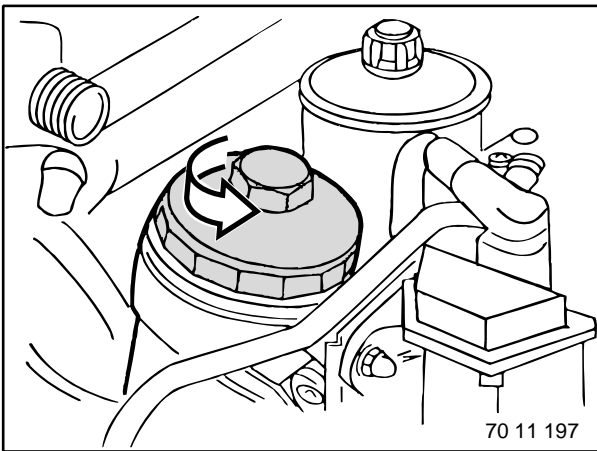


# 00/6

## 00 00 249 BMW engine oil service (M60 / M62 / M73)

Change engine oil and oil filter.



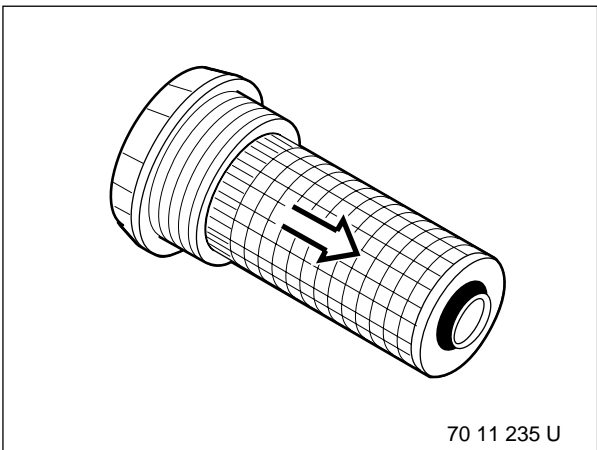
**Note:**

Do not damage main flow oil filter cover. Only open and tighten with socket wrench.

Unfasten main flow oil filter cover - engine oil now flows back into oil pan.

**Installation:**

Tightening torque, refer to Technical Data 11 42 2AZ

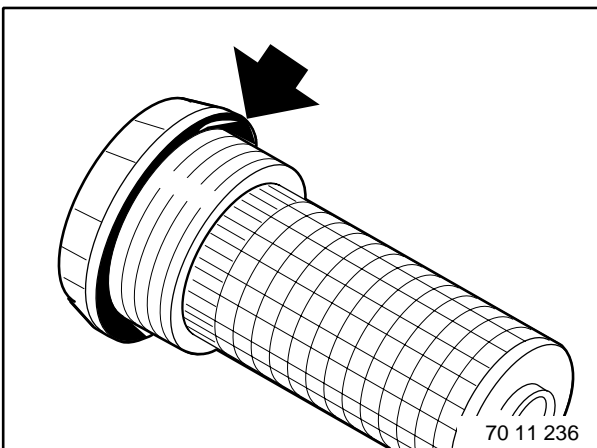


Remove oil filter from oil filter cover.

**Installation:**

Note direction of installation of oil filter insert.

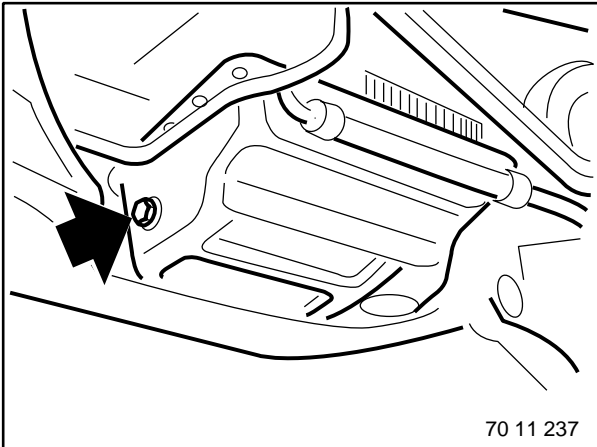
Oil filter insert must locate in oil filter cover.



**Installation:**

Replace sealing ring and coat with oil.

## 00/7



After draining oil from oil-filter housing, unscrew oil drain plug or draw out oil with a vacuum unit.

**Installation:**  
Replace sealing ring.

Tightening torque,  
refer to Technical Data 11 13 1AZ

Pour in engine oil.

Switch on engine and run at idle until oil indicator lamp goes out.

Stop engine and check oil level.

**Note:**  
Position car on a flat, horizontal surface.

# 11/63

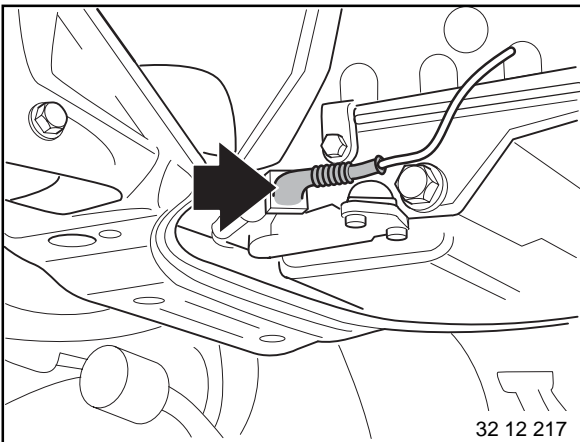
## 11 13 020 Removing and installing / replacing lower oil pan section (M60/M62)

Unscrew and remove splash guard.

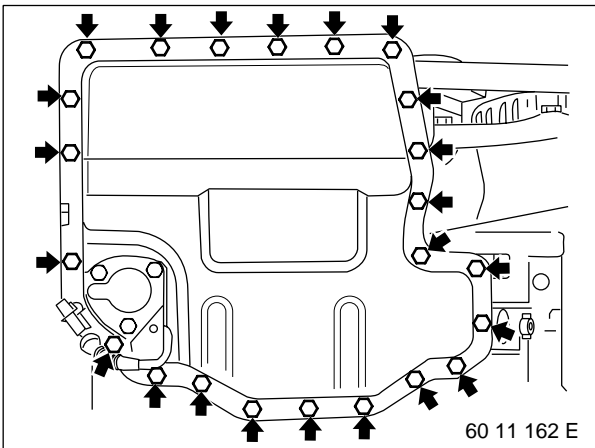
Drain engine oil.

This operation is described in section on BMW engine oil service,  
refer to 00 00 249

Unfasten plug connection on oil level switch.



Unfasten lower oil pan section.



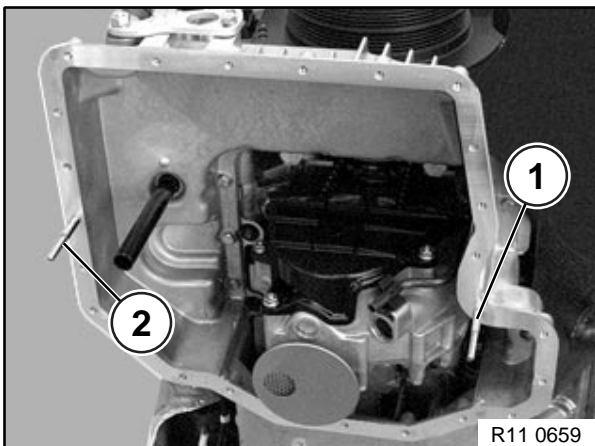
### **Installation:**

Clean sealing surfaces.

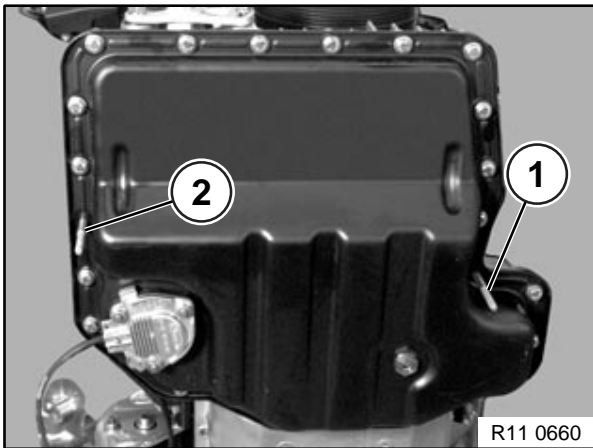
Install stud screws (1 and 2) at the locating points in the oil pan.

### **Note:**

The stud screws (1 and 2) secure the gasket and oil pan during installation and prevent damage to the sealing lip.



# 11/64



***Installation:***

**Mount new gasket and lower oil pan section over the stud screws (1 and 2).**

**Install and tighten down screws. Remove stud screws (1 and 2), insert remaining bolts and tighten.**

**Tightening torque,  
refer to Technical Data 11 13 2AZ**

# 11/6

## 11 00 039 Checking compression of all cylinders (M62)



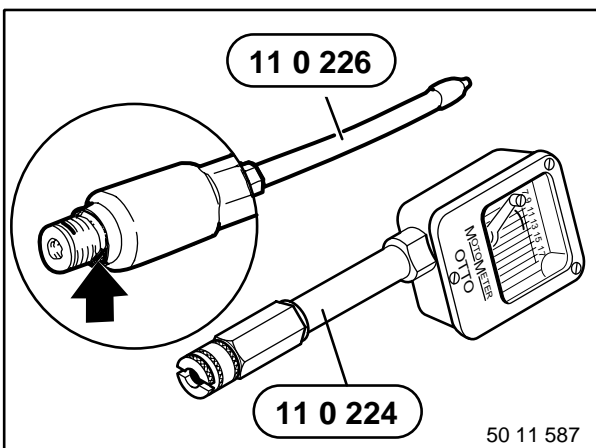
**Caution!**

High tension - danger!

Interrupt power supply to ignition coils.

Follow instructions on compression check, refer to General Information MG 12

Remove DME master relay, refer to 12 63 520



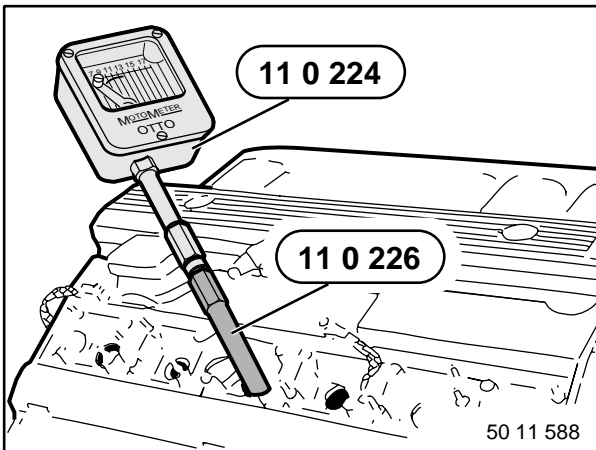
Unscrew and remove all spark plugs, refer to 12 12 011

Screw special tool 11 0 226 by hand into spark plug thread and attach compression tester, special tool 11 0 224.

**Note:**

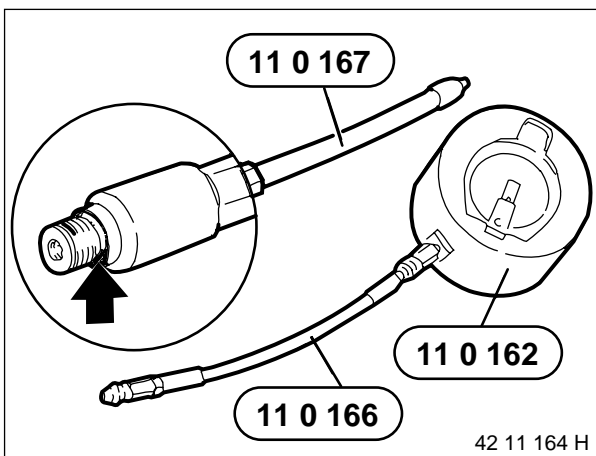
Check that seal is in perfect condition.

# 11/7



Depress accelerator and actuate starter until compression stops rising.

Compression pressure, refer to Technical Data



**Note:**

Special tools 11 0 162/166/167 can be used again.

# 11/8

## 11 00 045 Checking absolute compression of all cylinders

With BMW Diagnosis Information System (DIS).



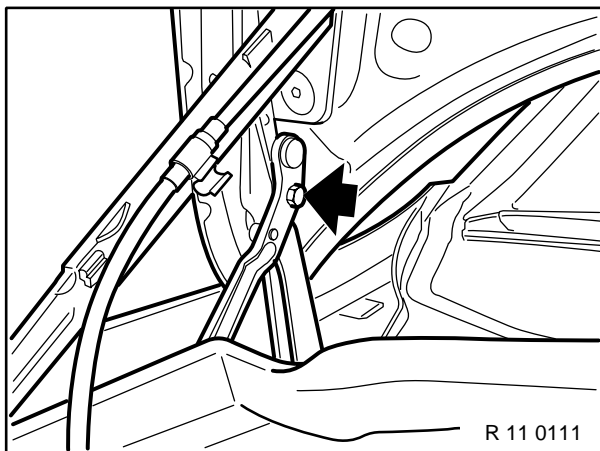
W05 95 001

- **Connect DIS tester**
- **BMW measuring technology**
- **Preset measurements**
- **Absolute compression**
  - The further procedure is described in
  - Help
  - Help on preset measurements
  - Adaptation of “Absolute compression”
- **Clear fault memory**

# 11/9

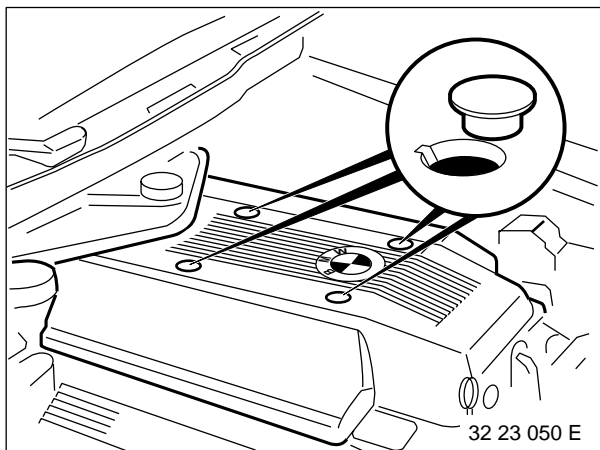
## 11 00 050 Removing and installing engine (M62)

Note instructions on connecting and decoupling battery,  
refer to General Information MG12  
Disconnect negative battery lead.



Lift engine hood into assembly position.

Disconnect damper on hood, open hood fully and secure with a screw on left and right sides.

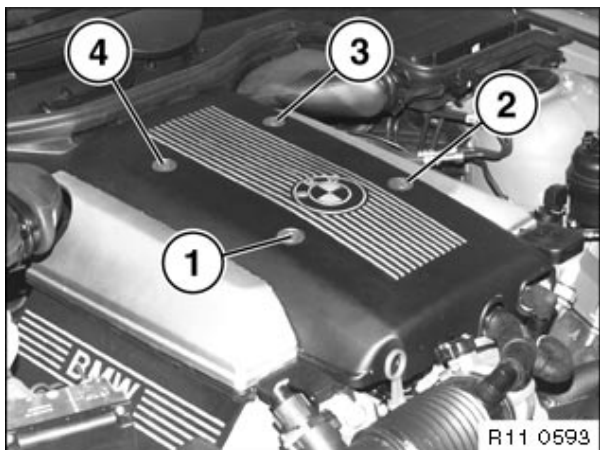


### Version 1

(acoustic cover screwed down)

Pry out sealing cap. Unscrew nuts.

Remove acoustic cover.



### Version 2

(acoustic cover with press-stud fastener)

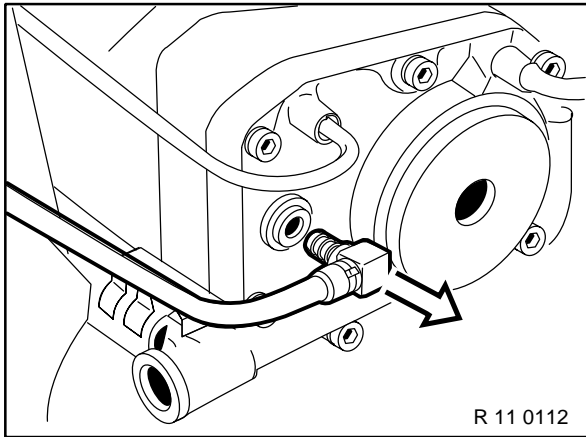
Open press-studs (1 ... 4) one at a time, at the same time lifting the acoustic cover slightly. Once all four press-studs have been opened, remove the acoustic cover.

#### *Installation:*

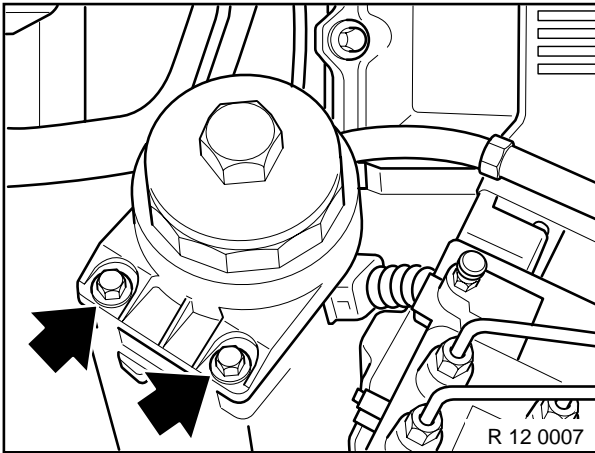
Position acoustic cover and press downwards until press-studs (1 ... 4) click into place.



# 11/10

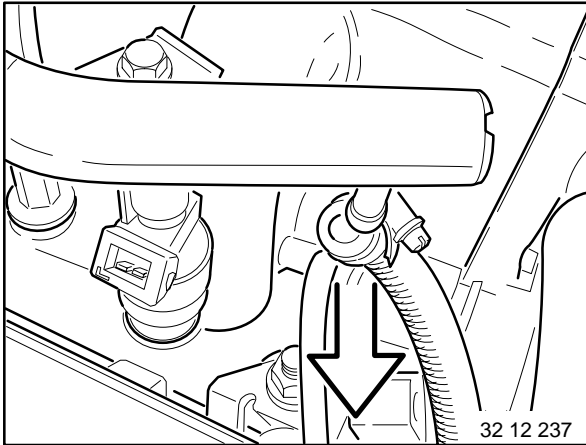


Remove connector for brake force booster.



Unfasten main flow oil filter housing from bracket and attach to engine.

**Note:**  
Lines remain connected.



**Caution!**  
Catch and dispose of fuel as it escapes.

Unfasten fuel feed and return lines to injector tube.

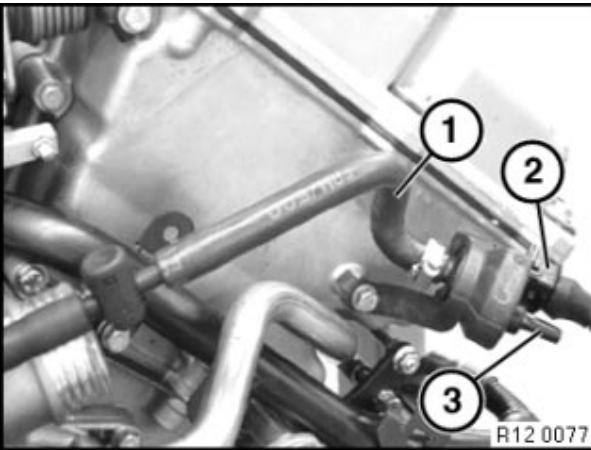
Follow instructions on removal and installation of fuel hoses,  
refer to 13 53 540

Remove intake filter housing with mass air flow sensor,  
refer to 13 71 000

Remove throttle body ASC+T,  
refer to 13 54 060

Disconnect Bowden cables for throttle valve actuation.  
This operation is described in section on removing and  
installing/sealing the throttle body,  
refer to 13 54 030

# 11/11



Disconnect plug connection (2) and vacuum hose (3) from tank vent valve.

Unfasten engine section of wiring harness and placing to one side with cable ducts, refer to 12 51 001

Unclip diagnosis connector on spring strut shock absorber and place to one side.

Unfasten heat baffle plate on left and right sides.

Unfasten drain plug for coolant in left and right engine block.

Drain and dispose of coolant.

***Installation:***

Replace sealing ring.

Tightening torque, refer to Technical Data 11 11 5AZ

Remove radiator, refer to 17 11 000

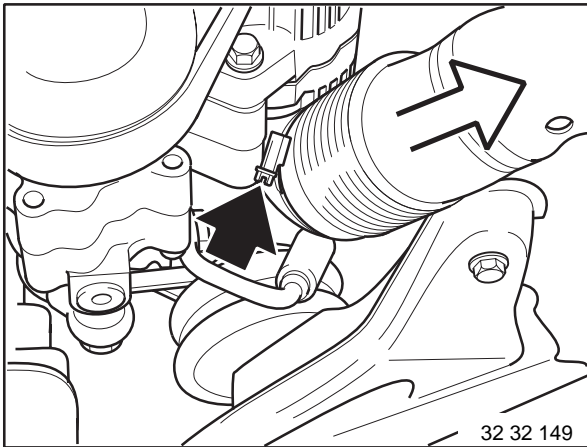
Remove transmission.

Unfasten positive battery lead from starter motor.

Remove starter motor.

Unfasten positive battery lead from oil pan and unfasten left carrier bracket and alternator.

# 11/12



Remove cooling air duct for alternator.

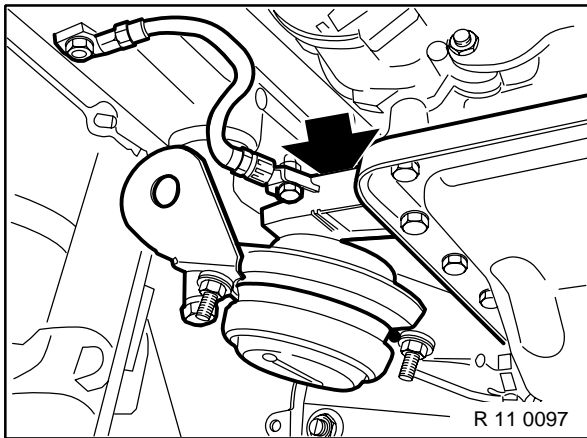
Remove alternator drive belt,  
refer to 11 28 010

Remove vane pump,  
refer to 32 41 060

Remove compressor drive belt from air conditioner,  
refer to 11 28 050

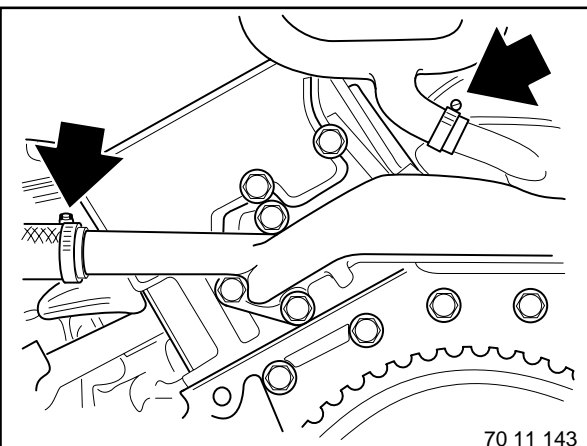
Disconnect a/c compressor from mounting block and  
tie up to one side.

**Note:**  
Lines remain connected.



Unfasten ground tape from engine support.

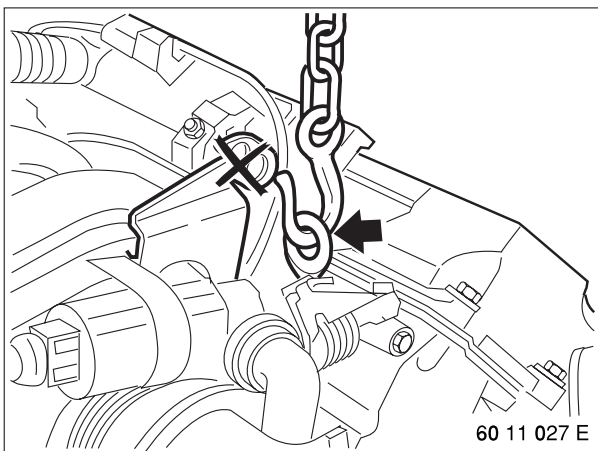
Unfasten top left and right nuts on engine mount.



Unfasten coolant hoses from coolant manifold.

