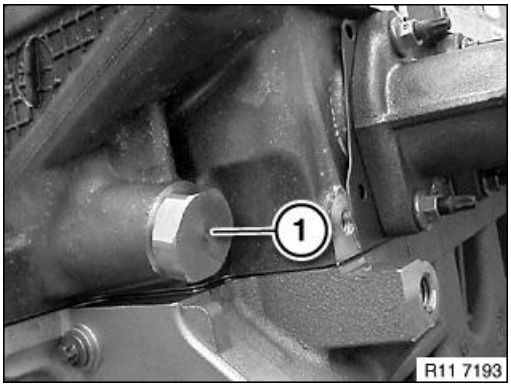


Crank engine with special tool 11 6 480 to TDC firing position of cylinder no. 1.**Important!**
Do not crank the engine back!



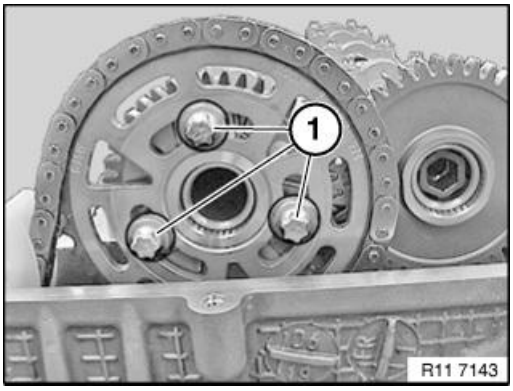
Remove protective cap of gear case cover.

Block crankshaft in firing TDC position of cylinder no. 1 with special tool 11 5 320 .



Release chain tensioner (1).

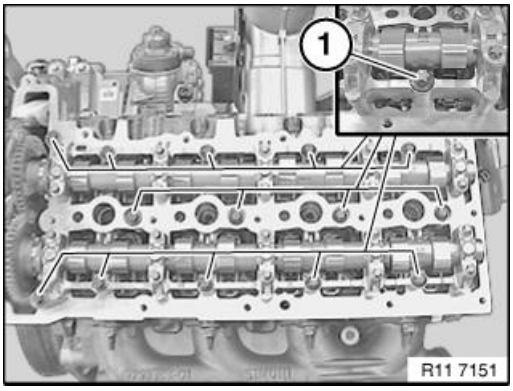
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Release screws (1).

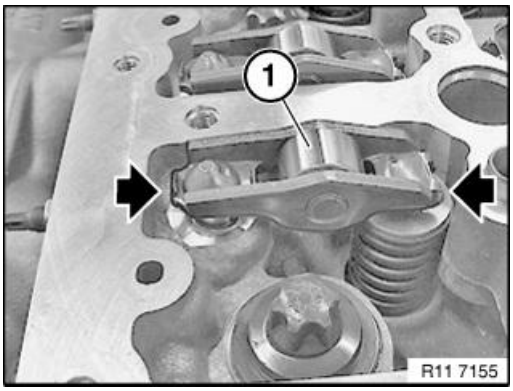
Remove camshaft sprockets from camshaft and feed out of timing chain.

Place timing chain in cylinder head.

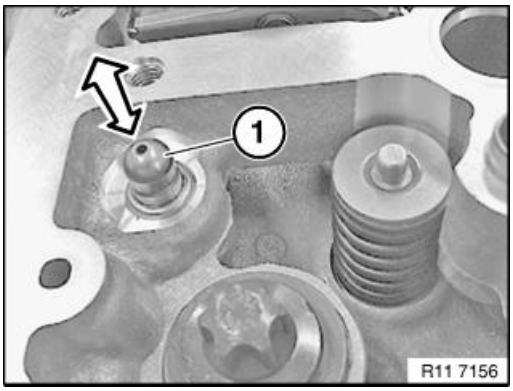


Note:
Both camshafts can be removed with the camshaft carrier.

Release all bolts (1) from outside inwards.



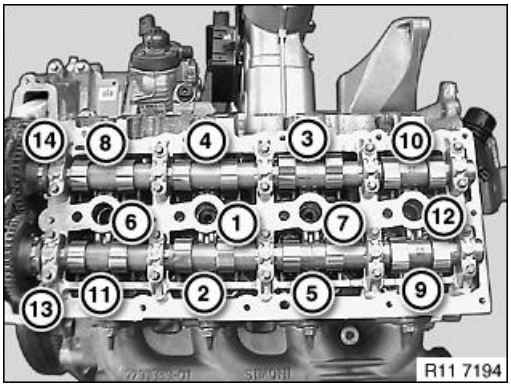
Set down all rocker arms (1) on special tool 11 4 480 in neat order.*Installation note:*
Already used rocker arms may be reused only in the same position.



Remove valve clearance compensating element (1) in direction of arrow.*Installation note:*
If reusing valve clearance compensating elements (1), set down in an orderly fashion in special tool 11 4 480 .

Reuse valve clearance compensating elements in the same position.

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Installation note:
Make sure roller cam followers are in correct installation positions.

Place camshaft carrier on cylinder head.

Tighten bolts in sequence (1 to 14).

Tightening torque: 11 31 3AZ.

Adjust valve timing.

Assemble engine.

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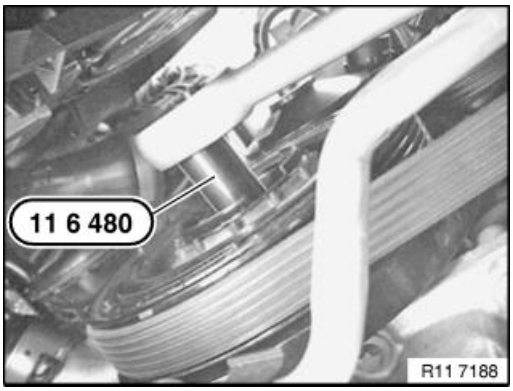
11 33 062 Removing and installing/replacing all rocker arms (N47 D20 O1)

Special tools required:

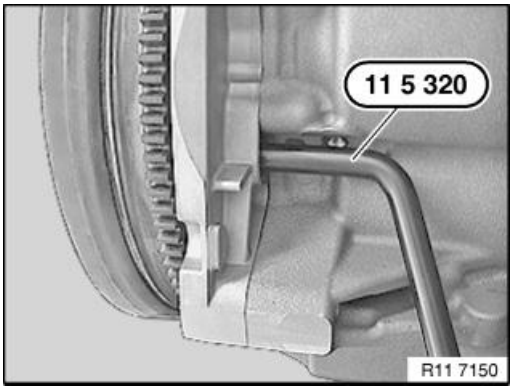
- 11 4 480
- 11 5 320
- 11 6 480

Necessary preliminary work:

- Remove cylinder head cover.

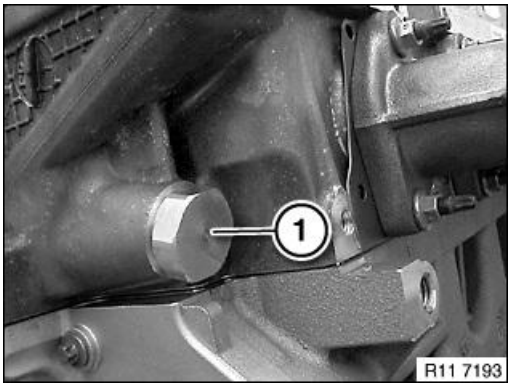


Crank engine with special tool 11 6 480 to TDC firing position of cylinder no. 1.**Important!**
Do not turn the engine against the direction of travel.



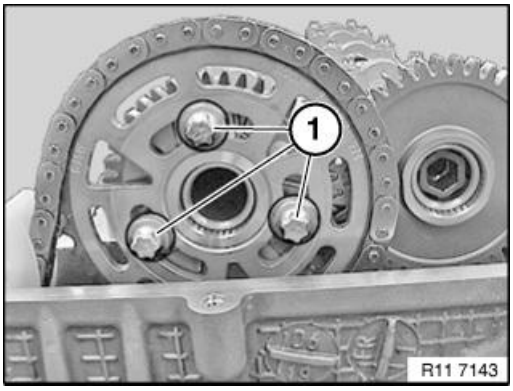
Remove protective cap of gear case cover.

Block crankshaft with cylinder no. 1 in TDC firing position with special tool 11 5 320 .



Release chain tensioner (1).

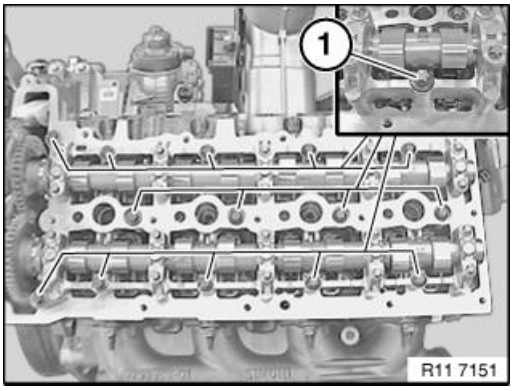
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Release screws (1).

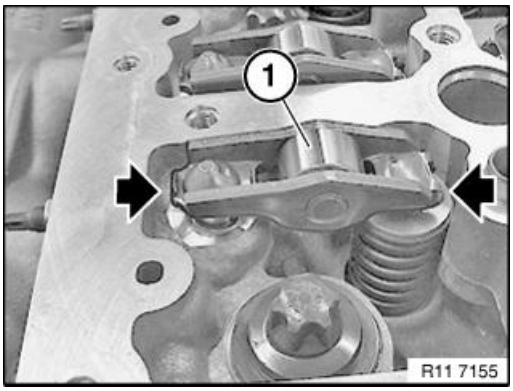
Remove camshaft sprocket from the intake camshaft and feed out of timing chain.

Place timing chain at the cylinder head.

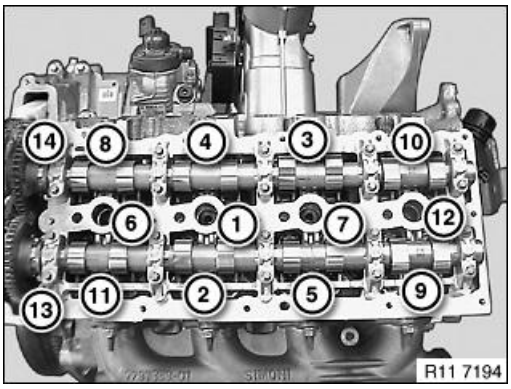


Note:
Both camshafts can be removed with the camshaft carrier.

Release all bolts (1) from outside inwards.



Set down all rocker arms (1) on special tool 11 4 480 in neat order.*Installation note:*
Already used rocker arms (1) may only be reused in the same position.



Installation note:
Make sure roller cam followers are in correct installation positions.

Place camshaft carrier on cylinder head.

Tighten bolts in sequence (1 to 14).

Tightening torque: 11 31 3AZ.

Adjust valve timing.

Assemble engine.

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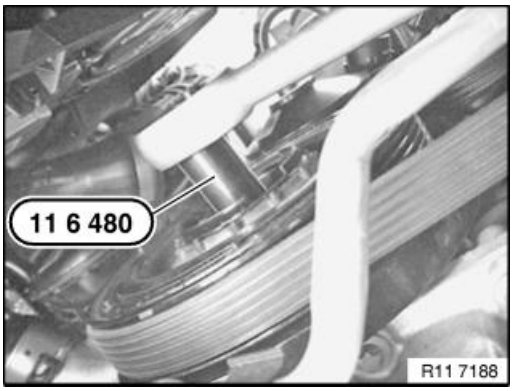
11 33 062 Removing and installing/replacing all rocker arms (N47, N47S)

Special tools required:

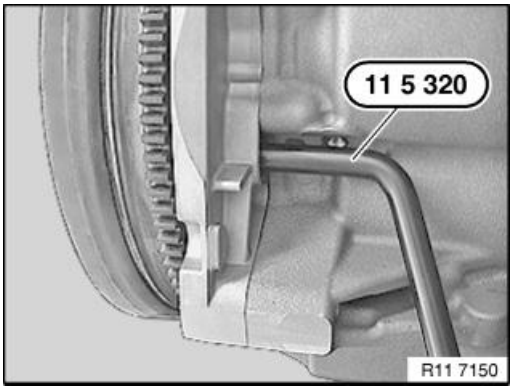
- 11 4 480
- 11 5 320
- 11 6 480

Necessary preliminary tasks:

- Remove cylinder head cover.

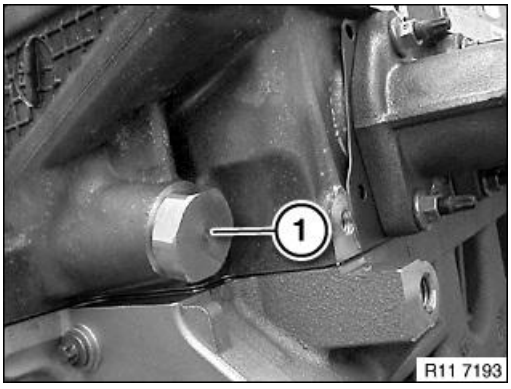


Crank engine with special tool 11 6 480 to TDC firing position of cylinder no. 1.**Important!**
Do not crank the engine back!



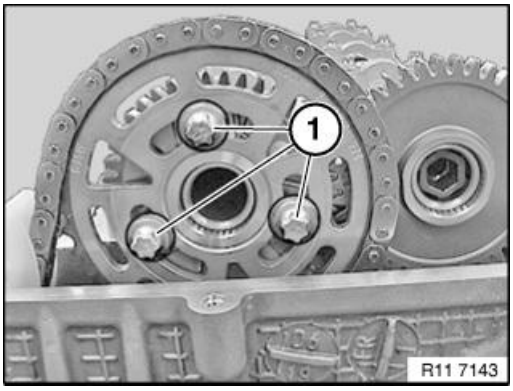
Remove protective cap of gear case cover.

Block crankshaft with special tool 11 5 320 in firing TDC position for cylinder 1.



Release chain tensioner (1).

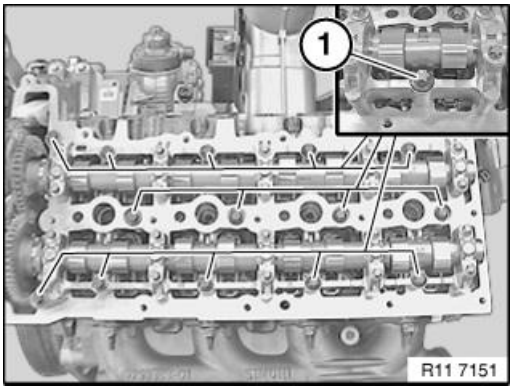
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Release screws (1).

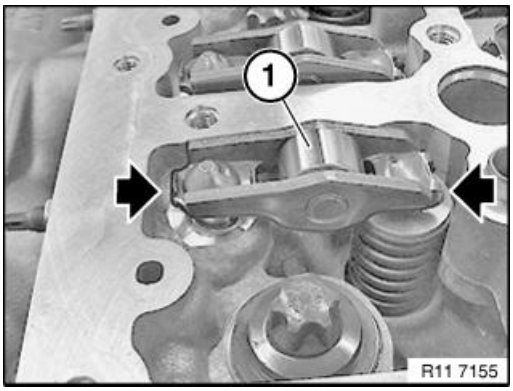
Remove camshaft sprockets from camshaft and feed out of timing chain.

Place timing chain in cylinder head.

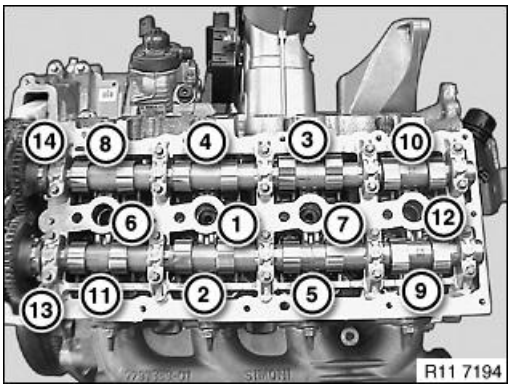


Note:
Both camshafts can be removed with the camshaft carrier.

Release all bolts (1) from outside inwards.



Set down all rocker arms (1) on special tool 11 4 480 in neat order.*Installation note:*
Already used rocker arms (1) may only be reused in the same position.



Installation note:
Make sure roller cam followers are in correct installation positions.

Place camshaft carrier on cylinder head.

Tighten bolts in sequence (1 to 14).

Tightening torque: 11 31 3AZ.

Adjust valve timing.

Assemble engine.

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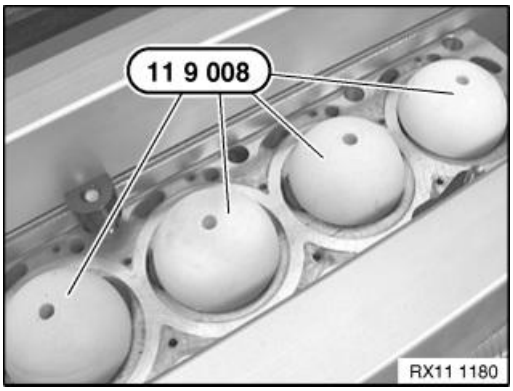
11 34 715 Replacing all valve springs (N47 D20 O1)

Special tools required:

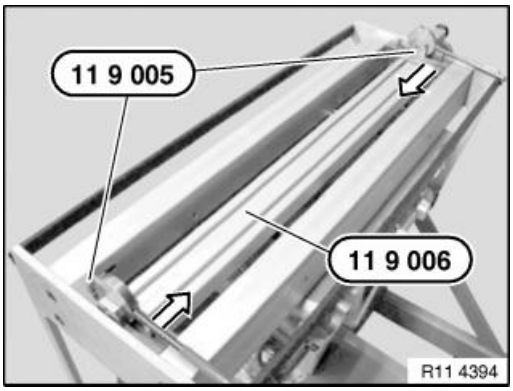
- 11 4 480
- 11 8 840
- 11 9 000
- 11 9 001
- 11 9 005
- 11 9 006
- 11 9 008
- 11 9 009
- 11 9 011

Necessary preliminary work:

- Remove cylinder head.
- Place cylinder head on special tool 11 9 001 .

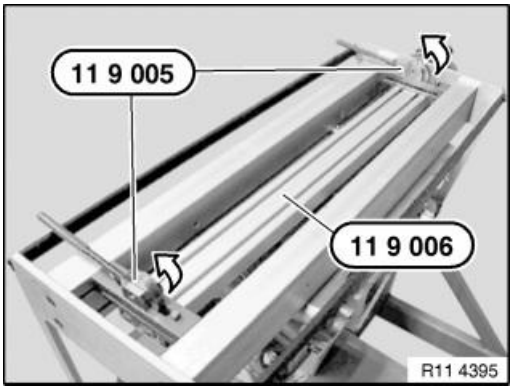


Position special tool 11 9 008 with straight surface on the cylinder head (see illustration).*Note:*
Procedure for all 4-, -6- and 8-cylinder diesel engines.



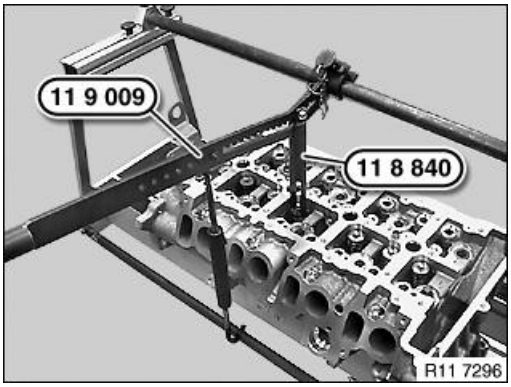
Insert special tool 11 9 006 and lock with special tool 11 9 005 in direction of arrow.

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Lock special tool 11 9 005 in direction of arrow.

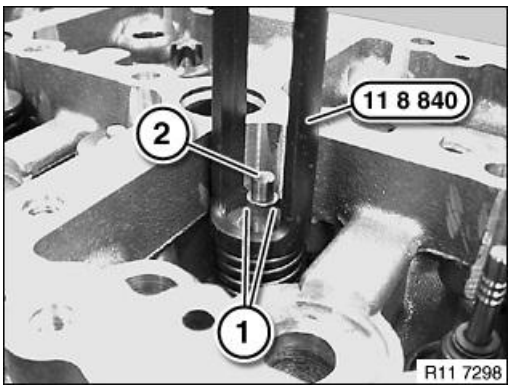
Rotate cylinder head, using special tool 11 9 000 , 180° into installation position.



Align special tool 11 9 009 in direction of valve axis. Select corresponding groove with special tool 11 8 840 .

Press down valve spring on upper spring cup with special tool 11 9 009 .

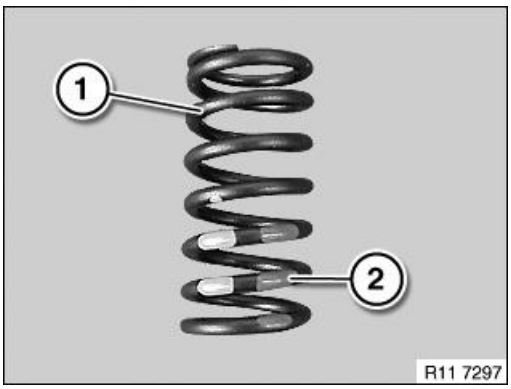
Hook in with special tool 11 9 011 .



Use a magnet to remove valve keys (1) from valve (2).

Remove valve spring and spring cup.

Place down valve springs and valve keys on special tool 11 4 480 in an orderly manner.



Check colour code of valve spring (1).

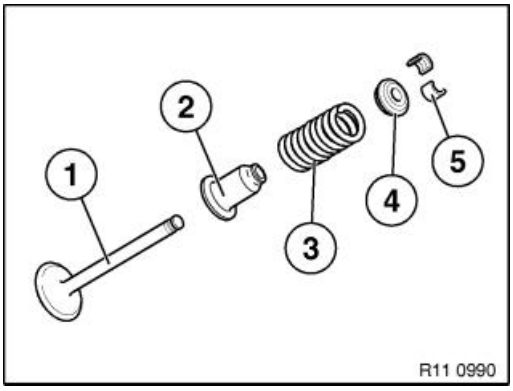
The colour (2) on the valve spring is important for allocation purposes.

Possible colour sets:

- Yellow - orange
- Green - orange
- Blue - orange

The installation position of the valve spring can be freely selected.

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Installation sequence:

1. Valve
2. Valve stem seal
3. Valve spring
4. Top spring cup
5. Valve keys

If necessary, replace valve stem seals.
Assemble engine.

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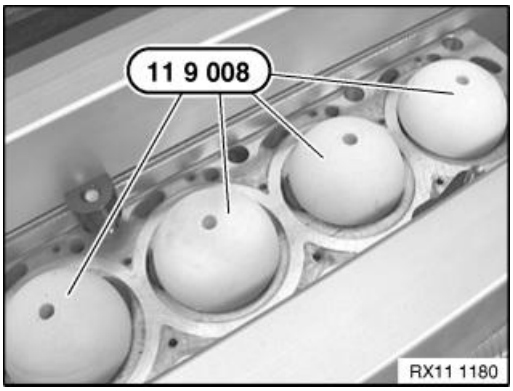
11 34 715 Replacing all valve springs (N47, N47S)

Special tools required:

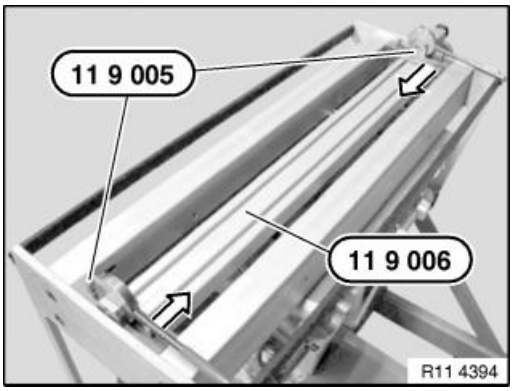
- 11 4 480
- 11 8 840
- 11 9 000
- 11 9 001
- 11 9 005
- 11 9 006
- 11 9 008
- 11 9 009
- 11 9 011

Necessary preliminary tasks:

- Remove cylinder head.
- Place cylinder head on special tool 11 9 001 .

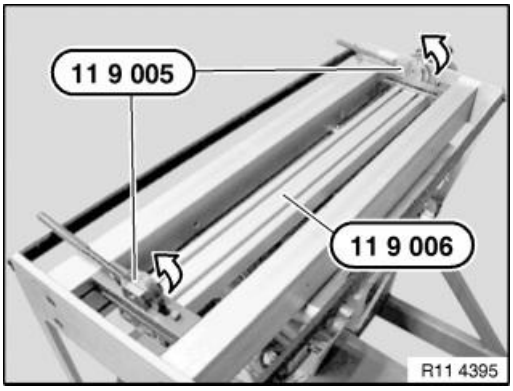


Position special tool 11 9 008 with straight surface on combustion chamber side of cylinder head (see illustration).*Note:*
Procedure for all 4-, -6- and 8-cylinder diesel engines.



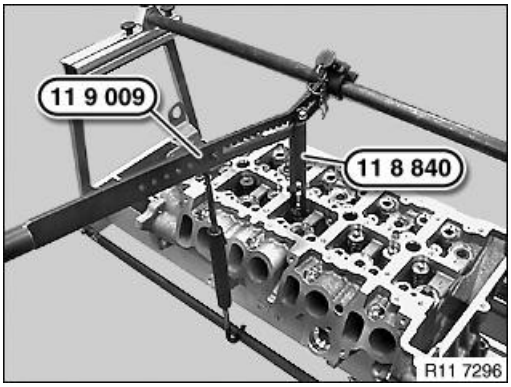
Insert special tool 11 9 006 and lock with special tool 11 9 005 in direction of arrow.

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Lock special tool 11 9 005 in direction of arrow.

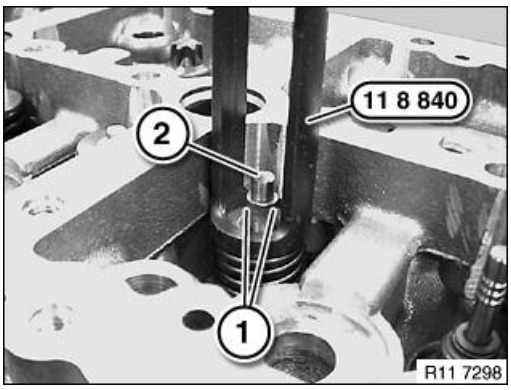
Rotate cylinder head, using special tool 11 9 000 , 180° into installation position.



Align special tool 11 9 009 in direction of valve axis. Select corresponding groove in special tool 11 8 840 .

Press down valve spring on upper spring cup with special tool 11 9 009 .

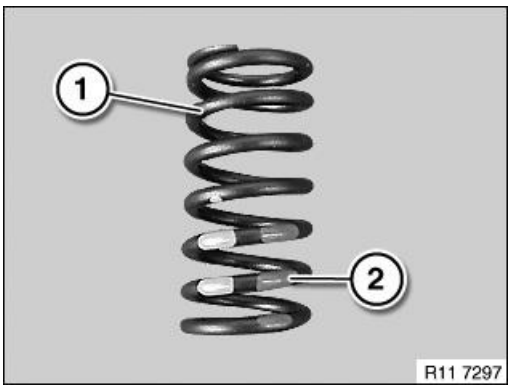
Hook in with special tool 11 9 011 .



Use a magnet to remove valve keys (1) from valve (2).

Remove valve spring and spring cup.

Place down valve springs and valve keys on special tool 11 4 480 in an orderly manner.



Check colour code of valve spring (1).

The colour (2) on the valve spring is important for allocation purposes.

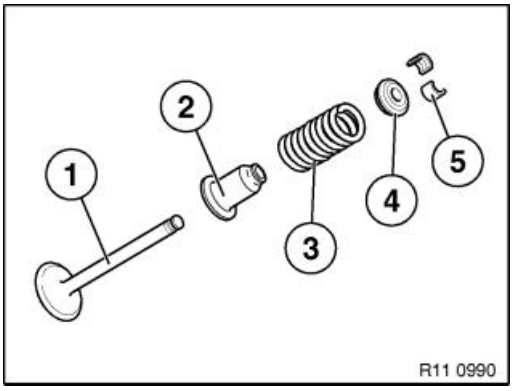
Only valve springs with the colour (2) **orange** may be installed in the N47 engine.

Possible colour sets:

- Yellow - orange
- Green - orange
- Blue - orange

The installation position of the valve spring can be freely selected.

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installation sequence:

1. Valve
2. Valve stem seal
3. Valve spring
4. Top spring cup
5. Valve keys

If necessary, replace valve stem seals.
Assemble engine.

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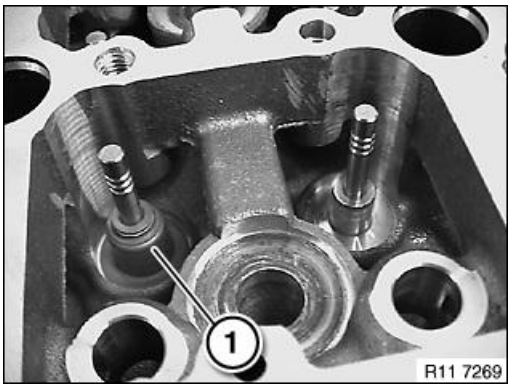
11 34 560 Replacing all valve stem seals (N47 D20 O1)

Special tools required:

- 11 1 480
- 11 6 380

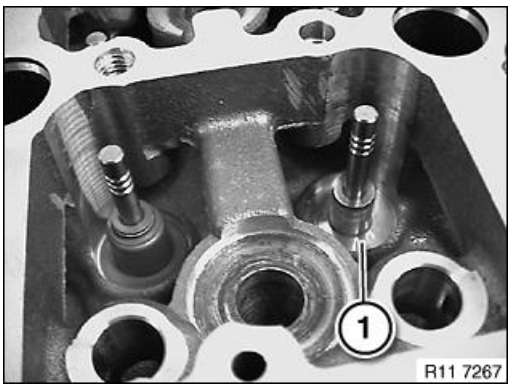
Necessary preliminary work:

- Remove cylinder head.
- Remove all valve springs.