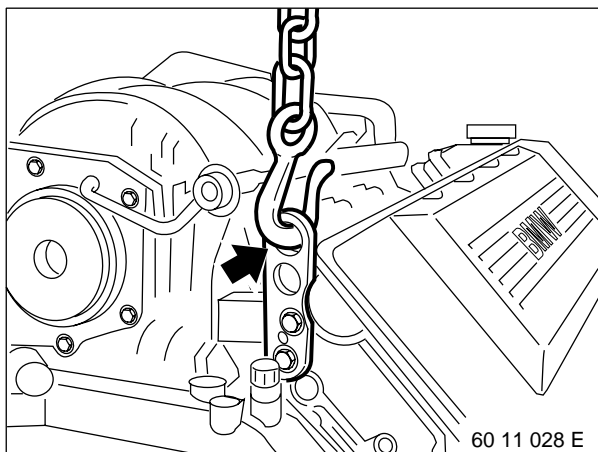
# 11/13

Remove left and right exhaust manifolds,  
refer to 11 62 142 / 143

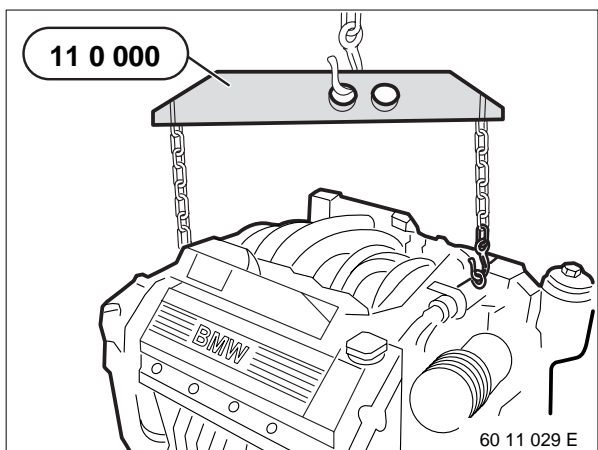


**Caution!**  
Only raise engine on locating lugs provided for this  
purpose.

Layout of front engine mount.



Layout of rear engine mount.



Secure engine to special tool 11 0 000.

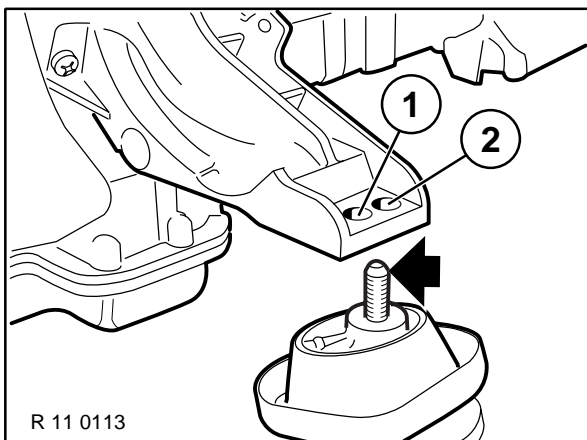
# 11/14



**Caution!**

Note narrow points between lines on ABS unit, air conditioner compressor with lines, cylinder head cover, steering spindle and heating valve.

Carefully lift out engine.



**Installation:**

**E38**

Install engine mount in rear bore (2) of mounting bracket.

**E39**

Install engine mount in front bore (1) of support bracket.

# 11/15

## 11 12 004 Removing and installing/sealing both cylinder head covers (M62)

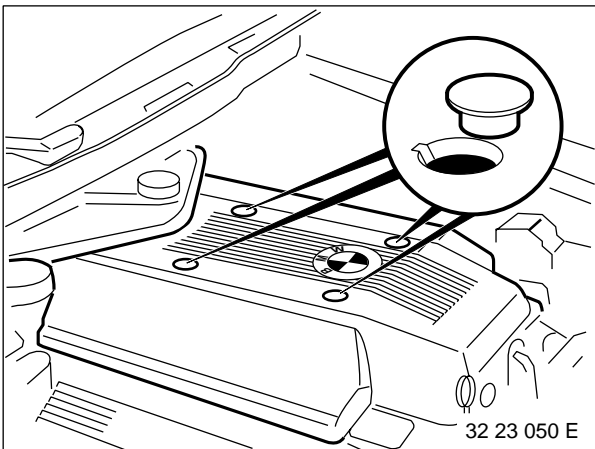
Note instructions on connecting and decoupling battery,  
refer to General Information MG12  
Disconnect negative battery lead.

### Version 1

(acoustic cover screwed down)

Pry out sealing cap. Unscrew nuts.

Remove acoustic cover.



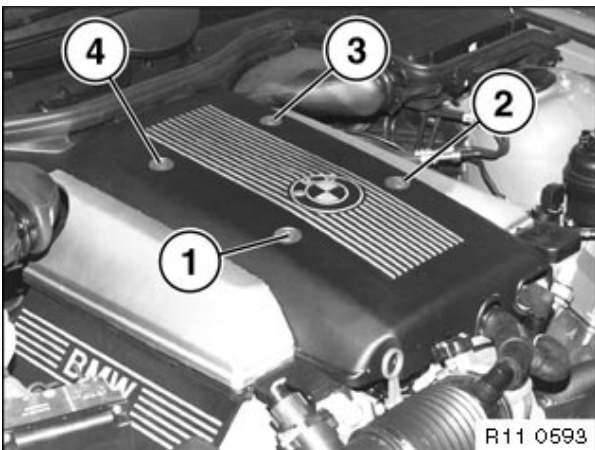
### Version 2

(acoustic cover with press-stud fastener)

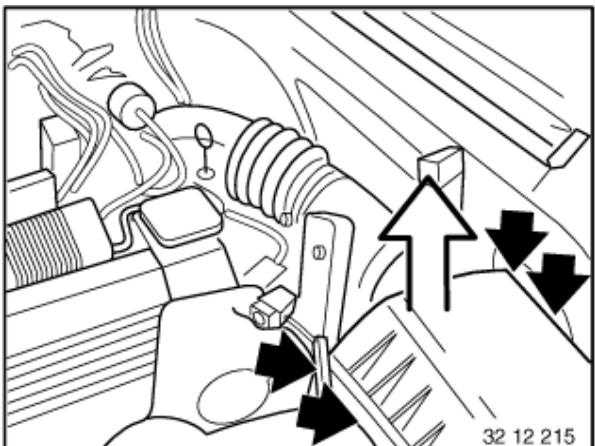
Open press-studs (1 ... 4) one at a time, at the same time lifting the acoustic cover slightly. Once all four press-studs have been opened, remove the acoustic cover.

#### *Installation:*

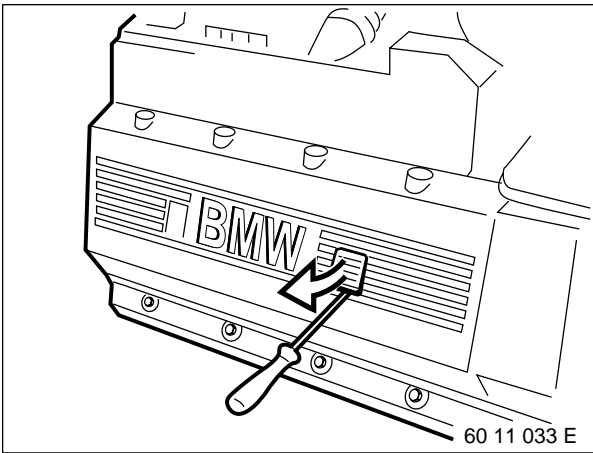
Position acoustic cover and press downwards until press-studs (1 ... 4) click into place.



Remove suction-filter housing with air-mass sensor,  
refer to 13 71 000

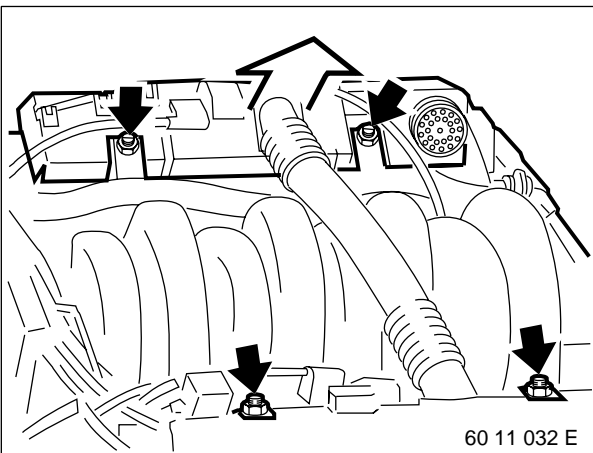


# 11/16



Remove covers from ignition coils.

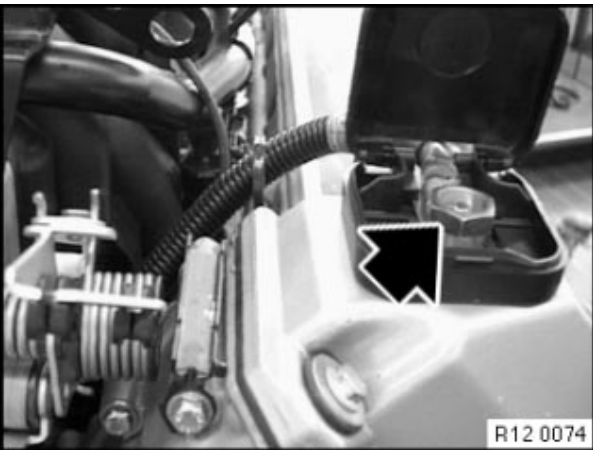
Remove ignition coils,  
refer to 12 13 511



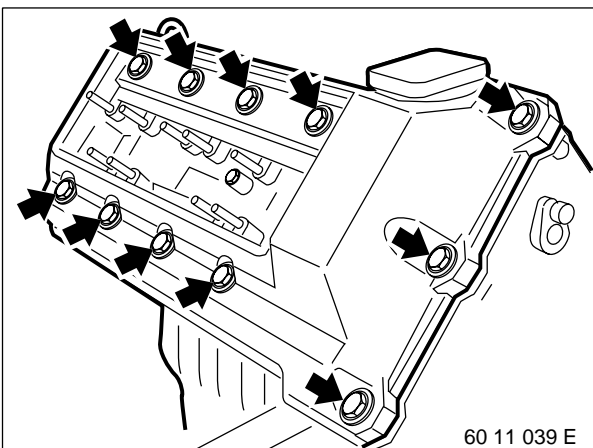
Unfasten left and right cable ducts and fold inwards.

*Note:*

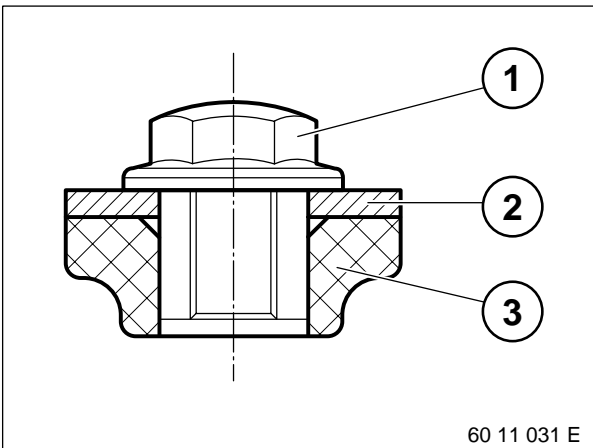
Note cable guide and plug connection to transmission control unit and to coolant manifold.



Unfasten positive battery terminal on battery support point.



Unfasten retaining elements on left and right sides.

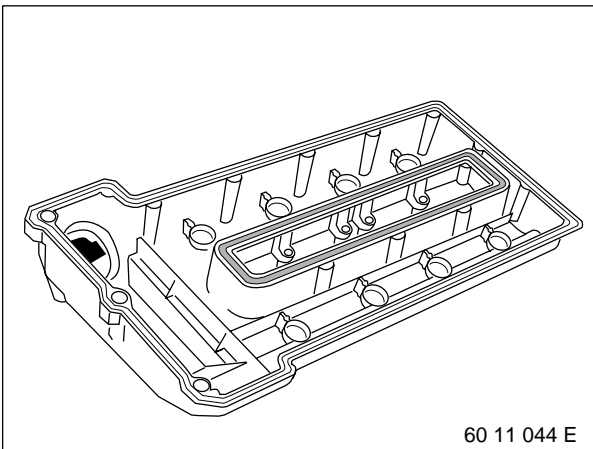


60 11 031 E

**Installation:**

Layout of retaining elements:

- (1) Nut
- (2) Washer
- (3) Rubber mount



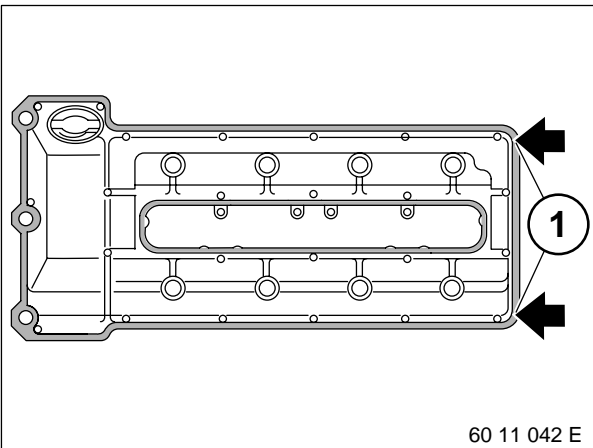
60 11 044 E

**Installation:**

Check seal, replace if necessary.

Coat outer and inner grooves and sealing face of cylinder head cover all round with anti-friction rubber coating, e.g. glycerine.

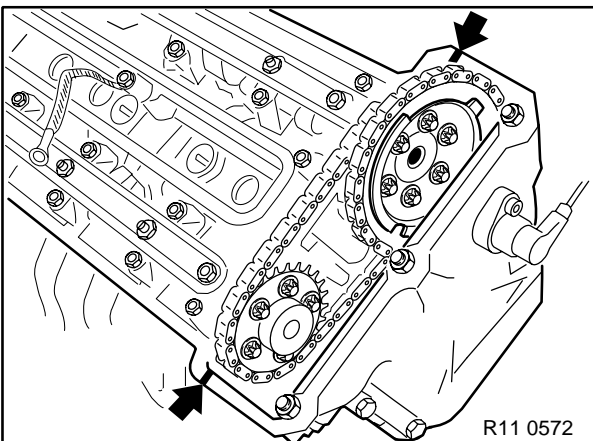
Press internal gasket into groove in cover without torsional stress, starting at the four corner radii.



60 11 042 E

**Installation:**

Align outer gasket loosely on groove in cover. Secure gasket in groove in cover, starting in the corner radii at the back (1) and locate without torsional stress in the groove.



R11 0572

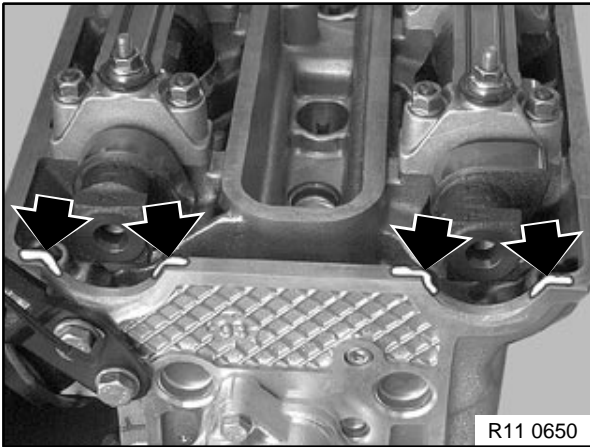
**Installation:**

Clean gasket residue from sealing surface.

Apply coat of Drei Bond 1209 (refer to BMW Parts Service) to contact surfaces of joint.



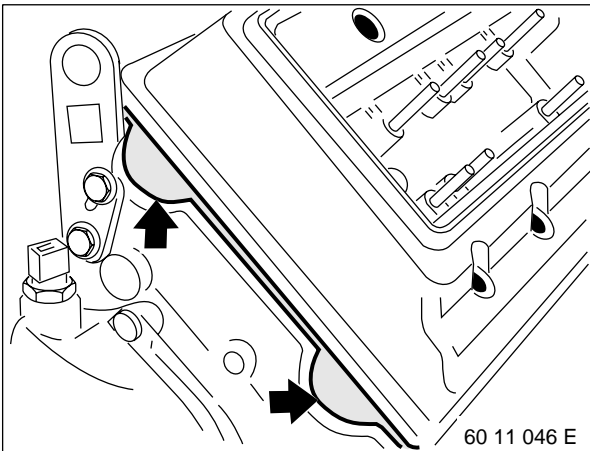
# 11/18



**Installation:**

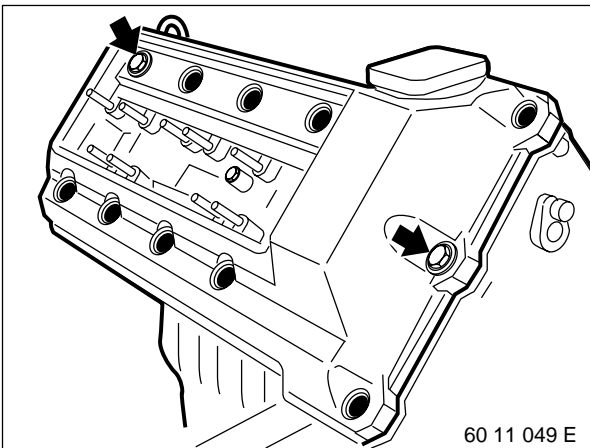
Clean gasket residue from sealing surface.

Apply thin, uniform bead of Drei Bond 1209 (refer to BMW Parts Service) to transmission area on half-moon sections.



**Installation:**

Check that side of gasket is correctly seated and check back of cylinder head.



**Installation:**

Screw two retaining elements to the locating points, without preload at this stage, and align the cover. Install all other retaining elements and tighten crosswise from inside to outside.

# 11/19

## 11 12 005 Removing and installing / sealing left cylinder head cover (M62)

This operation is described in section on removing and installing / sealing both cylinder head covers,  
refer to 11 12 004

# 11/20

## 11 12 006 Removing and installing / sealing right cylinder head cover (M62)

This operation is described in section on removing and installing / sealing both cylinder head covers,  
refer to 11 12 004

# 11/21

## 11 12 105 Removing and installing left cylinder head (M62)

(Cylinder bank 5-8)

Remove left exhaust manifold,  
refer to 11 62 142

Unfasten drain plug for coolant on left engine block.

Drain and dispose of coolant.

**Installation:**

Replace sealing ring.

Tightening torque,  
refer to Technical Data 11 11 5AZ

Bleed cooling system and check for water leaks,  
refer to 17 00 039

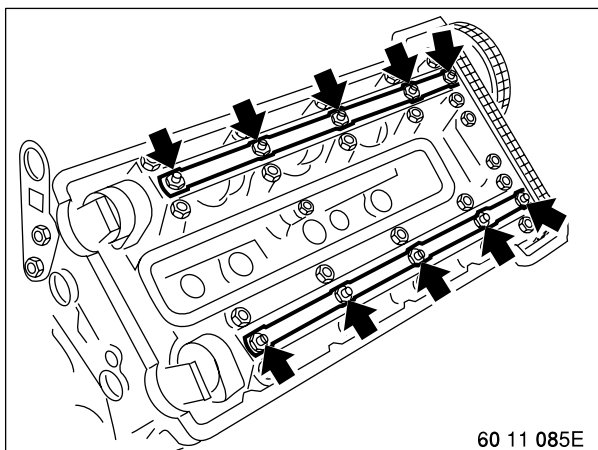
Remove both cylinder head covers,  
refer to 11 12 004

Remove spark plugs,  
refer to 12 12 011

Remove piston for chain tensioner,  
refer to 11 31 090

Remove coolant manifold,  
refer to 11 53 325

Remove oil lines on left and right of cylinder head.

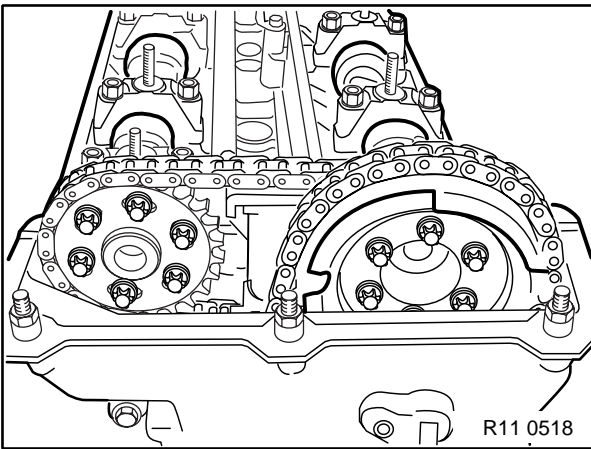


60 11 085E

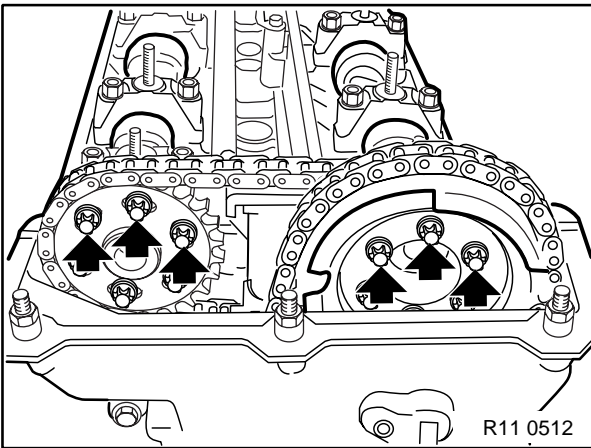
# 11/22

## Removal

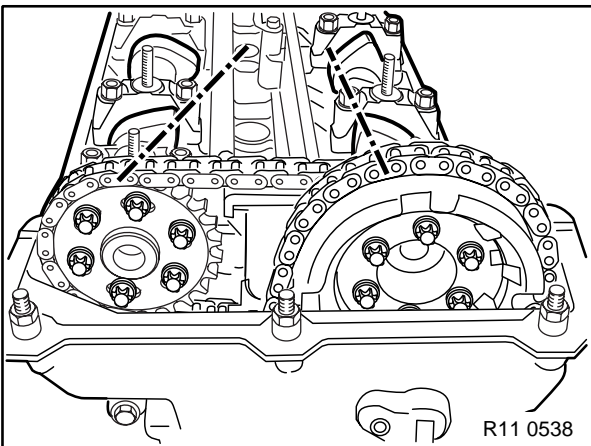
Removal of cylinder head is described separately from installation. Assembly sequence for removal and installation is different.



Crank engine at central bolt in direction of rotation until the first cylinder is in TDC position.

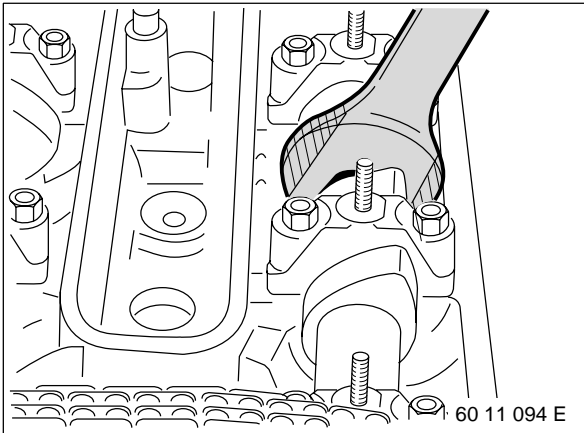


Unfasten the accessible three screws on exhaust and intake camshafts on cylinder bank 1-4 approx. 1/2 a turn.



Crank engine once engine wise up to TDC position of first cylinder.

# 11/23



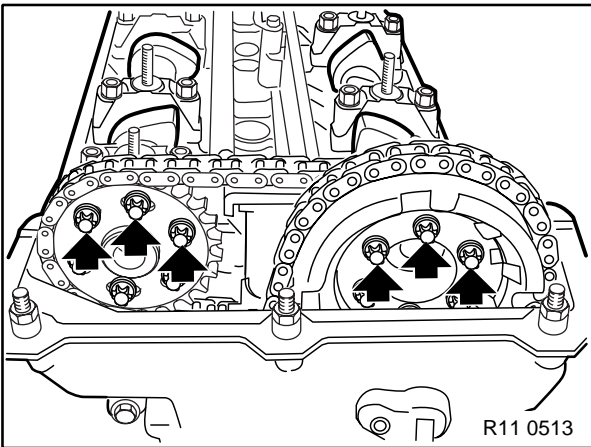
**Note:**

When camshaft screw connection is unfastened, brace camshaft on hex head.

**Caution!**

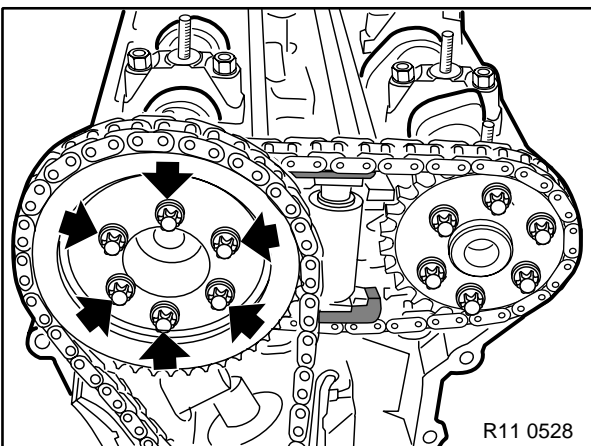
Do not damage the cylinder head.

Machine open-end wrench accordingly if necessary.



Unfasten remaining three screws on exhaust and intake camshafts on cylinder bank 1-4 approx. 1/2 a turn.

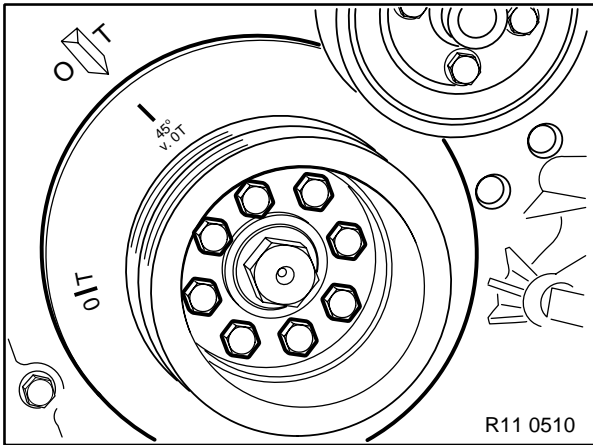
Remove top left timing case cover, refer to 11 14 080



Remove sprocket on left intake camshaft (cylinder bank 5-8).

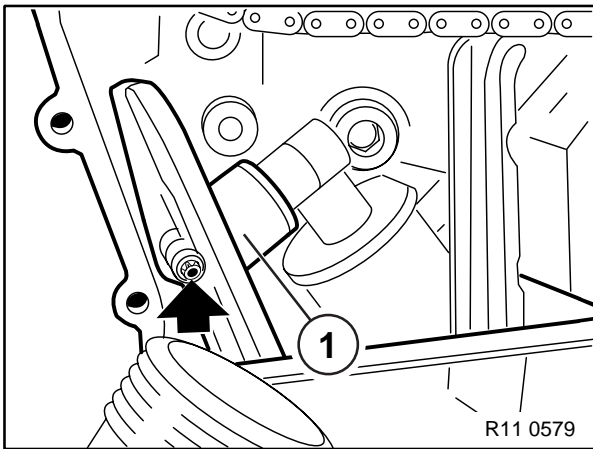
Secure chain to prevent it from dropping.

# 11/24



Turn engine on central screw counter-engine wise up to 45° before TDC position.

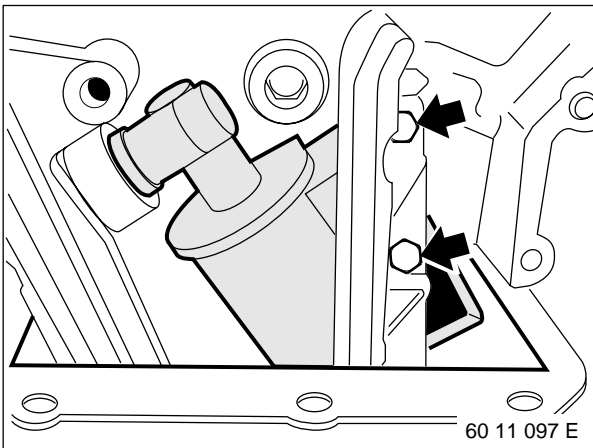
Note markings!



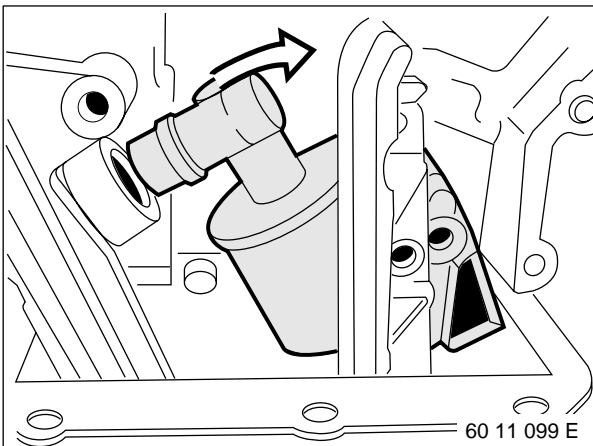
Loosen grub screw.

**Note:**

Grub screw secures the angle bracket (1) in the cylinder head.



Unfasten guide rail and retaining screw for oil separator.



Lift oil separator out of angle bracket.

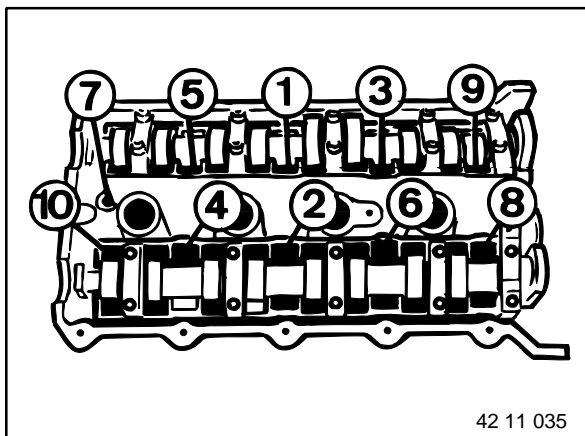
**Caution!**

When lifting the cylinder head, press oil separator outwards.

# 11/25

Release cylinder-head bolts in sequence 10 ... 1.

Lift off cylinder head.



42 11 035

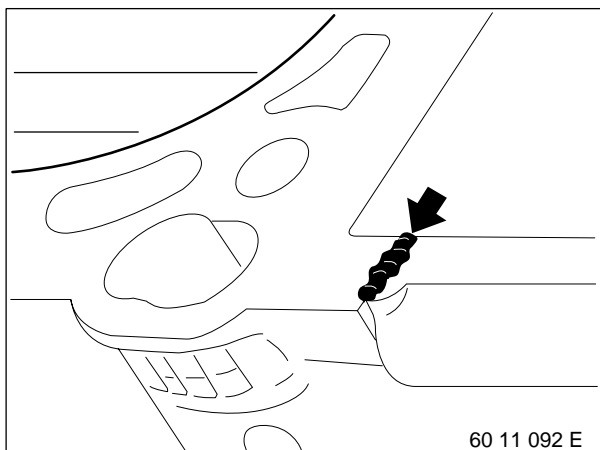
## Installation

Installation of cylinder head is described separately from removal. Assembly sequence for removal and installation is different.

Clean sealing faces of cylinder head and engine block, if necessary using wooden scraper to remove gasket debris. Ensure that no gasket debris drops into the oil and coolant ducts.

Threaded bores in engine block must be free of dirt and oil (risk of cracking).

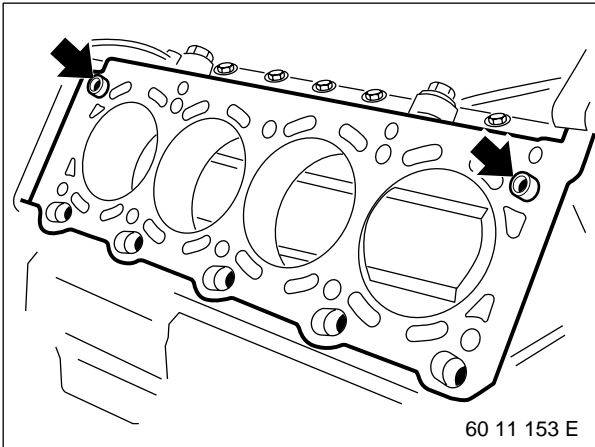
Coat joint between engine block and timing case cover with three Bond 1209 (refer to BMW Parts Service).



60 11 092 E

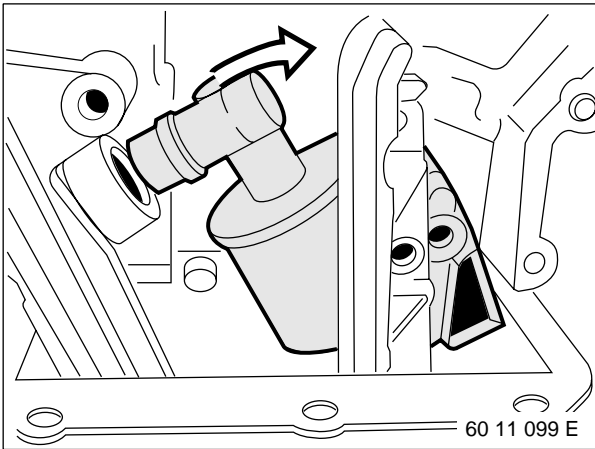


# 11/26



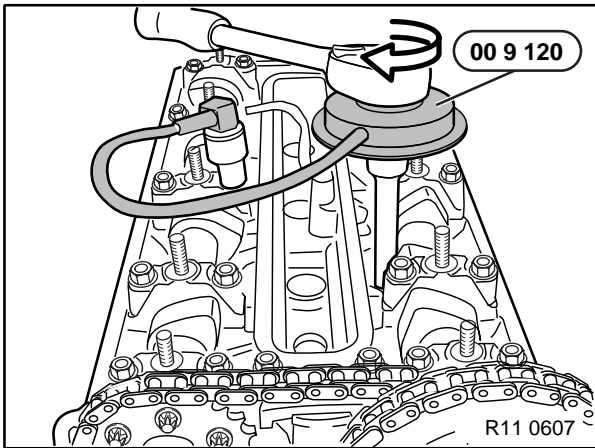
Check that dowel sleeves are undamaged and correctly located.

Fit new cylinder-head seal.



**Caution!**

When fitting cylinder head, press oil separator outwards.

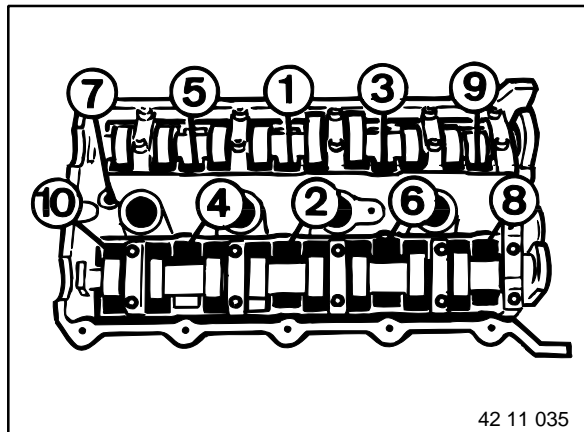


Fit cylinder head and install new cylinder head screws.

Do not wash off screw coating.

**Note:**

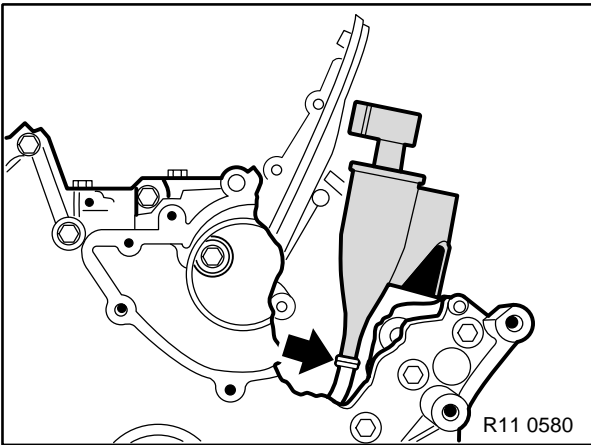
Use special tool 00 9 120 as a torsion angle bracket.



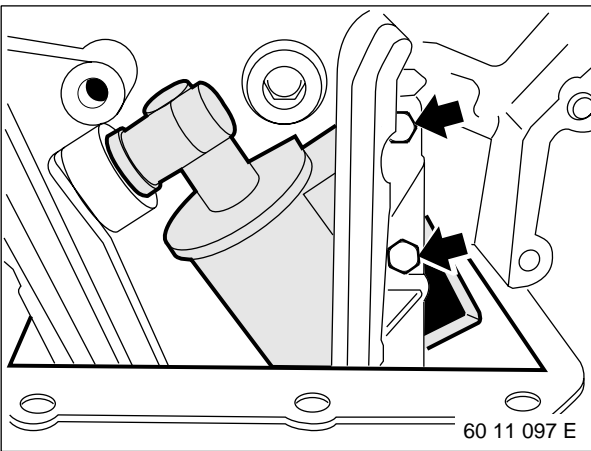
Tighten down cylinder head screws in sequence 1 ... 10.

Tightening torque, refer to Technical Data 11 12 8AZ

# 11/27



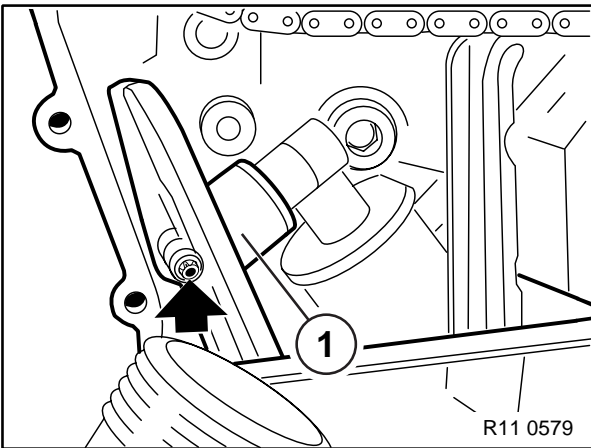
Ensure that oil return pipe is correctly seated in oil separator.



Check sealing ring in angle section and replace if necessary.

Press oil separator into angle section.

Tighten guide rail and retaining screw for oil separator.

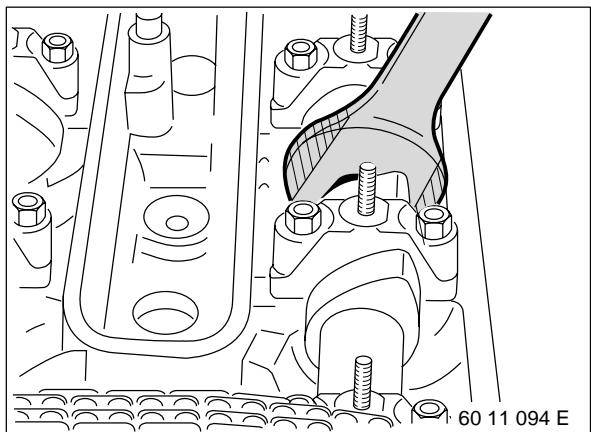


Replace grub screw.

Insert grub screw until it is flush with the angle bracket (1) but do not tighten down.

**Note:**

Grub screw secures the angle bracket (1) in the cylinder head.



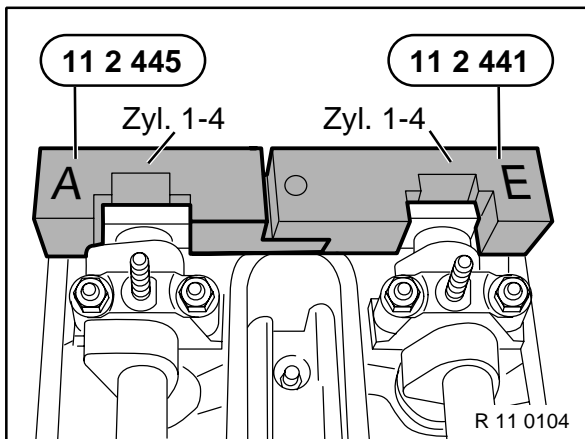
Align camshafts with open-end wrench.

**Caution!**

Do not damage the cylinder head.

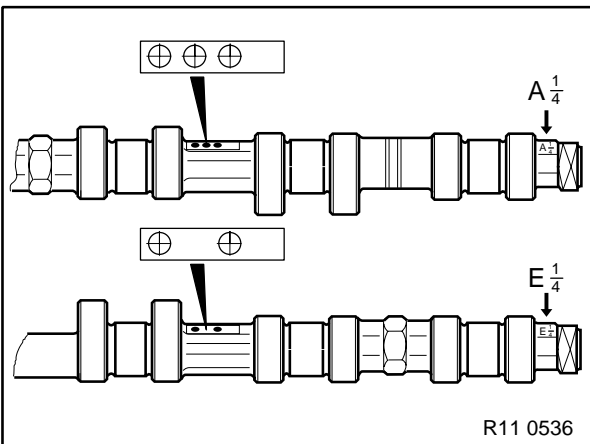
# 11/28

Fit special tool 11 2 445 / 441 to camshafts on cylinder bank 1-4.

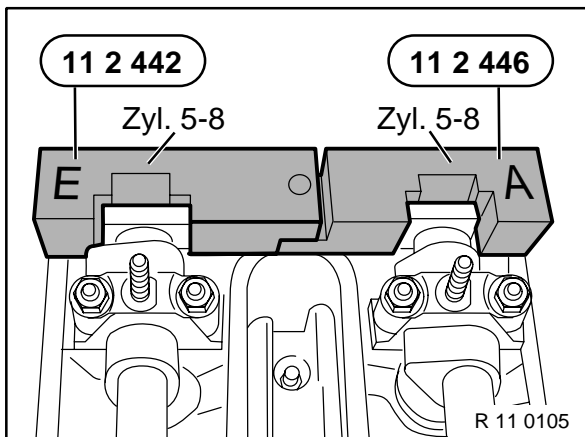


**Note:**

In TDC position of first cylinder, marker bores of camshafts point upwards.

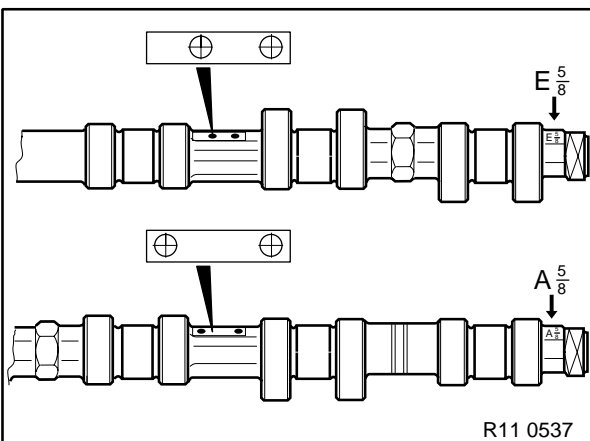


Fit special tool 11 2 446 / 442 to camshafts on cylinder bank 5-8.

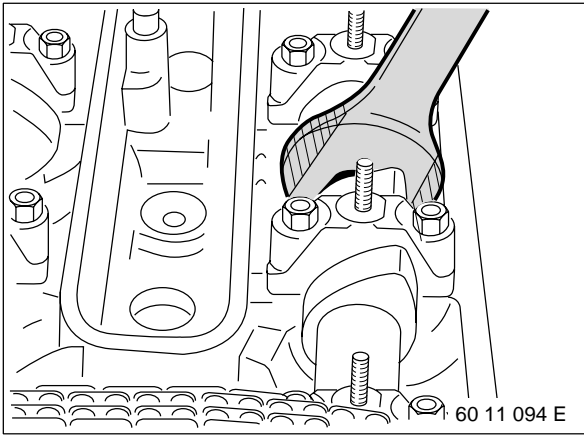


**Note:**

In TDC position of first cylinder, marker bores of camshafts point upwards.



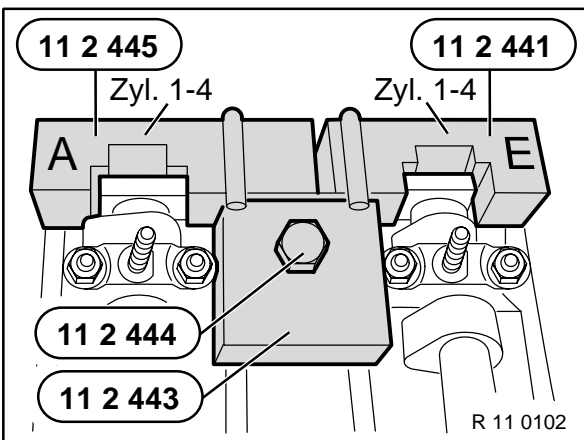
# 11/29



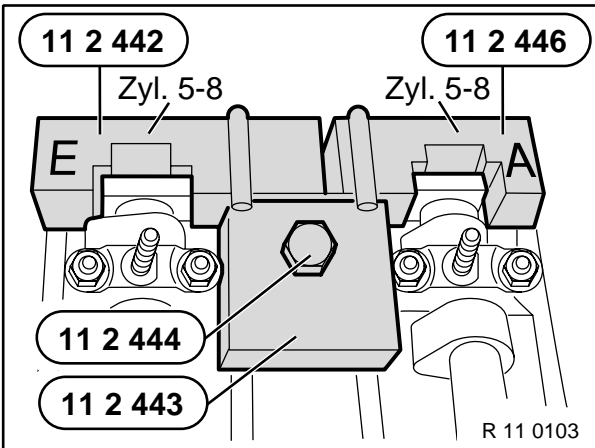
Align all camshafts with open-end wrench in such a way that special tools 11 2 445 / 441 / 446 / 442 fit on cylinder heads with no gaps.

**Caution!**

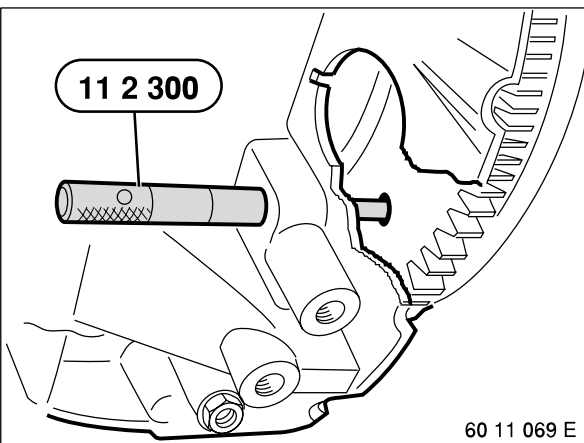
Do not damage the cylinder head.



Fit special tool 11 2 443 to special tool 11 2 445 / 441 and secure with special tool 11 2 444 using the spark plug thread.



Fit special tool 11 2 443 to special tool 11 2 446 / 442 and secure with special tool 11 2 444 using the spark plug thread.



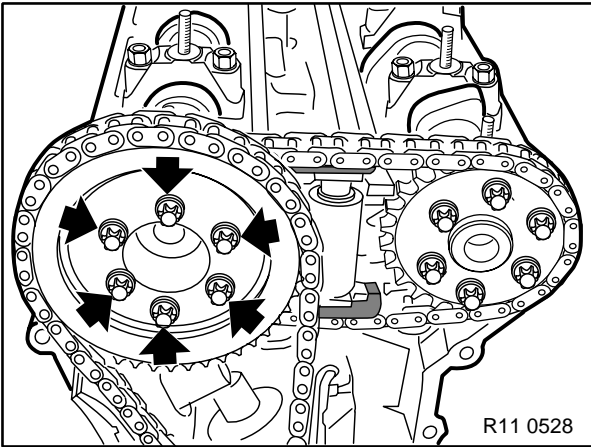
Rotate engine from 45° before TDC position engine-wise until in TDC position.

Secure crankshaft in TDC position with special tool 11 2 300.

**Caution!**

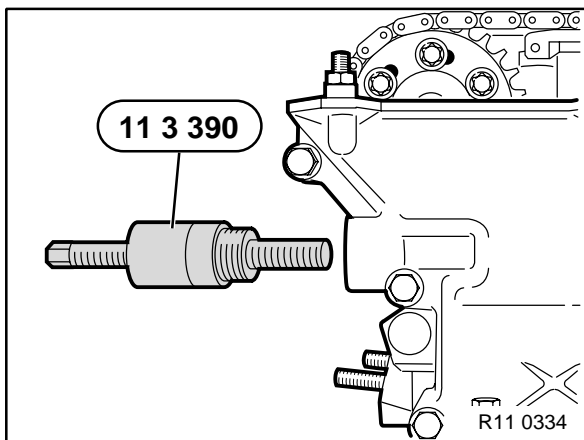
Remove special tool 11 2 300 before starting engine.

# 11/30

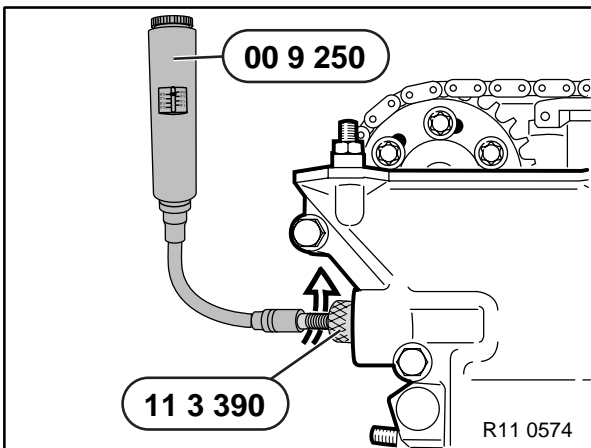


Fit sprocket with chain to intake camshaft on cylinder bank 5-8 with long holes aligned centrally.