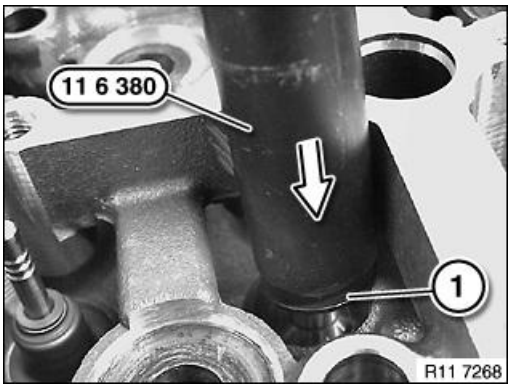


Tap open valve stem seal (1) with special tool 11 1 480 or with a size 13 or 14 hexagon bit.

Remove valve stem seal (1) with a twisting and pulling action.



Installation note:
The contact surface (1) must be clean.



Installation note:
Before installing the valve stem seals, the protective grommet must be fitted on the valve stem **Risk of damage!** to the sealing lip!

Press on valve stem seal (1) to stop using special tool 11 6 380 in direction of arrow.

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Assemble engine.

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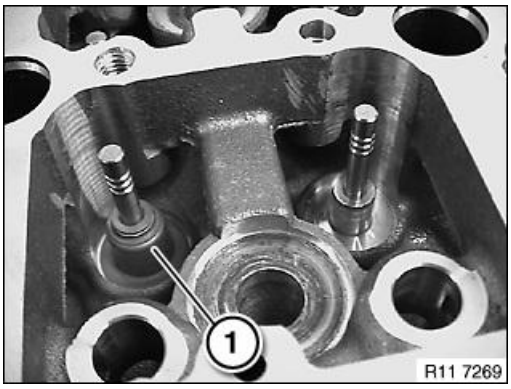
11 34 560 Replacing all valve stem seals (N47, N47S)

Special tools required:

- 11 1 480
- 11 6 380

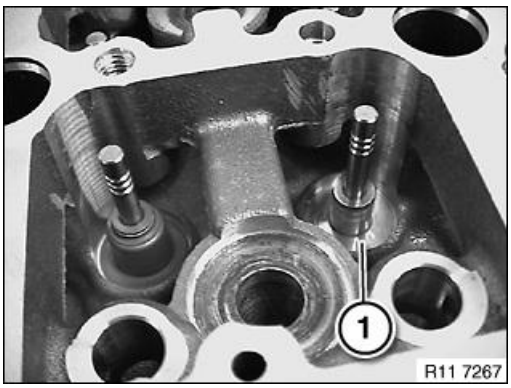
Necessary preliminary tasks:

- Remove cylinder head.
- Remove all valve springs.

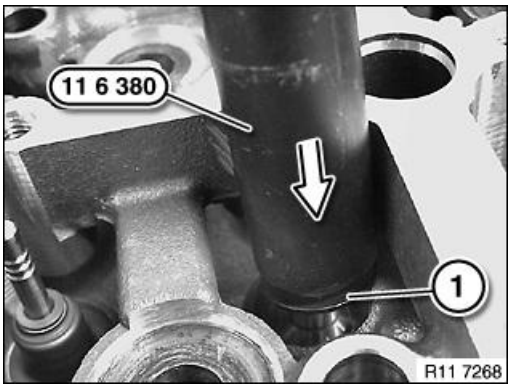


Tap open valve stem seal (1) with special tool 11 1 480 or with a size 13 or 14 hexagon bit.

Remove valve stem seal (1) with a twisting and pulling action.



Installation note:
The contact surface (1) must be clean.



Installation note:
Before installing the valve stem seals, the protective grommet must be fitted on the valve stem **Risk of damage!** to the sealing lip!

Press on valve stem seal (1) to stop using special tool 11 6 380 in direction of arrow.

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Assemble engine.

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11 40 000 Checking engine oil pressure (N47, N47S)

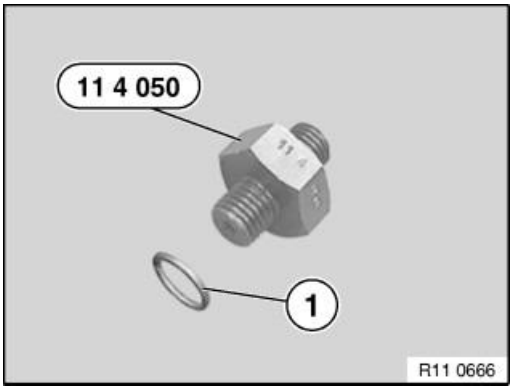
Special tools required:

- 11 4 050
- 13 3 061
- 13 3 063
- 13 6 051
- 13 6 054

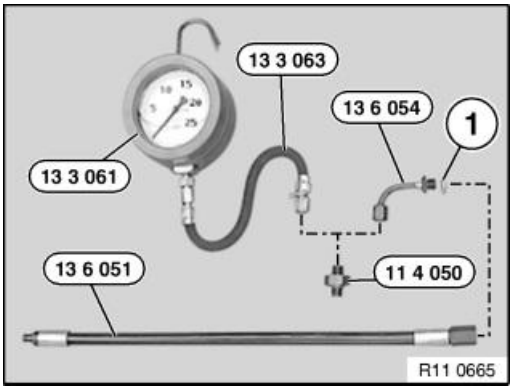
Note:
Drain the full-flow oil filter to prevent excessive oil leakage when removing the oil pressure switch.

Necessary preliminary tasks:

- Drain oil filter.
- Remove oil pressure switch.



Install special tool 11 4 050 with sealing ring (1) in place of oil pressure switch.



Check engine oil pressure with DIS tester.

Attach special tool 13 6 054 with sealing ring (1) and special tool 13 6 051 and connect to DIS Tester.

Check engine oil pressure with pressure gauge.

Install special tool 13 3 063 and special tool 13 3 061 (pressure gauge).

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Start engine and run at idle speed.
Check engine oil pressure.
Setpoint value.
Remove all special tools.
Reassemble vehicle and set in horizontal position.
Switch off engine, wait approx. 5 min. and then check engine oil level.
Top up engine oil if necessary.

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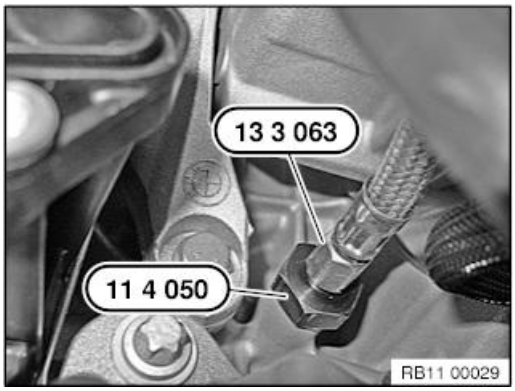
11 40 000 Checking oil pressure (N47 D20 O1)

Special tools required:

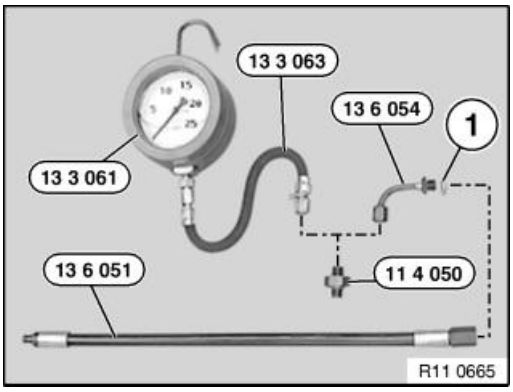
- 11 4 050
- 13 3 061
- 13 3 063
- 13 6 051
- 13 6 054

Necessary preliminary work:

- Remove oil pressure switch.



Install special tool 11 4 050 with sealing ring (1) in place of oil pressure switch.

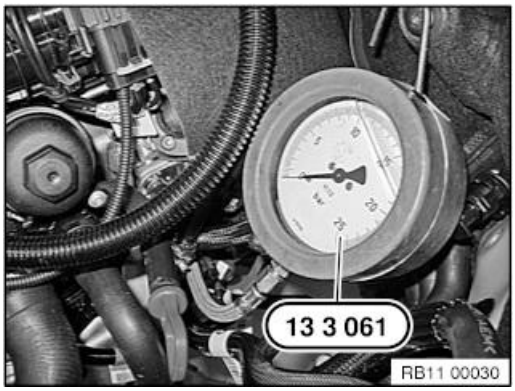


Check engine oil pressure with DIS Tester

Attach special tool 13 6 054 with sealing ring (1) and special tool 13 6 051 and connect to DIS Tester.

Check engine oil pressure with pressure gauge

Install special tool 13 3 063 and special tool 13 3 061 (pressure gauge).



Fit pressure gauge 13 3 061 .

Check engine oil pressure.

Start engine and run at idle speed.

Nominal value.

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Remove all special tools.

Reassemble vehicle and set in horizontal position.

Switch off engine, wait approx. 5 minutes and then check engine oil level.

Top up engine oil if necessary.

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11 41 000 Remove and install or replace oil vacuum pump (N47 D20 O1)

Special tools required:

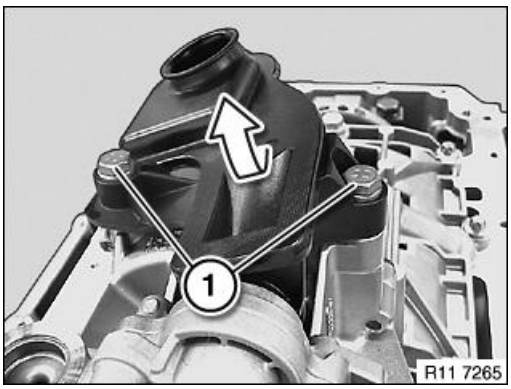
- 00 9 120
- 11 4 350
- 11 4 470

Important!

It is possible to remove and install the oil vacuum pump **without** removing the transmission.

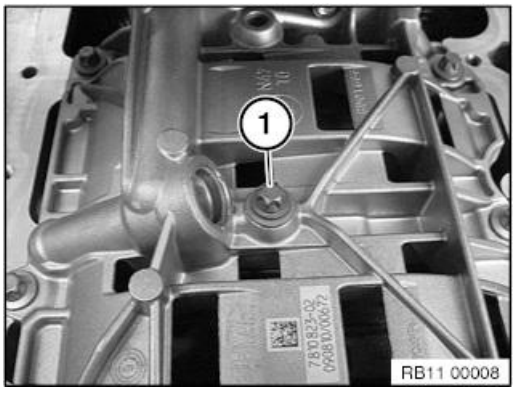
Necessary preliminary tasks:

- Removing oil sump.



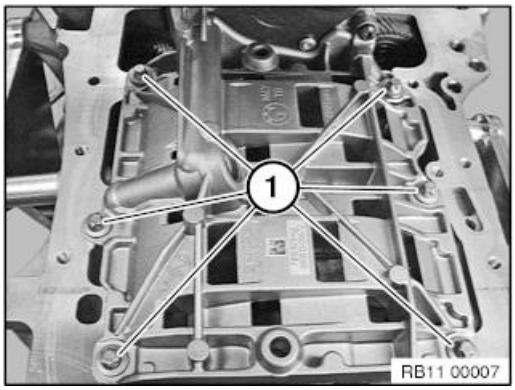
Release screws (1).

Remove oil intake snorkel in direction of arrow.

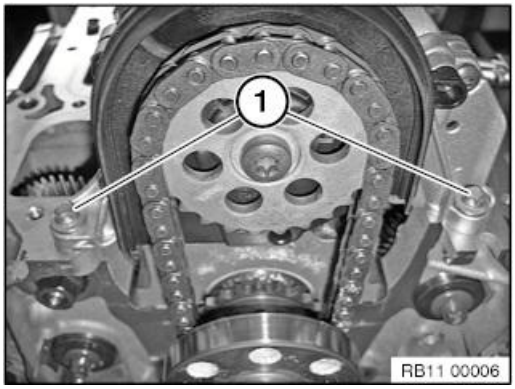


Release screw (1).*Installation note:*
Clean and blow out the thread.

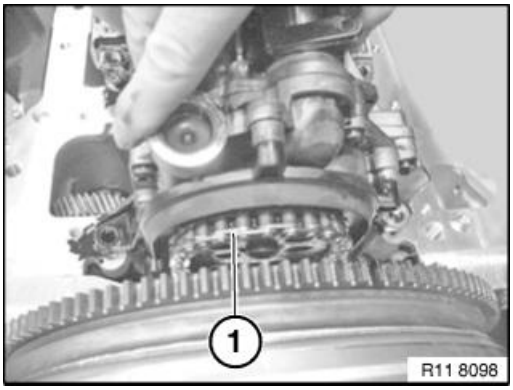
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Release screws (1).

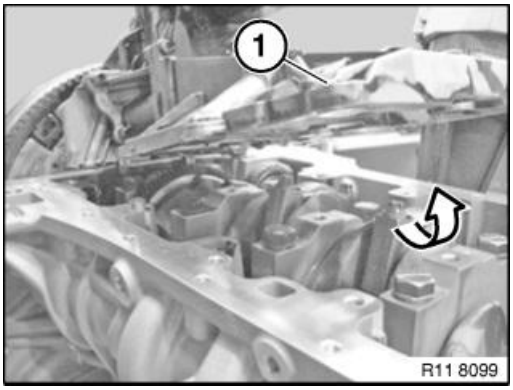


Release screws (1).*Note:*
Figure without timing case cover.



Oil vacuum pump must be fed out at chain drive (1).

When installed, the chain (1) must be fed out from the camshaft sprocket wheel of the oil pump drive gear; the camshaft sprocket wheel cannot be removed.

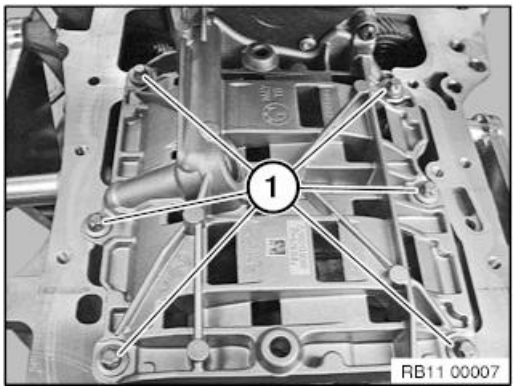


Feed out oil vacuum pump (1) in direction of arrow and remove.

Installation in reverse sequence.

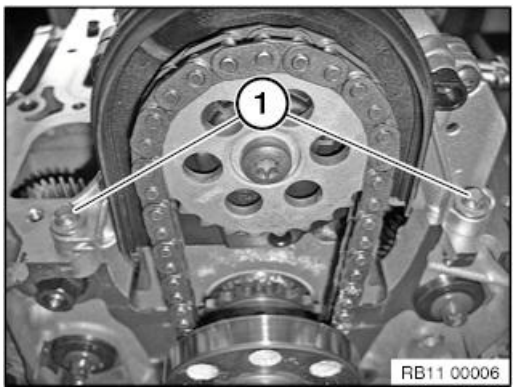
Installation note:
Clean all sealing surfaces with special tool 11 4 470 .

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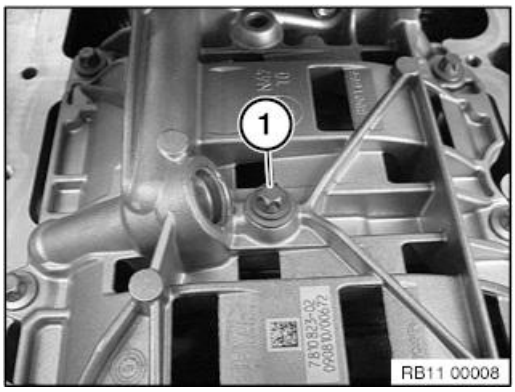
Insert and tighten all screws (1).

Tightening torque: 11 41 1AZ.



Install and tighten down screws (1).

Tightening torque: 11 41 1AZ.



Installation note:
Clean and blow out the thread.

Insert and tighten screw (1).

Secure screw (1) with special tool 00 9 120 .

Tightening torque: 11 41 2AZ.

Assemble engine.

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11 41 000 Removing and installing or replacing oil/vacuum pump (N47, N47S)

Special tools required:

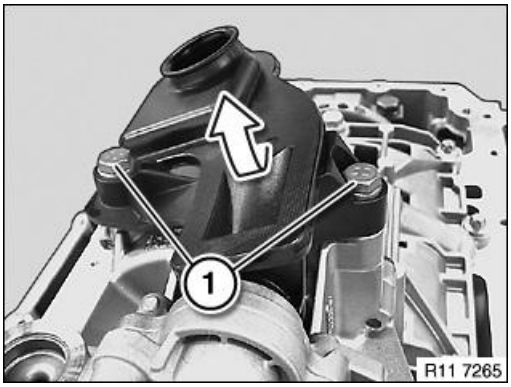
- 00 9 120
- 11 4 350

Important!

It is possible to remove and install the oil vacuum pump **without** removing the transmission.

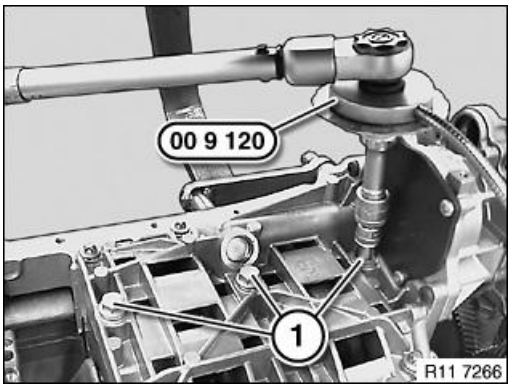
Necessary preliminary tasks:

- Remove oil sump.



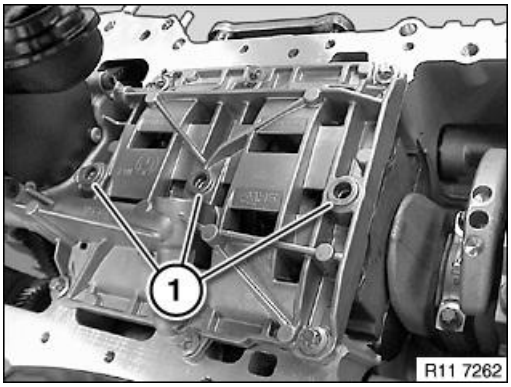
Release screws (1).

Remove intake snorkel in direction of arrow.

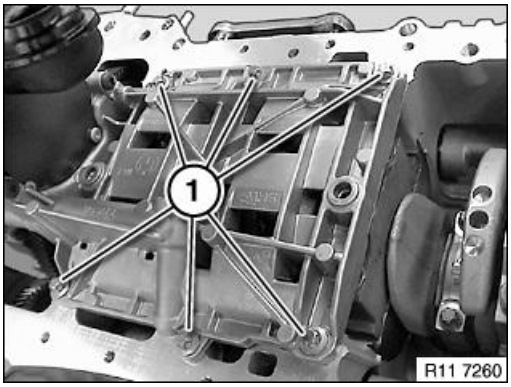


Release screws (1).

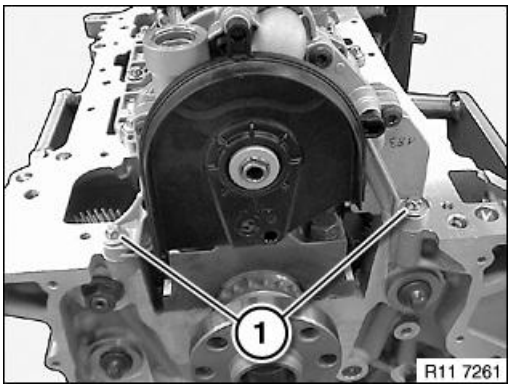
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Unscrew all spacers (1) anticlockwise.



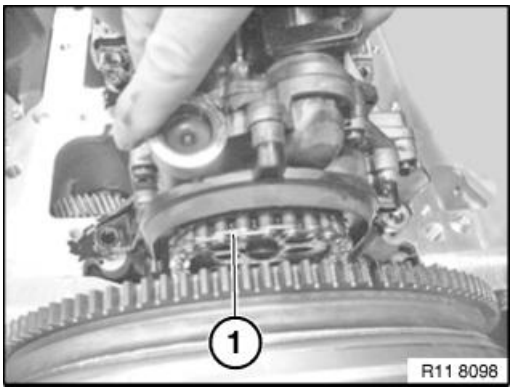
Release screws (1).



Release screws (1).

When installed, the oil pump chain must be fed out from the sprocket wheel of the oil pump drive gear; the sprocket wheel cannot be removed.

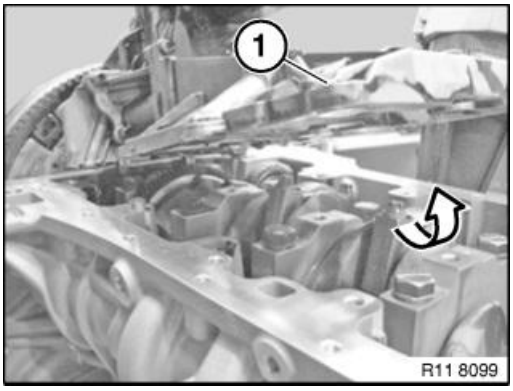
Note:
Graphic without gear case cover.



Engine installed.

Oil vacuum pump must be fed out at chain drive (1).

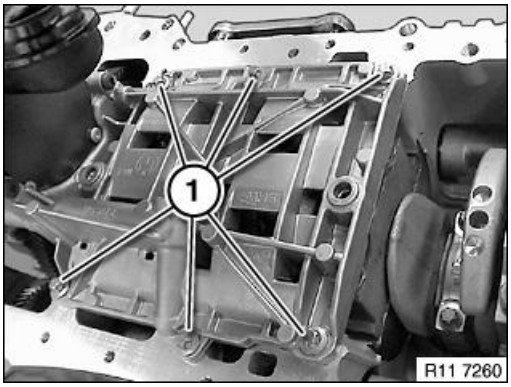
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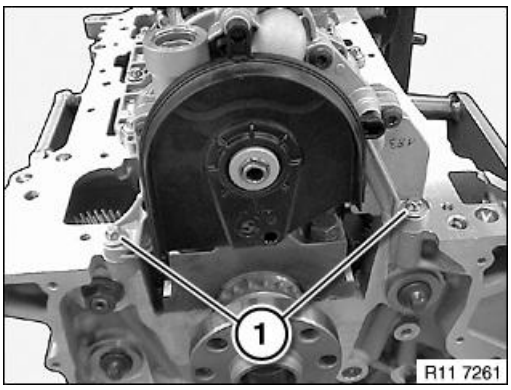
Feed out oil vacuum pump (1) in direction of arrow and remove.

Installation in reverse sequence.

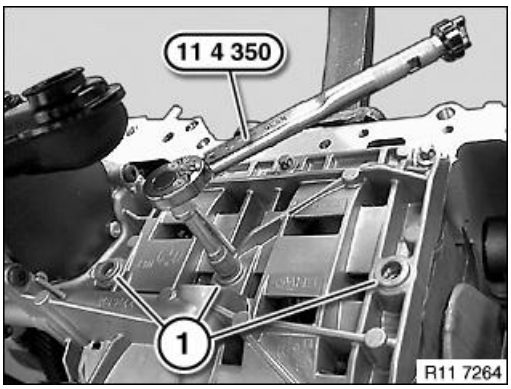
Installation note:
Clean all sealing surfaces.



Install all screws (1) and tighten down.



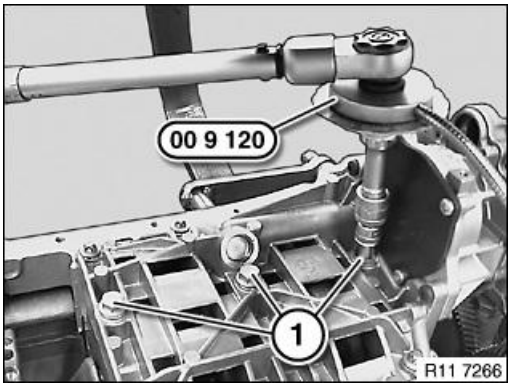
Install and tighten down screws (1).*Note:*
Graphic without chain drive.



Secure threaded support sleeves (1) with special tool 11 4 350 .

Tightening torque: 11 41 1AZ.

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Secure special tool 00 9 120 with bolts (1).

Tightening torque: 11 41 2AZ.

Assemble engine.

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11 66 000 Removing and installing or replacing vacuum/oil pump (N47 D20 O1)

Special tools required:

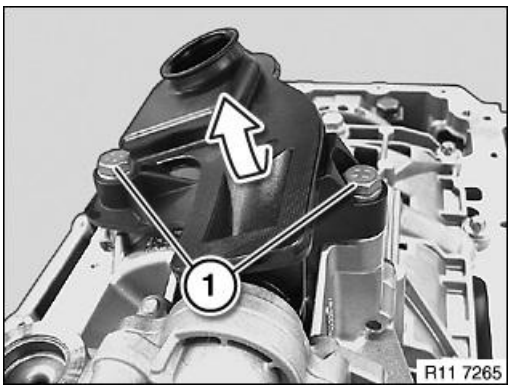
- 00 9 120
- 11 4 350

Important!

It is possible to remove and install the vacuum oil pump **without** removing the transmission.

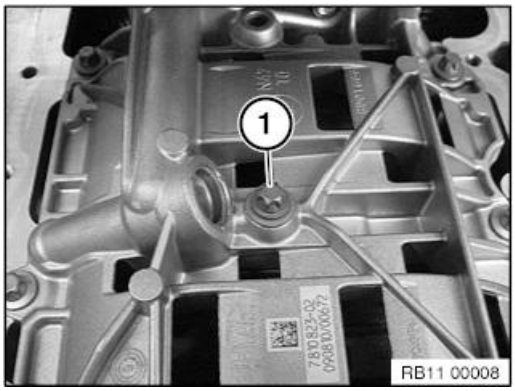
Necessary preliminary tasks:

- Removing oil sump.



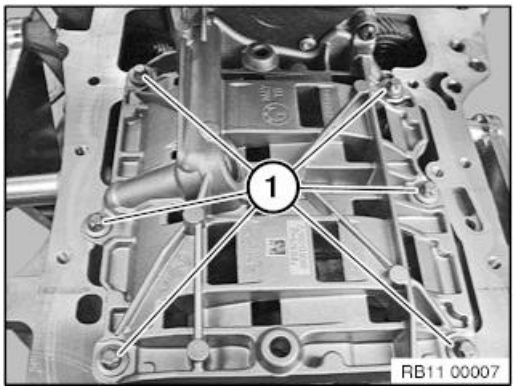
Release screws (1).

Remove intake snorkel in direction of arrow.

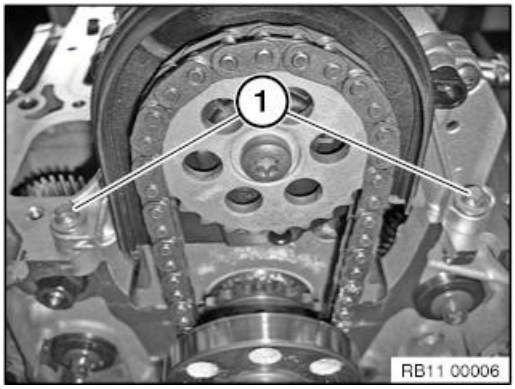


Release screw (1).

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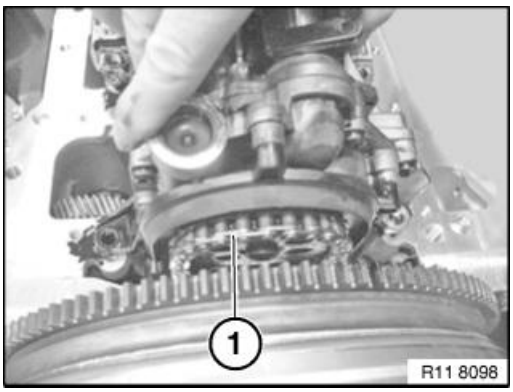
Release screws (1).*Installation note:*
Clean and blow out the thread



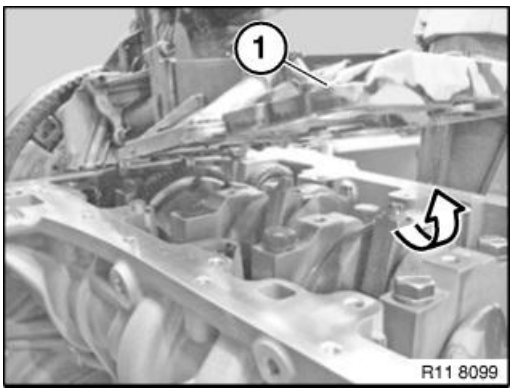
Release screws (1).

When installed, the oil pump chain must be fed out from the sprocket wheel of the oil pump drive gear; the sprocket wheel cannot be removed.

Note:
Illustration shows gear case cover removed.



Oil vacuum pump must be fed out at chain drive (1).