Fit screws with no clearance.



Install special tool 11 3 390 in right timing case cover.



Tighten tensioning rail by turning the adjusting screw on the special tool 11 3 390 with special tool 00 9 250 to 0.7 Nm.

**Note:**

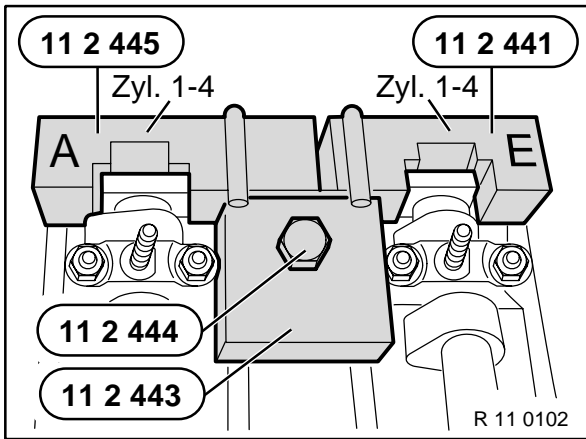
If installation tolerance is unfavorable, attach special tool 00 9 250 from underside.

Tighten sprockets in following order:

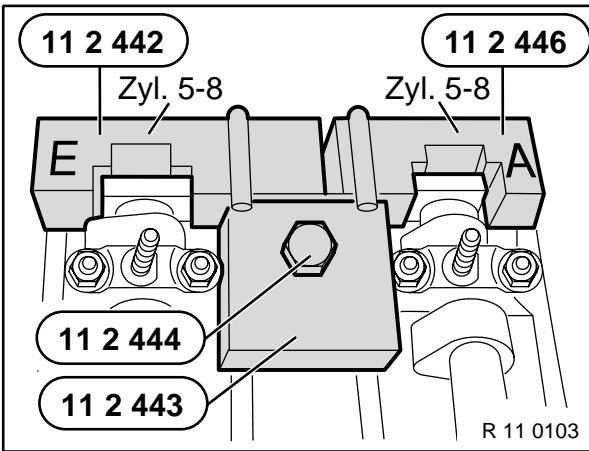
All screws on left exhaust camshaft, three screws on right exhaust camshaft, all screws on left intake camshaft, three screws on right intake camshaft.

Tightening torque,  
refer to Technical Data 11 31 3AZ

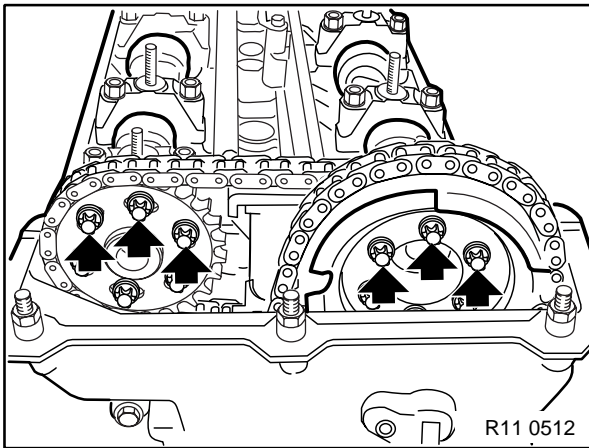
# 11/31



Remove special tools 11 2 444 / 443 / 441 / 445.



Remove special tools 11 2 44 / 443 / 442 / 446.

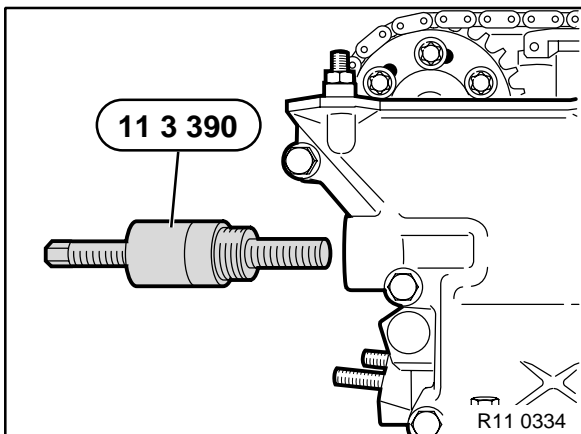


Remove special tool 11 2 300.

Turn over engine once.

Tighten down remaining three screws on exhaust and intake camshafts on cylinder bank 1-4 firmly.

Tightening torque,  
refer to Technical Data 11 31 3AZ



Loosen special tool 11 3 390 and remove.

Assemble engine.

# 11/32

## 11 12 106 Removing and installing right cylinder head (M62)

(Cylinder bank 1-4)

Remove right exhaust manifold,  
refer to 11 62 143

Unfasten drain plug for coolant on right engine block.

Drain and dispose of coolant.

*Installation:*

Replace sealing ring.

Tightening torque,

refer to Technical Data 11 11 5AZ

Bleed cooling system and check for water leaks,  
refer to 17 00 039

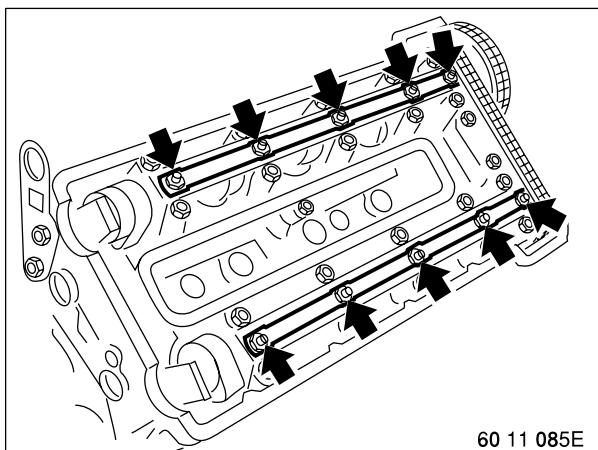
Remove both cylinder head covers,  
refer to 11 12 004

Remove spark plugs,  
refer to 12 12 011

Remove fan coupling with fan wheel,  
refer to 11 52 020

Remove coolant manifold,  
refer to 11 53 325

Remove oil lines on left and right of cylinder head.

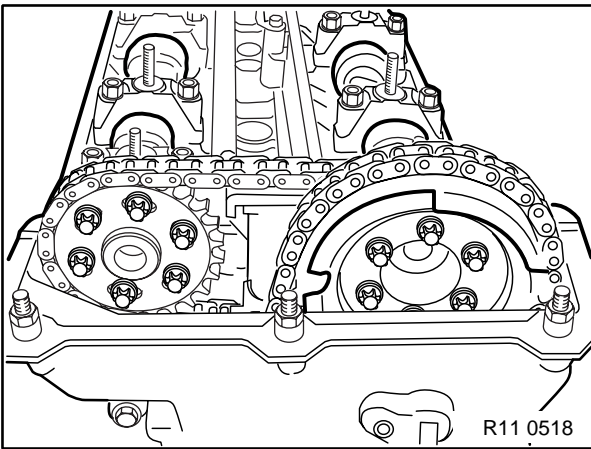


60 11 085E

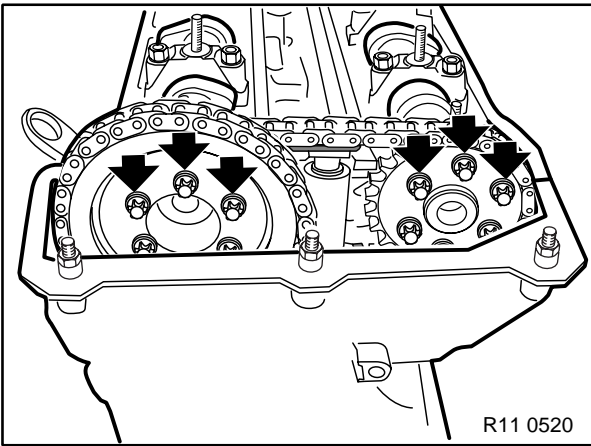
# 11/33

## Removal

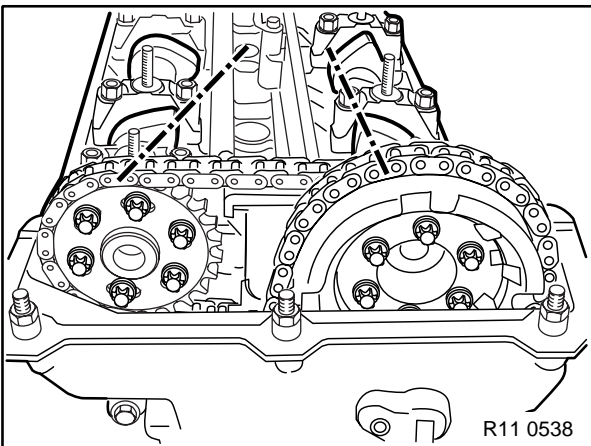
Removal of cylinder head is described separately from installation. Assembly sequence for removal and installation is different.



Crank engine at central bolt in direction of rotation until the first cylinder is in TDC position.



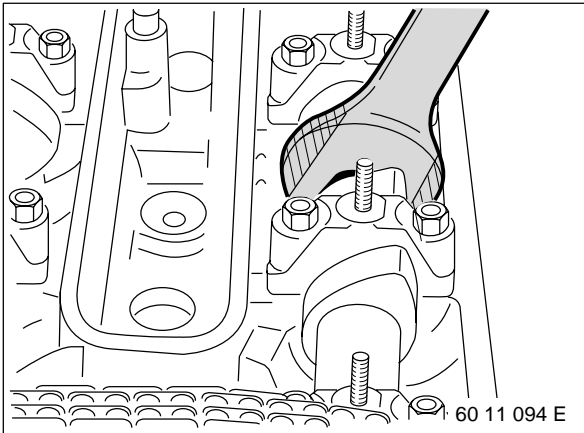
Unfasten the accessible three screws in the exhaust and intake camshaft on cylinder bank 5-8 approx. 1/2 a turn.



Crank engine once engine wise up to TDC position of first cylinder.



# 11/34



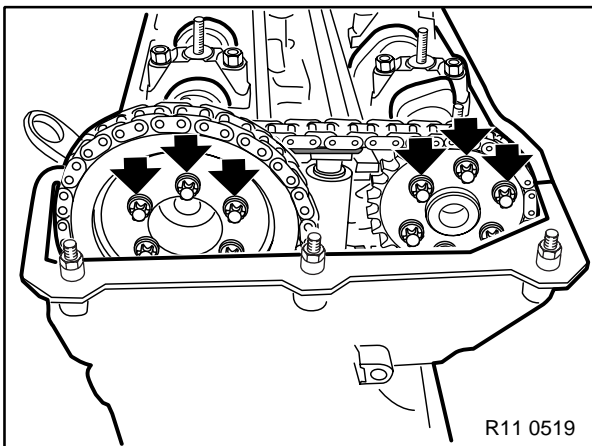
**Note:**

When camshaft screw connection is unfastened, brace camshaft on hex head.

**Caution!**

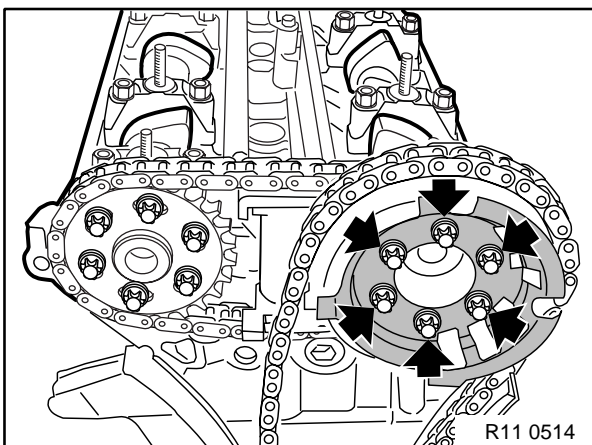
Do not damage the cylinder head.

Machine open-end wrench accordingly if necessary.



Unfasten remaining three screws in exhaust and intake camshafts in cylinder bank 5-8 approx. 1/2 a turn.

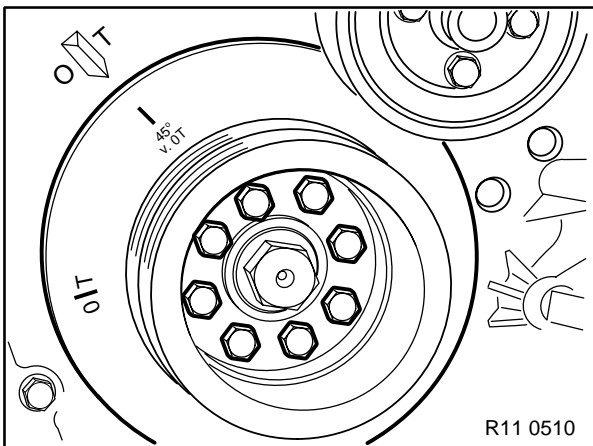
Remove top right timing case cover, refer to 11 14 085



Remove sprocket on right intake camshaft (cylinder bank 1-4).

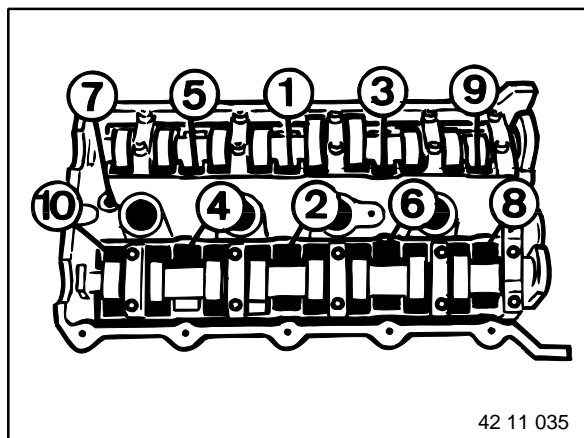
Secure chain to prevent it from dropping.

# 11/35



Turn engine on central screw counter-enginewise up to 45° before TDC position.

Note markings!



Release cylinder-head bolts in sequence 10 ... 1.

Lift off cylinder head.

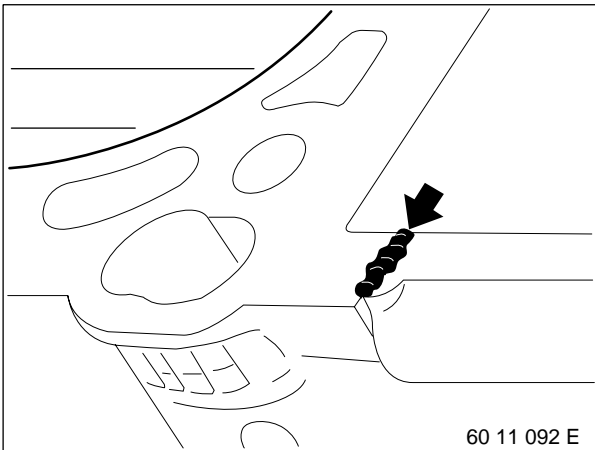
## Installation

Installation of cylinder head is described separately from removal. Assembly sequence for removal and installation is different.

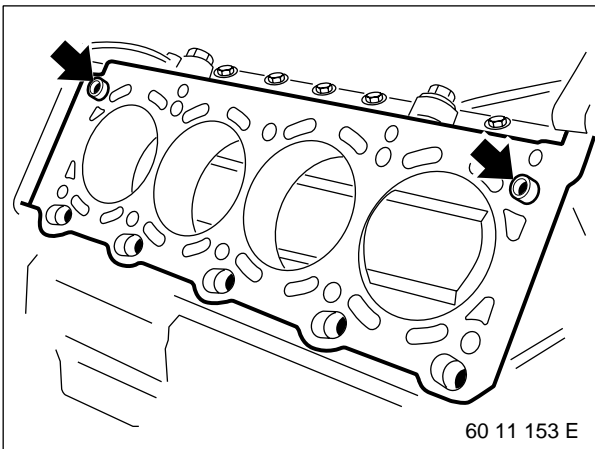
Clean sealing faces of cylinder head and engine block, if necessary using wooden scraper to remove gasket debris. Ensure that no gasket debris drops into the oil and coolant ducts.

Threaded bores in engine block must be free of dirt and oil (danger of cracking).

# 11/36

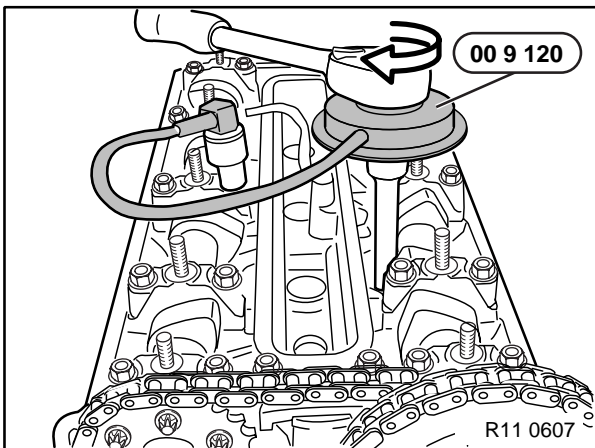


Coat joint between engine block and timing case cover with three Bond 1209 (refer to BMW Parts Service).



Check that dowel sleeves are undamaged and correctly located.

Fit new cylinder-head seal.

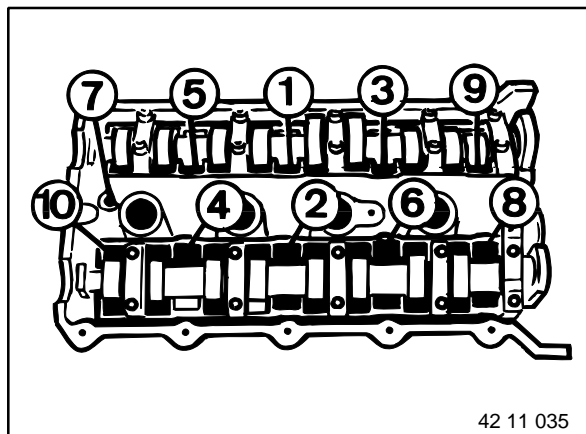


Fit cylinder head and install new cylinder head screws.

Do not wash off screw coating.

*Note:*

Use special tool 00 9 120 as a torsion angle bracket.



Tighten down cylinder head screws in sequence 1 ... 10.

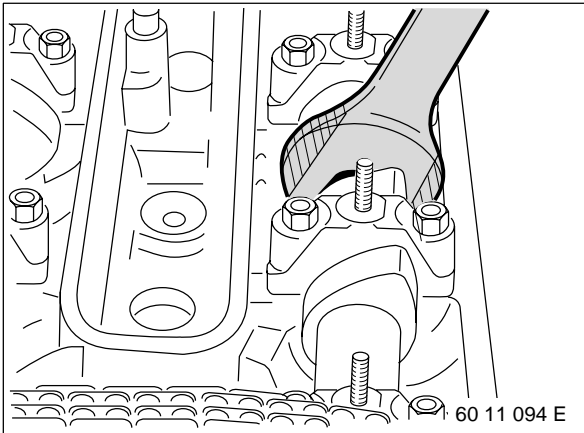
Tightening torque, refer to Technical Data 11 12 8AZ

# 11/37

Align camshafts with open-end wrench.

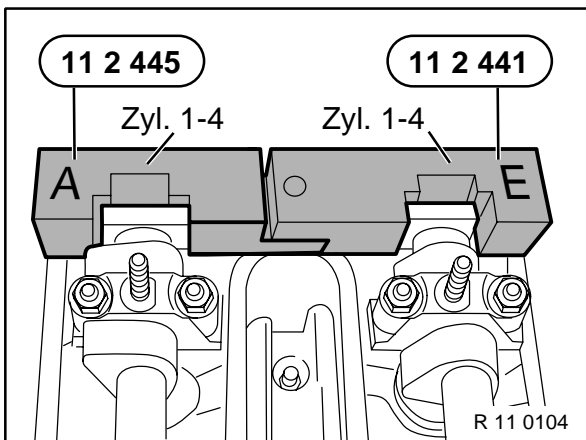
**Caution!**

Do not damage the cylinder head.



60 11 094 E

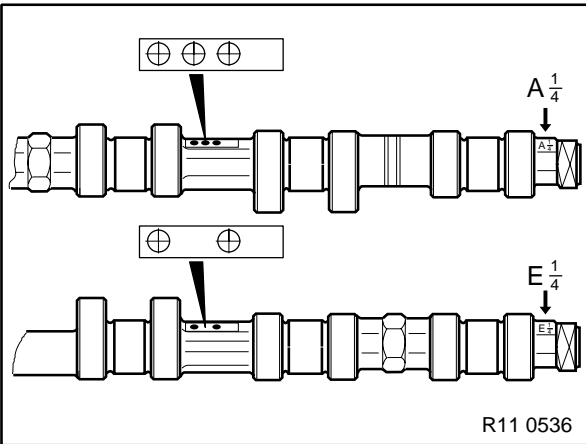
Fit special tool 11 2 445 / 441 to camshafts on cylinder bank 1-4.



R 11 0104

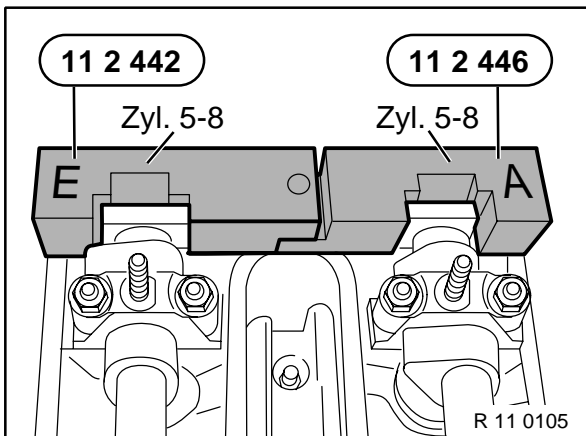
**Note:**

In TDC position of first cylinder, marker bores of camshafts point upwards.



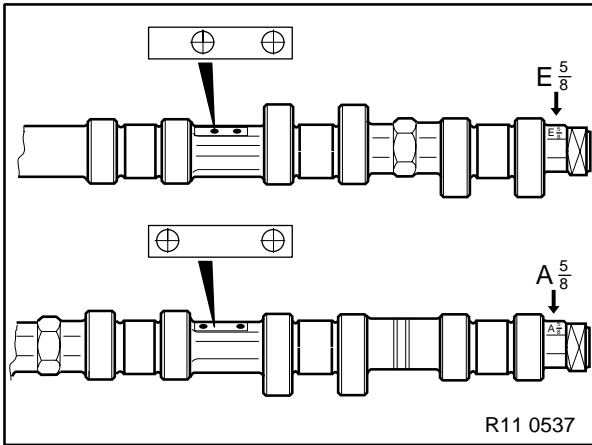
R11 0536

Fit special tool 11 2 446 / 442 to camshafts on cylinder bank 5-8.



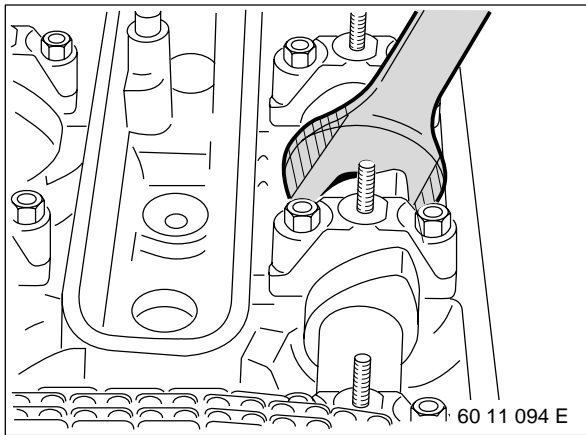
R 11 0105

# 11/38



**Note:**

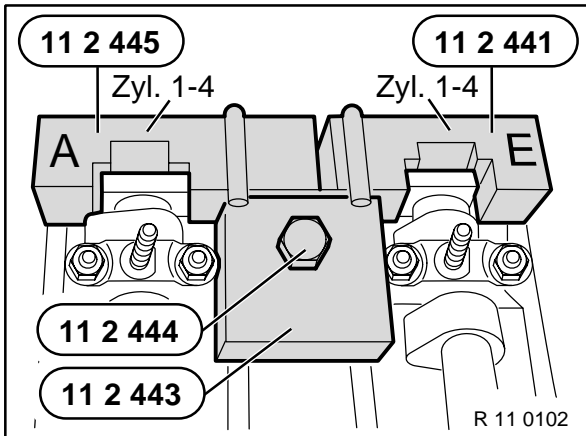
In TDC position of first cylinder, marker bores of camshafts point upwards.



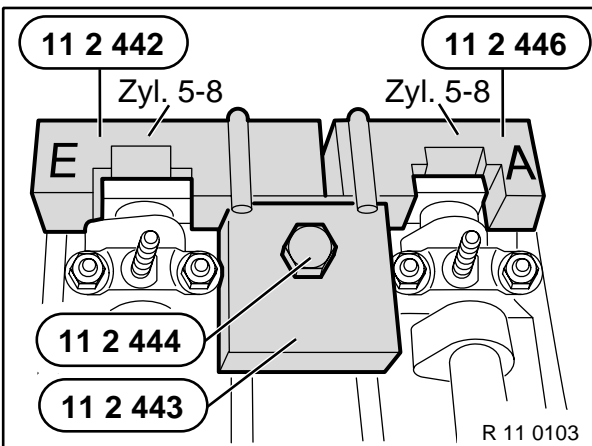
Align all camshafts with open-end wrench in such a way that special tools 11 2 441 / 445 / 446 / 442 locate firmly against cylinder heads.

**Caution!**

Do not damage the cylinder head.

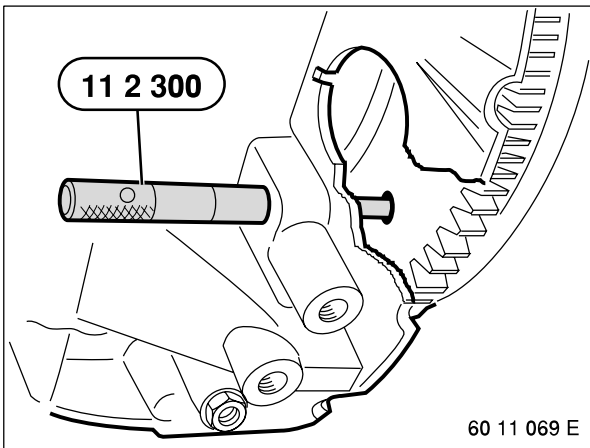


Fit special tool 11 2 443 to special tool 11 2 445 / 441 and secure with special tool 11 2 444 using the spark plug thread.



Fit special tool 11 2 443 to special tool 11 2 446 / 442 and secure with special tool 11 2 444 using the spark plug thread.

# 11/39

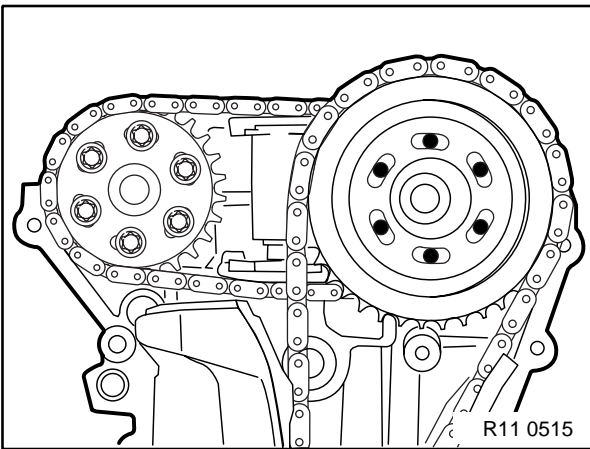


Rotate engine from 45° before TDC position engine-wise until in TDC position.

Hold crankshaft in TDC position with special tool 11 2 300.

**Caution!**

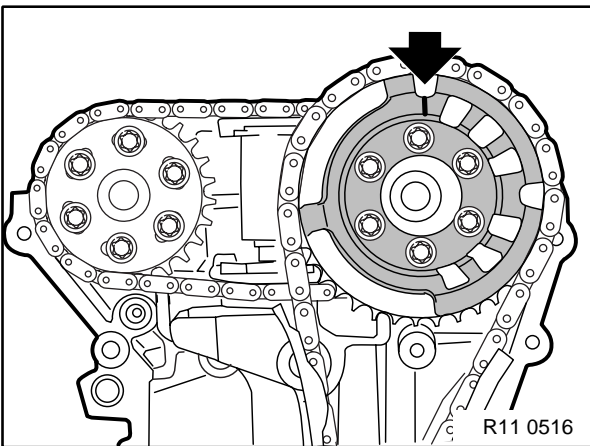
Remove special tool 11 2 300 before starting engine.



Fit sprocket with chain on intake camshaft of cylinder bank 1-4 with long bores centrally aligned.

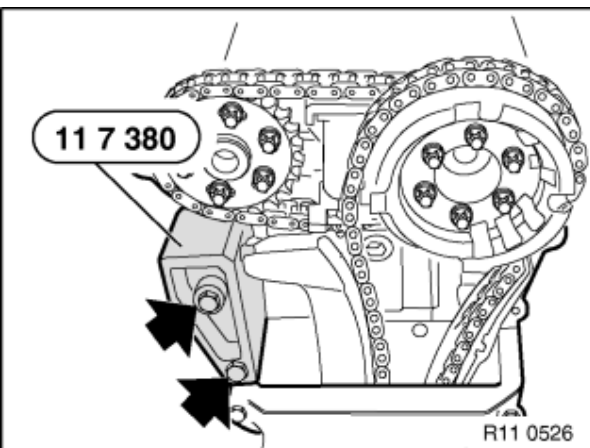
Brace sprocket, press tensioning rail against the timing chain and check the position of the long bores.

If necessary, remove sprocket once again and align position of long bores centrally.



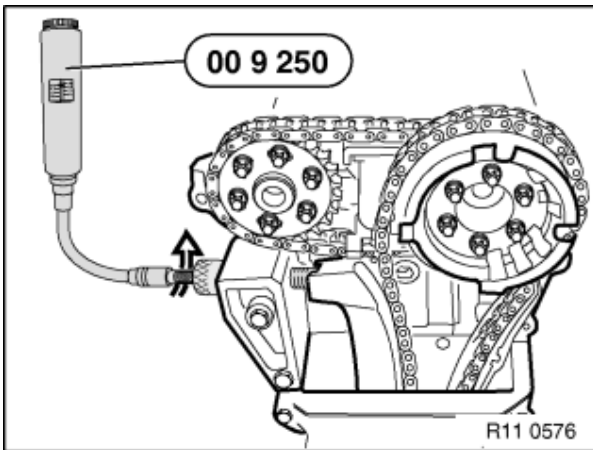
Fit sensor gear with mark on sensor gear in cylinder shaft pointing upwards.

Insert screws and fit flush.



Fit special tool 11 7 380 to right cylinder head (cylinder bank 1-4).

# 11/40



Install special tool 11 3 390 in special tool 11 7 380.

Tighten tensioning rail by turning the adjusting screw on the special tool 11 3 390 with special tool 00 9 250 to 0.7 Nm.

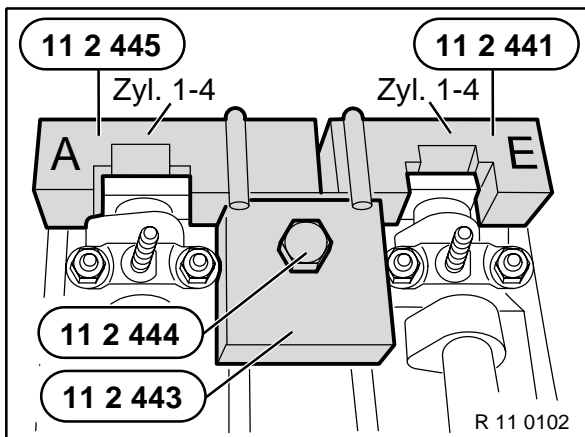
**Note:**

If installation tolerance is unfavorable, attach special tool 00 9 250 from underside.

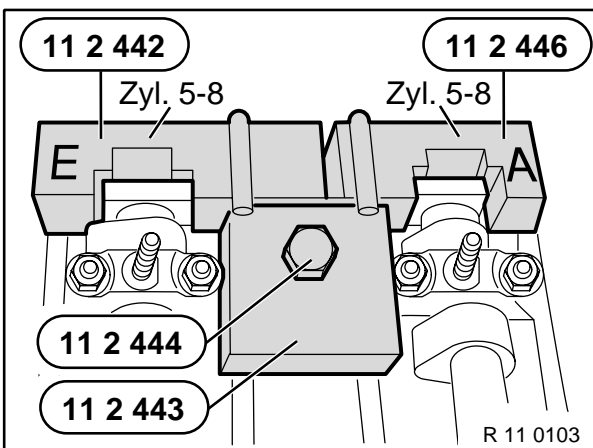
Tighten sprockets in following order:

Three screws on left exhaust camshaft, all screws on right exhaust camshaft, three screws on left intake camshaft, all screws on right intake camshaft.

Tightening torque,  
refer to Technical Data 11 31 3AZ

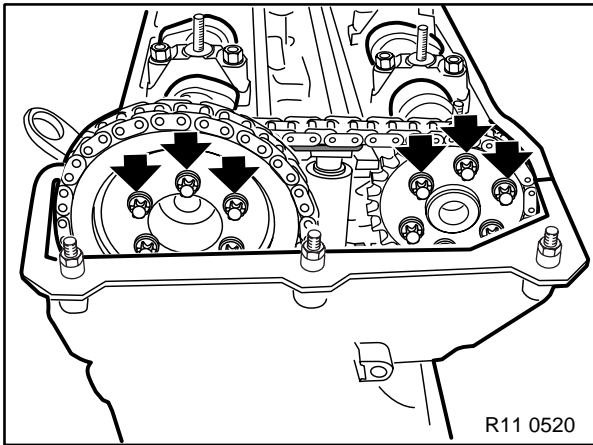


Remove special tools 11 2 444 / 443 / 441 / 445.



Remove special tools 11 2 444 / 443 / 442 / 446.

# 11/41

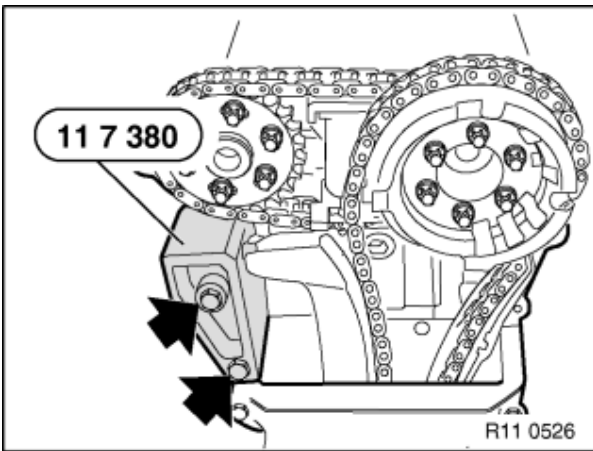


Remove special tool 11 2 300.

Turn over engine once.

Tighten down remaining three screws in exhaust and intake camshafts on cylinder bank 5-8.

Tightening torque,  
refer to Technical Data 11 31 3AZ



Relieve load on special tool 11 3 390 and remove with special tool 11 7 380.

Assemble engine.



# 11/42

## 11 12 107 Removing and installing both cylinder heads (M62)

**Remove both cylinder heads.**

**Operation is described in sections on removing and  
installing right / left cylinder heads,  
refer to 11 12 105 / 106**

# 11/43

## 11 12 110 Replacing left cylinder head gasket (M62)

Operation is described in sections on removing and installing right / left cylinder heads,  
refer to 11 12 105

# 11/44

## 11 12 111 Replacing right cylinder head gasket (M62)

This operation is described in section on removing and installing the right cylinder head, refer to 11 12 106

# 11/45

## 11 12 112 Replacing both cylinder head gaskets (M62)

Remove both cylinder head gaskets.

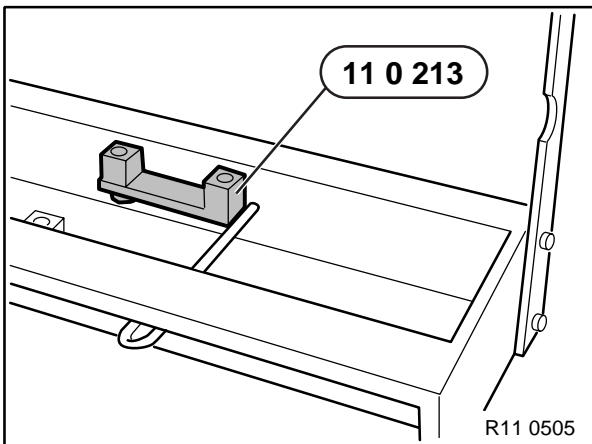
Operation is described in sections on removing and installing right / left cylinder heads, refer to 11 12 105 / 106

# 11/46

## 11 12 503 Dismantling and reassembling cylinder head (M62)

(cylinder head removed)

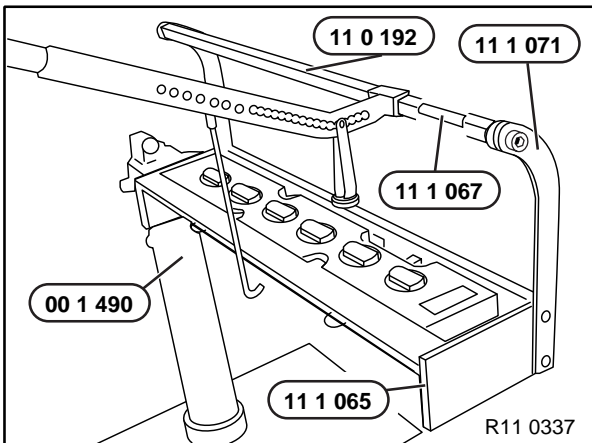
Screw special tool 11 0 213 to special tool 11 1 065.



Secure 11 1 065 to special tool 00 1 490.

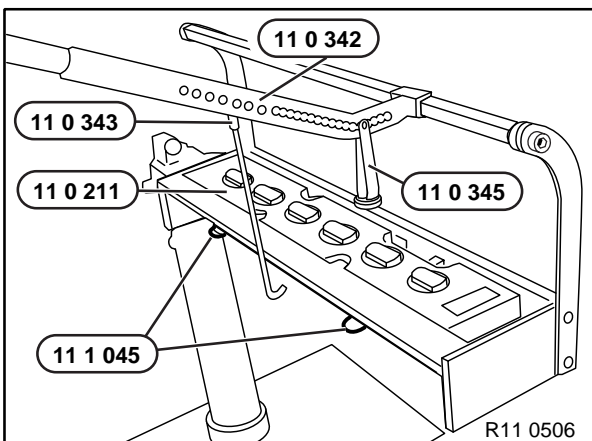
Prepare special tools for cylinder-head disassembly:

- Special tool 11 1 071
- Special tool 11 1 067
- Special tool 11 0 192

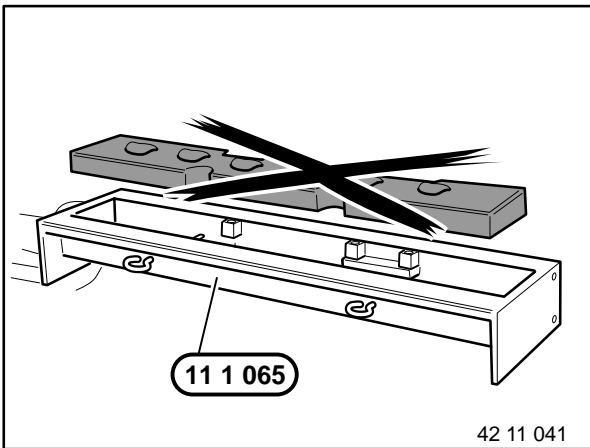


- Special tool 11 1 045
- Special tool 11 0 345
- Special tool 11 0 342
- Special tool 11 0 343
- special tool 11 0 211

Assemble special tool.

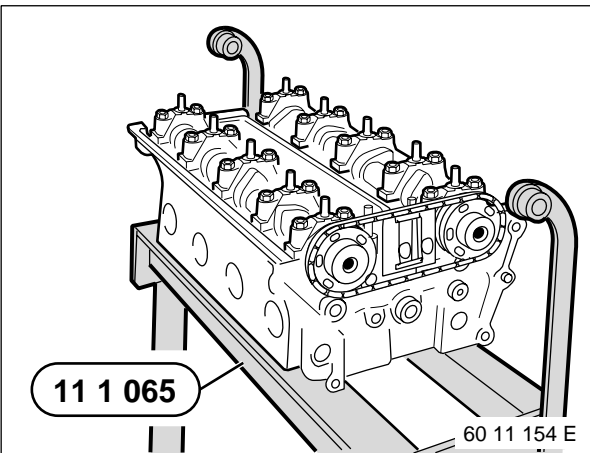


# 11/47



**Note:**

At this point, do not install special tool 11 0 211 (support board) in special tool 11 1 065.



Fit cylinder head on special tool 11 1 065 and secure with two cylinder head screws.

Remove all valves, refer to 11 34 552

# 11/48

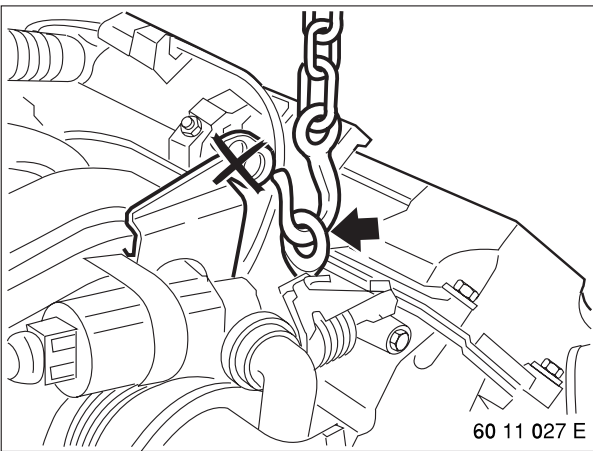
## 11 12 515 Removing and installing left cylinder head (M62)

(Engine removed)

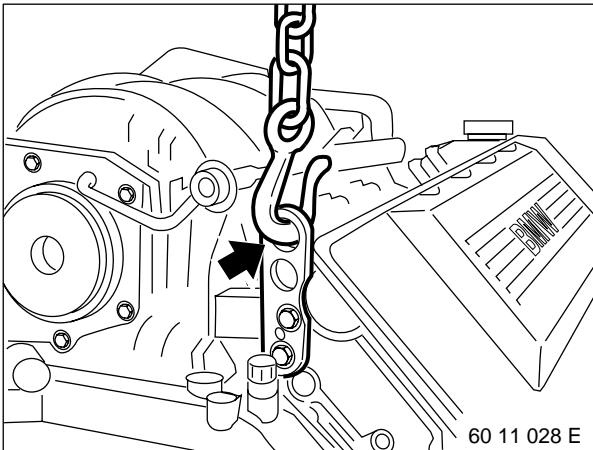
Fit engine to special tool 00 1 450.

**Caution!**  
Only raise engine on locating lugs provided for this purpose.

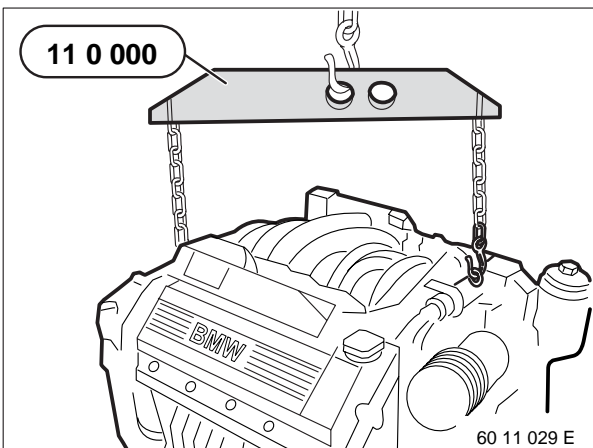
Layout of front engine mount.



Layout of rear engine mount.



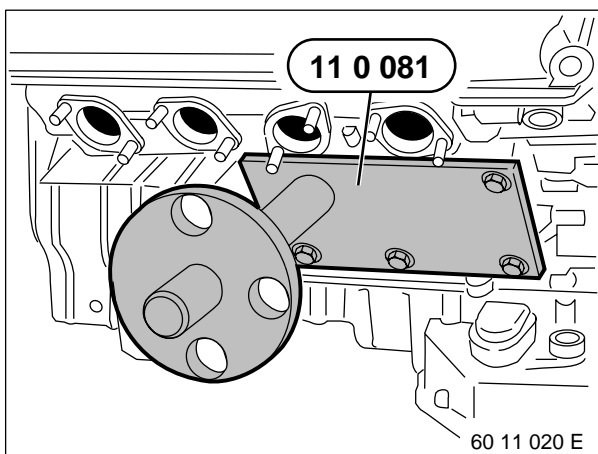
Raise engine with special tool 11 0 000.



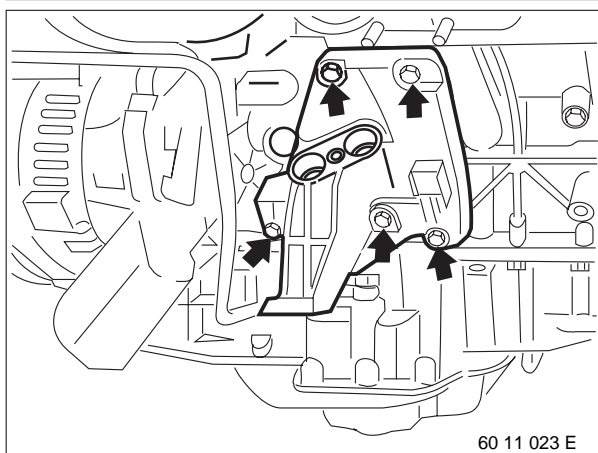
# 11/49

Remove oil dipstick guide.

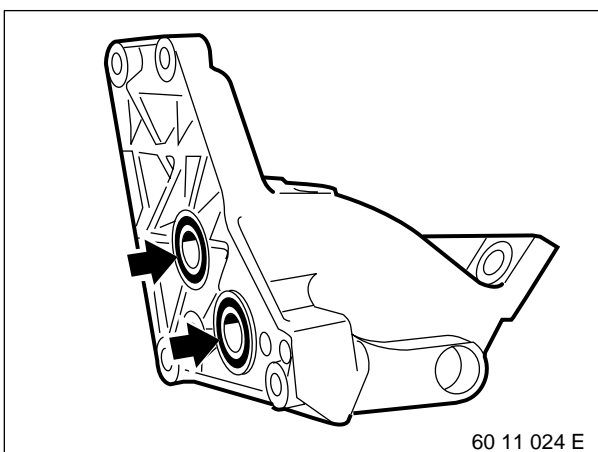
Remove carrier bracket from cylinder bank 1-4.



Fit special tool 11 0 081 to cylinder bank 1-4.



Remove carrier bracket from cylinder bank 5-8.

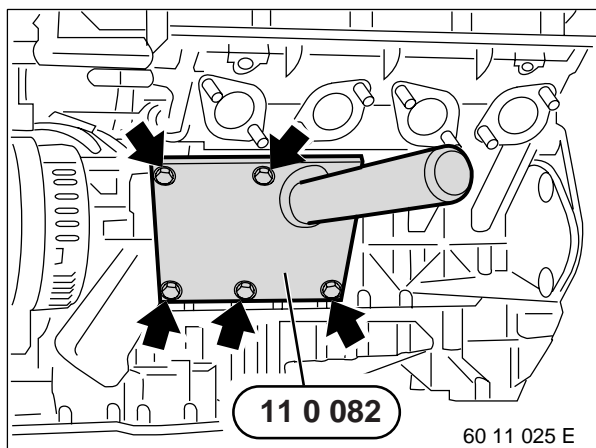


**Installation:**

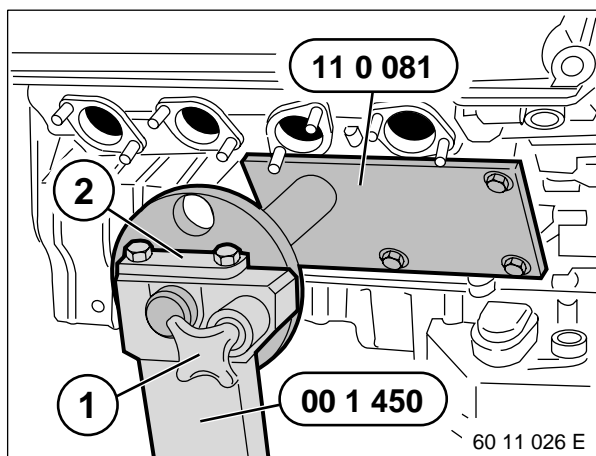
Replace sealing rings, ensure that seals are correctly located and, if necessary, secure with grease.



# 11/50



Fit special tool 11 0 082.



Install engine in special tool 00 1 450,

locate locking detent (1).

Close locking detents (2) on right and left and screw down.