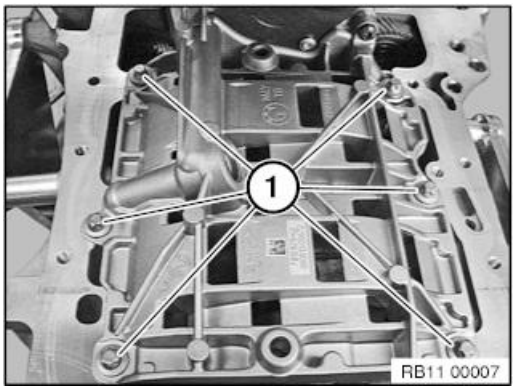


Feed out oil vacuum pump (1) in direction of arrow and remove.

Installation in reverse sequence.

Installation note:
Clean all sealing surfaces.

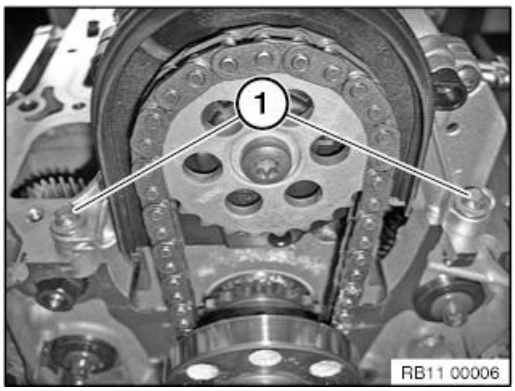
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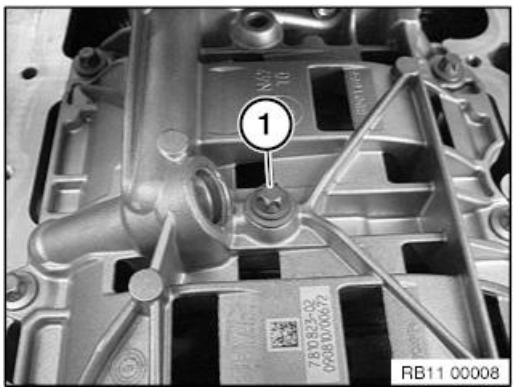
Installation note:
Replace O-ring.

Install all screws (1) and tighten down.

Tightening torque: 11 41 1AZ.



Install and tighten down screws (1).



Installation note:
Clean and blow out the thread

Insert and secure screw (1).

Secure screw (1) with special tool 00 9 120 .

Tightening torque: 11 41 2AZ.

Assemble engine.

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11 66 000 Removing and installing or replacing vacuum/oil pump (N47, N47S)

Special tools required:

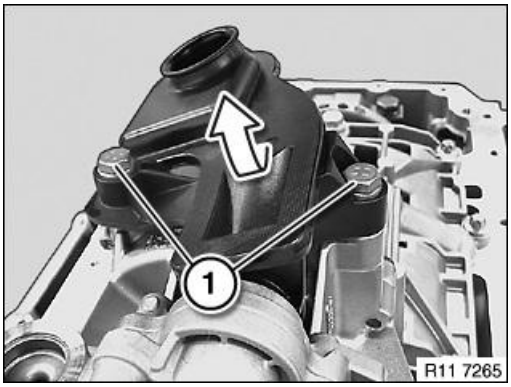
- 00 9 120
- 11 4 350

Important!

It is possible to remove and install the oil vacuum pump **without** removing the transmission.

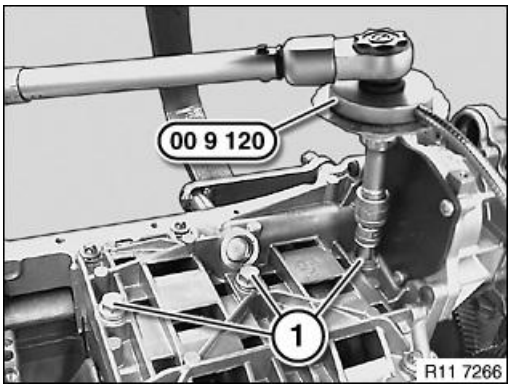
Necessary preliminary tasks:

- Remove oil sump.



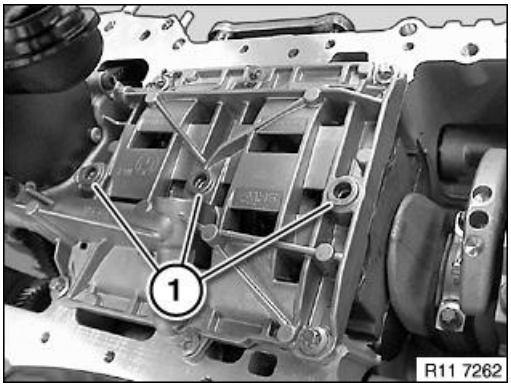
Release screws (1).

Remove intake snorkel in direction of arrow.

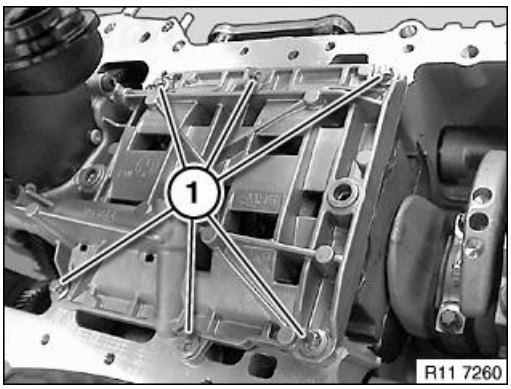


Release screws (1).

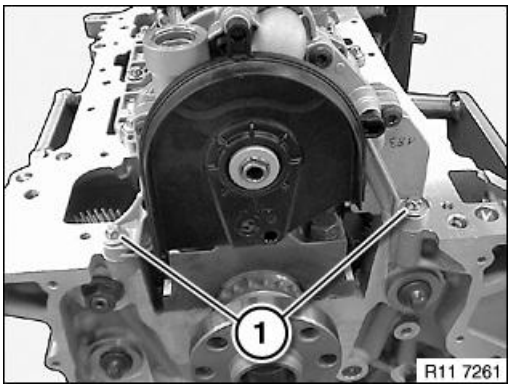
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Unscrew all spacers (1) anticlockwise.



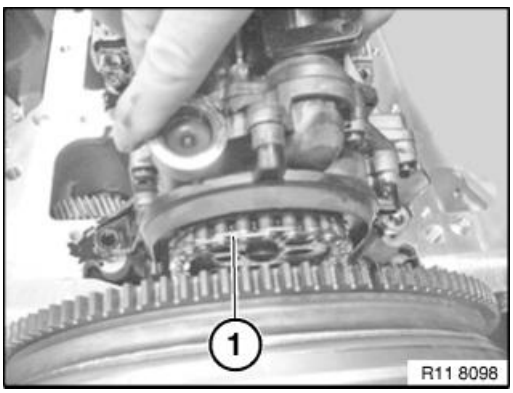
Release screws (1).



Release screws (1).

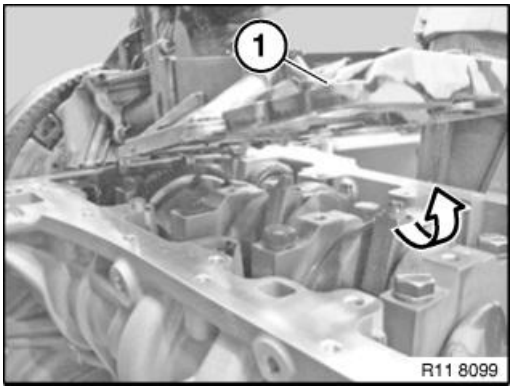
When installed, the oil pump chain must be fed out from the sprocket wheel of the oil pump drive gear; the sprocket wheel cannot be removed.

Note:
graphic without gear case cover.



Oil vacuum pump must be fed out at chain drive (1).

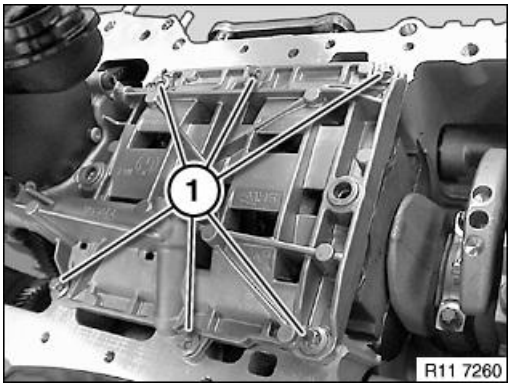
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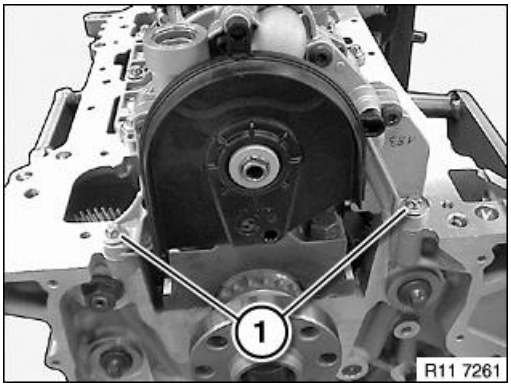
Feed out oil vacuum pump (1) in direction of arrow and remove.

Installation in reverse sequence.

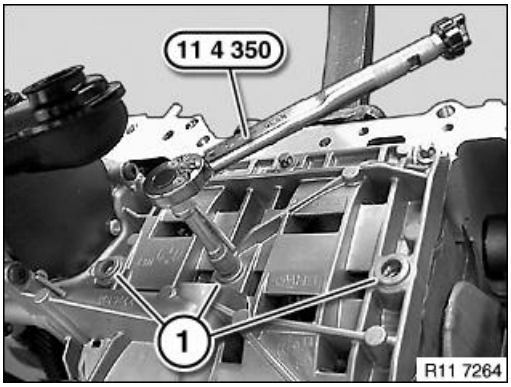
Installation note:
Clean all sealing surfaces.



Install all screws (1) and tighten down.



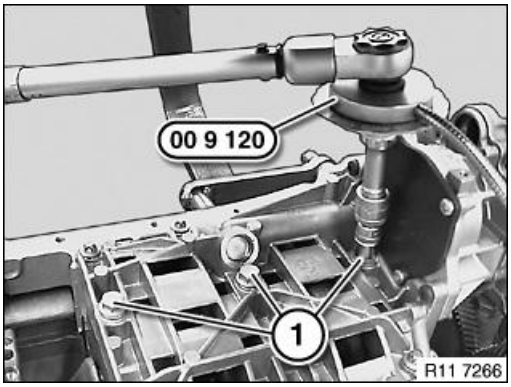
Install and tighten down screws (1).*Note:*
graphic without chain drive.



Secure threaded support sleeves (1) with special tool 11 4 350 .

Tightening torque: 11 41 1AZ.

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Secure special tool 00 9 120 with bolts (1).

Tightening torque: 11 41 2AZ.

Assemble engine.

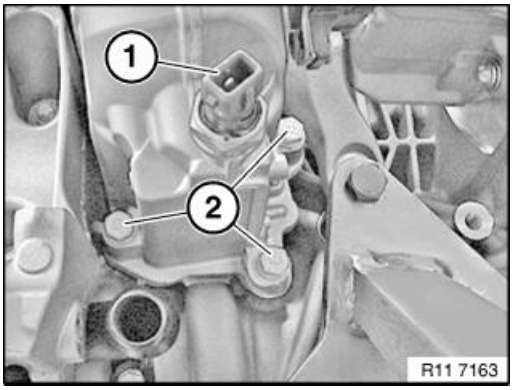
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11 42 020 Removing and installing/replacing complete main flow oil filter (N47, N47S)

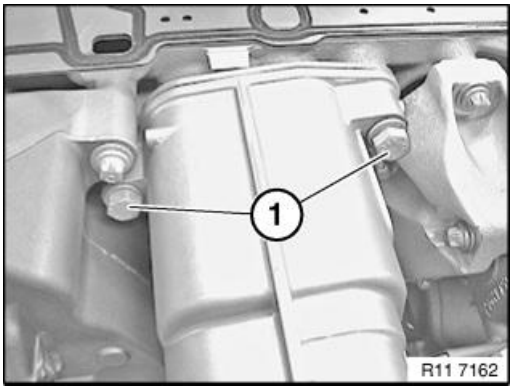
Necessary preliminary tasks:

- Drain coolant.
- Remove oil dipstick guide tube.
- Remove throttle valve
- Replace engine oil.

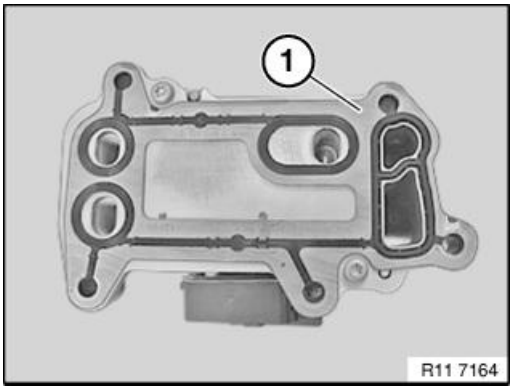
To avoid excess discharge of oil when removing the full flow oil filter:
Place rag under oil filter housing.



Disconnect plug connection on oil pressure switch (1)
Unfasten screws (2).



Release screws (1).
Lift out oil filter housing.



Installation note:
Replace sealing element (1).

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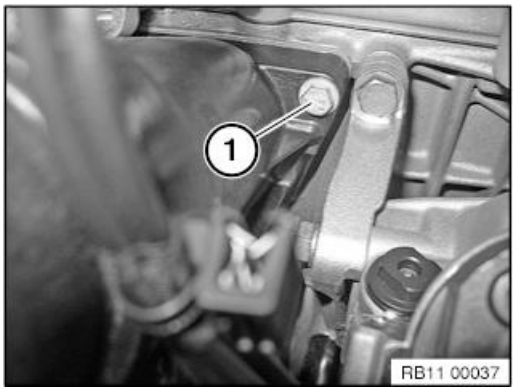
Assemble engine.

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11 42 020 Removing and installing/replacing full-flow oil filter (N47 D20 O1)

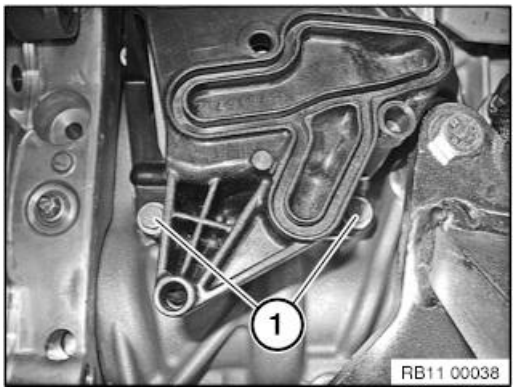
Necessary preliminary tasks:

- Drain coolant.
- Remove intake plenum.
- Remove transmission oil cooler (if fitted).
- Replace engine oil.



Release screw (1).

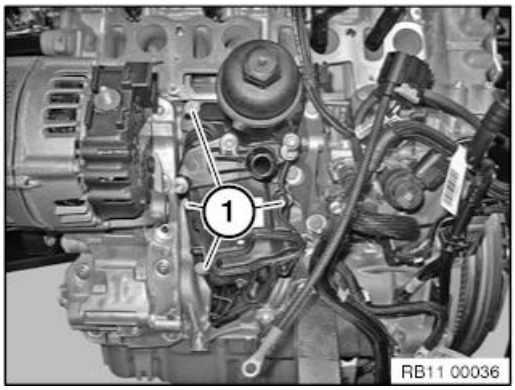
Tightening torque: 11 00 4AZ.



Release screws (1).

Tightening torque: 11 00 4AZ.

Lift out oil filter housing.

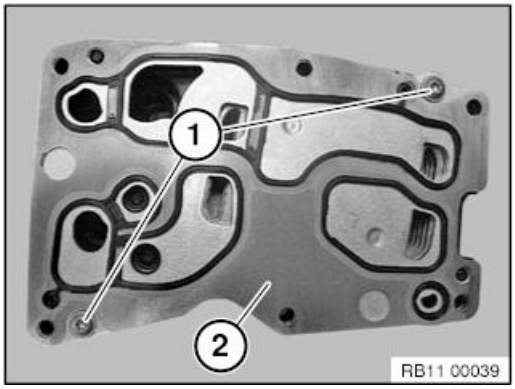


Release screws (1).

Tightening torque: 11 00 4AZ.

Remove oil filter module.

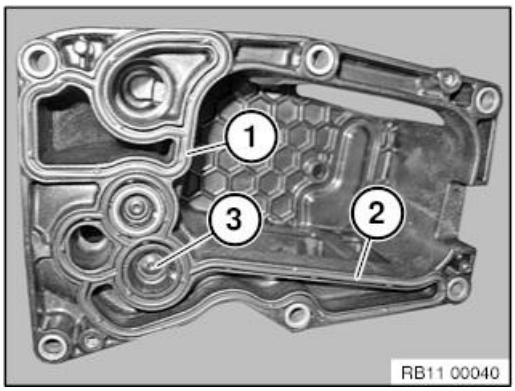
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Release screws (1).

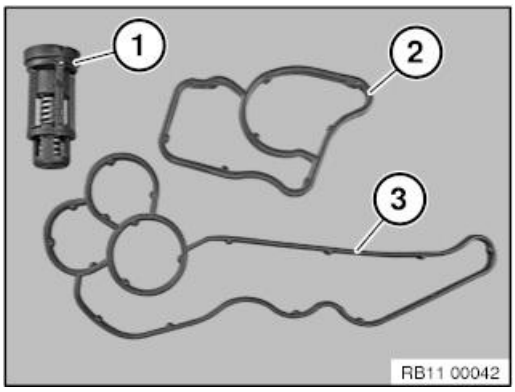
Tightening torque: 11 42 2AZ.

Installation note:
Replace sealing element (2).



Remove seals (1 and 2).

Remove non-return valve (3).



Installation note:
Replace non-return valve (1).

Replace profile seal (2).

Replace profile seal (3).

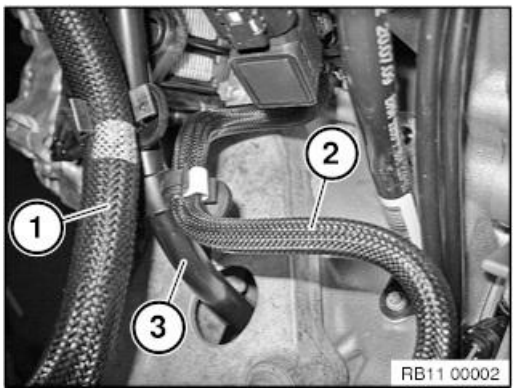
Assemble engine.

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11 43 000 Removing and installing or replacing guide tube for dipstick (N47 D20 O1)

Necessary preliminary work:

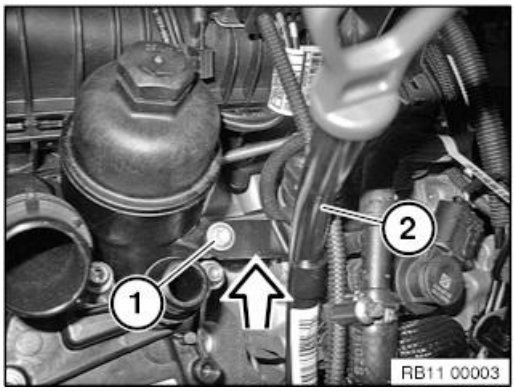
- Remove acoustic cover at front.
- Remove intake silencer housing (only F10, F11, F07).



Release fuel return line (1) from the retaining clip.

Release fuel delivery (2) from the retaining clip.

Guide tube (3).



Release screw (1).

Remove guide tube (2) in direction of arrow.

Installation note:
Replace O-ring.

Assemble engine.

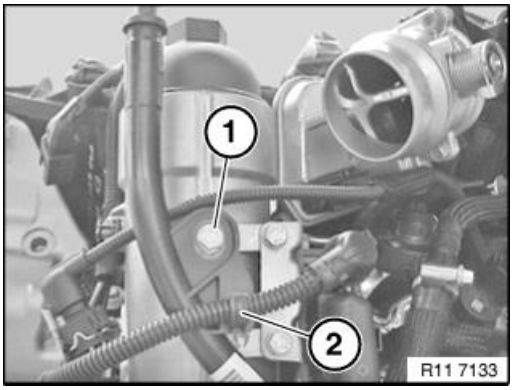
Check oil level; correct if necessary.

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11 43 000 Removing and installing/replacing guide tube for oil dipstick (N47, N47S)

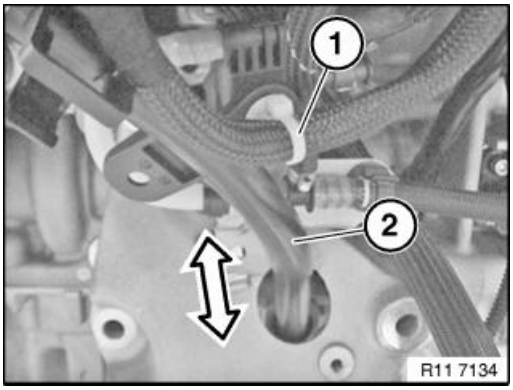
Necessary preliminary tasks:

- Remove pressure pipe at throttle valve
- Disconnect plug connection at preheater control unit



Release screw (1).

Cut cable tie (2).



Cut open cable strap (1).

Remove guide tube (2) in direction of arrow.

Installation note:
Replace O-ring.

Assemble engine.

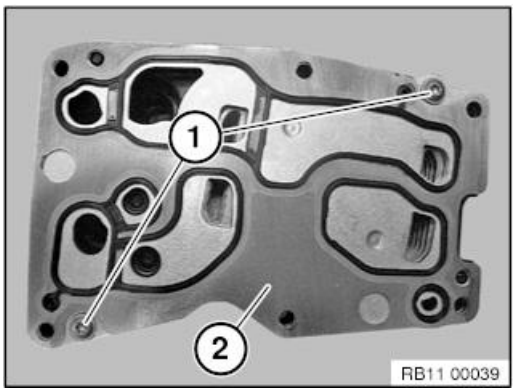
Check oil level, correcting if necessary.

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11 44 001 Removing and installing or replacing oil-to-water heat exchanger (N47 D20 O1)

Necessary preliminary work:

- Remove full-flow oil filter.



Release screws (1).

Remove plate together with heat exchanger (2).

Tightening torque: 11 42 2AZ.

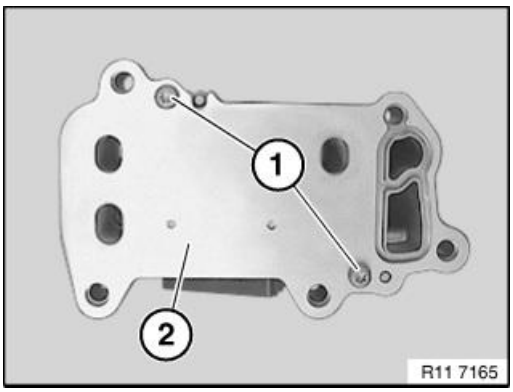
Assemble engine.

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11 44 001 Removing and installing/replacing oil-water heat exchanger (N47, N47S)

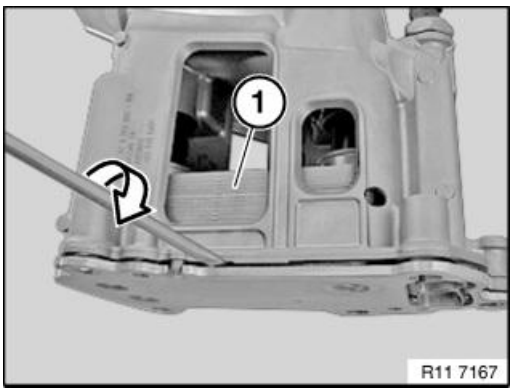
Necessary preliminary tasks:

- Remove full-flow oil filter.

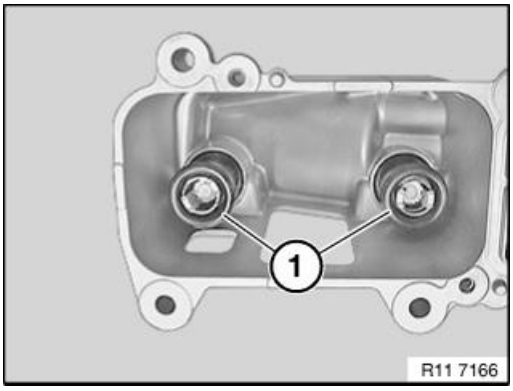


Release screwsÂ (1).

Remove panel together with heat exchanger (2).



Note:
Detach heat exchanger (1) from panel with an appropriate tool.



Remove sealing elements (1).*Installation note:*
Replace all O-rings.

Assemble engine.

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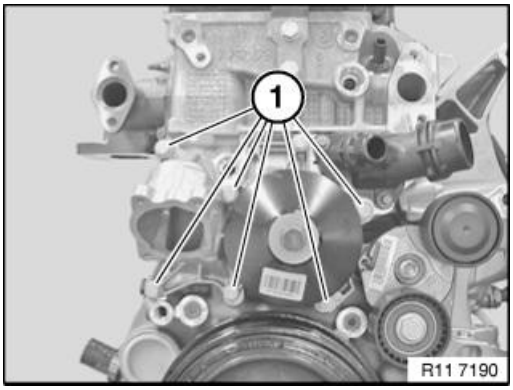
11 51 000 Removing and installing/replacing coolant pump (N47 D20 O1)

Installation note:

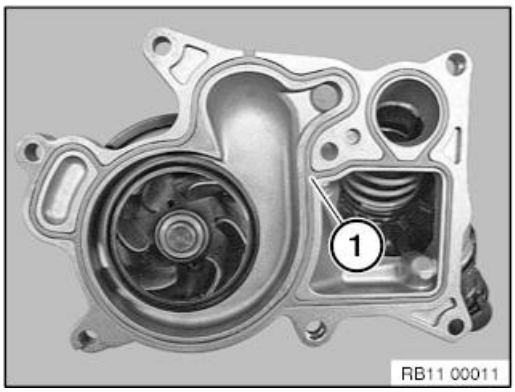
1. All screws, nuts, bolts and hose clamps removed during the repair must be replaced.
2. Retaining elements on chassis and suspension and steering parts must be replaced.

Necessary preliminary tasks:

- Remove drive belt for alternator
- Remove exhaust-gas recirculation cooler
- Remove coolant thermostat



Release boltsÂ (1) and remove coolant pump.*Note:*
Picture shows N47.



Installation note:
Seal coolant pump (1) with liquid sealing compound 2.2.

Assemble engine.

Vent cooling system and check for leak tightness.

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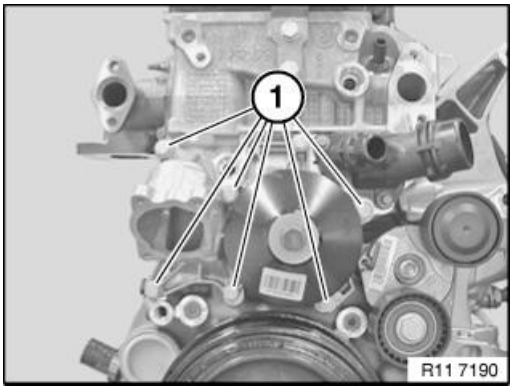
11 51 000 Removing and installing/replacing coolant pump (N47, N47S)

Installation note:

1. All screws, nuts, bolts and hose clamps removed during the repair must be replaced.
2. Retaining elements on chassis and suspension and steering parts must be replaced.

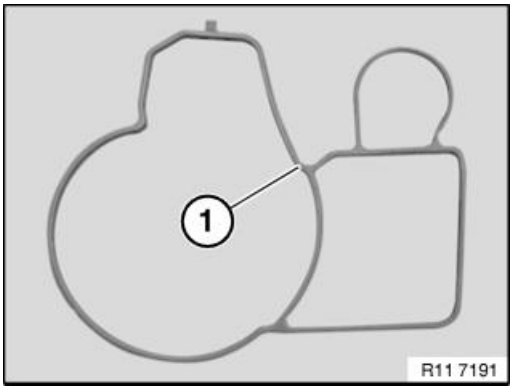
Necessary preliminary tasks:

- Remove drive belt for alternator.
- Remove exhaust-gas recirculation cooler.
- Remove coolant thermostat.



Release bolts (1) and remove coolant pump.

Tightening torque 11 00 2AZ.



Installation note:
Replace gasket (1).

Assemble engine.

Vent cooling system and check tightness.

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11 53 736 Coolant pipe (N47, N47S)

Warning!

Risk of scalding!

Only perform this repair work on an engine that has cooled down.

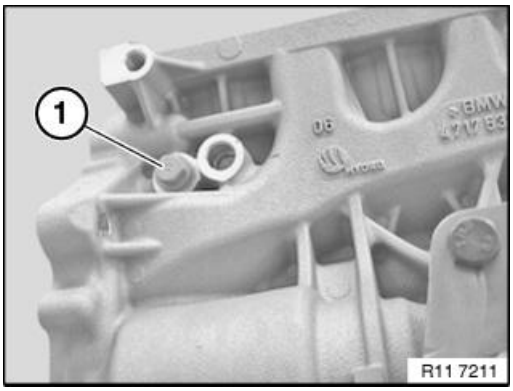
Recycling:

Catch and dispose of drained coolant.

Observe country-specific waste disposal regulations.