Subsequent procedure is described in section on removing and installing left cylinder head, refer to 11 12 105

# 11/51

## 11 12 516 Removing and installing right cylinder head (M62)

(Engine removed)

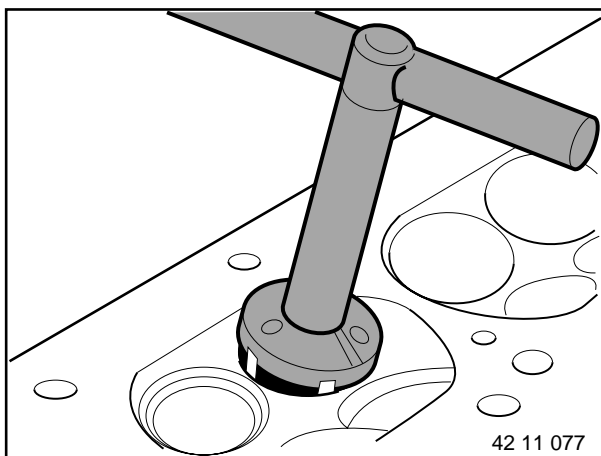
Secure engine to special tool 00 1 450. Operation is described in section on removing and installing left cylinder head, refer to 11 12 515

Subsequent procedure is described in section on removing and installing right cylinder head, refer to 11 12 106

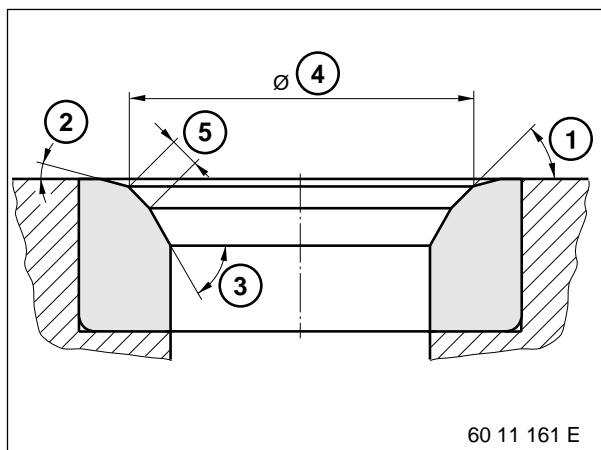
# 11/52

## 11 12 527 Reworking one valve seat (M62)

(cylinder head dismantled)



Machine valve-seat face with special tool 00 3 520 or 00 3 580 in accordance with specifications of tool manufacturer.



After machining the outer and inner diameters of valve seat face, use correction milling tool to rework to specified diameter until valve seat width (5) is achieved.

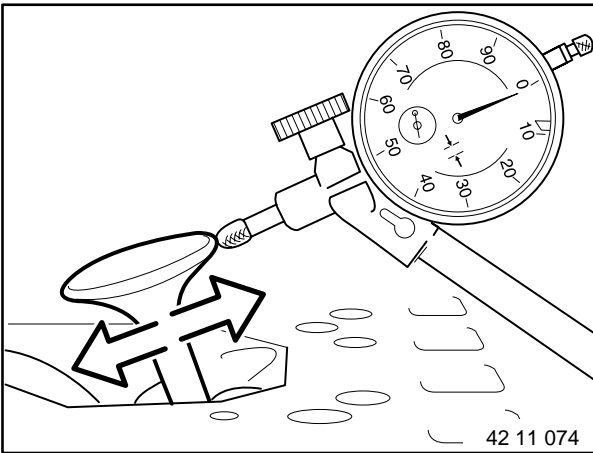
- 1 Valve-seat angle
- 2 Correction angle, external diameter
- 3 Correction angle, internal diameter
- 4 Outside  $\varnothing$  the seat face
- 5 Valve seat width

Nominal values (1-5), refer to Technical Data

# 11/53

## 11 12 595 Checking one valve guide for wear (M62)

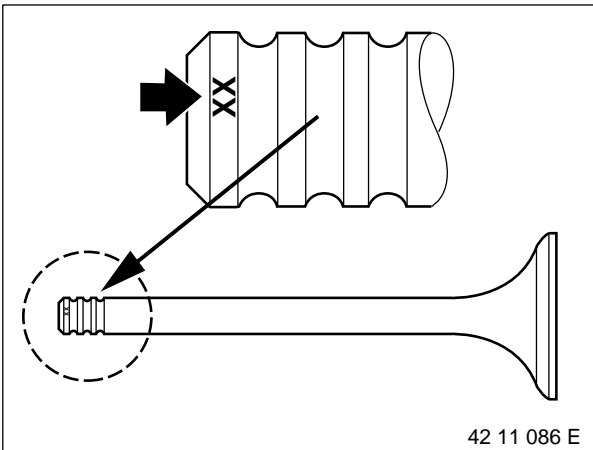
(valve removed)



To measure tilt clearance, insert new valve so that valve stem end is flush with valve guide.

Mount dial gauge and measure tilt clearance.

**Note:**  
Maximum permitted tilt clearance, refer to Technical Data



**Note:**  
If tilt clearance is excessive, valve guide is reamed out and a repair valve with a larger shaft diameter is installed.

If necessary, ream out valve guide, refer to 11 12 600

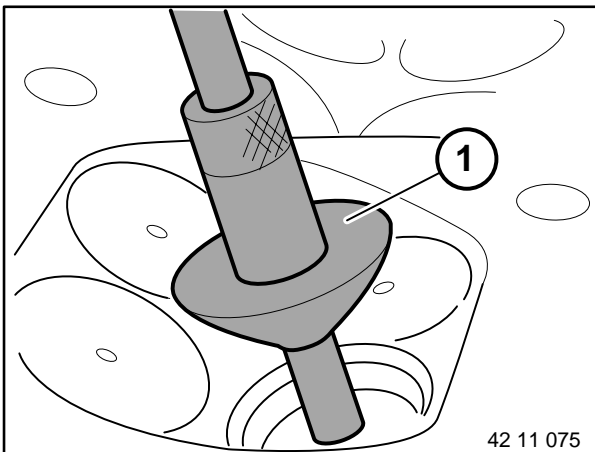
# 11/54

## 11 12 600 Reaming out one valve guide (M62)

(Valve removed)

**Note:**

If clearance between valve shaft and valve guide is too great, ream out valve guide and install repair valve with larger shaft diameter.



Assemble the reaming tool and guide taper (1) from the special tool kit 00 4 210 depending on the shaft diameter. Press guide taper (1) against valve seat and ream out valve guide (when dry) from combustion-chamber end. Rotate reaming tool once in downwards direction.

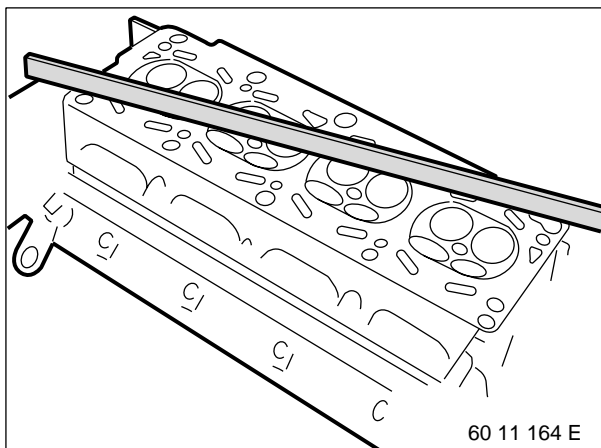
**Note:**

After the reaming operation, rework the valve seat, refer to 11 12 527

# 11/55

## 11 12 719 Milling down cylinder head gasketing face (M62)

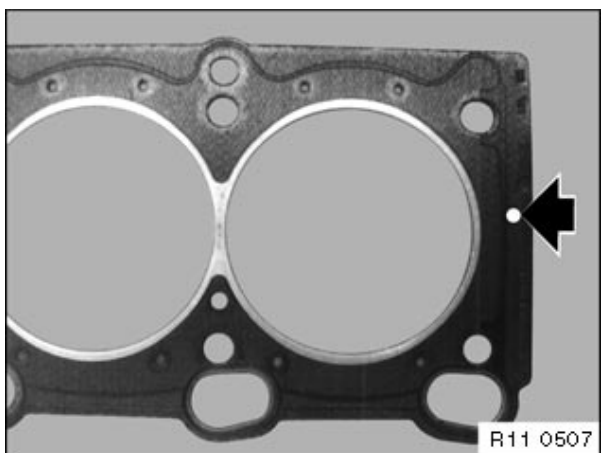
(Cylinder head dismantled)



Check planeness of cylinder head gasketing face with straightedge (standard).

Deviation from planeness max. 0.05 mm.

**Note:**  
Machine limit,  
refer to Technical Data



**Caution!**

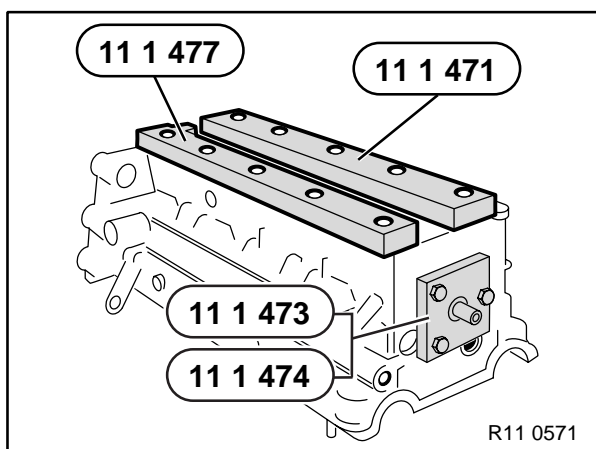
To compensate for compression, there is a repair cylinder head gasket.

**Note:**  
The repair cylinder head gasket is designated at the back with a bore beside the 4th or 8th cylinder.

# 11/56

## 11 12 729 Checking cylinder head for water leaks (M62)

(Cylinder head dismantled)

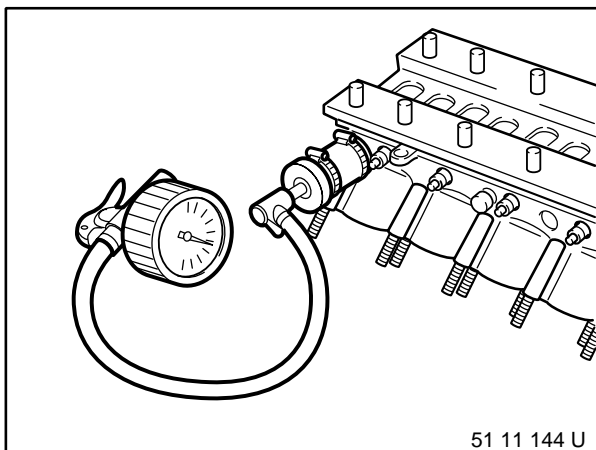


Seal coolant apertures with special tool kit 11 1 470.

**Note:**

Special tool 11 1 473 for cylinder bank 1-4

Special tool 11 1 474 for cylinder bank 5-8



Immerse cylinder head in a water bath. Inspection pressure 4.5 bar.

Check cylinder head for escaping air (cracks).

**Note:**

If necessary, add cleaning agent to water bath.

# 11/57

## 11 13 010 Removing and installing/replacing upper section of oil pan (M62)

**Note:**

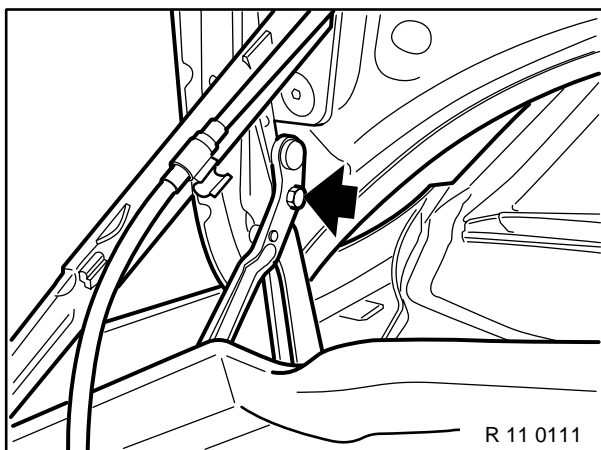
For removal of oil pan, front axle support must be lowered.

There is no need to perform a front axle alignment check.

### E38 only

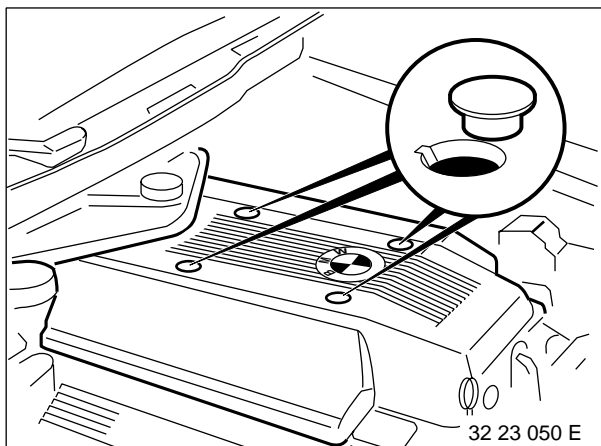
Note instructions on connecting and decoupling battery, refer to General Information MG12

Disconnect negative battery lead.



Lift engine hood into assembly position.

Disconnect damper on hood, open hood fully and secure with a screw on left and right sides.



### Version 1

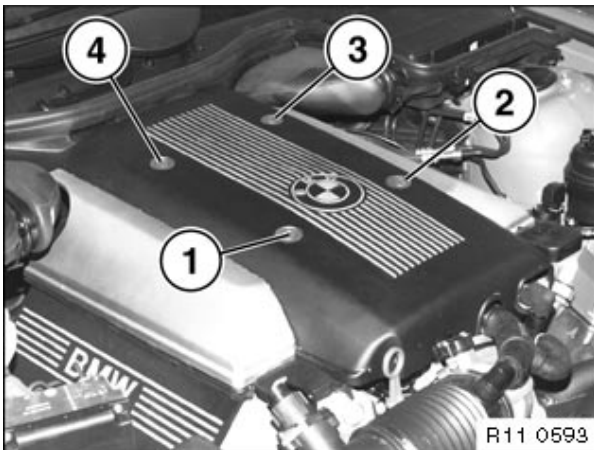
(acoustic cover screwed down)

Pry out sealing cap. Unscrew nuts.

Remove acoustic cover.



# 11/58



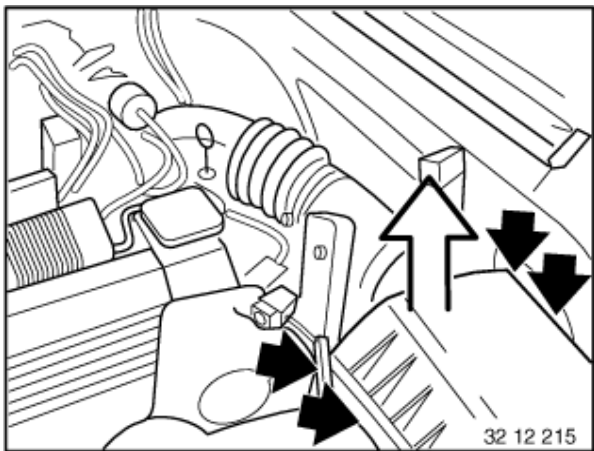
## Version 2

(acoustic cover with press-stud fastener)

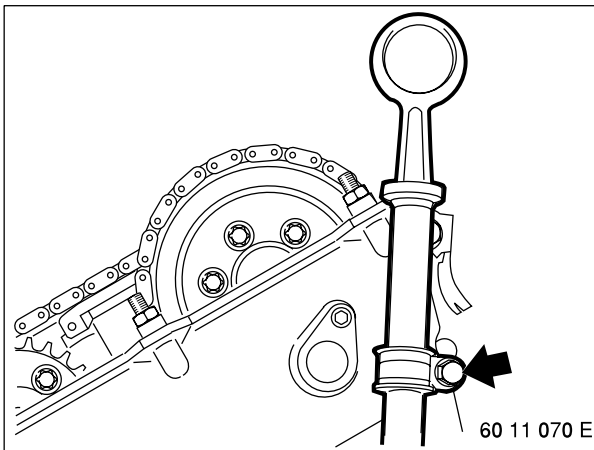
Open press-studs (1 ... 4) one at a time, at the same time lifting the acoustic cover slightly. Once all four press-studs have been opened, remove the acoustic cover.

### *Installation:*

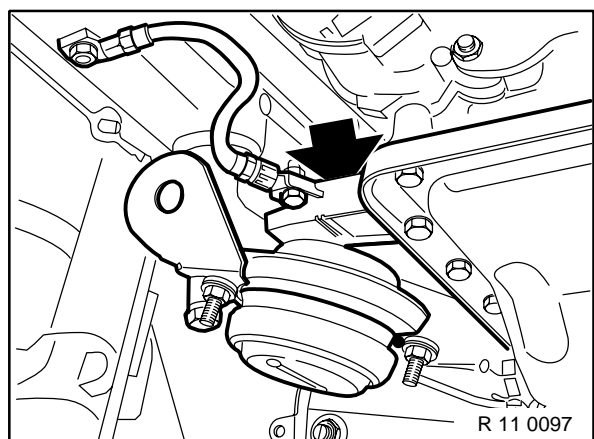
Position acoustic cover and press downwards until press-studs (1 ... 4) click into place.



Remove suction-filter housing with air-mass sensor, refer to 13 71 000

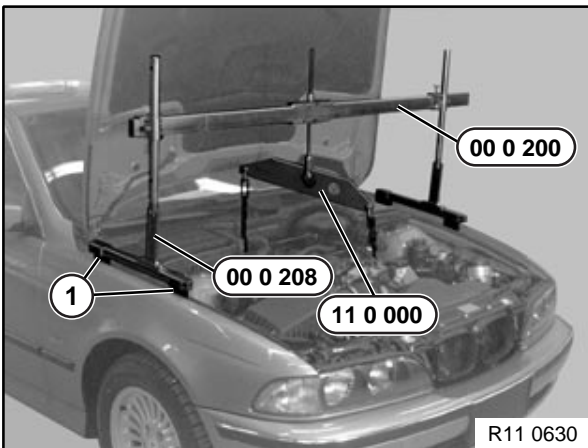


Unfasten dipstick guide from right timing case cover.



Unfasten top left and right nuts on engine mount.

# 11/59

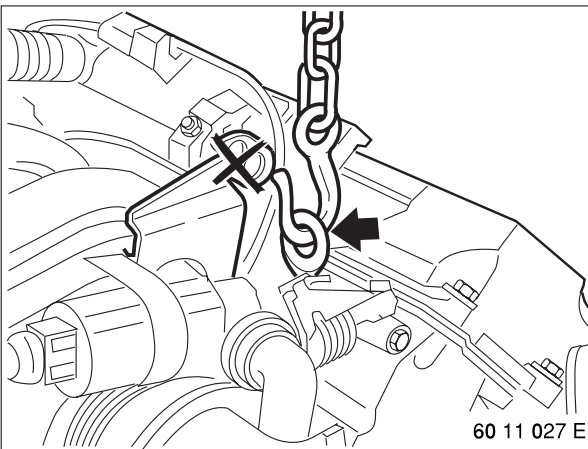


Fit special tool 00 0 200 to special tool 00 0 201 / 202 / 204 / 208 and attach.

**Note:**

The supports (1) of special tool 00 0 208 must make contact with the screws on the side walls.

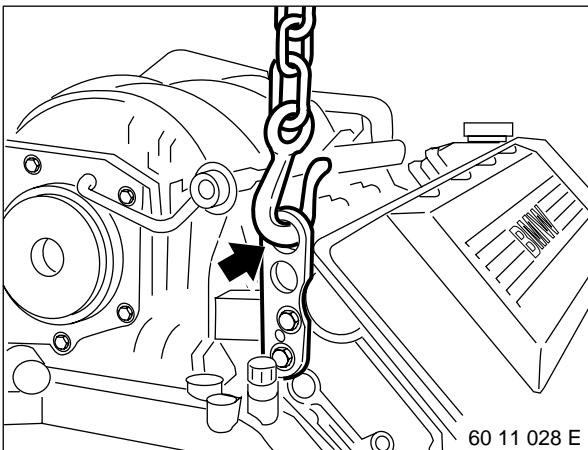
Secure special tool 11 0 000 to special tool 00 0 200.



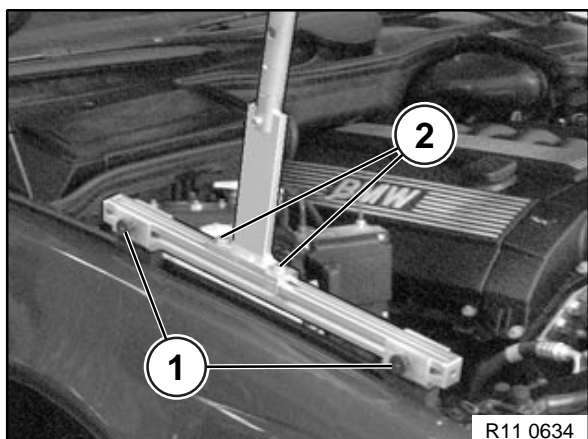
**Caution!**

Only attach engine to relevant suspension lugs.

Layout of front engine mount.



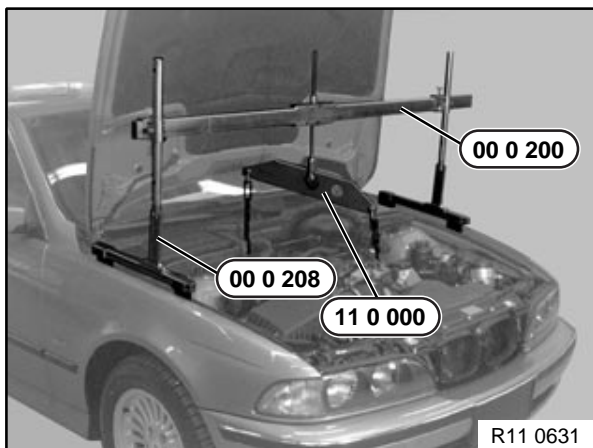
Layout of rear engine mount.



Tighten the screws (1 and 2).

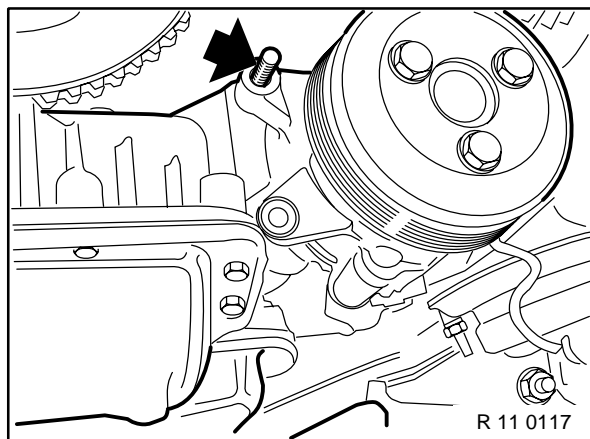
# 11/60

Lift engine with special tool 00 0 200 approx. 6 - 8 mm.



Remove lower section of oil pan,  
refer to 11 13 020

Relieve load on drive belt of air conditioner and remove  
adjusting plate from oil pan,  
refer to 11 28 050



Unfasten vane pump,  
refer to 32 41 060

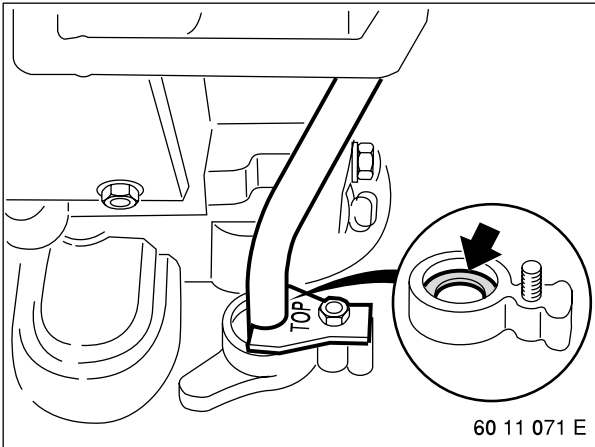
**Note:**  
Lines remain connected. If necessary, remove stud bolt  
from upper section of oil pan and tie vane pump to one  
side.

## E38

Unfasten protective tube on positive battery lead from  
oil pan and unfasten from right engine support.

Unfasten positive battery lead from starter motor and  
unfasten from left retaining bracket.

# 11/61

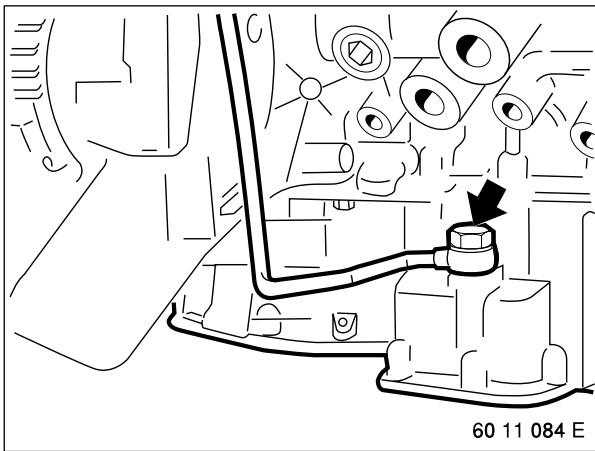


Unfasten guide tube for dipstick on oil pan.

**Installation:**

Check O-ring, replace if necessary.

Insert O-ring and washer in oil pan bore.



Unfasten return line from oil pan.

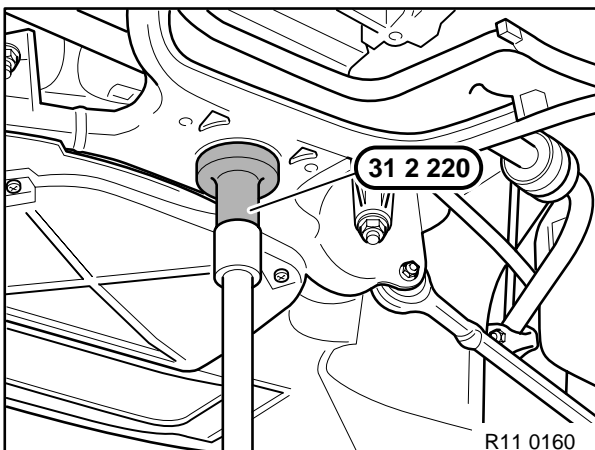
**Installation:**

Replace sealing ring.

For Tightening torque,  
refer to Technical Data 11 42 5AZ

Unfasten steering spindle from steering gear.

This operation is described in section on removing and installing the steering gear,  
refer to 32 13 060

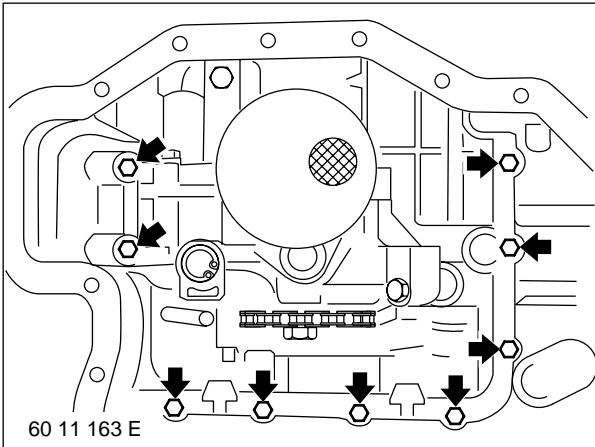


Unfasten bracket for hydraulic line from front axle support.

Brace front axle support with special tool 00 2 030 in conjunction with special tool 31 2 220.

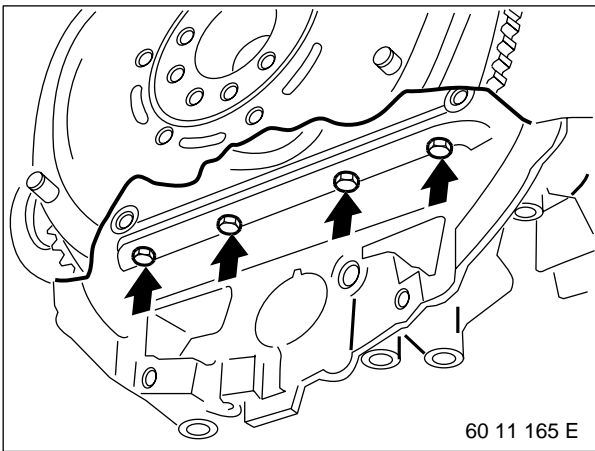
Unfasten front axle support from engine support and lower approx. 60 mm,  
refer to 31 11 001

# 11/62

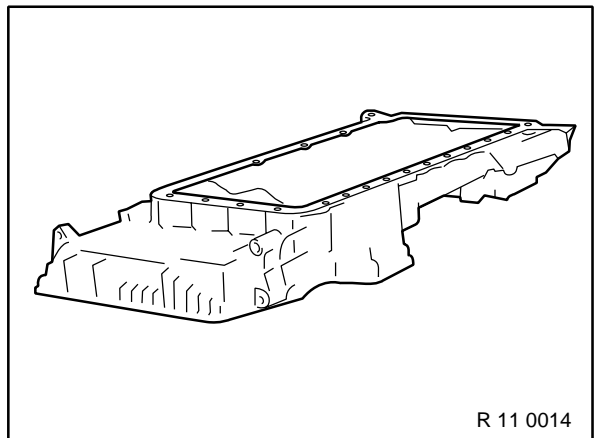


Unfasten screws inside oil pan.

Remove oil pump,  
refer to 11 41 000



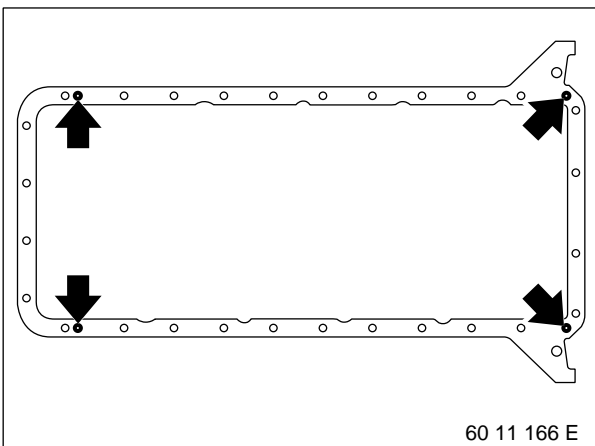
Unfasten screws to sealing cover.



If necessary, unfasten oil cooler line bracket from oil pan.

Unfasten remaining screws from oil pan.

Lift upper section of oil pan forwards to remove.



### Installation:

Sealing faces clean and free of seal debris. Coat edges of joint with three Bond 1209 sealing compound (refer to BMW Parts Service).

- 1 Replace gasket
- 2 Install oil pan
- 3 Insert all screws in oil pan.
- 4 Insert screws in transmission end without preload at this stage.
- 5 Tighten down screws in engine end.
- 6 Tighten down screws in transmission end.

# 11/65

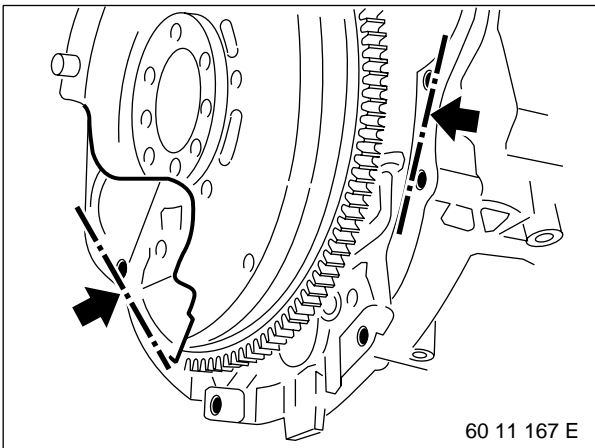
## 11 13 510 Removing and installing / replacing upper section of oil pan (M62)

(Engine removed)

Secure engine to special tool 00 1 450.

Operation is described in section on removing and installing left cylinder head, refer to 11 12 515

Subsequent procedure, refer to 11 13 010



### ***Installation:***

To prevent any possibility of torsion stress when transmission is fitted, align oil pan on transmission end with engine block.

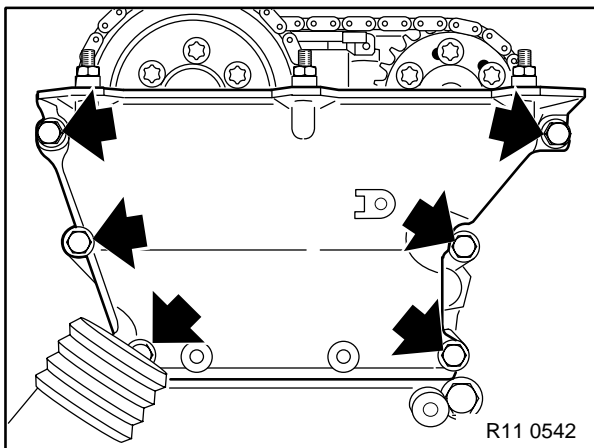
# 11/66

## 11 14 080 Removing and installing/sealing or replacing top left timing case cover (M62)

Remove left cylinder head cover. This operation is described in section on removing and installing / sealing both cylinder head covers, refer to 11 12 004

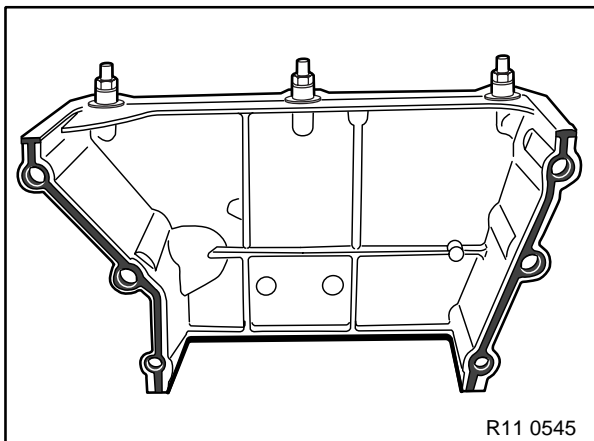
Remove fan coupling with fan wheel, refer to 11 52 020

Unfasten timing case cover.

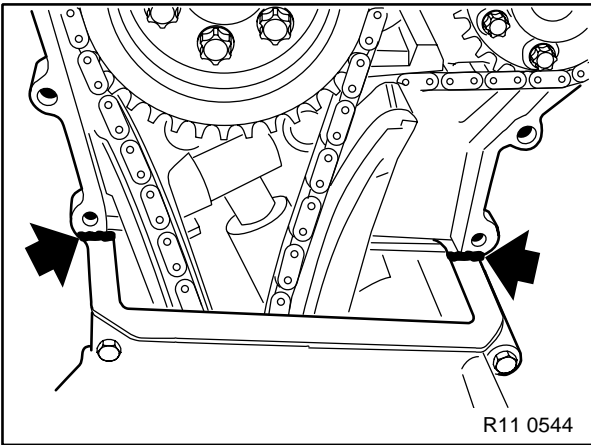


Remove rubber sealing strip.

**Installation:**  
Clean groove for rubber profile seal and sealing surfaces of remains of seal.



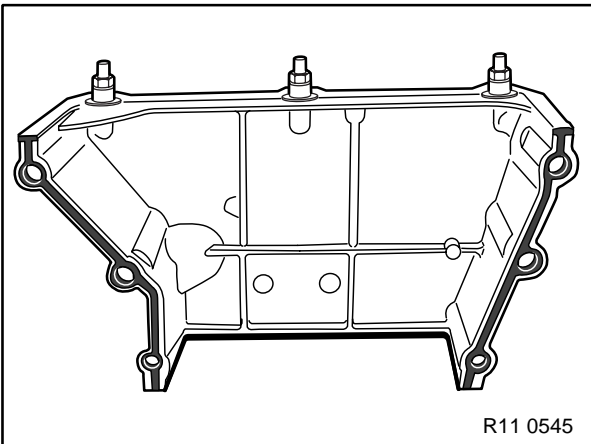
# 11/67



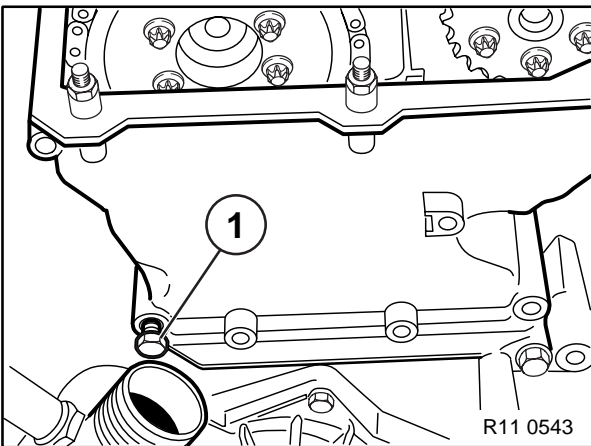
**Installation:**

Keep sealing faces clean and free of oil.

Apply coat of Drei Bond 1209 to joint between cylinder head and lower timing case cover (refer to BMW Parts Service).



Seat new rubber seal in groove.

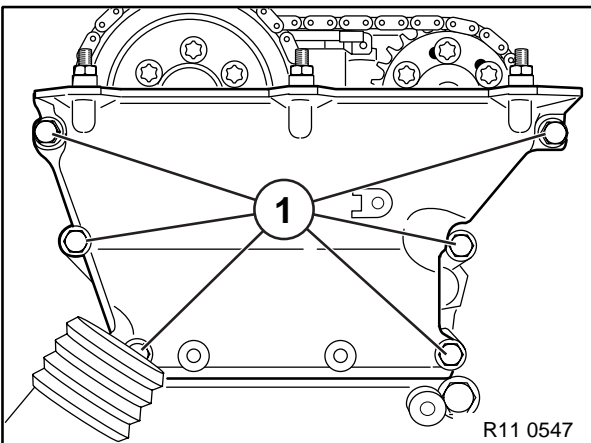


**Installation:**

Ensure that gasket is correctly seated then fit timing case cover with inserted screw (1).

**Note:**

It is not subsequently possible to insert screw (1).

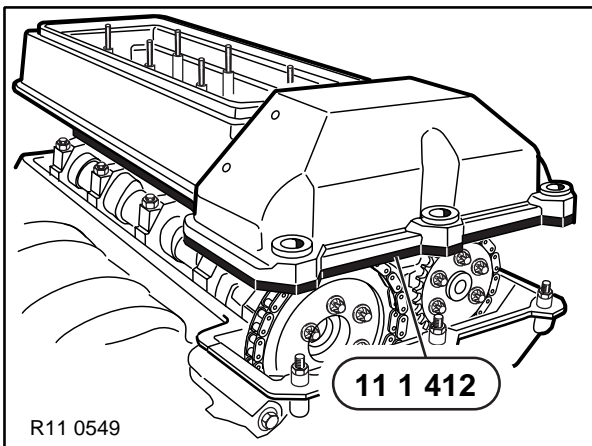


**Installation:**

Install screws (1) and fit flush with cylinder head.



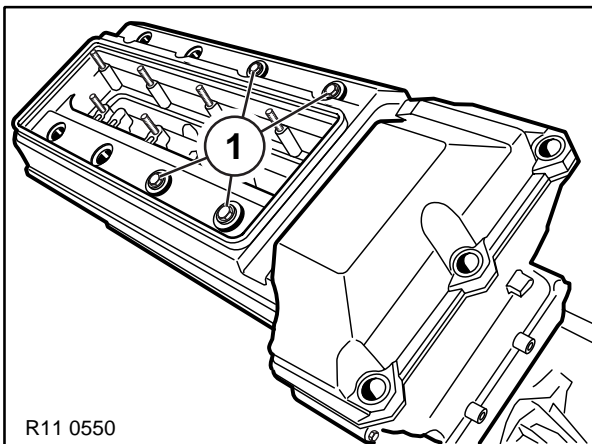
# 11/68



**Installation:**

Remove outer and inner gasket from cylinder head cover.

Insert special tool 11 1 412 from special tool kit 11 1 410 in groove of cover and fit cylinder head cover.



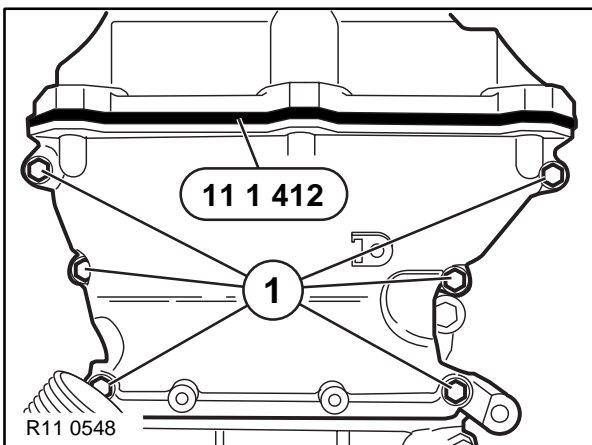
**Installation:**

Install cover nuts (1) and tighten down uniformly in 1/2 turn steps.

Tightening torque, refer to Technical Data 11 12 11AZ

**Note:**

The timing case cover is pressed down onto level of cylinder head by cylinder head cover.



**Installation:**

Tighten screws (1) on timing case cover in two passes.

Remove cylinder head cover and remove special tool 11 1 412.

Assemble engine.

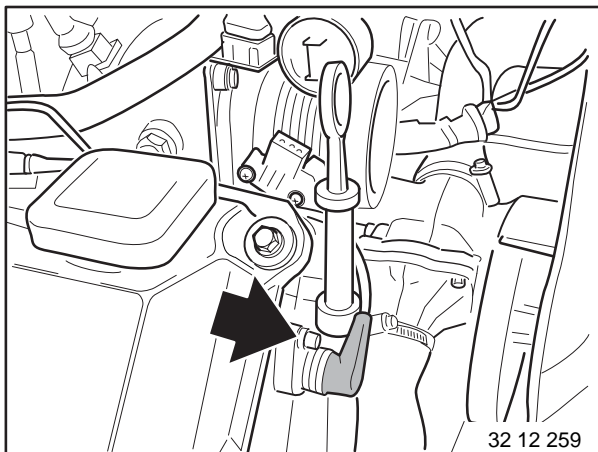
# 11/69

## 11 14 085 Removing and installing/sealing or replacing top right timing case cover (M62)

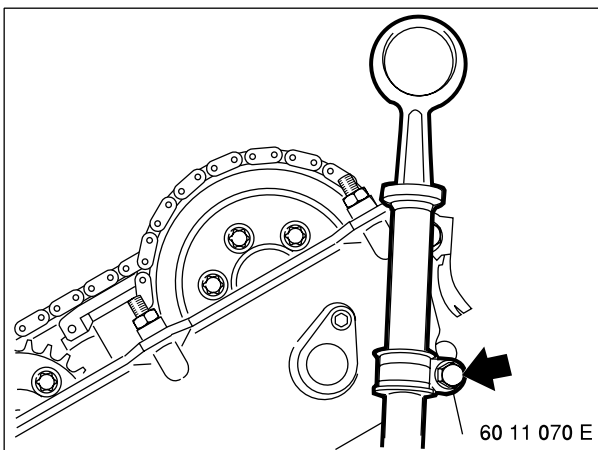
Remove right cylinder head cover. This operation is described in section on removing and installing / sealing both cylinder head covers, refer to 11 12 004

Remove piston for chain tensioner, refer to 11 31 090

Remove camshaft sensor.

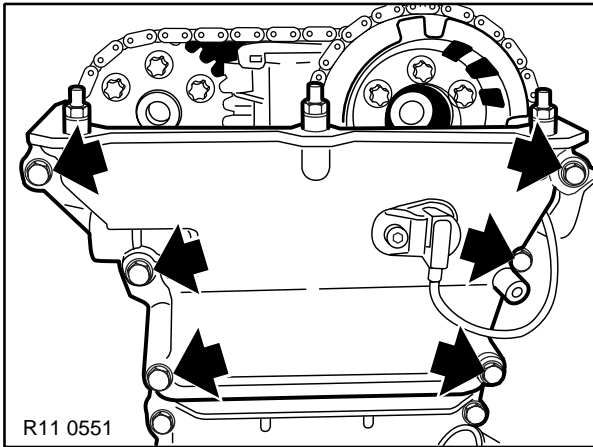


Unfasten top screw from dipstick tube.



# 11/70

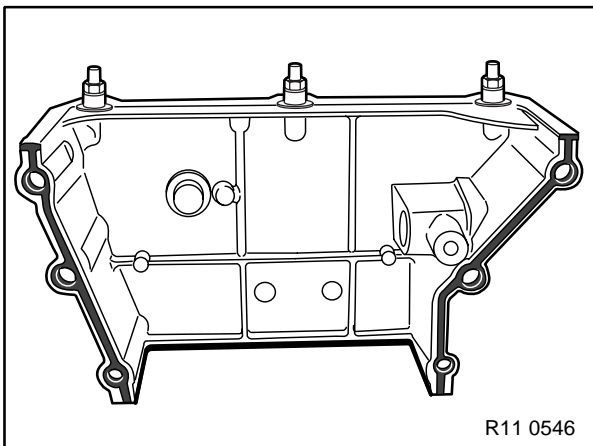
Unfasten timing case cover.



Remove rubber sealing strip.

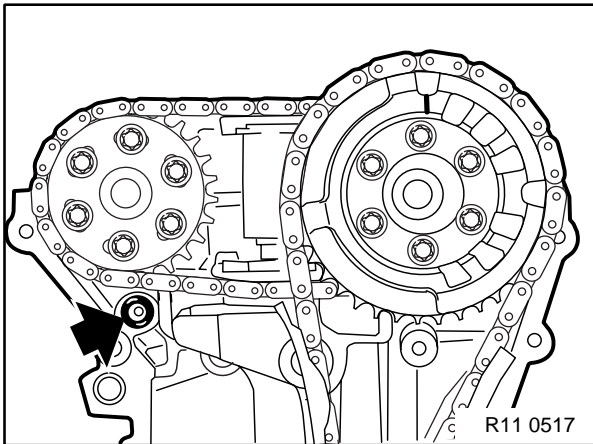
*Installation:*

Clean groove for rubber profile seal and sealing surfaces of remains of seal.



*Installation:*

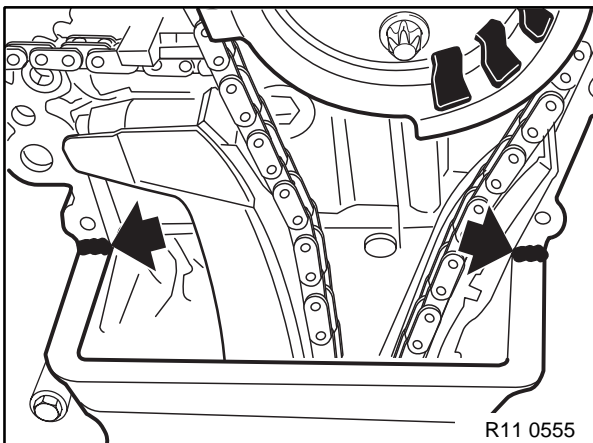
Replace sealing ring in cylinder head for oil supply of chain tensioner.



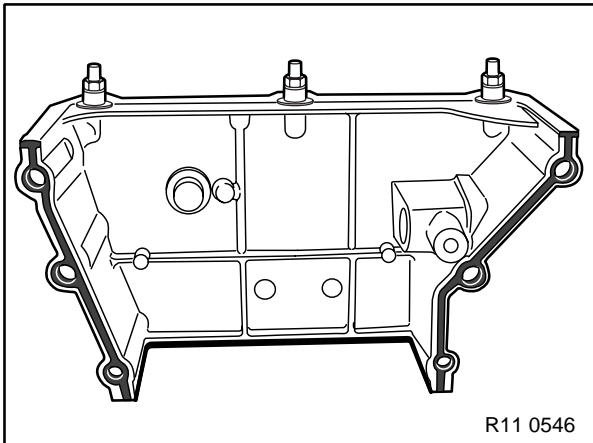
*Installation:*

Keep sealing faces clean and free of oil.

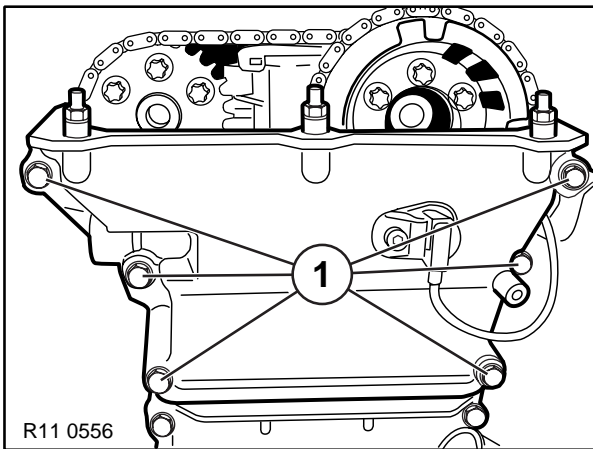
Apply coat of Drei Bond 1209 to joint between cylinder head and lower timing case cover (refer to BMW Parts Service).



# 11/71



Seat new rubber seal in groove.

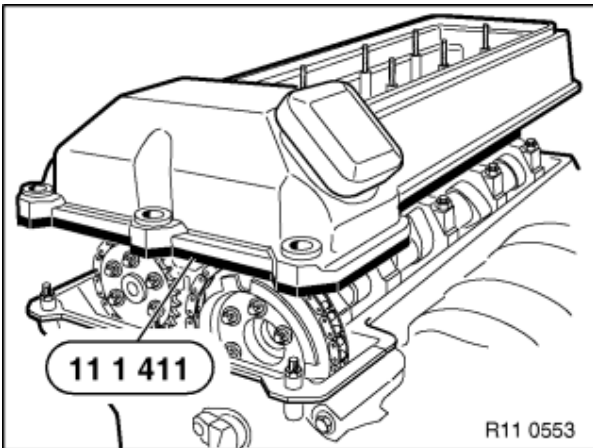


**Installation:**

Ensure that gaskets are correctly seated.

Press tensioning rail inwards and fit timing case cover.