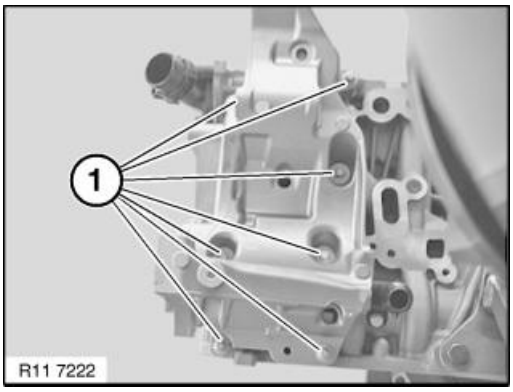
Necessary preliminary tasks:

- Remove alternator.
- Remove air conditioning compressor.
- Remove power steering pump.



Release screw (1).

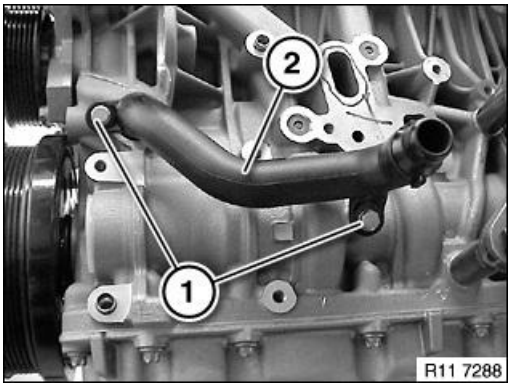
Drain coolant from engine block.



Release screws (1).

Remove component carrier.

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Release screws (1).

Remove coolant pipe (2) of return line.

Installation note:
Replace O-ring.

Assemble engine.

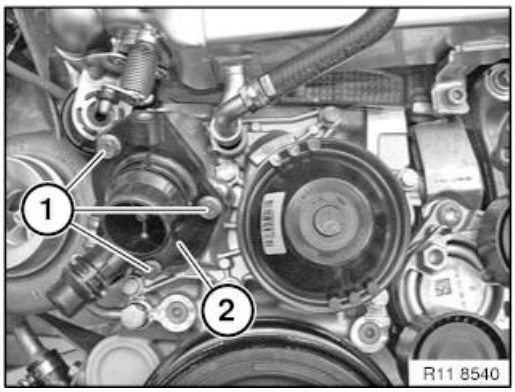
Vent cooling system and check tightness.

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11 53 000 Removing and installing or replacing coolant thermostat (N47D20 O1)

Necessary preliminary tasks:

- Drain coolant.
- Remove right fan cowl.

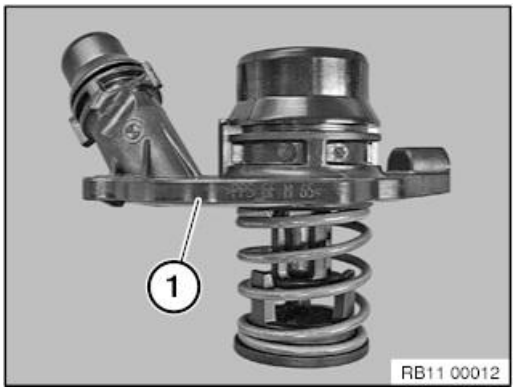


Disconnect coolant hoses on thermostat.

Release screws (1) on thermostat housing.

Remove thermostat housing (2).

Installation note:
Replace gasket.



Installation note:
Replace gasket (1).

Assemble engine.

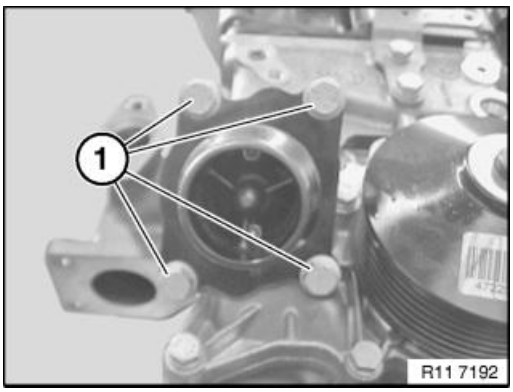
Fill and bleed cooling system.

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11 53 000 Removing and installing or replacing the coolant thermostat (N47, N47S)

Necessary preliminary tasks:

- Drain coolant.
- Remove charge air hose on right.



Release screwsÂ (1) on thermostat housing.

Remove thermostat housing.

Installation note:
Replace gasket.

Assemble engine.

Fill and bleed cooling system.

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11 12 ... Clean intake plenum (N47, N57)

Necessary preliminary work:

- Remove intake plenum

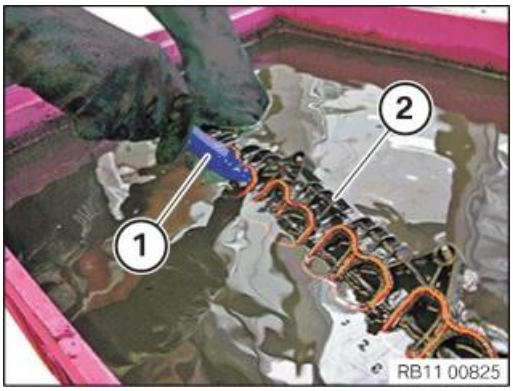
Dismantle intake plenum:

- Remove throttle body
- If applicable, remove adjuster
- If applicable, remove the preheating control unit
- If applicable, remove charging pressure sensor

Wear protective goggles and gloves.

Caution!
Never place electrical components in cleaning agent!

- Put on personal protective clothing/equipment!
- Prepare cleaning agent: Mix 2 parts water with 1 part BMW universal cleaner (part number: 83 19 2 360 981) mixed
- Place intake plenum in cleaning agent
- Adhere to an application time of at least 1 h



Wear protective goggles and gloves.

Caution!
Do not clean electrical components with a parts cleaning unit or high pressure cleaner.

- Remove the intake plenum (2) from the cleaning agent
- Clean the openings of the intake plenum (2) and swirl flaps using the brush (1)

  (Part number: 83 19 2 298 237)
- Clean throttle valve, exhaust-gas recirculation valve, mixing tube and mounted parts with brush (1) if necessary
- Clean the intake plenum (2) with a parts cleaning unit or a high-pressure cleaner.
- Check all seals for damage and replace if necessary.

Pay attention to country specific instructions for disposal.

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Required follow-up work:

Assemble intake plenum:

- Installing the throttle body
- If applicable, install adjuster
- If applicable, install preheating control unit
- If applicable, install charging pressure sensor

- Install intake plenum

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11 12 800 Cleaning cylinder heat intake channels and intake plenum (N47, N57)

Special tools required:

- 11 6 480
- 11 5 320
- 2 356 969
- 2 356 966
- 2 356 967
- 00 9 120

Necessary preliminary work:

- Disconnect battery negative cable
- Removing intake plenum
- Remove electric fan if necessary
- Remove underbody protection
- Remove stiffening plate if necessary

Dismantle intake plenum:

- Remove throttle body
- If applicable, remove adjuster
- If applicable, remove preheating control unit
- If applicable, remove charging pressure sensor



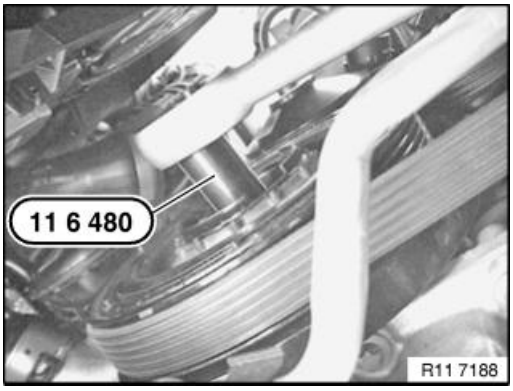
Wear protective goggles and gloves.



Caution!
Never place electrical components in cleaning agent!

- Wear personal protective clothing/equipment
- Prepare cleaning agent: Mix 2 parts water with 1 part BMW universal cleaner (see Section 3.2)
- Place intake plenum in cleaning agent
- Observe application time of at least 1 hour

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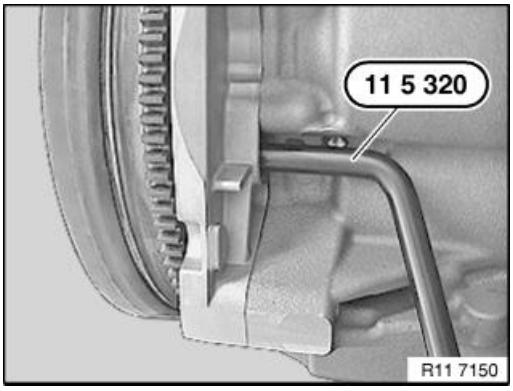
Crank engine to cylinder no. 1 TDC setting:

Crank engine with special tool11 6 480 to TDC firing position of cylinder 1.

Caution!

Do not crank engine in reverse direction.

Note:
Figure N47D.



Remove protective cap of timing case cover.

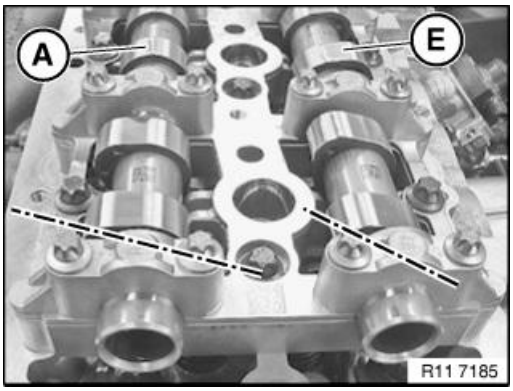
Crank engine at central bolt with special tool 11 6 480

Block crankshaft with special tool 11 5 320 in the TDC firing position of cylinder 1.

Caution!

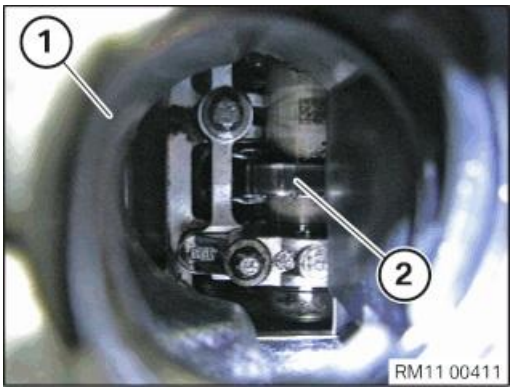
Do not turn the engine back.

Special tool 11 6 480 must be removed before starting the engine.



The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.



Note:
Visual inspection via oil filler cap (1) if necessary. Remove oil filler neck if necessary.

Cam (2) on exhaust camshaft points obliquely outward to the left at cylinder No. 1.

Figure N47.

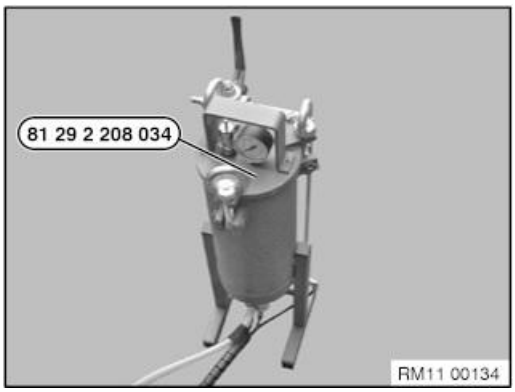
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Cleaning intake ports: Caution!

Risk of engine damage!

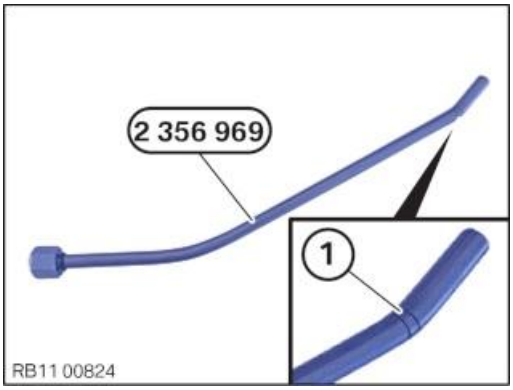
When cleaning the intake ports, it must be ensured that the intake valves of the corresponding cylinder are closed.

Start with the 1st cylinder when cleaning the intake ports.



The following are required:

- Blasting tool 81 29 2 208 034
- Walnut shell granulate
- Vacuum cleaner



Caution!

Front area of sensors is marked with two notches. These can additionally be highlighted in colour.

During the blasting process, only pull the wands out of the vacuum adapter until the mark becomes visible.

Blasting wand for swirl ports:

- 2 356 969



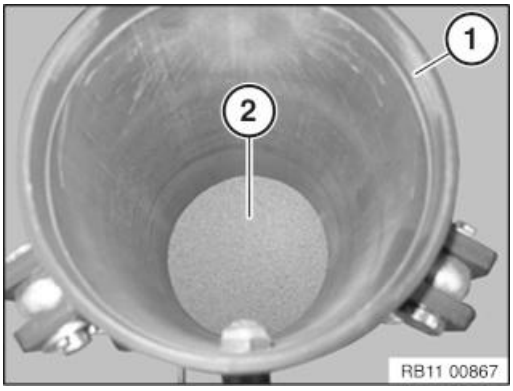
Vacuum adapter for tangential swirl port:

- 2 356 966

Vacuum adapter for swirl port:

- 2 356 967

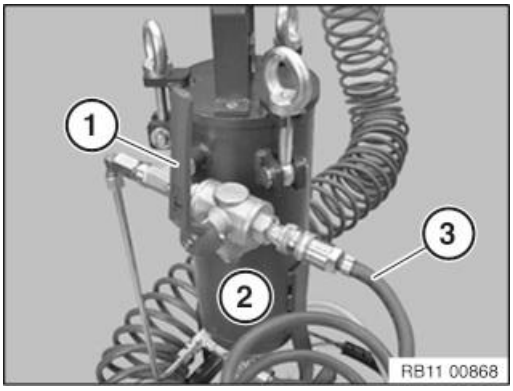
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Note:
Use 2 litres of granulate per cleaning operation; this corresponds to a blasting duration of approx. 20 seconds.

Open blasting tool (1) and pour in 2 litres of granulate (2).

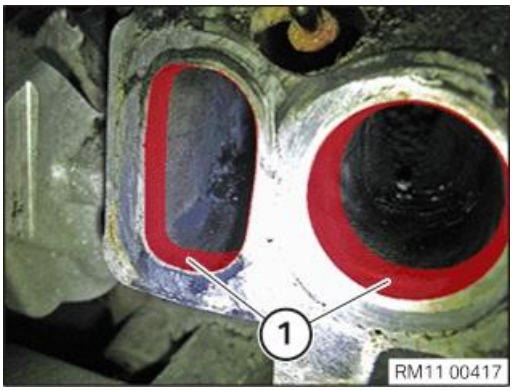
Close the device again.



Note:
Operating pressure 6 - 8 bar.

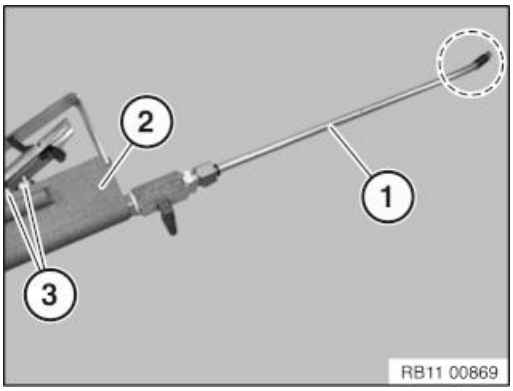
Close main valve (1) on blasting tool (2).

Connect compressed air (3).



Cleaning the swirl port of 1st cylinder:

Prior to the blasting process, clean the front area of both intake ports (1) of first cylinder with a suitable tool (e.g. plastic scraper, brushes 83 19 2 298 237).



Screw together blasting wand 2 356 969 (1) and actuator (2).

Open blasting tool and pour in 2 l granulate.

Close the device again.

Note:
Actuator (3) has two stages!

In stage one, only compressed air flows through the blasting wand.

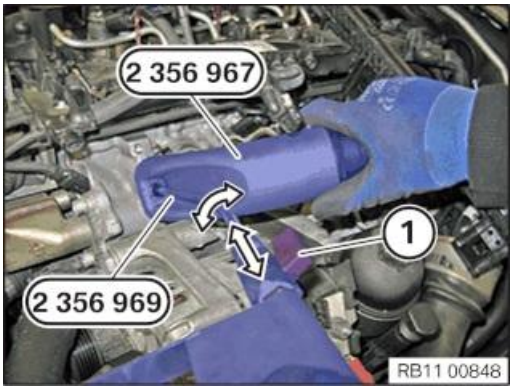
In stage two (operation is fully pressed), granulate is added (blasting process).

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Connect vacuum adapter 2 356 967 to vacuum cleaner. Hold vacuum adapter 2 356 967 against swirl port at no. 1 cylinder.

Open the main valve on the blasting tool and switch the vacuum cleaner on.



Caution!

Danger of injury!

Risk of damage!

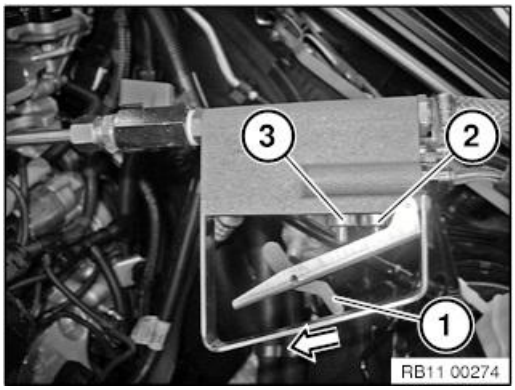
Second person required to assist.

Blasting wand may only be pulled out until the mark becomes visible.

Wear safety goggles

Insert blasting wand 2 356 969 in the adapter 2 356 967 .

Open the actuator valve (1).



Slide locking lever (1) to the front in direction of arrow.

Operate compressed-air valve (2) at stage one; compressed air can now flow in.

Fully operate valve (3) at stage two; walnut shell granulate is now injected.

Clean intake port, rotating the blasting wand and moving it vertically up and down.

Blasting wand may only be pulled out until the mark becomes visible.

When you notice that the collection container is becoming empty, continue operation for at least 10 seconds at stage one in order to swirl up and draw off the remaining granulate.

Close operation valve. Close main valve, check pressure drop at the pressure gauge.

Evaluate result if necessary.

If necessary, repeat procedure.



Cleaning the tangential swirl port of 1st cylinder:

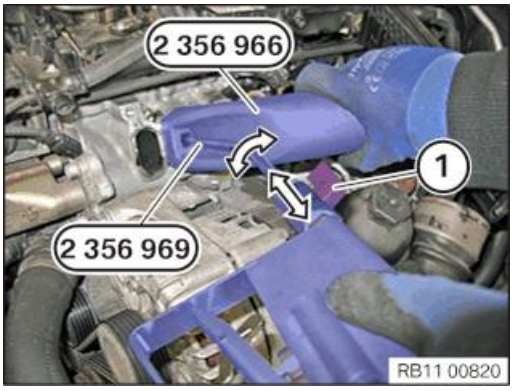
Open blasting tool and pour in 2 l granulate.

Close the device again.

Connect vacuum adapter 2 356 966 to vacuum cleaner. Hold vacuum adapter 2 356 966 on swirl port of first cylinder.

Open the main valve on the blasting tool and switch the vacuum cleaner on.

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Caution!

Danger of injury!

Risk of damage!

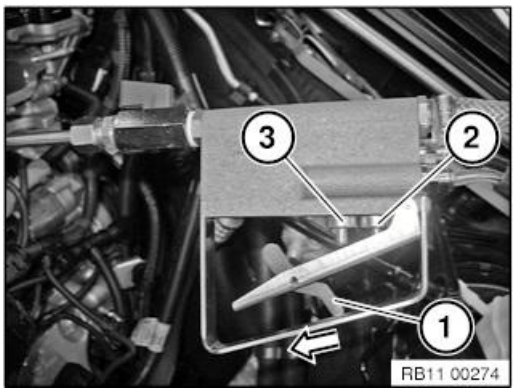
Second person required to assist.

Blasting wand may only be pulled out until the mark becomes visible.

Wear safety goggles

Insert blasting wand 2 356 969 in the adapter 2 356 966 .

Open the actuator valve (1).



Slide locking lever (1) to the front in direction of arrow.

Operate compressed-air valve (2) at stage one; compressed air can now flow in.

Fully operate valve (3) at stage two; walnut shell granulate is now injected.

Clean intake port, rotating the blasting wand and moving it vertically up and down.

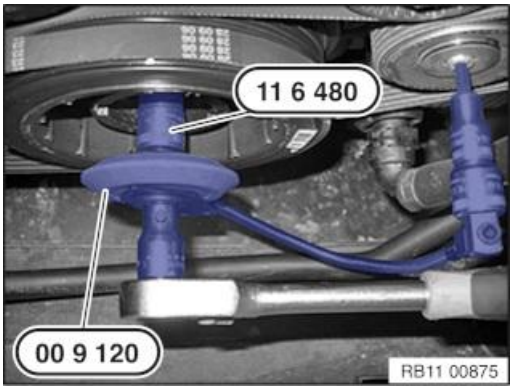
Blasting wand may only be pulled out until the mark becomes visible.

When you notice that the collection container is becoming empty, continue operation for at least 10 seconds at stage one in order to swirl up and draw off the remaining granulate.

Close operation valve. Close main valve, check pressure drop at the pressure gauge.

Evaluate result if necessary.

If necessary, repeat procedure.



Cleaning the other cylinders:

Caution!

Do not crank engine in reverse direction.

Remove special tool for securing the crankshaft.

Proceed in the standard firing order while using the same procedure to clean the swirl ports at the remaining cylinders.

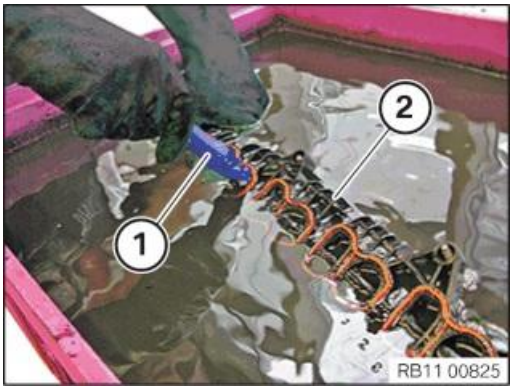
Firing order:

- **1 3 4 2** (4-cylinder engine)
- **1 5 3 6 2 4** (6-cylinder engine)

Thereby, turn motor on the central screw with 00 9 120 and 11 6 480 respectively by **180°** (4-cylinder-engine) and/or **120°** (6-cylinder-engine).

Note:
Figure M47.

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Wear protective goggles and gloves.

Caution!
Do not clean electrical components with a parts cleaning unit or high pressure cleaner!

- Remove the intake plenum (2) from the cleaning agent
- Clean the openings on intake plenum (2) and swirl flap using the brush (1)

  (Part number: 83 19 2 298 237)
- Clean throttle valve, exhaust-gas recirculation valve, mixing tube and mounted parts with the brush (1) if necessary
- Then clean intake plenum (2) with a parts cleaning unit or a high-pressure cleaner
- Check all seals for damage and replace if necessary.

Observe country-specific waste disposal regulations.

Required follow-up work:

Dismantle intake plenum:

- Installing the throttle body
- If applicable, install adjuster
- If applicable, install preheating control unit
- If applicable, install charging pressure sensor

- Crank the engine at the central bolt at minimum twice

- Install intake plenum
- If necessary, install an electric fan
- Install underbody protection
- If necessary, install stiffening plate
- Connect battery earth lead
- Reset the quantity correction under:
  - Service functions
  - 01 Drive
  - Digital Diesel Electronics
  - Reset correction values of injectors

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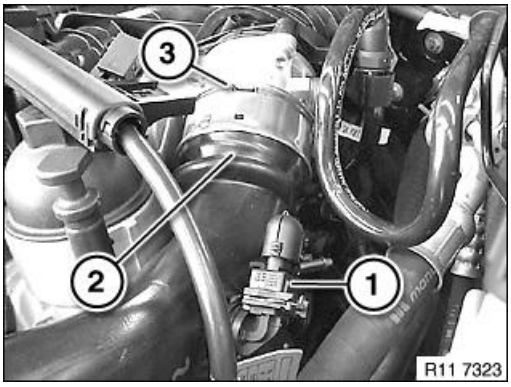
11 61 350 Remove/install/replace pressure pipe at the throttle body (N47, N47S)

Important!

In the event of a leak at the pressure pipe, there is a **risk of damage** to the exhaust turbocharger.

Necessary preliminary tasks:

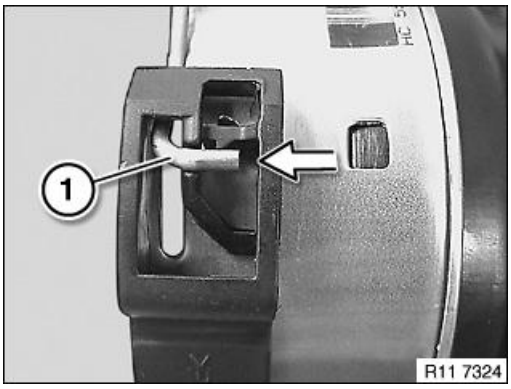
- Remove acoustic cover at front



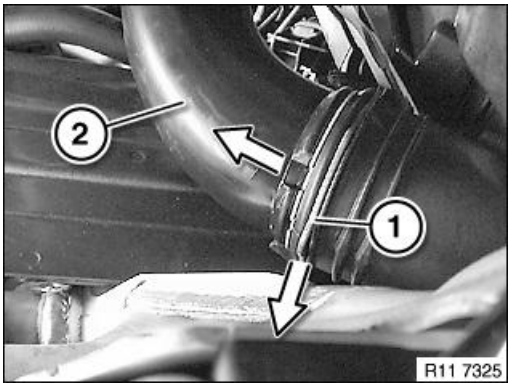
Disconnect plug connection (1) on intake temperature sensor.

Release lock (3) with a suitable tool.

Disconnect pressure pipe (2) from electromotive throttle actuator.



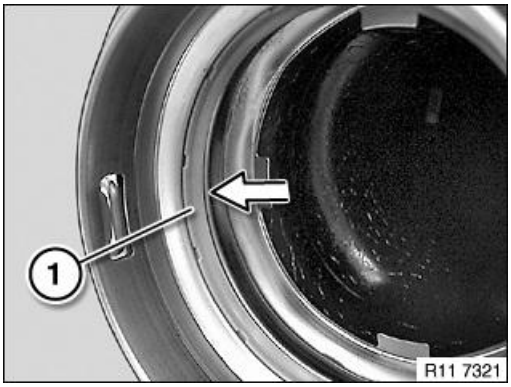
Note:
Lock (1) must snap into place in bracket (see arrow).



Release lock (1) in direction of arrow.

Release pressure pipe (2) in direction of arrow.

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Important!

In the event of a leak at the pressure pipe, there is a **risk of damage** to the exhaust turbocharger.

Check sealing lip (1) for damage.*Installation note:*
If sealing lip (1) is damaged, the gasket must be replaced.



Important!

In the event of a leak at the pressure pipe, there is a **risk of damage** to the exhaust turbocharger.

Check sealing ring for damage.*Installation note:*
If sealing ring is damaged, replace gasket.

Assemble engine.

Check air intake system for leaks.

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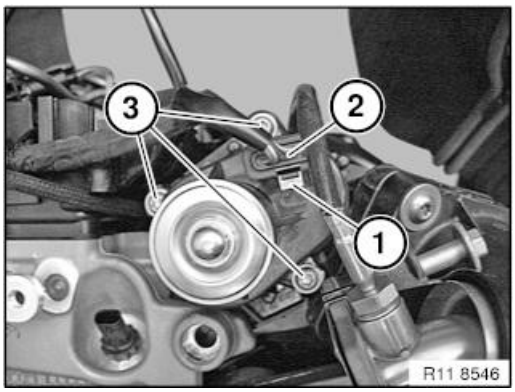
11 61 085 Removing and installing / replacing adjuster (N47 D20 O1)

Important!

The adaptation values must be reset before the adjuster is replaced.

Necessary preliminary work:

- Reset adaptation value with diagnosis system.
- Remove acoustic cover



Disconnect plug connection (1).

Release screws (3).

Detach adjuster (2).

Installation note:
Observe installation position at linkage.

Assemble engine.

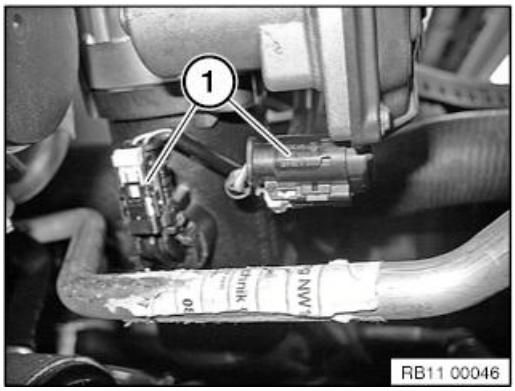
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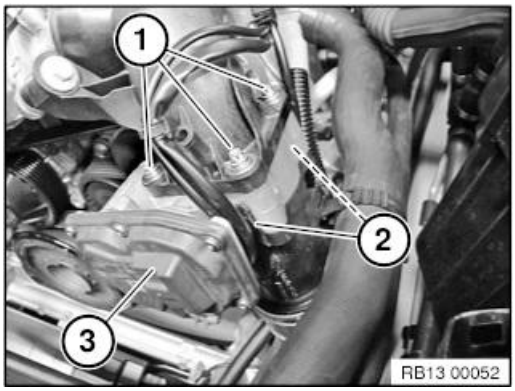
11 61 ... Removing and installing / replacing mixing tube for intake air (N47 D20 O1)

Necessary preliminary work:

- **Only on replacement or cleaning of the mixing tube.** Reset adaptation values with diagnosis system
- Remove acoustic cover



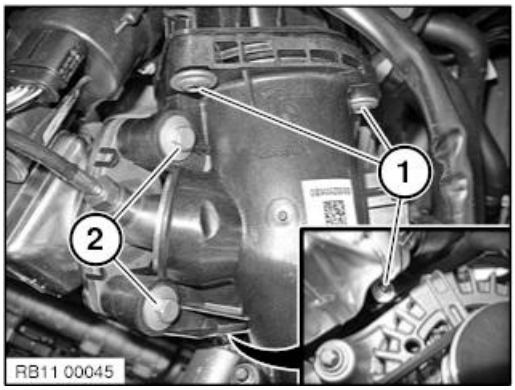
Disconnect plug connection (1).



Release screws (1) on throttle valve assembly.

Tightening torque 13 54 1AZ.

Installation note:
Replace seals on throttle body and intake air mixing tube.



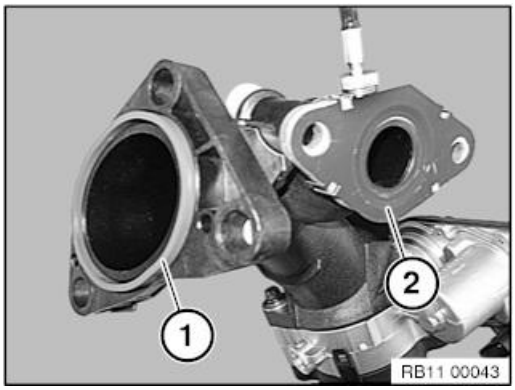
Release screws (1).

Unfasten screws (2).

Disconnect plug connection of exhaust-gas temperature sensor.

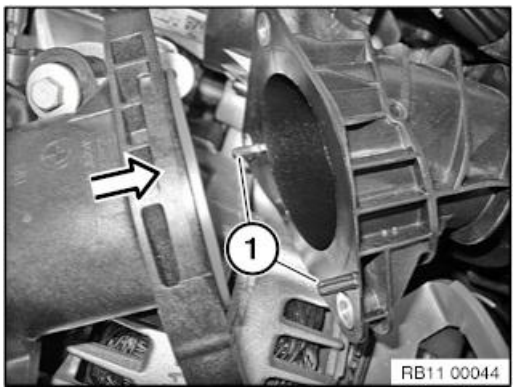
Remove mixing tube towards front.

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Installation note:
Replace O-ring (1).

Replace seal (2).



Installation note:
Pay attention to mounting lugs (1).

Remove mixing tube in direction of arrow.

Assemble engine.

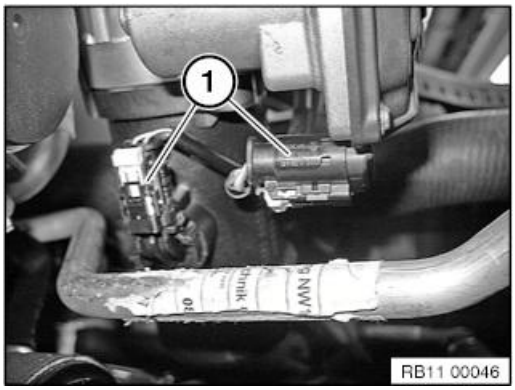
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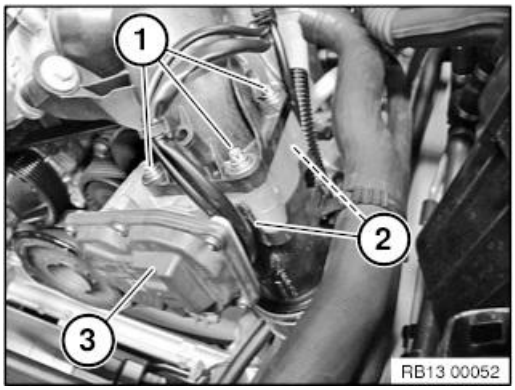
11 61 ... Removing and installing / replacing mixing tube for intake air (N47 D20 T1)

Necessary preliminary work:

- **Only at the time of replacement or cleaning of the mixing tube:**
  Reset adaptation values with diagnosis system
- Remove acoustic cover at top.
- Remove acoustic cover at front



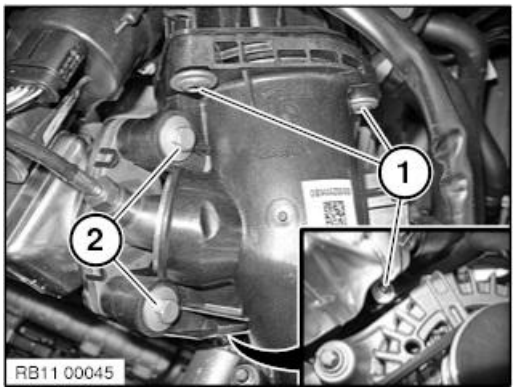
Disconnect plug connections (1).



Release screws (1) on throttle valve assembly.

Tightening torque 13 54 1AZ.

Installation note:
Replace seals on throttle body and intake air mixing tube.



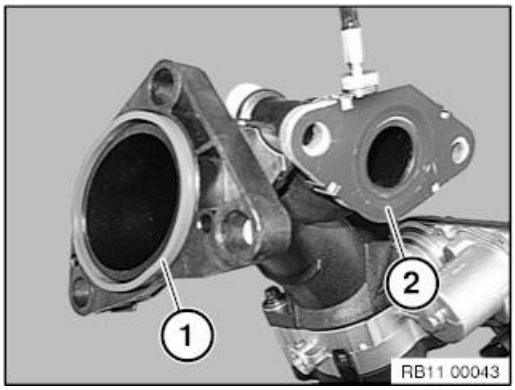
Release screws (1).

Unfasten screws (2).

Disconnect plug connection of exhaust-gas temperature sensor.

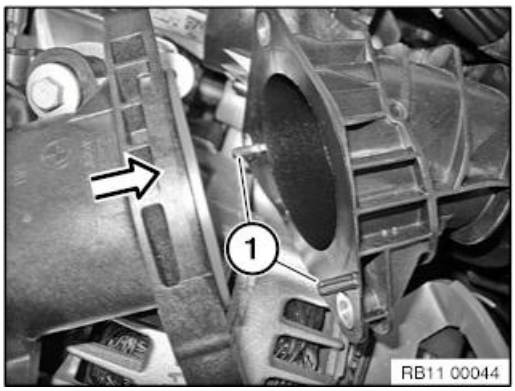
Remove mixing tube towards front.

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Installation note:
Replace O-ring (1).

Replace seal (2).



Installation note:
Pay attention to mounting lugs (1).

Remove mixing tube in direction of arrow.

Assemble engine.

.

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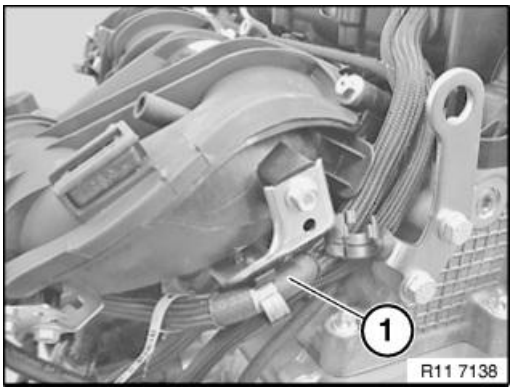
11 61 550 Removing and installing intake plenum (N47, N47S)

Necessary preliminary tasks:

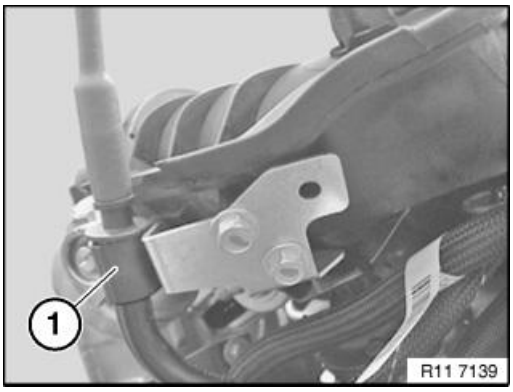
- Disconnect battery earth lead.
- Remove acoustic cover at front.
- Remove acoustic cover at rear.
- Remove pressure pipe at throttle body.
- Disconnect plug connection on electromotive throttle actuator.
- Disconnect plug connection at charging pressure sensor.

Installation note:
If the air intake plenum is replaced, the stop values must be deleted and taught in again.

Follow diagnosis instruction.

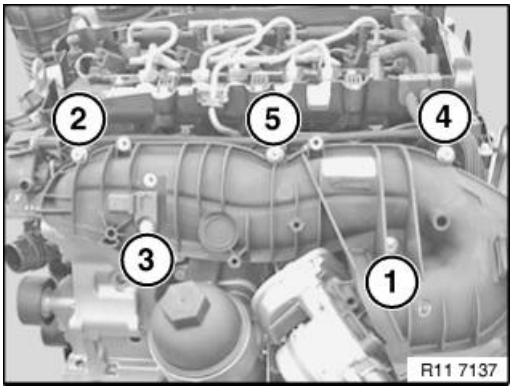


Unclamp hose (1) from bracket.



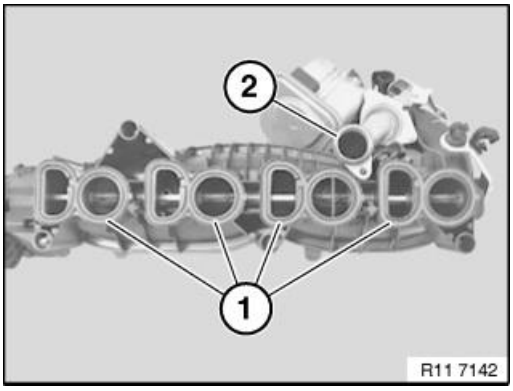
Unclamp positive battery cable (1) from bracket.

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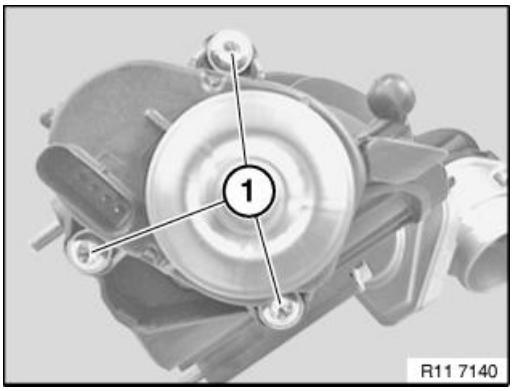


Release bolts in sequence (5 to 1).*Installation note:*
Tighten bolts in sequence (1 to 5).

Tightening torque: 11 61 1AZ.



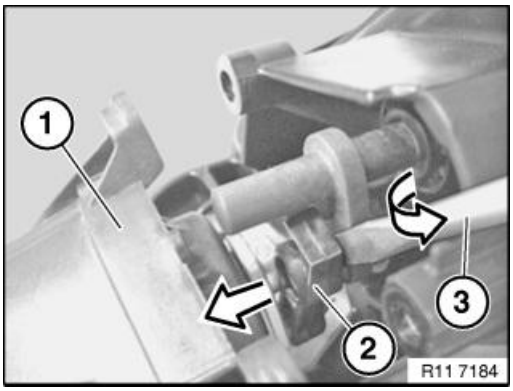
Installation note:
Replace seals (1 and 2).



Replace intake plenum.

Release screws (1).

Convert throttle valve assembly.



Slide drive unit for swirl flaps (1) forwards.

Lever out stop lever (2) with a screwdriver (3).

Reset stop values of swirl flap.

Observe diagnosis instruction:

1 Service function.

2 Adaptations.

3 Swirl-flap actuator.

Assemble engine.

Check air intake system for leaks.

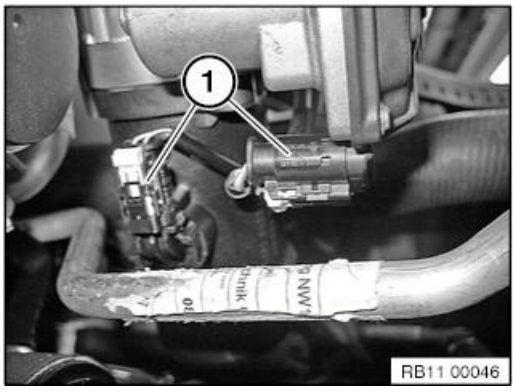
Check function of DDE.

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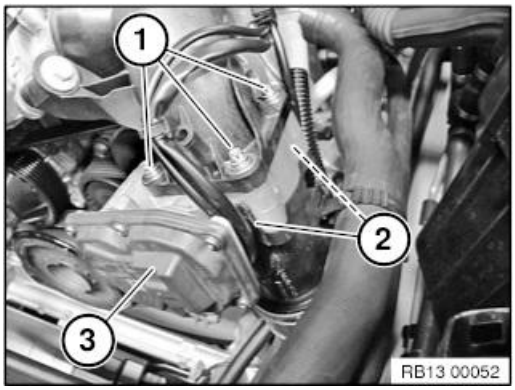
11 61 ... Removing and installing/renewing mixing tube for intake air (N47D20 K/U/O/T 1)

Necessary preliminary work:

- **Only at the time of replacement or cleaning of the mixing tube:** Reset adaptation values with diagnosis system
- Remove acoustic cover
- Release positive battery cable from alternator and holder.



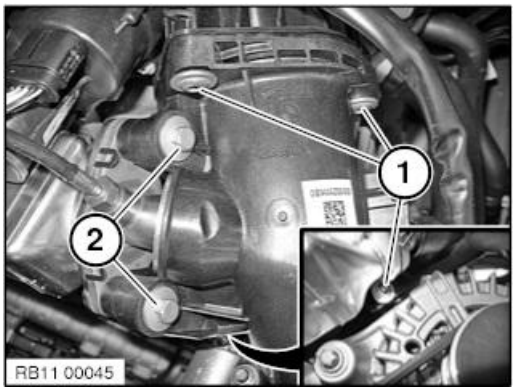
Detach plug connections (1) from throttle body and charge air pipe.



Release screws (1) on throttle valve assembly.

Tightening torque 13 54 1AZ.

Installation note:
Replace seals on throttle body and intake air mixing tube.



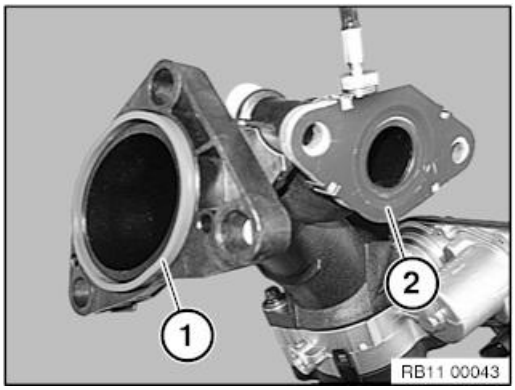
Release screws (1).

Unfasten screws (2).

Disconnect plug connection of exhaust-gas temperature sensor.

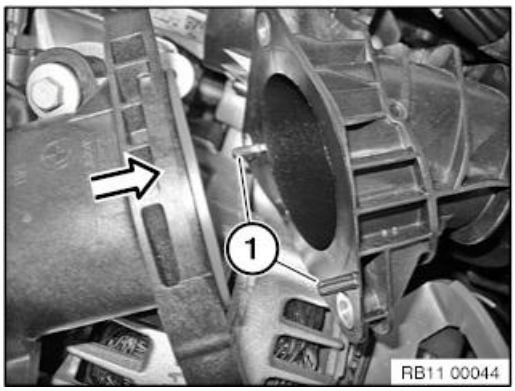
Remove mixing tube towards front.

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Installation note:
Replace O-ring (1).

Replace seal (2).



Installation note:
Pay attention to mounting lugs (1).

Remove mixing tube in direction of arrow.

Assemble engine.

Reset adaptation values with diagnosis system.

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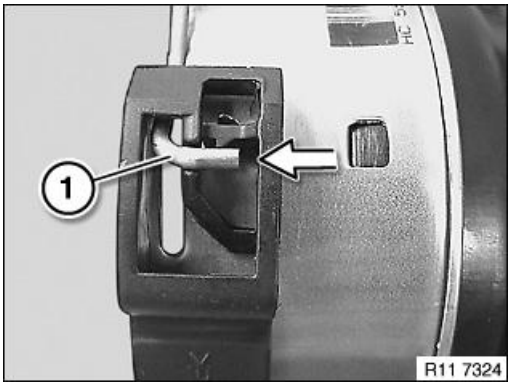
11 61 350 Removing and installing/renewing pressure pipe on throttle body (N47 D20 O1)

Important!

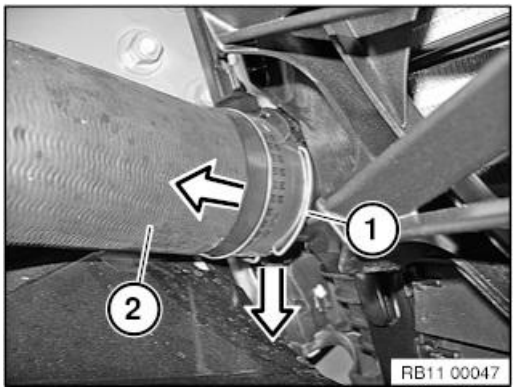
In the event of a leak at the pressure pipe, there is a **risk of damage** at the exhaust turbocharger.

Necessary preliminary work:

- Remove acoustic cover.

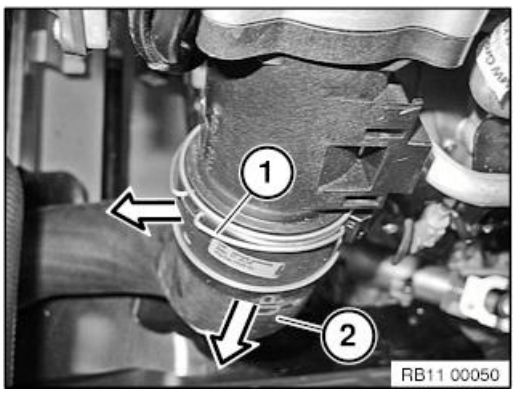


Note:
Lock (1) must snap into place in bracket (see arrow).



Release lock (1) with a suitable tool.

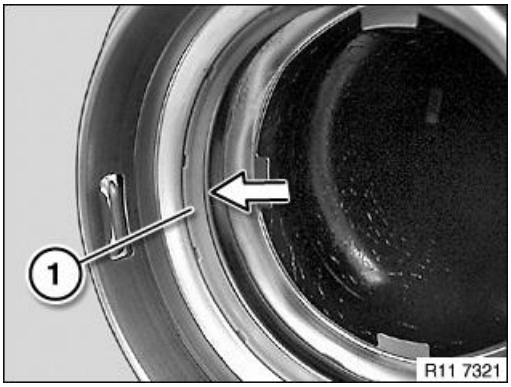
Disconnect pressure pipe (2) from charge air cooler.



Release lock (1) in direction of arrow.

Release pressure pipe (2) in direction of arrow.

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Important!

In the event of a leak at the pressure pipe, there is a **risk of damage** to the exhaust turbocharger.

Check sealing lip (1) for damage.*Installation note:*
If sealing lip (1) is damaged, the gasket must be replaced.



Important!

In the event of a leak at the pressure pipe, there is a **risk of damage** to the exhaust turbocharger.

Check sealing ring for damage.*Installation note:*
If sealing ring is damaged, the sealing ring must be replaced.

Assemble engine.

Check air intake system for leaks.

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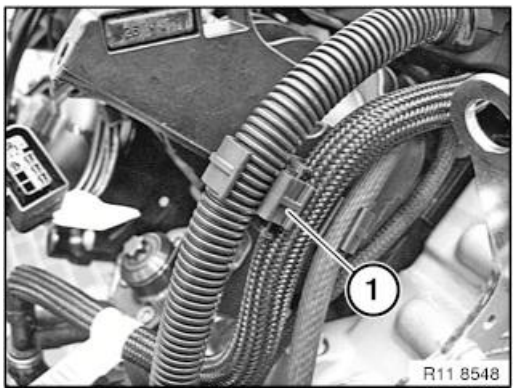
11 61 550 Removing and installing/replacing air intake plenum (N47 D20 O1)

Installation note:
If the intake plenum is renewed, the values for the end stop of the swirl flap must be deleted and re-programmed.

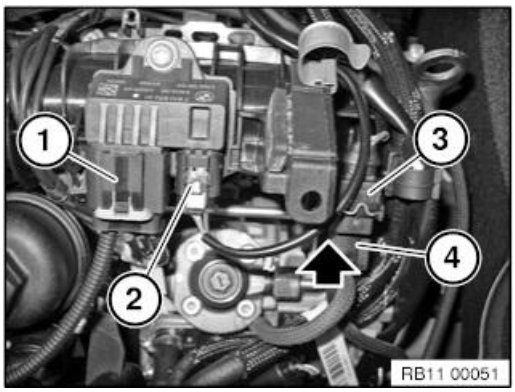
Follow diagnosis instruction.

Necessary preliminary work:

- Disconnect battery earth lead.
- Remove acoustic cover.
- Remove lower section of microfilter housing (only E9x, E84).
- Remove pressure pipe at throttle body.



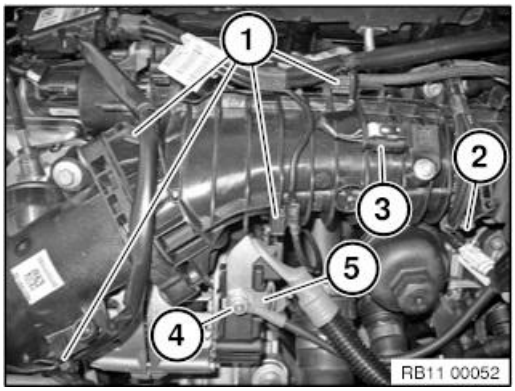
Push the cable clamps (1) on both halves apart and pull them off the holder.



Disconnect plug connection (1 and 2) from the preheating control unit.

Disconnect plug connection (3) from the electric changeover valve (4) of the engine mount.

Detach the electric changeover valve (4) in direction of arrow and lay to one side.



Loosen all cable clamps (1 and 2) on the intake plenum.

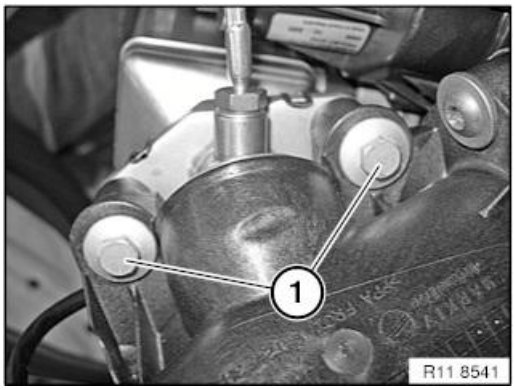
Disconnect plug connection (3) at charge air pressure sensor.

Release nut (4) on alternator.

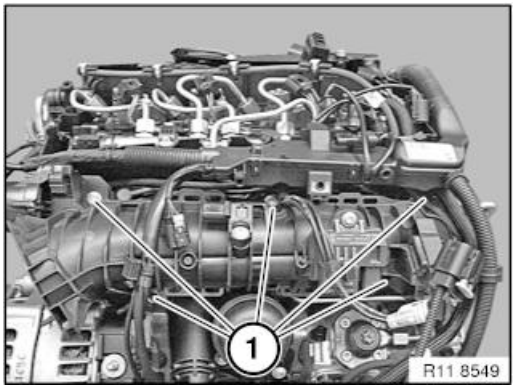
Tightening torque: 12 52 2AZ

Lay positive battery cable (5) to one side.

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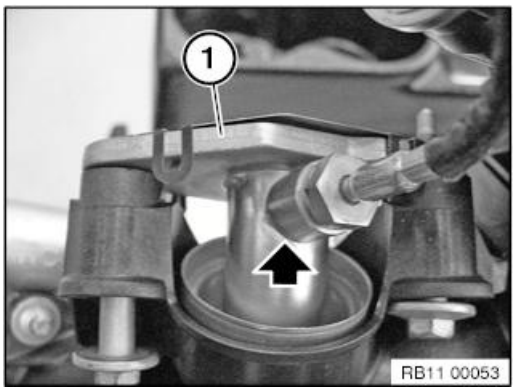


Loosen screws (1) on the exhaust-gas recirculation cooler.

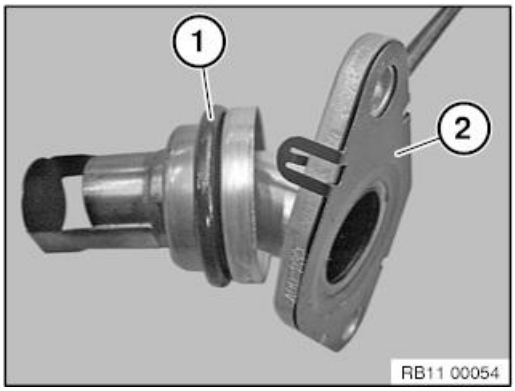


Release screws (1).

Remove the air intake system toward the top.



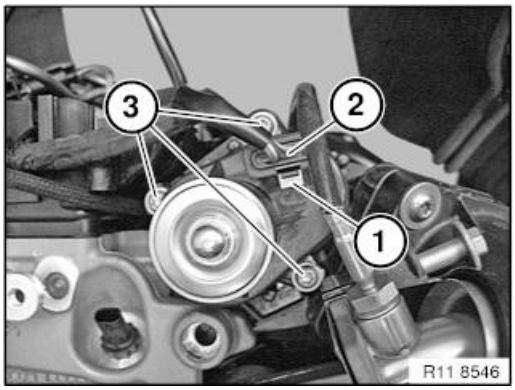
Remove the exhaust-gas recirculation pipe (1) in direction of arrow.



Installation note:
Replace O-ring (1).

Replace beaded metal gasket (2).

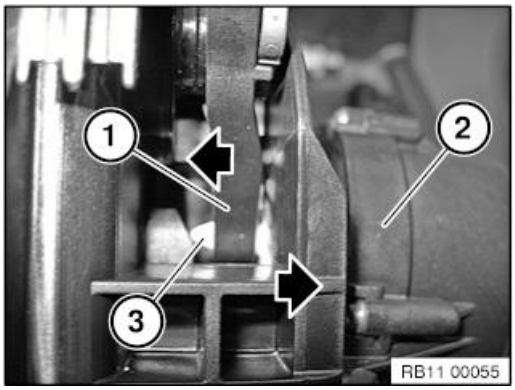
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Replace intake plenum.

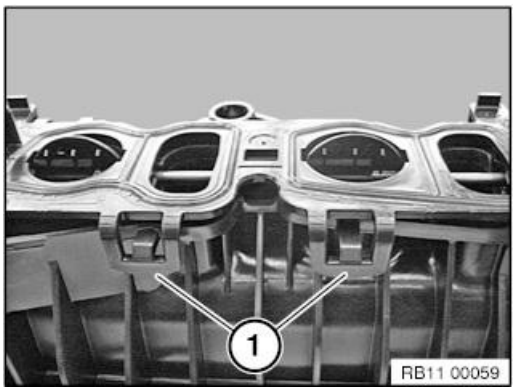
Release screws (3).

Remount swirl-flap controller (2).

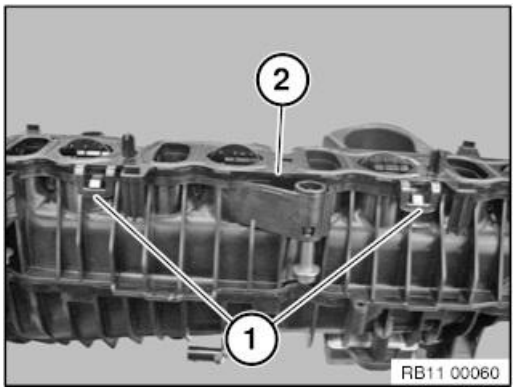


Slide swirl-flap controller (2) in the direction of arrow towards front.

Lever out adjustment plate (1) with a screwdriver in the direction of arrow, till the drive arm (3) has been released from the adjustment plate (1).



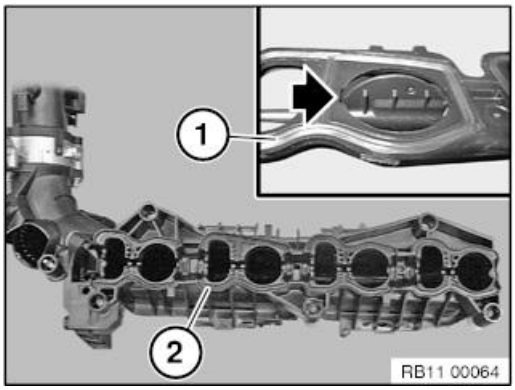
Unclamp retaining clamps (1) from the seal holder.



Unclamp retaining clamps (1) from the seal holder.

Remove the seal holders (2) with swirl flaps.

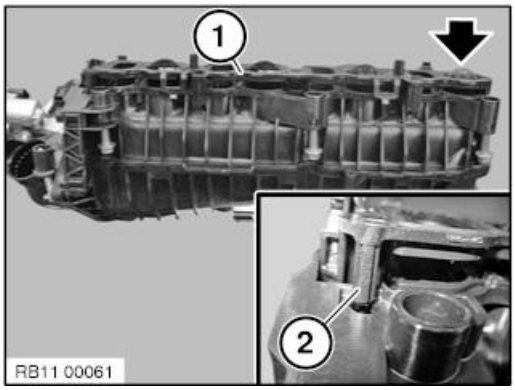
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Installation note:
For the seal carrier assembly (1) all swirl flap must be opened; this prevents the seal carrier (1) jamming.

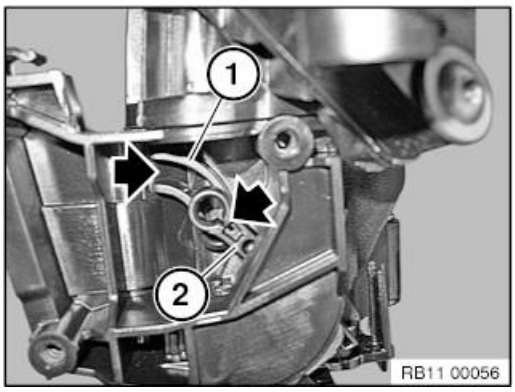
Clean the sealing ring on the intake plenum (2).

Position the seal holder (1) with open swirl flaps on the intake plenum (2).



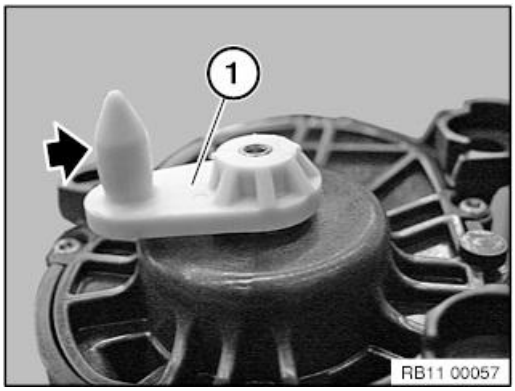
Installation note:
Note fixing (2) on the seal holder (1).

Attach the seal holder (1) with the retaining clamps on the air intake system.



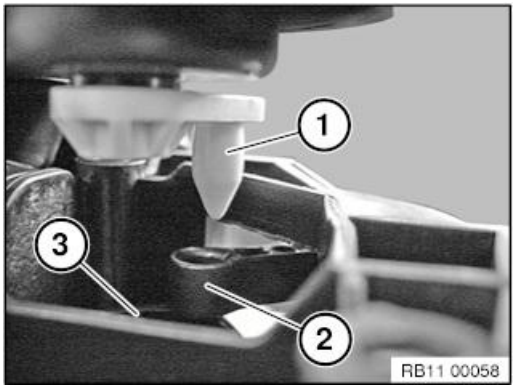
Before the swirl-flap controller can be mounted, the adjustment plate (2) must be positioned to the intake plenum.

Prepare the adjustment plate (2) for the guide (1) on the intake plenum.

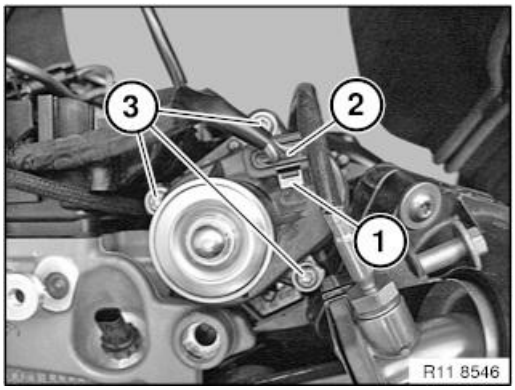


The drive arm (1) on the swirl-flap controller is edited at the marked area.

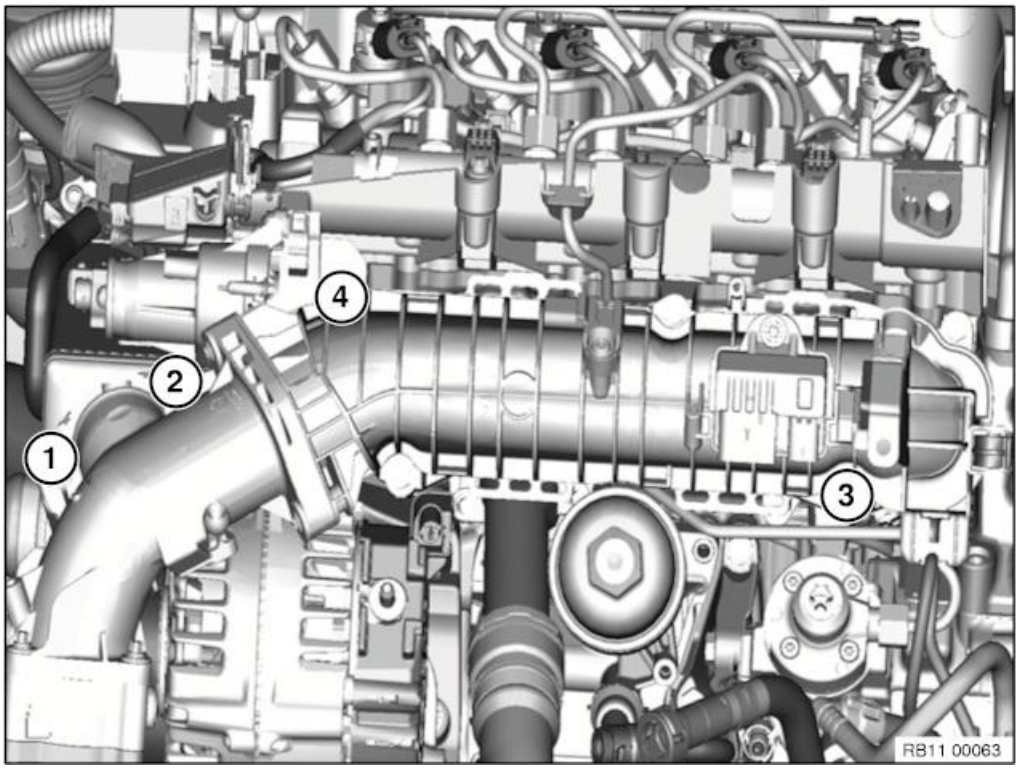
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The drive arm (1) on the swirl-flap controller must be positioned with the adjustment plate (2) of the swirl flap to the guiding groove (3) on the intake plenum. Only then can the swirl-flap controller be attached.



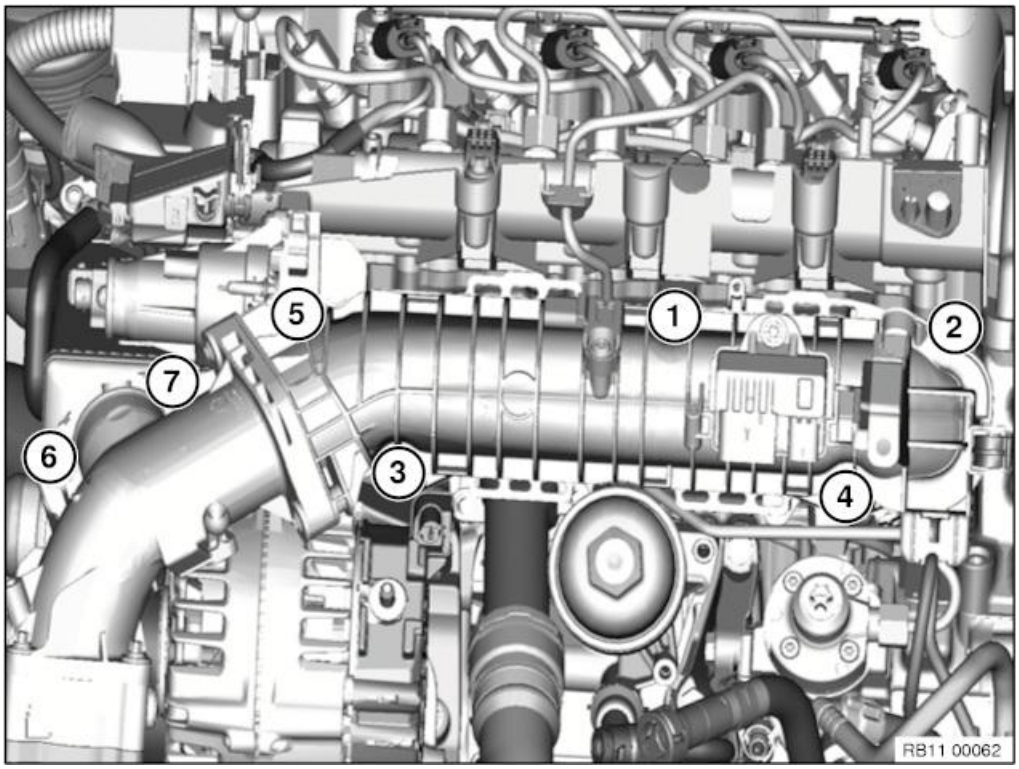
Secure swirl-flap controller (1) with screws (3).



Installation note:
Position the air intake system on the cylinder head.

Tack the air intake system on in the following order (from 1 to 4).

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Installation note:
To ensure tightness of the air intake system, the tightening sequence must be complied with.

Tighten the air intake system in sequence (1 to 7).

Tightening torque: 11 61 1AZ.

Assemble engine.

Check air intake system for leaks.

Check function of DDE.

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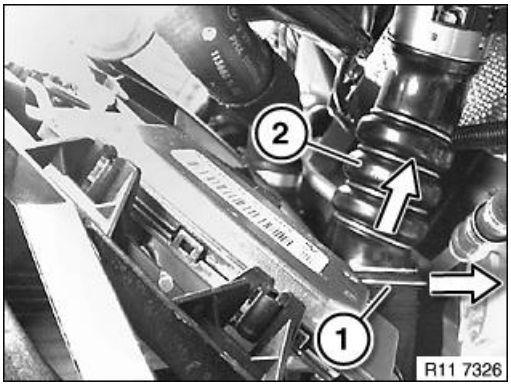
11 61 360 Removing and installing/replacing pressure pipe from exhaust turbocharger to charge air cooler (N47, N47S)

Important!

In the event of a leak at the pressure pipe, there is a **risk of damage** to the exhaust turbocharger.

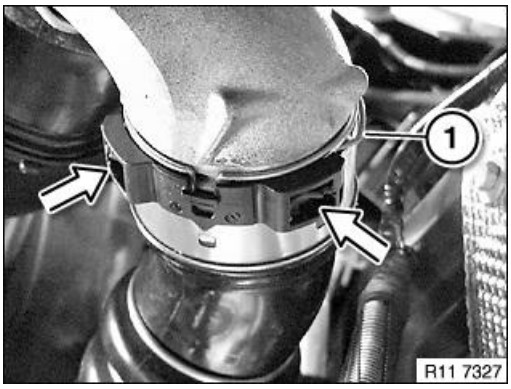
Necessary preliminary tasks:

- Remove intake silencer housing.



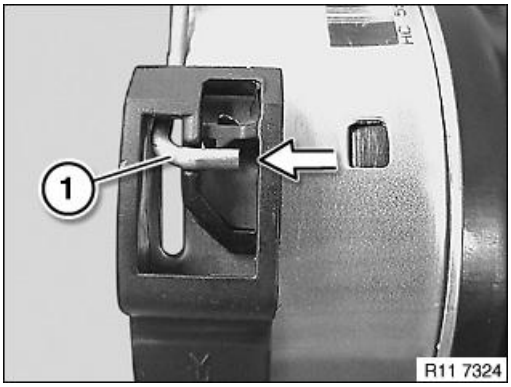
Release lock (1) in direction of arrow.

Release pressure pipe (2) in direction of arrow.



Release lock (1).

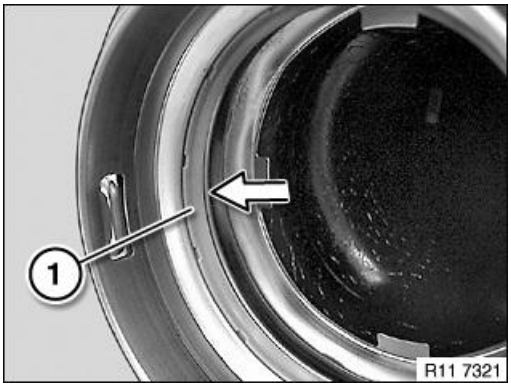
Lock (1) must engage in this holder (see arrow).



Note:

Snap lock (1) into place on lock (see arrow).

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Check sealing lip (1) for damage.*Installation note:*
If sealing lip (1) is damaged, the gasket must be replaced.

Important!

In the event of a leak at the pressure pipe, there is a **risk of damage** to the exhaust turbocharger.



Check sealing ring for damage.*Installation note:*
If sealing ring is damaged, replace gasket.

Important!

In the event of a leak at the pressure pipe, there is a **risk of damage** to the exhaust turbocharger.

Assemble engine.

Check air intake system for leaks.

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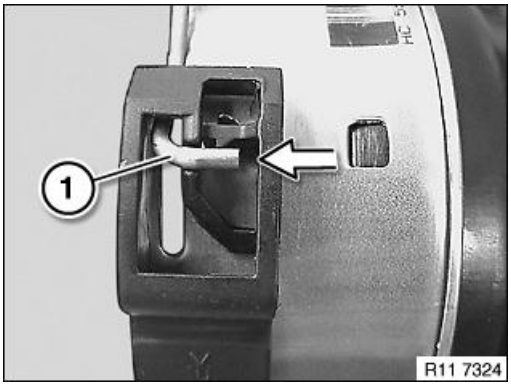
11 61 360 Removing and installing/replacing pressure pipe, exhaust turbocharger to charge air cooler (N47 D20 O1)

Important!

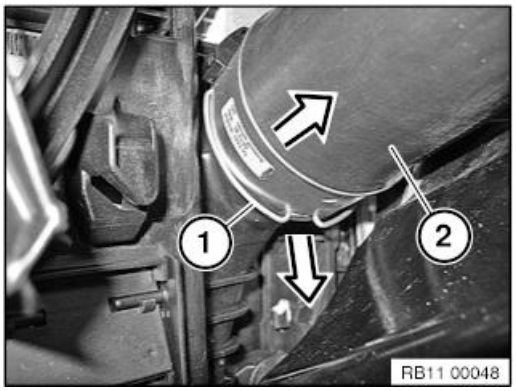
In the event of a leak at the pressure pipe, there is a **risk of damage** at the exhaust turbocharger.

Necessary preliminary work:

- Remove intake silencer housing.

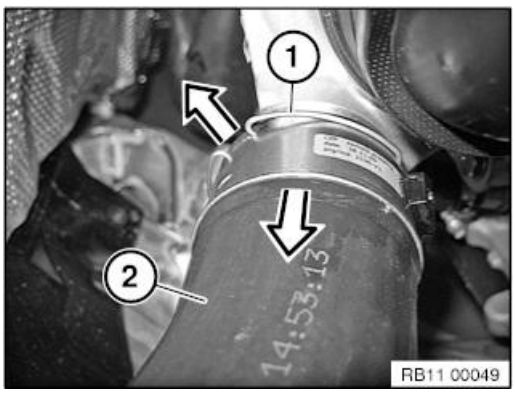


Note:
Snap lock (1) into place on lock (see arrow).



Release lock (1) in direction of arrow.

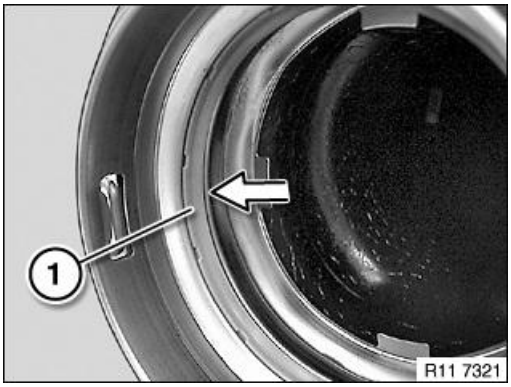
Release pressure pipe (2) in direction of arrow.



Release lock (1).

Release pressure pipe (2) in direction of arrow.

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Check sealing lip (1) for damage.*Installation note:*
If sealing lip (1) is damaged, the gasket must be replaced.

Important!

In the event of a leak at the pressure pipe, there is a **risk of damage** at the exhaust turbocharger.



Check sealing ring for damage.*Installation note:*
If sealing ring is damaged, the sealing ring must be replaced.

Important!

In the event of a leak at the pressure pipe, there is a **risk of damage** at the exhaust turbocharger.

Assemble engine.

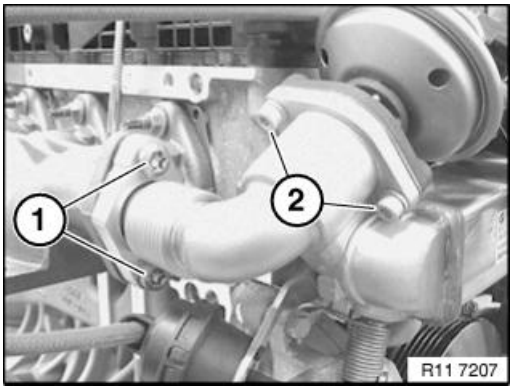
Check air intake system for leaks.

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18 40 040 Removing and installing, sealing or replacing exhaust manifold (N47)

Necessary preliminary tasks:

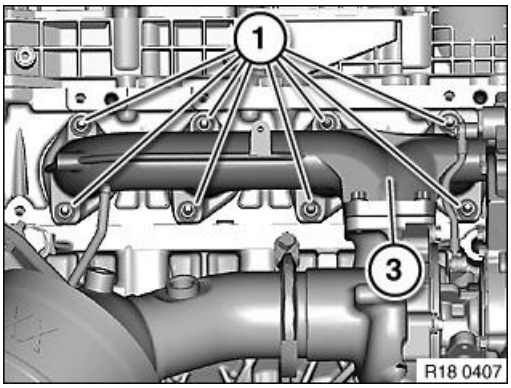
Remove exhaust turbocharger



Release screws (1).

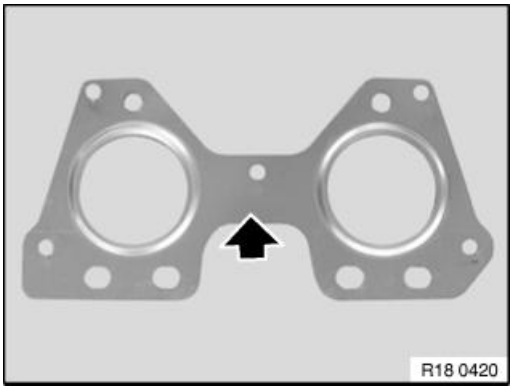
Tightening torque, 11 71 1AZ.

Note:
The exhaust turbocharger is removed for clearer illustration.



Release nuts (1), remove exhaust manifold (3) from cylinder head.*Installation:*
Tightening torque: 11 62 1AZ

Clean connection points and fit new seals.



Important!

Manifold gaskets are graphite-coated on one side!

The graphite coating must be fitted on the manifold side.

Assemble engine.

Check function of DDE.

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11 65 020 Damage on the exhaust turbocharger due to obstructed oil supply lines



Caution!

If there is damage on the exhaust turbocharger:

- **Complaint:**

  Power loss, malfunction indicator lamp on

  Damage to the exhaust turbocharger.

  After damage to the exhaust turbochargers, the oil supply lines are often not replaced and the oil is not changed, this can lead to damage to the exhaust turbocharger again.

  Further, fault code entries in the preheating system or to the charging pressure controller (variable turbine geometry) are not considered.

  For N57X, additionally the following faults can be stored: 292200 Charging pressure controller (variable turbine geometry): Position sensor in charging pressure controller faulty or undervoltage 48F6 in charging pressure controller (variable turbine geometry)

  Attention: Subsequent damage is not covered by the warranty!

- **Cause**

  The oil supply lines for the exhaust turbocharger are clogged or blocked by oil sludge/coking. Due to that, oil supply to the exhaust turbocharger may be inadequate and can cause damage to the exhaust turbocharger again.

  Malfunctions in the preheating system can lead to clogging of the diesel particulate filter and thus to problems with the charging pressure control or the charging pressure build-up. Consequence: Problems at cold start or the engine does not start due to a faulty preheating system. Power loss or overheating of the exhaust branch.

  If the new exhaust turbocharger is not filled with enough oil prior to installation, the shaft bearings can be damaged at the first starting operation itself.

- **Solution**

  Proceed as follows in response to a customer complaint:

  If fault code entries are available for the preheating system, the preheating system must be repaired. Then delete the fault memory.

  Caution!

  If the engine does not heat up or only heats up very slowly because of a defective thermostat, this can result in premature or repeated damage to the exhaust turbocharger. **Always** check the coolant thermostat and thermostat for the EGR cooling if there is a complaint, and repair if applicable.

  Engine oil and filter exchange must be carried out on the engine absolutely, so as to guarantee operation of the changed exhaust turbocharger with fresh oil!

  Since the oil feed line as well as the oil return line may coke with increased mileage especially in the cable connection area of the exhaust turbocharger, the followings rules are applicable:

  Engines with one exhaust turbocharger:

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- Exhaust turbocharger exchange due to electrical fault on the exhaust turbocharger (vehicle mileage/km up to 100,000 km):
  - Check the oil feed line, oil return line and the associated banjo bolts for coking, **replace if applicable**.
  - If the oil return line is replaced, the connecting pipe on the crankcase must **always** be cleaned, as it is also subject to coking!
  - If a replacement is not necessary: If the exhaust turbocharger is offered only along with the oil return line and oil feed line in the Electronic Parts Catalogue (EPC), it can be removed from the order list again.
- Exhaust turbocharger exchange due to electrical fault on the exhaust turbocharger (vehicle mileage/km starting at 100,000 km):
  - Replace the oil feed line, oil return line and the associated banjo bolts.
  - If the oil return line is replaced, the connecting pipe on the crankcase must **always** be cleaned, as it is also subject to coking!
- Exchanging the exhaust turbocharger if there is mechanical damage on the exhaust turbocharger:
  - Always replace the oil feed line, oil return line and the associated banjo bolts.
  - If the oil return line is replaced, the connecting pipe on the crankcase must **always** be cleaned, as it is also subject to coking!

Engines with several exhaust turbochargers:

- Exchanging one or several exhaust turbochargers due to electrical faults on the exhaust turbocharger (vehicle mileage/km up to 100,000 km):
  - Check the oil feed lines, oil return lines and the associated banjo bolts of **all** exhaust turbochargers (including the intact exhaust turbocharger) for coking, **replace if applicable**.
  - If all the oil return lines are replaced, all the connecting pipes on the crankcase must **always** be cleaned, as they are also subject to coking!
  - If a replacement is not necessary: If the exhaust turbocharger is offered only along with the oil return line and oil feed line in the Electronic Parts Catalogue (EPC), it can be removed from the order list again.
- Exchanging one or several exhaust turbochargers due to electrical faults on the exhaust turbocharger (vehicle mileage/km starting at 100,000 km):
  - Replace the oil feed lines, oil return lines and the associated banjo bolts of **all** exhaust turbochargers (including the intact exhaust turbocharger).
  - If all the oil return lines are replaced, all the connecting pipes on the crankcase must **always** be cleaned, as they are also subject to coking!
- Exchanging one or several exhaust turbochargers if there is mechanical damage on the exhaust turbocharger:
  - Always replace the oil feed lines, oil return lines and the associated banjo bolts of **all** exhaust turbochargers (including the intact exhaust turbocharger).
  - If all the oil return lines are replaced, all the connecting pipes on the crankcase must **always** be cleaned, as they are also subject to coking!

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In case the diesel particulate filter is foul with oil, clean or replace it, if necessary.

In order to exclude that the oil supply to the exhaust turbocharger is not impaired due to faulty crankcase ventilation, carry out a function check of the crankcase ventilation in this regard. The corresponding test module can be found in ISTA at:

- Power train
- Digital Diesel Electronics
- Engine ventilation
- Internal engine pressure

When installing the exhaust turbocharger, the exhaust turbocharger itself needs to be filled to capacity with fresh engine oil through the oil intake hole before the oil feed line is mounted. Important: Never use liquid sealing compounds when connecting the engine oil pipe as they can block the oil ducts.

After installing the exhaust turbocharger, start the engine and let it run at idle for 2 to 3 minutes before increasing the speed.

If required, initiate a regeneration of the diesel particulate filter

Important: For vehicles with N57x engines that have fault memory entries that are at the top, a successful diesel particulate filter regeneration must be carried out.

Then delete the fault memory.

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11 65 020 Removing and installing or replacing exhaust turbocharger (N47 D20 O1)

Special tools required:

- 11 6 050

Warning!

Risk of burning!

Only perform this repair work on an engine that has cooled down.

Note:

Troubleshooting on exhaust turbocharger.

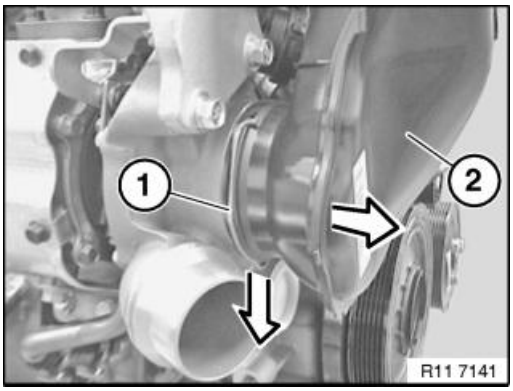
Attention!

For exhaust turbocharger damage:

In order to avoid subsequent damage, the following notes and test steps must always be followed.

Necessary preliminary tasks:

- Remove air filter.
- Remove acoustic covers on top and front.
- Loosen V-Band washer Diesel Particle Filter (diesel particle filter does not have to be removed).
- Remove right pressure pipe.

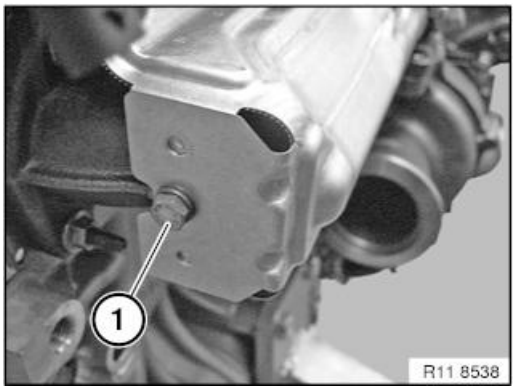


Loosen screw on air intake hose (2).

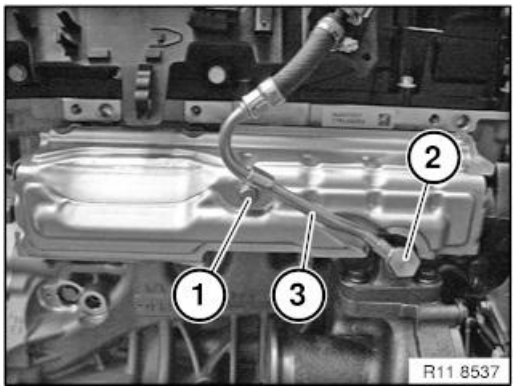
Unlock clip (1) in direction of arrow.

Pull off air intake hose (2) in direction of arrow.

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Release screw (1).



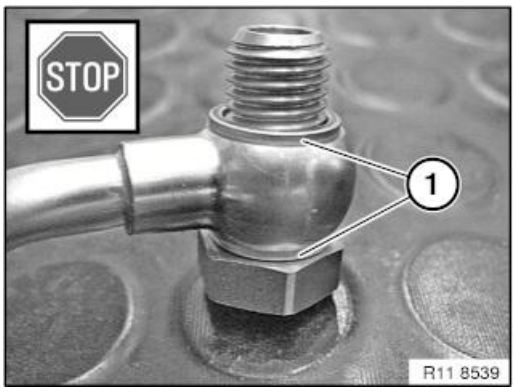
Release screw (1).

Unfasten banjo bolt (2).

Tightening torque 13 62 7AZ.

Place exhaust pipe (3) to one side.

Remove heat shield toward top.

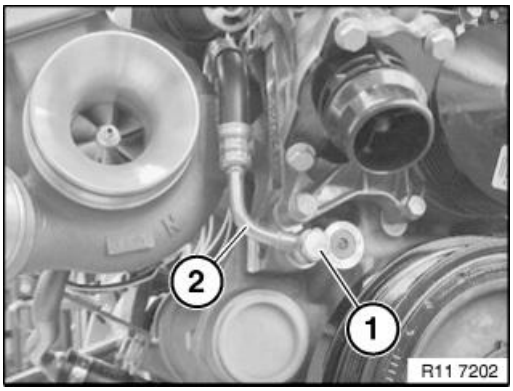


Attention!

Use steel sealing rings (1) only.

Risk of damage!

Installation note:
Replace steel sealing rings (1).



Release banjo bolt (1).

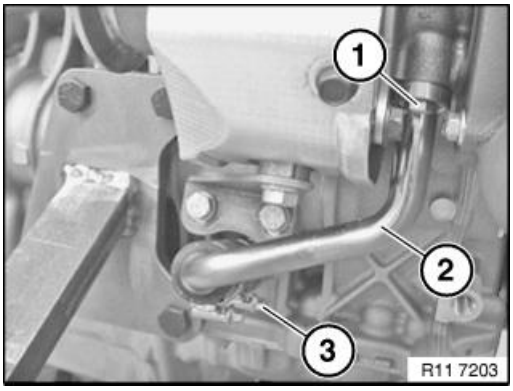
Note:
Catch escaping engine oil in a suitable container.

Disconnect line (2).

Tightening torque 11 42 3AZ.

Installation note:
Clean sealing surfaces.

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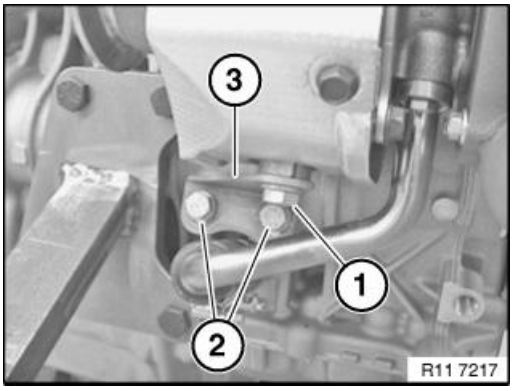
Unfasten hose clamp (3).

Tightening torque: 11 00 7AZ.

Remove return line (2) from the removed exhaust turbocharger.

Release screws (1).

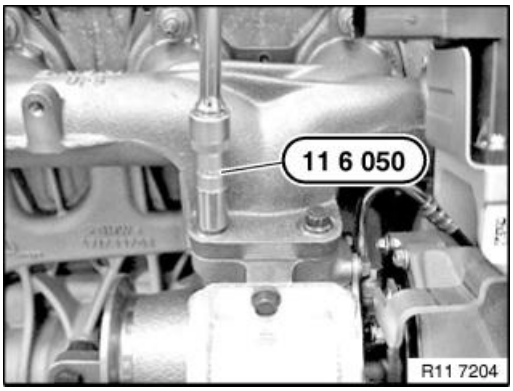
Installation note:
Renew gasket.



Release screw (1).

Unfasten screws (2).

Remove bracket (3).



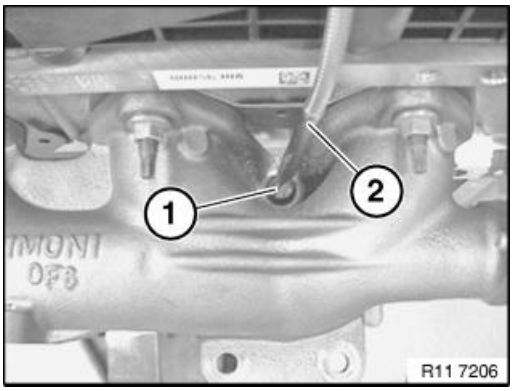
Release bihexagonal bolts on exhaust turbocharger with special tool 11 6 050 .

Tightening torque: 11 65 1AZ.

Installation note:
Renew gasket.

Attention!

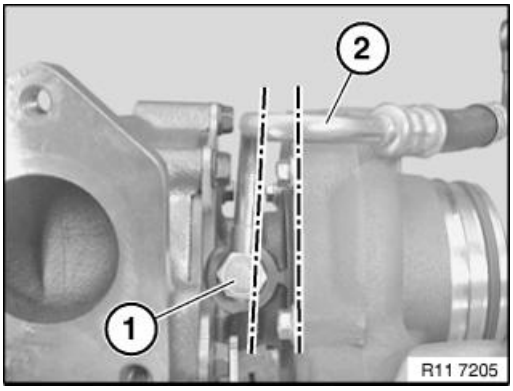
To avoid damaging the threads and prevent exhaust turbocharger leaks, insert mounting bolts in 1/2 turns simultaneously.



Note:
High-strength bolts are not magnetic and cannot be removed with a magnet.

Use gripper (2) to remove bihexagonal bolt (1).

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Note:
When replacing the exhaust turbocharger:

Release banjo bolt (1).

Remove engine oil pipe (2).

Crank exhaust turbocharger by hand several times.

Position oil line (2) on new exhaust turbocharger.

Tighten banjo bolt (1).

Installation note:
Renew sealing rings.

Oil line (2) must run obliquely along the housing (see diagram).

Tightening torque 11 42 3AZ.

Assemble engine.**Attention!**

Grease the thread on the exhaust turbocharger with the assembly paste 4.2.

To avoid damaging the threads and prevent exhaust turbocharger leaks, insert the mounting bolts in 1/2 turns simultaneously to the stop.

Release all bolts again by a 90° turn.

Follow sequence of exhaust turbocharger screw connections:

1. Fasten V-band clip 18 31 1AZ.

2. exhaust turbocharger screw connection at the exhaust manifold 11 65 1AZ.

3. Crankcase holder on the exhaust turbocharger 11 00 2AZ.

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11 65 020 Removing and installing or replacing exhaust turbocharger (N47)

Special tools required:

- 11 6 050

Warning!

Risk of burning!

Only perform this repair work on an engine that has cooled down.

Note:

Troubleshooting on exhaust turbocharger.

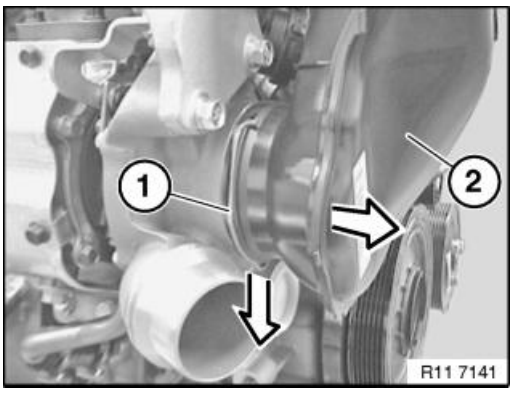
Attention!

For exhaust turbocharger damage:

In order to avoid subsequent damage, the following notes and test steps must always be followed.

Necessary preliminary tasks:

- Remove acoustic cover.
- Remove air filter.
- Release diesel particulate filter (do not remove).
- Release diesel particulate filterE60E61 (do not remove).
- Remove right pressure pipe.
- Remove front underbody protection.
- Remove rear underbody protection.

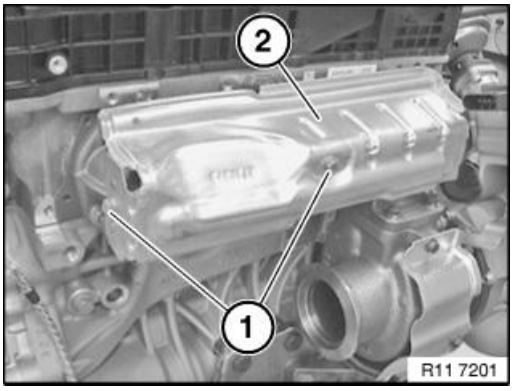


Unlock clip (1) in direction of arrow.

Pull off air intake hose (2) in direction of arrow.

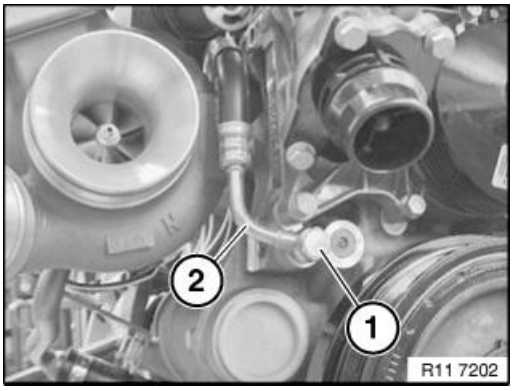
Disconnect plug connection at exhaust turbocharger.

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Release screws (1).

Remove heat shield (2).



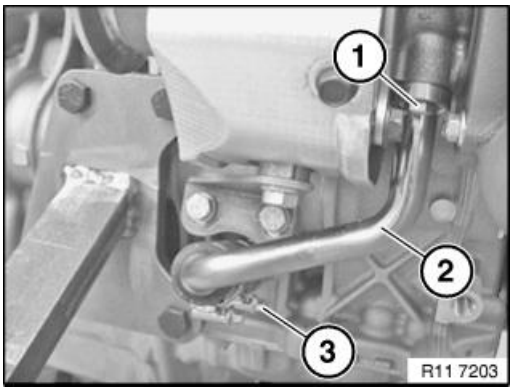
Release banjo bolt (1).

Note:
Catch escaping engine oil in a suitable container.

Disconnect line (2).

Tightening torque 11 42 2AZ

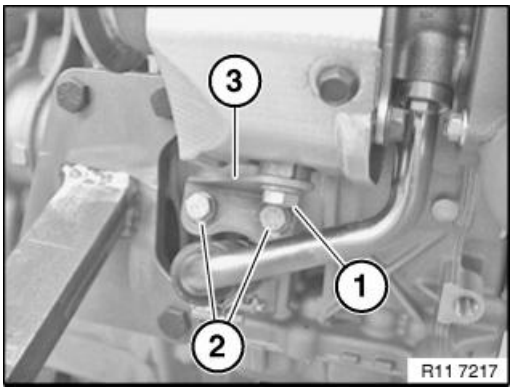
Installation note:
Clean sealing surfaces.



Release screw (1).

Unfasten hose clamp (3).

Remove return line (2).

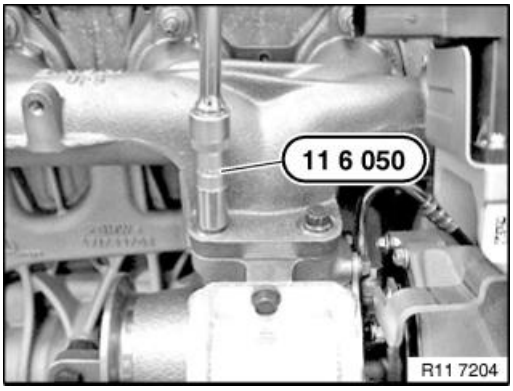


Release screw (1).

Unfasten screws (2).

Remove bracket (3).

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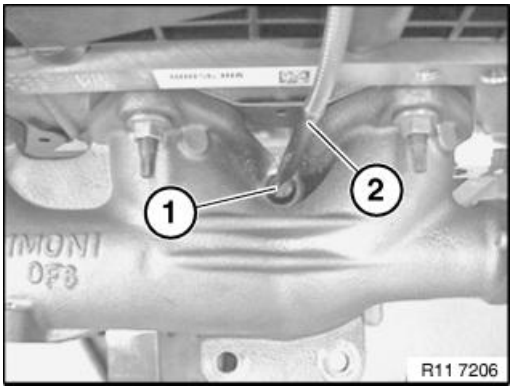
Release bihexagonal bolts on exhaust turbocharger with special tool 11 6 050 .

Tightening torque: 11 65 1AZ

Installation note:
Renew gasket.

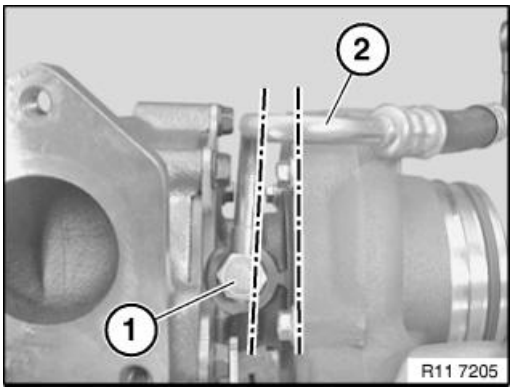
Attention!

To avoid damaging the threads and prevent exhaust turbocharger leaks, insert mounting bolts in 1/2 turns simultaneously.



Note:
High-strength bolts are not magnetic and cannot be removed with a magnet.

Use gripper (2) to remove bihexagonal bolt (1).



If necessary, replace exhaust turbocharger.

Release banjo bolt (1).

Installation note:
Tightening torque 11 42 2AZ

Renew sealing rings.

Oil line (2) must run obliquely along the housing (see diagram).

Assemble engine.**Attention!**

To avoid damaging the threads and prevent exhaust turbocharger leaks, insert mounting bolts in 1/2 turns simultaneously.

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11 65 ... Test steps in the event of turbocharger damage



Attention!

The following components must always be checked for foreign bodies, damage and function before installing the new turbocharger.

- Pressure pipe and hoses
- Charge air cooler
- Intake plenum
- If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as this can even coke!

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11 66 000 Removing and installing or replacing vacuum/oil pump (N47 D20 O1)

Special tools required:

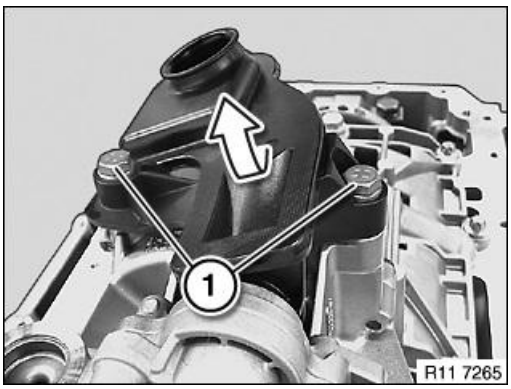
- 00 9 120
- 11 4 350

Important!

It is possible to remove and install the vacuum oil pump **without** removing the transmission.

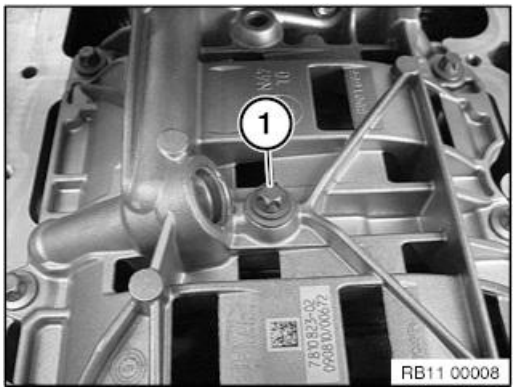
Necessary preliminary tasks:

- Removing oil sump.



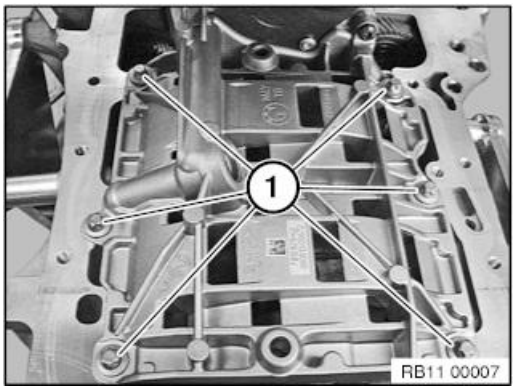
Release screws (1).

Remove intake snorkel in direction of arrow.

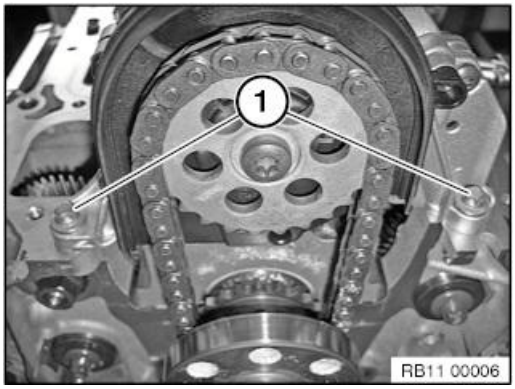


Release screw (1).

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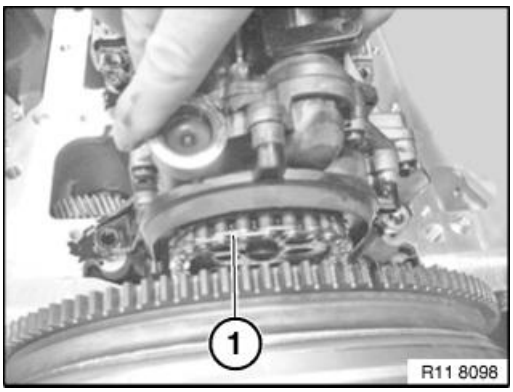
Release screws (1).*Installation note:*
Clean and blow out the thread



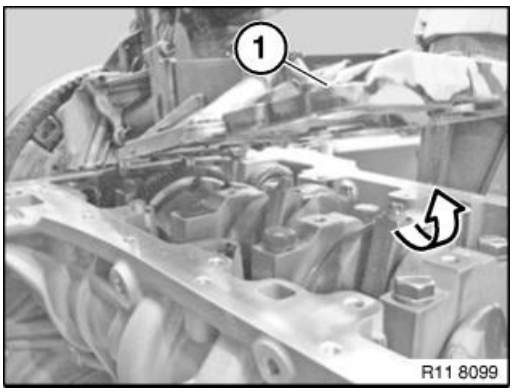
Release screws (1).

When installed, the oil pump chain must be fed out from the sprocket wheel of the oil pump drive gear; the sprocket wheel cannot be removed.

Note:
Illustration shows gear case cover removed.



Oil vacuum pump must be fed out at chain drive (1).

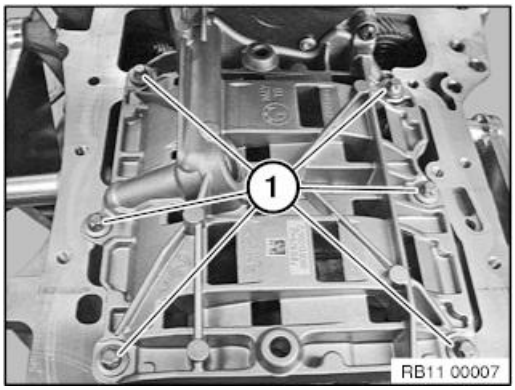


Feed out oil vacuum pump (1) in direction of arrow and remove.

Installation in reverse sequence.

Installation note:
Clean all sealing surfaces.

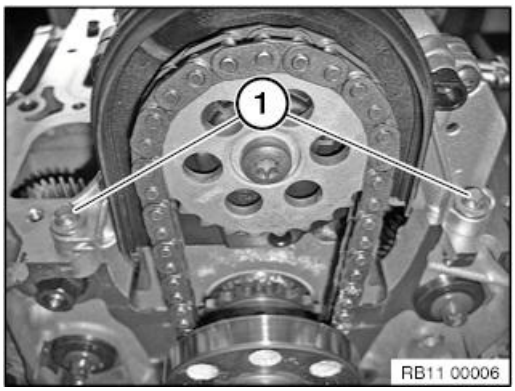
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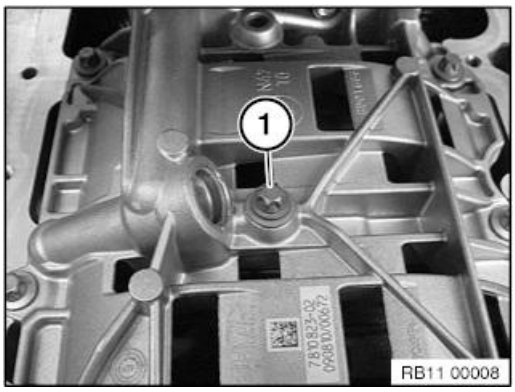
Installation note:
Replace O-ring.

Install all screws (1) and tighten down.

Tightening torque: 11 41 1AZ.



Install and tighten down screws (1).



Installation note:
Clean and blow out the thread

Insert and secure screw (1).

Secure screw (1) with special tool 00 9 120 .

Tightening torque: 11 41 2AZ.

Assemble engine.

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11 66 000 Removing and installing or replacing vacuum/oil pump (N47, N47S)

Special tools required:

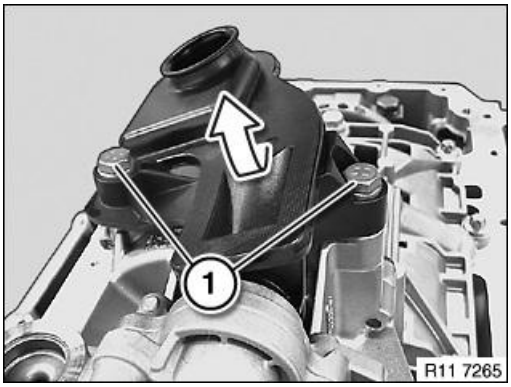
- 00 9 120
- 11 4 350

Important!

It is possible to remove and install the oil vacuum pump **without** removing the transmission.

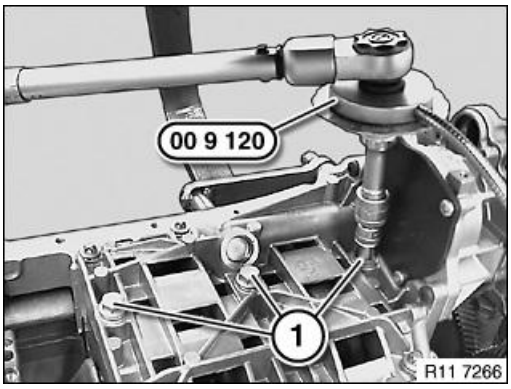
Necessary preliminary tasks:

- Remove oil sump.



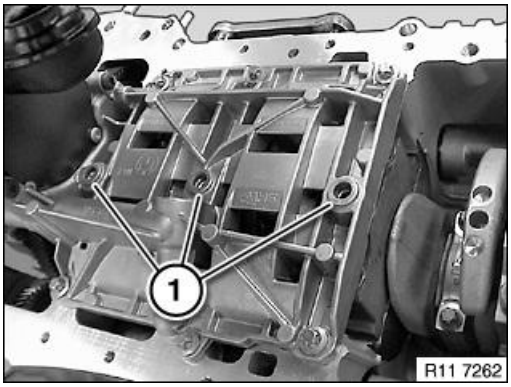
Release screws (1).

Remove intake snorkel in direction of arrow.

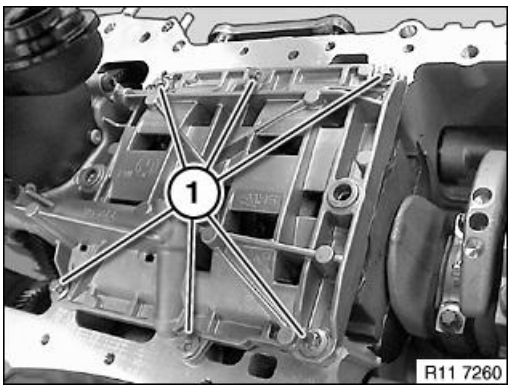


Release screws (1).

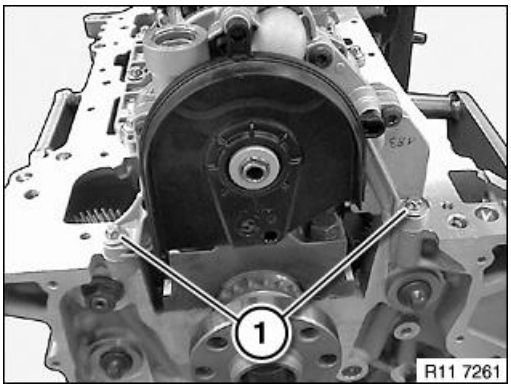
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Unscrew all spacers (1) anticlockwise.



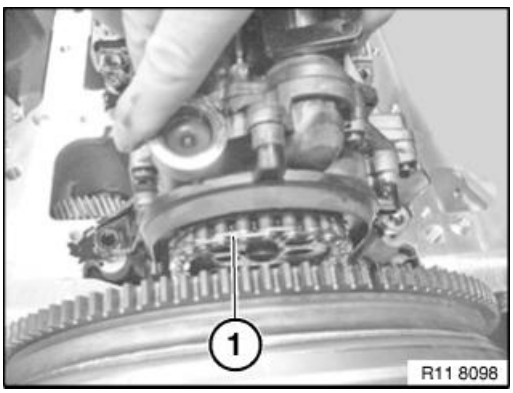
Release screws (1).



Release screws (1).

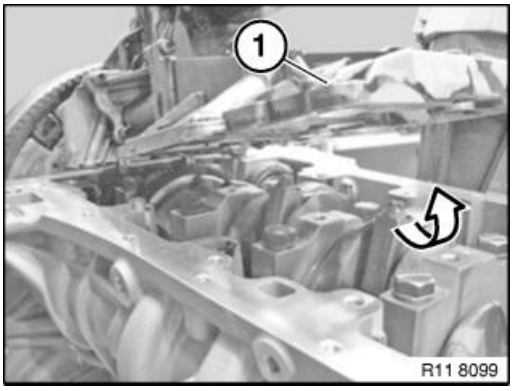
When installed, the oil pump chain must be fed out from the sprocket wheel of the oil pump drive gear; the sprocket wheel cannot be removed.

Note:
graphic without gear case cover.



Oil vacuum pump must be fed out at chain drive (1).

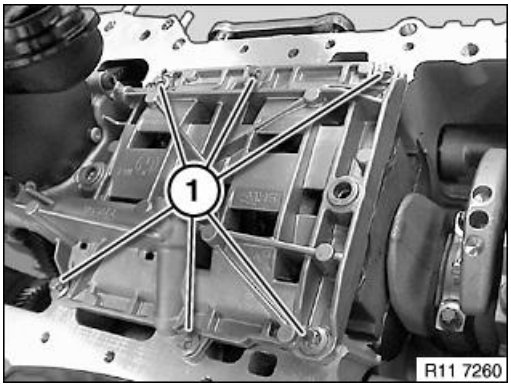
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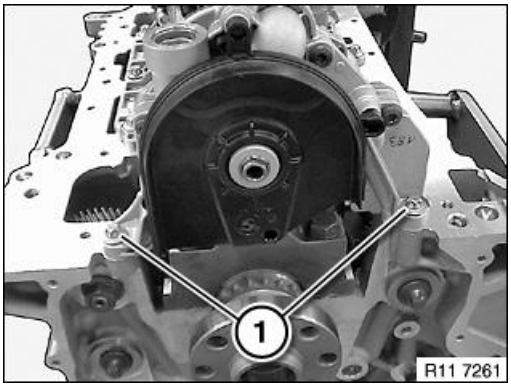
Feed out oil vacuum pump (1) in direction of arrow and remove.

Installation in reverse sequence.

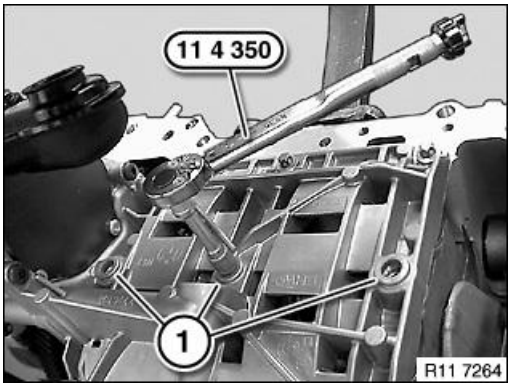
Installation note:
Clean all sealing surfaces.



Install all screws (1) and tighten down.



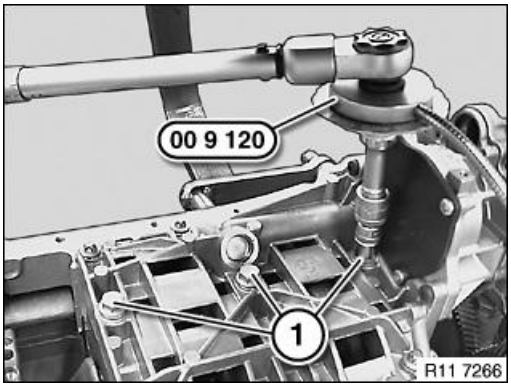
Install and tighten down screws (1).*Note:*
graphic without chain drive.



Secure threaded support sleeves (1) with special tool 11 4 350 .

Tightening torque: 11 41 1AZ.

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Secure special tool 00 9 120 with bolts (1).

Tightening torque: 11 41 2AZ.

Assemble engine.

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11 71 501 Remove and install/renew the exhaust-gas recirculation valve (EGR) (N47 D16/20 K/U/O/T 1)

Note:
The adaptation values must be reset after cleaning or replacing the exhaust-gas recirculation valve.

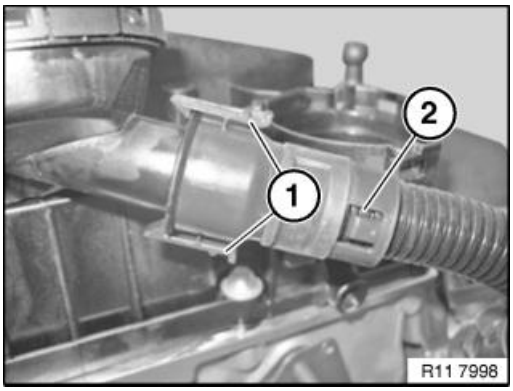
Warning!

Risk of burning!

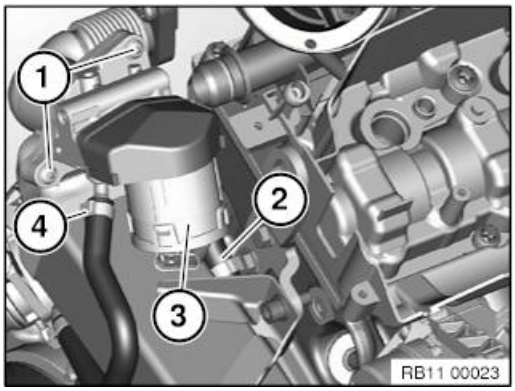
Only perform this repair work on an engine that has cooled down.

Necessary preliminary work:

- Remove front acoustic cover (only E6x, F1x, F07, F25)
- Remove intake filter housing (only E6x, E8x, F25)
- Remove clean air pipe (E8x only, F25)



Unlock vent line (2) and pull off to achieve improved freedom of movement of the exhaust-gas recirculation valve mounting.



Release screws (1) on exhaust-gas recirculation valve (3).

Tightening torque 11 00 2AZ.

Release coolant lines (2) and (4).

Disconnect plug connection on exhaust-gas recirculation valve (3).

Installation note:
Install rear hose (2) before installing the exhaust-gas recirculation valve.

Replace O-ring.

Add coolant.

Assemble engine.

Check function of DDE.

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11 71 100 Removing and installing or replacing exhaust-gas recirculation cooler (N47, N47S)

Note:
The adaptation values must be reset after cleaning or replacing the exhaust-gas recirculation cooler.

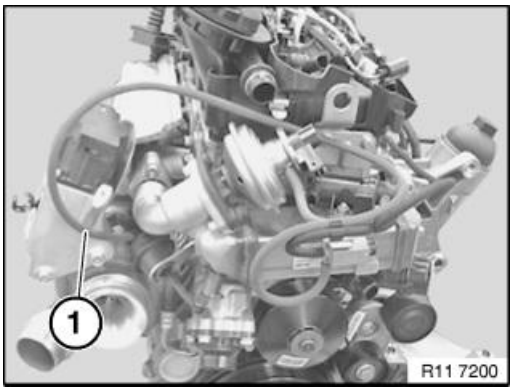
Warning!

Risk of burning!

Only perform this repair work on an engine that has cooled down.

Necessary preliminary work:

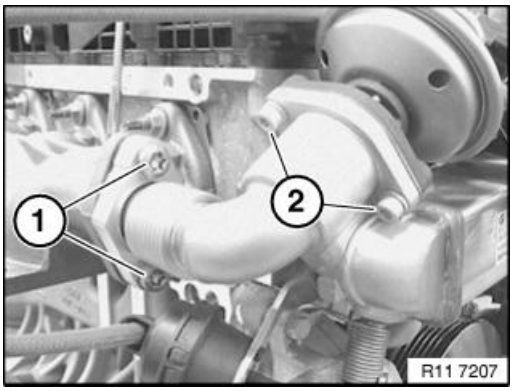
- Remove acoustic cover
- Remove fan cowl
- Drain coolant from radiator



Pull off vacuum hose (1).

Connect vacuum pump to vacuum unit of bypass flap.

Check exhaust gas recirculation is working using vacuum pump.

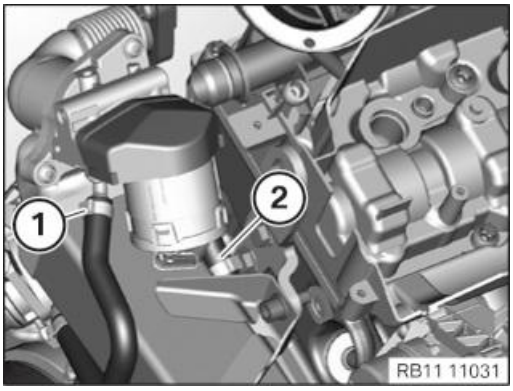


Unfasten screws (2).

Tightening torque 11 00 4AZ.

Disconnect vacuum unit.

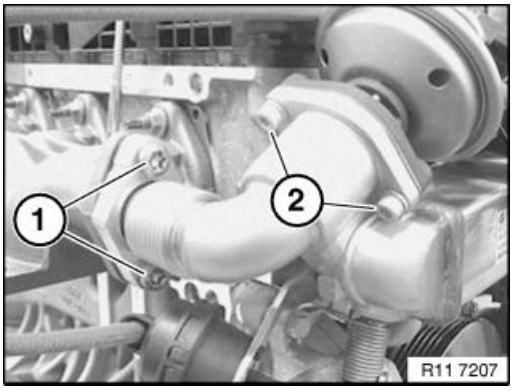
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If fitted:

Pull off the coolant lines (1) and (2) from the exhaust-gas recirculation cooler.

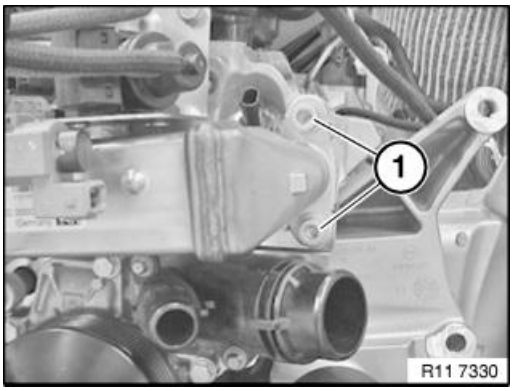
Unlock the plug connection fort the exhaust-gas recirculation valve and pull it off.



Release screws (1).

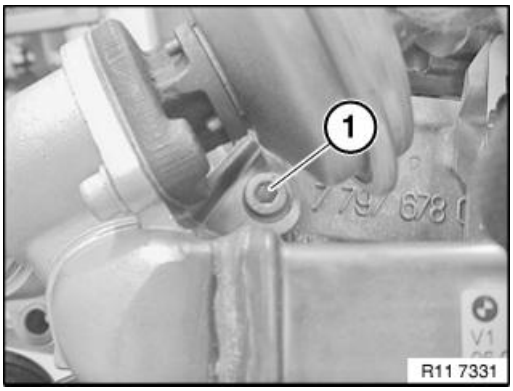
Tightening torque 11 00 4AZ.

Installation note:
Renew screws (1) and seal.



Release screws (1).

Tightening torque 11 00 4AZ.



Release screw (1).

Tightening torque 11 00 4AZ.

Installation note:
Replace pipe neck on EGR cooler.

Ensure that the pipe neck is mounted without tension.

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Installation note:
Replace all gaskets.

Assemble engine.

Vent cooling system.

Check cooling system for watertightness.

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11 71 100 Removing and installing/renewing exhaust-gas recirculation cooler (N47D20 K/U/O/T 1)

Note:
The adaptation values must be reset after cleaning or replacing the exhaust-gas recirculation cooler.

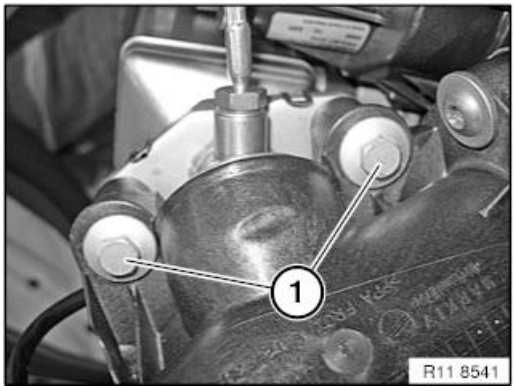
Warning!

Risk of burning!

Only perform this repair work on an engine that has cooled down.

Necessary preliminary work:

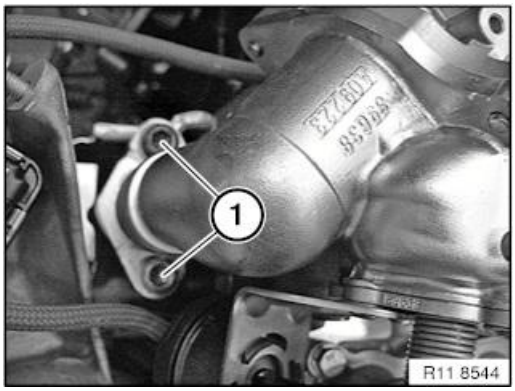
- Remove front acoustic cover.
- Drain coolant.
- If necessary, remove the clean air pipe.



Release screws (1).

Installation note:
Renew gasket.

Tightening torque: 11 61 2AZ.



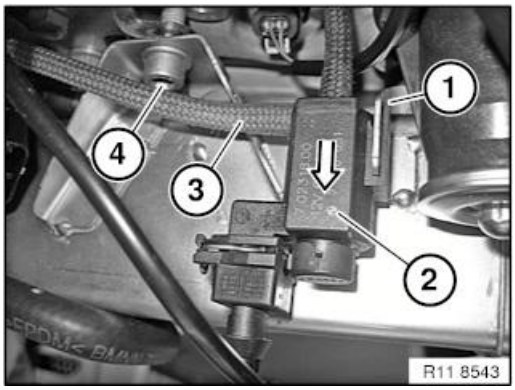
Release screws (1).

Installation note:
Renew screws (1) and seal.

Grease screws with assembly paste 4.2.

Tightening torque: 11 71 1AZ.

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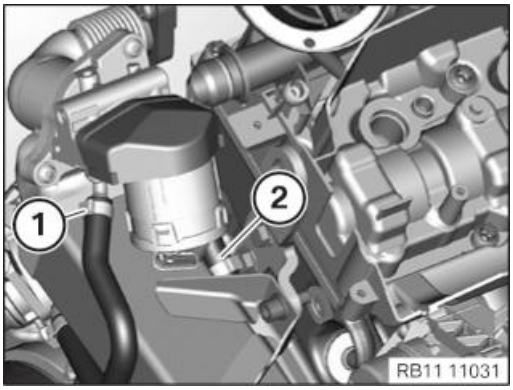


Loosen the electric changeover valve (2) at the retaining clip (1) and pull off in direction of arrow.

Detach vacuum line (3) from electric changeover valve (2).

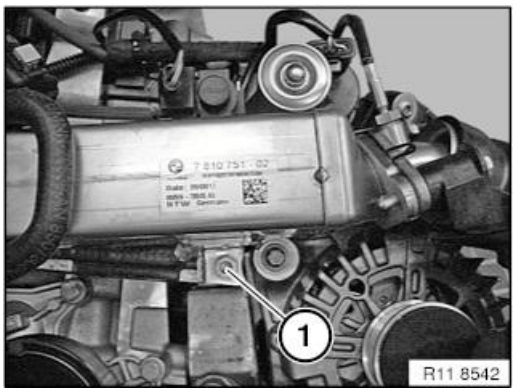
Release screw (4).

Tightening torque: 11 00 4AZ.



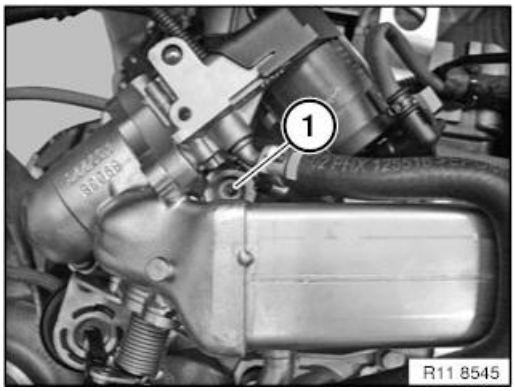
Pull off the coolant lines (1) and (2) from the exhaust-gas recirculation cooler.

Unlock the plug connection fort the exhaust-gas recirculation valve and pull it off.



Release screw (1).

Tightening torque: 11 00 4AZ.



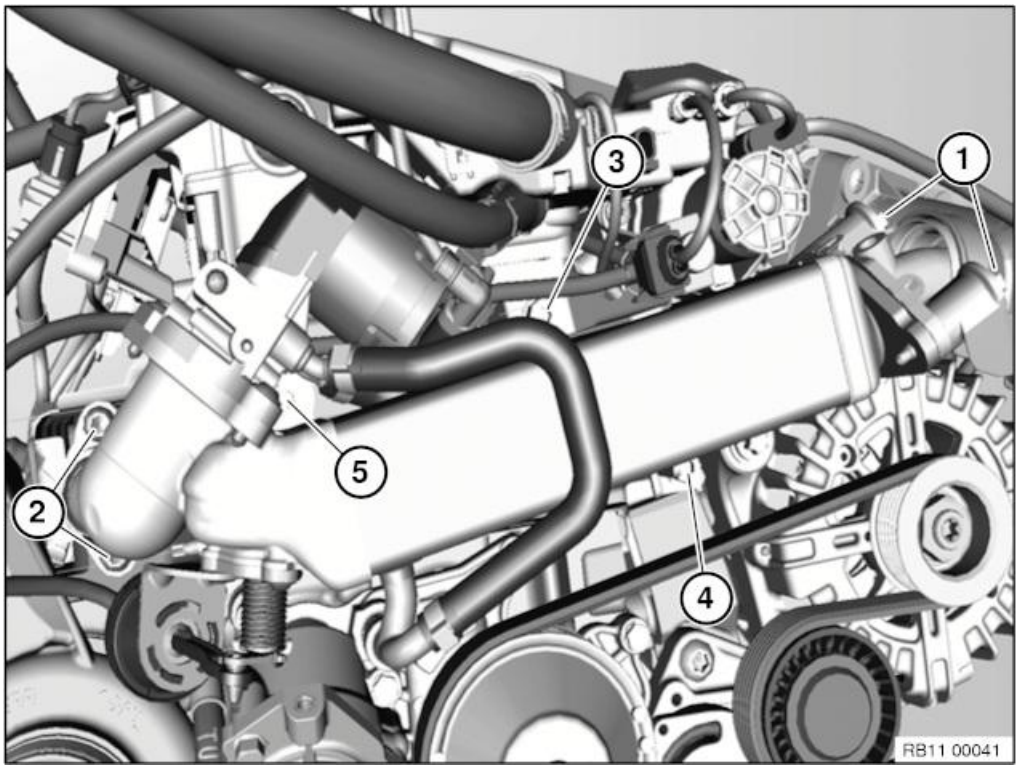
Release screw (1).

Tightening torque: 11 00 4AZ.

Installation note:
Renew pipe neck on exhaust-gas recirculation cooler.

Ensure that the pipe neck is mounted without tension.

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Installation note:
Renew screws (2), seal.

Note screw sequence at the exhaust-gas guide module.

Screwed connections in sequence (1) to (5).

Assemble engine.

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11 71 501 Remove and install/renew the exhaust-gas recirculation valve (EGR) (N47 D16/20 K/U/O/T 1)

Note:
The adaptation values must be reset after cleaning or replacing the exhaust-gas recirculation valve.

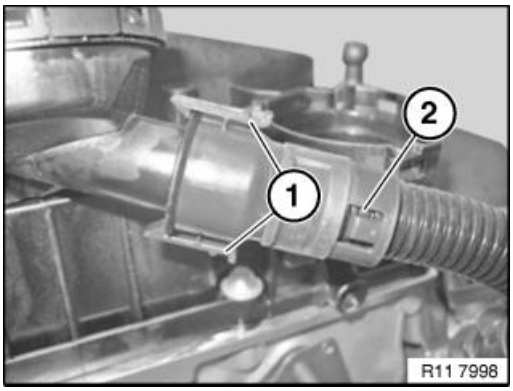
Warning!

Risk of burning!

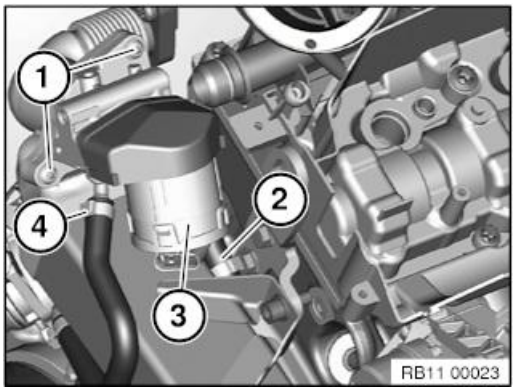
Only perform this repair work on an engine that has cooled down.

Necessary preliminary work:

- Remove front acoustic cover (only E6x, F1x, F07, F25)
- Remove intake filter housing (only E6x, E8x, F25)
- Remove clean air pipe (E8x only, F25)



Unlock vent line (2) and pull off to achieve improved freedom of movement of the exhaust-gas recirculation valve mounting.



Release screws (1) on exhaust-gas recirculation valve (3).

Tightening torque 11 00 2AZ.

Release coolant lines (2) and (4).

Disconnect plug connection on exhaust-gas recirculation valve (3).

Installation note:
Install rear hose (2) before installing the exhaust-gas recirculation valve.

Replace O-ring.

Add coolant.

Assemble engine.

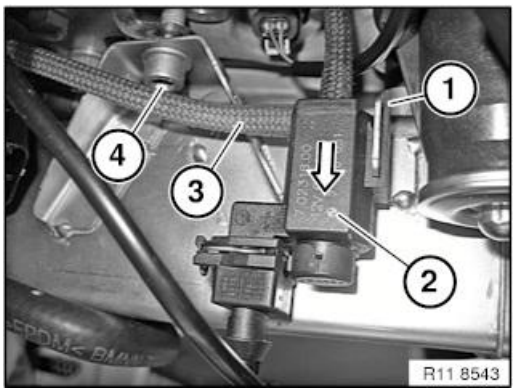
Check function of DDE.

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11 74 555 Removing and installing/ replacing exhaust-gas recirculation valve (N47 D20 O1)

Necessary preliminary work:

Remove front acoustic cover.



Loosen the electric changeover valve (2) at the retaining clip (1) and pull off in direction of arrow.

Detach vacuum lines from electric changeover valve (2).

Disconnect plug connection on electric changeover valve (2).

Assemble engine.

Check function of Digital Diesel Electronics.

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13 62 651 Replacing exhaust backpressure sensor (N47, N47S)

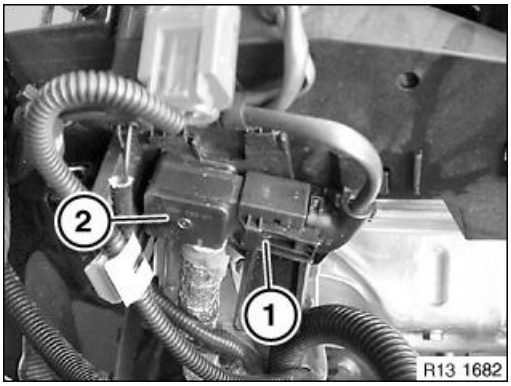
Warning!

Risk of burning!

Only perform this repair work on an engine that has cooled down.

Necessary preliminary tasks:

- Read out the fault memory of the DDE control unit.
- Switch off ignition.
- Remove acoustic cover



Unlock connector (1) and remove.

Unlock exhaust-gas pressure sensor (2) at holder.

Remove exhaust backpressure sensor.

Remove hose retainer.

Disconnect pressure hose.

Installation note:
Check pressure hose. Replace hardened pressure hose.

Check connection on pressure pipe and pressure sensor for tightness.

A pressure hose which has been pulled off once must be secured with a 15 mm - 19 mm diameter screw clamp.

Tightening torque 18 32 1AZ.

Installation note:
Check stored error/fault messages.

Delete fault memory.

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13 62 534 Replacing exhaust-gas temperature sensor (N47, N47S)

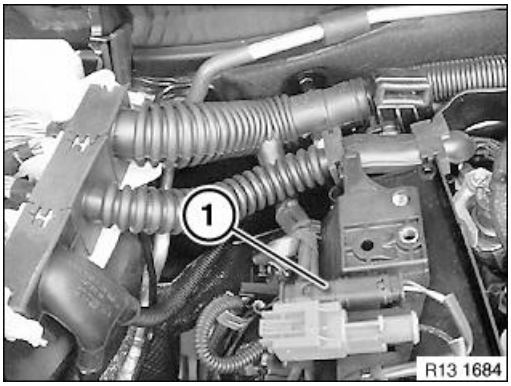
Warning!

Risk of burning!

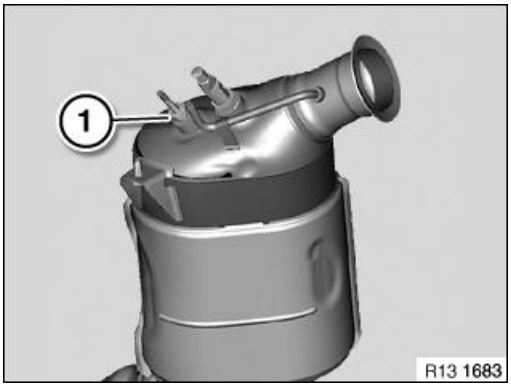
Only perform this repair work on an engine that has cooled down.

Necessary preliminary tasks:

- Read out the fault memory of the DDE control unit
- Switch off ignition
- Remove acoustic cover

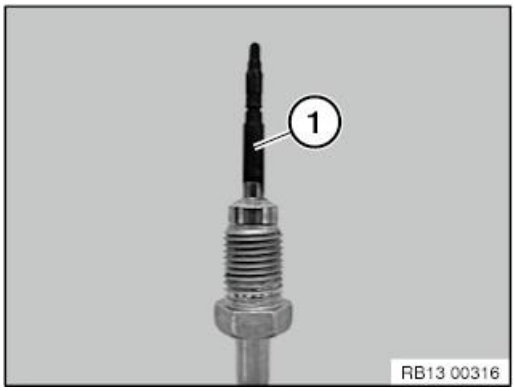


Disconnect plug (1) from the exhaust backpressure sensor.



Release exhaust-gas temperature sensor and remove.

Tightening torque 13 62 4AZ.



Important!

Make sure when installing the exhaust-gas temperature sensor that the gauge tip (1) is not damaged.

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Installation note:
Check stored fault messages.

Delete fault memory.

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13 62 651 Replacing the control sensor (N47, N47S)

Special tools required:

- 11 7 020

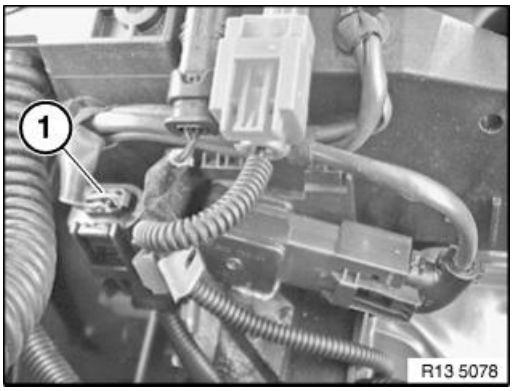
Warning!

Risk of burning!

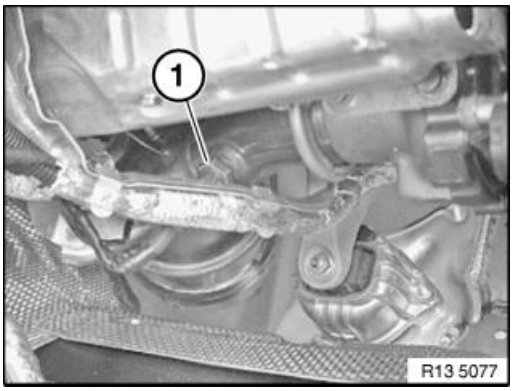
Only perform this repair work on an engine that has cooled down.

Necessary preliminary tasks:

- Read out the fault memory of the DDE control unit
- Switch off ignition



Disconnect plug (1).



Release control sensor (1) with special tool 11 7 020 .

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Installation note:

Threads of new oxygen sensors are already coated with NEVER-SEEZ compound.

If an oxygen sensor is reused, only apply a thin and uniform coat of NEVER-SEEZ compound (refer to BMW Parts Department) to thread.

Oxygen sensor section projecting into exhaust branch must not be cleaned or come into contact with lubricant.

Pay attention to cable routing of oxygen sensors.

11 7 020 Use special tool to tighten down oxygen sensor.

Tightening torque 13 62 3AZ.

Cover oxygen sensors when applying underbody protection.

Installation note:
Check stored fault messages.

Delete fault memory.

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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 00 670 Securing engine in installation position (N47, N47S)



Special tools required:

- 00 6 000
- 00 6 001
- 00 6 002
- 00 6 031
- 00 6 051
- 00 6 053
- 00 6 070
- 00 6 080



Warning!

Risk of injury!

Observe following instructions relating to special tool:

1. Prior to each use, check the special tools for defects, modifications and operational reliability.
2. Damaged/modified special tools must not be used!
3. No changes or modifications may be made to the special tools!
4. Keep special tools dry, clean and free of grease.



Important!

Before lifting the engine, check the lifting eyes for damage (cracks) and secure seating.



Note:

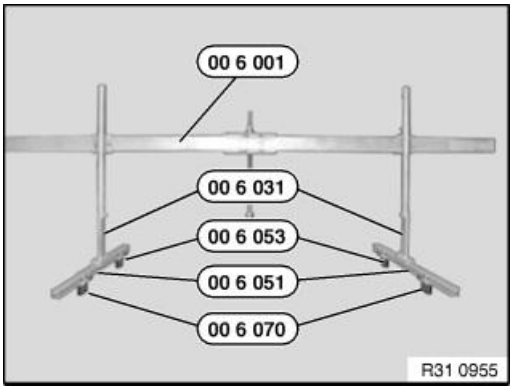
- Numbering system for special tools has been re-encoded.



Necessary preliminary tasks:

- Secure engine compartment lid in service position
- Remove acoustic cover

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Assemble transverse member 00 6 000 with special tools:

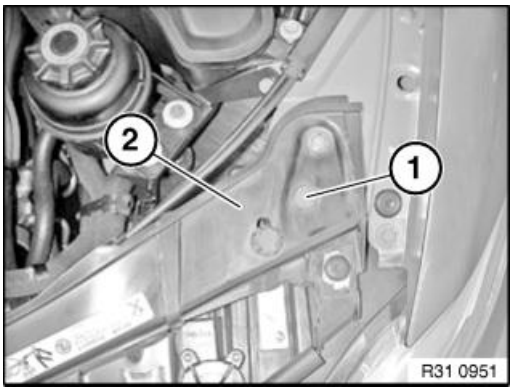
- 00 6 051 (profile strips)
- 00 6 070 (supports)
- 00 6 053 (supports)
- 00 6 031 (connections)

complete.

Important!

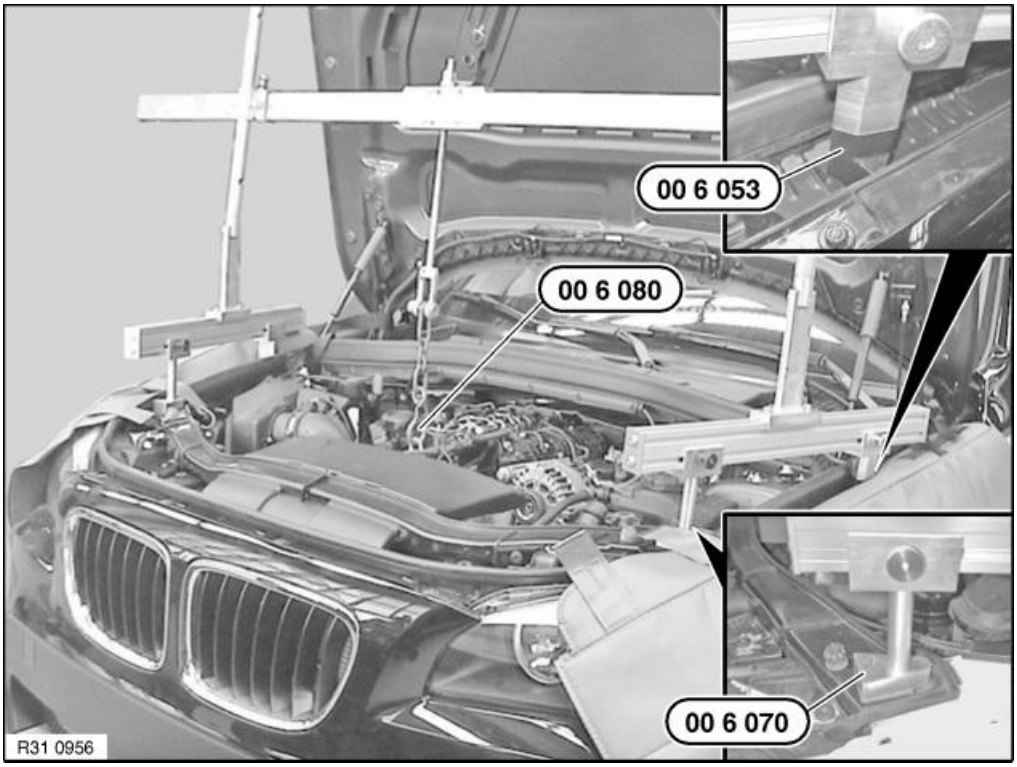
Avoid a change of engine position in the transverse or longitudinal direction.

Always make sure there is sufficient clearance between the engine (or its attachment parts) and the body.



Release screw (1) on front panel (2).

Tightening torque 41 33 1AZ.



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Important!

Risk of damage!

Fit transverse member 00 6 000 with a 2nd person helping.

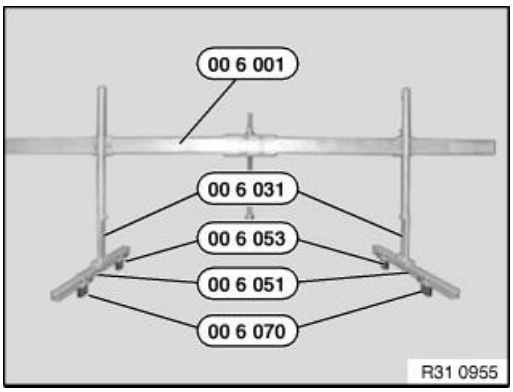
Place front supports in area of front panel screw connection and rear supports on side panel.

Bolt connections of transverse member 00 6 001 must point to windscreen.

Special tool 00 6 070 consists of a left and right support.

Secure chain with hook 00 6 080 to spindle 00 6 002 and align centrally over front engine suspension lug.

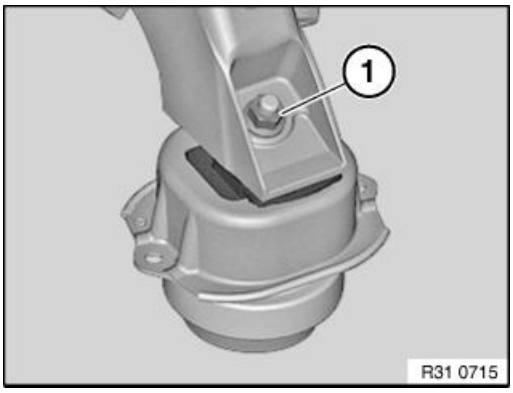
Attach special tool to front suspension lug.



Warning!

Risk of injury!

Tighten down all adjusting screws and nuts on transverse member 00 6 000 .



Unscrew nuts (1).

Raise engine approx. 10 mm with transverse member.

Installation:
Replace self-locking nuts.

Tightening torque 22 11 2AZ.

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