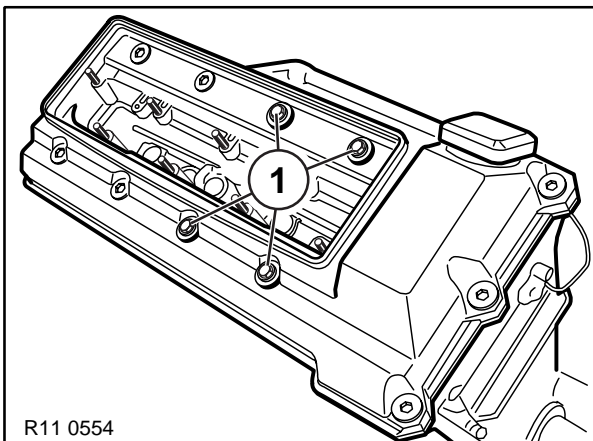
Install screws (1) and fit flush with cylinder head.



**Installation:**

Remove outer and inner gasket from cylinder head cover.

Insert special tool 11 1 411 from special tool kit 11 1 410 in groove of cover and fit cylinder head cover.



**Installation:**

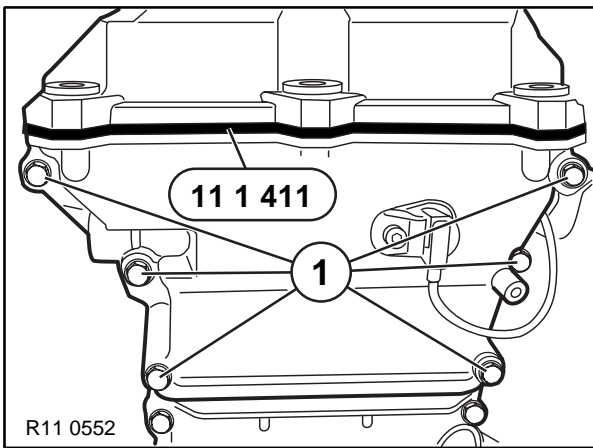
Install cover nuts (1) and tighten down uniformly in 1/2 turn steps.

Tightening torque, refer to Technical Data 11 12 11AZ

**Note:**

The timing case cover is pressed down onto level of cylinder head by cylinder head cover.

# 11/72



**Installation:**  
Tighten screws (1) on timing case cover in two passes.

Remove cylinder head cover and remove special tool 11 1 411.

Assemble engine.

# 11/73

## 11 14 110 Removing and installing/sealing or replacing lower timing case cover (M62)

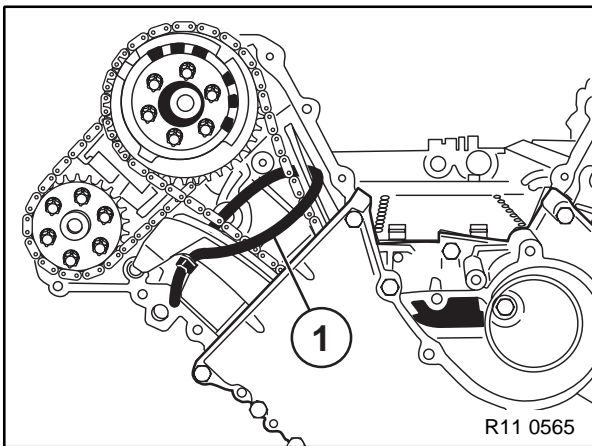
Remove top left and right timing case cover, refer to 11 14 080 / 11 14 085

Remove hub for vibration damper, refer to 11 23 010

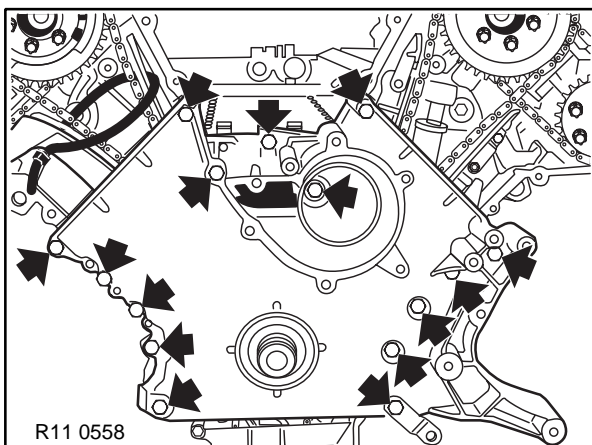
Remove water pump with thermostat housing, refer to 11 51 000

Remove upper section of oil pan, refer to 11 13 010

Remove alternator, refer to 12 31 020

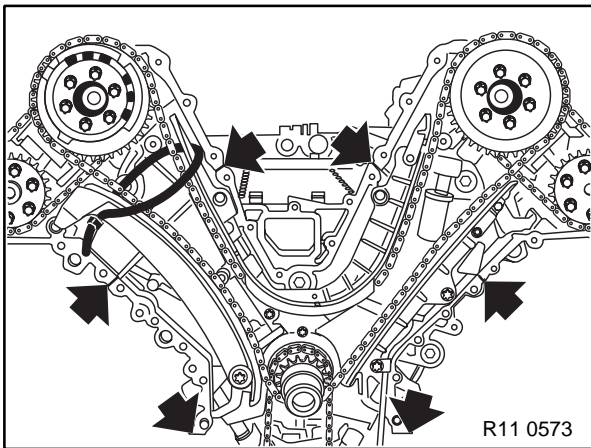


Press tensioning rail against the timing chain. Secure tensioning rail with a plastic strap (1).



Unfasten lower timing case cover.

# 11/74



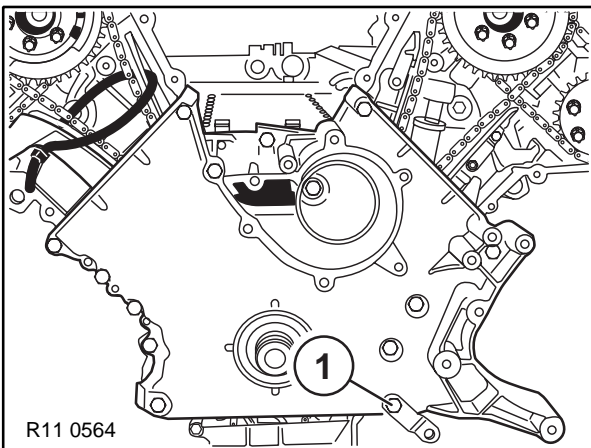
**Installation:**

Clean and remove grease from sealing surfaces of the engine block.

Make sure that sleeves are correctly seated.

Replace seals.

Apply thin coat of three Bond 1209 to front and back edges of gaskets (refer to BMW Parts Service).



**Installation:**

Do not tighten screw (1) with bracket for vane pump until after the vane pump has been fitted.

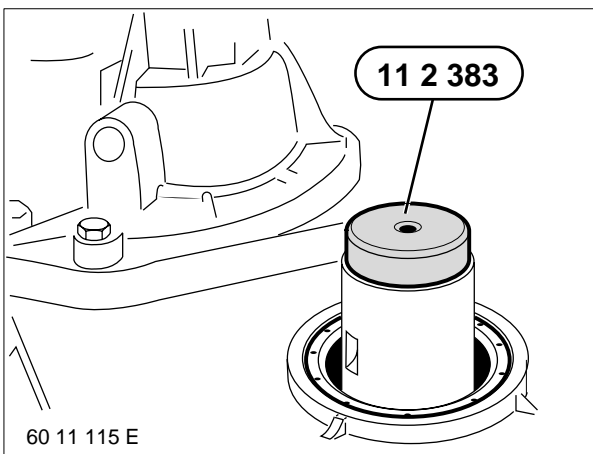
Replace radial seal in lower timing case cover, refer to 11 14 141

# 11/75

## 11 14 141 Replacing radial seal below timing case cover (M62)

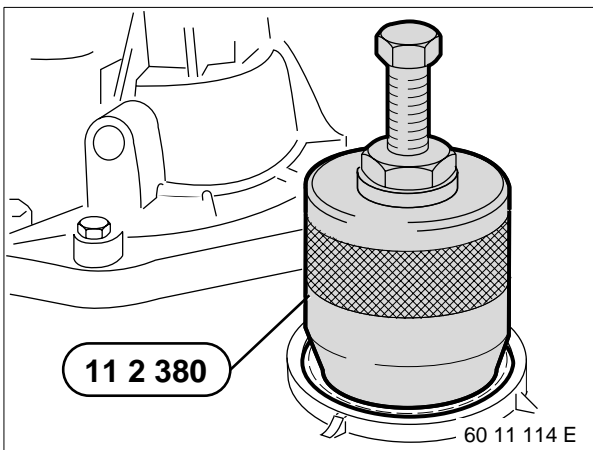
Removing hub for vibration damper,  
refer to 11 23 031

Fit special tool 11 2 383 to crankshaft.



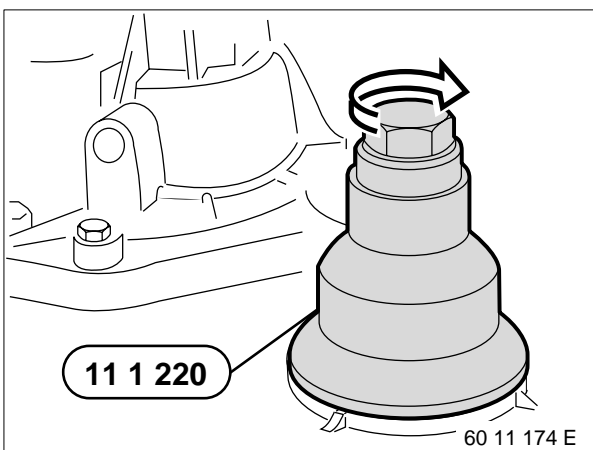
Screw on special tool 11 2 380 until it is securely connected to the radial seal.

Remove radial sealing ring by tightening in the screw.



Coat sealing lips of new radial sealing ring with oil.

Using special tool 11 1 220 and central screw, install radial seal until flush with timing case cover.





# 11/76

## 11 14 151 Replacing crankshaft radial sealing ring (M62)

(Transmission side)

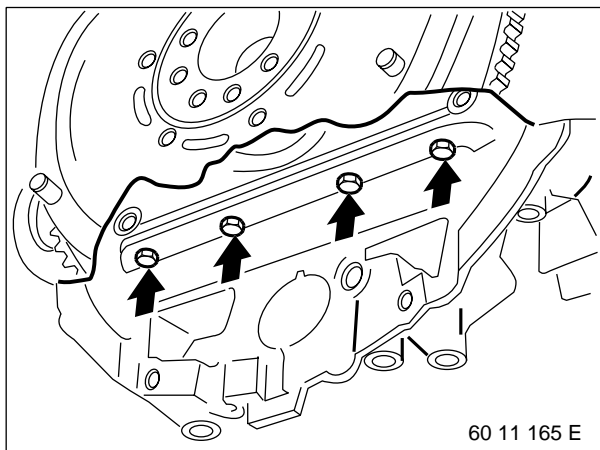
Remove transmission.

Drain engine oil.

This operation is described in section on BMW engine oil service,  
refer to 00 00 249

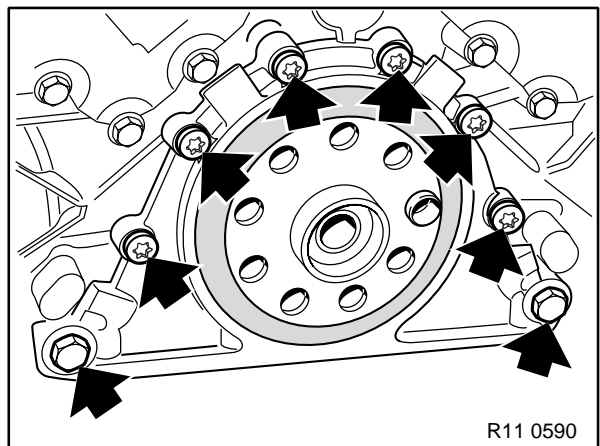
Remove flywheel,  
refer to 11 22 500

Unfasten screws.

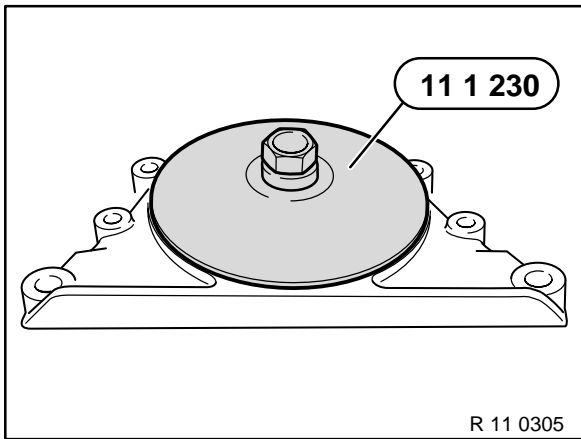


Unfasten screw on rear end cover.

Carefully unfasten oil pan gasket from end cover and  
remove end cover.

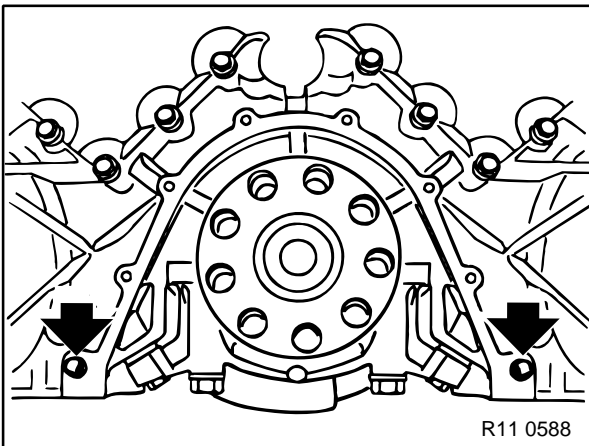


# 11/77



**Note:**

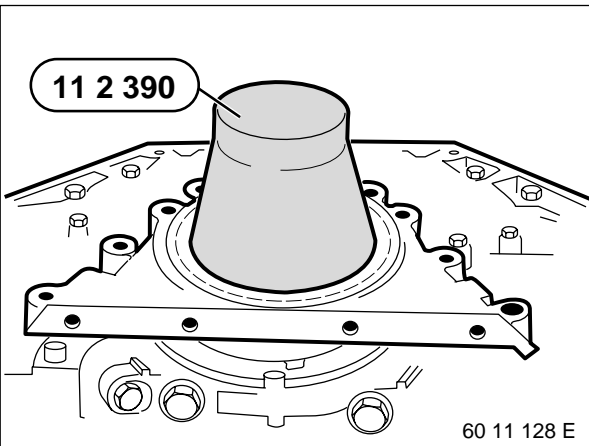
The end cover is in the set with the radial sealing ring. If necessary, push out the radial sealing ring and drive in new sealing ring with special tool 11 1 230 in combination with special tool 00 5 500.



Check for correct fit of hollow bushes.

Replace seal.

Coat contact points on joint along oil pan with three Bond 1209 (refer to BMW Parts Service).

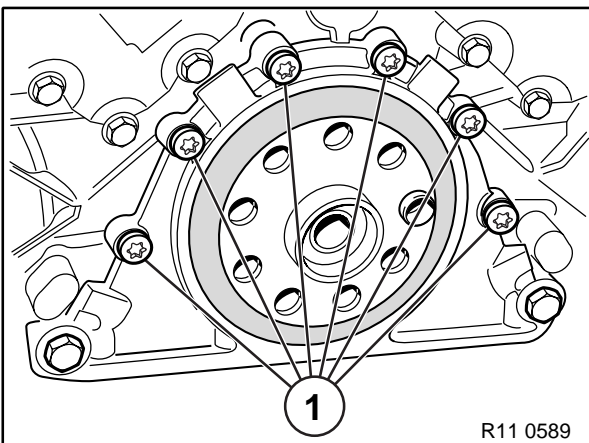


Fit special tool 11 2 390 on crankshaft.

Coat sealing lip of radial sealing ring with oil.

Slide on end cover.

Carefully remove special tool 11 2 390.



Replace the sealing washers under the screws (1).

Insert all screws and tighten down end cover.

# 11/78

## 11 21 500 Replacing crankshaft (M62)

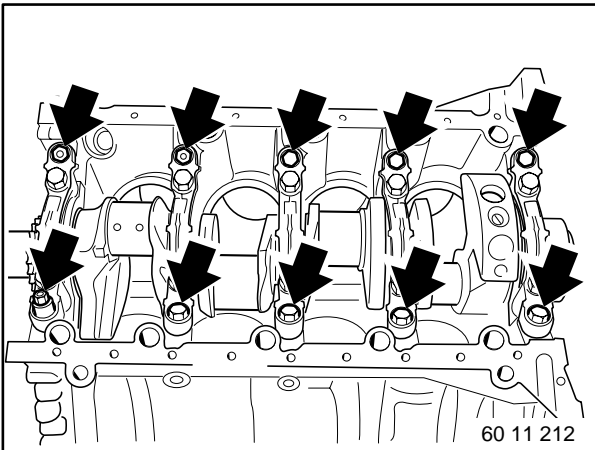
(Engine removed)

Remove timing case cover, bottom,  
refer to 11 14 110

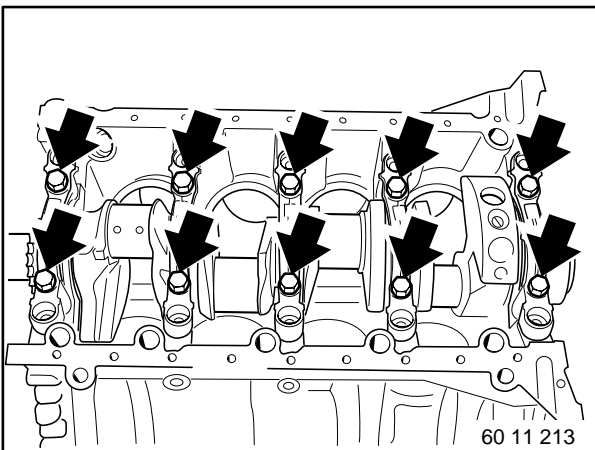
Remove piston,  
refer to 11 25 530

Remove flywheel,  
refer to 11 22 500

Remove rear end cover, the procedure is described as  
part of replacing crankshaft radial sealing ring,  
refer to 11 14 151

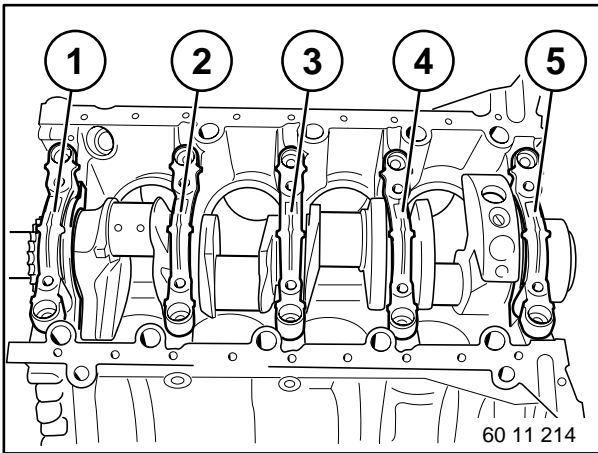


Unfasten taper screw mount on main bearing. (Collar  
screws and spacer screws.)

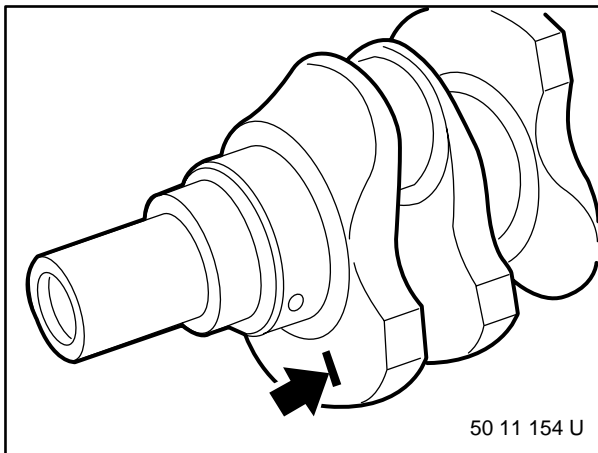


Remove screws securing main bearing caps.

# 11/79

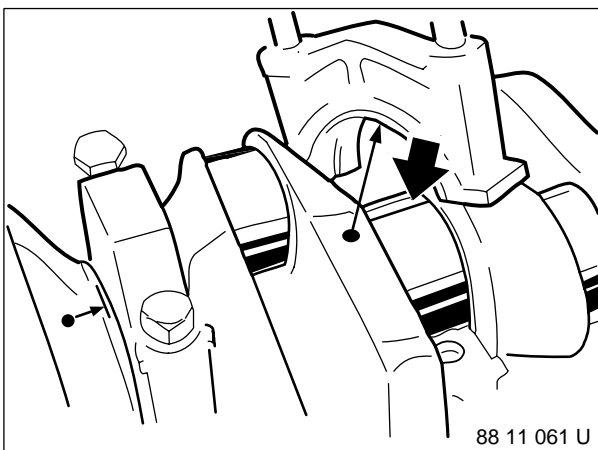


Remove main bearing covers 1 ... 5.  
Lever out crankshaft.



**Caution!**  
Note grinding stage of crankshaft,  
refer to Technical Data

Check bearing clearance on crankshaft:  
Install main bearing shells in engine block,  
refer to 11 21 531



Fit special tool 00 2 590 (Plastigage Type PG 1) to the  
oil-free crankshaft.

**Note:**  
Do not twist crankshaft.

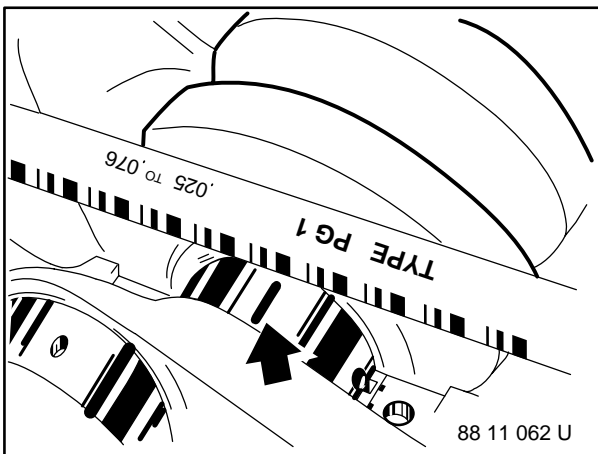
# 11/80

**Note:**

To check crankshaft bearing clearance, use old main bearing screws.

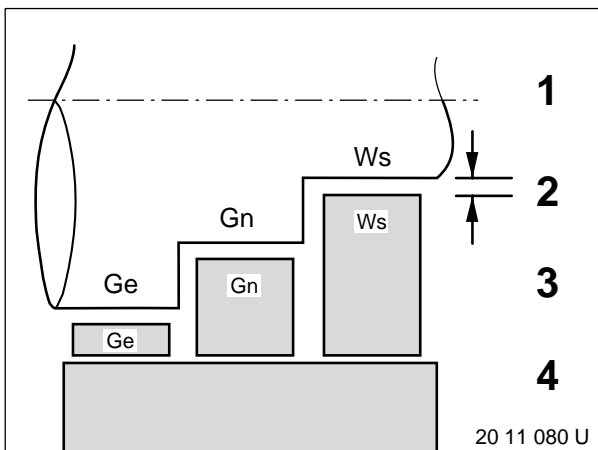
No oil is permitted in the blind bores (danger of cracking).

Fit main bearing cover to engine block and tighten down,  
refer to 11 21 531



Remove main bearing cover and read off main bearing clearance from thickness of crushed plastic thread with the help of the measuring scale.

Main bearing clearance,  
refer to Technical Data



**Summary:**

**Color code / shaft diameter / bearing strength**

**Ge** Yellow

**Gn** Green

**Wh** White

**(1)** crankshaft

**(2)** bearing clearance

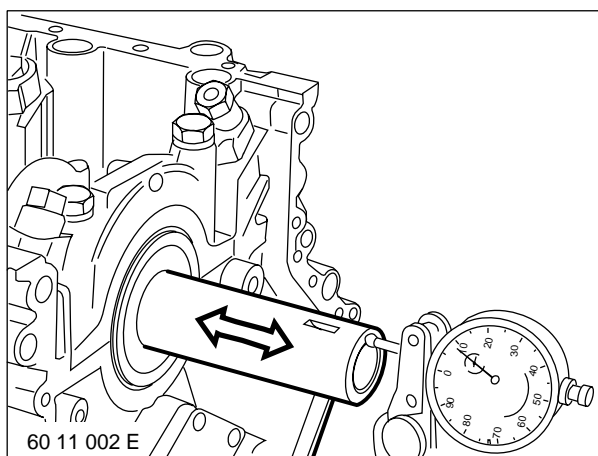
**(3)** main bearing shells: yellow, green or white

**(4)** main bearing cover

# 11/81

Remove plastic thread.

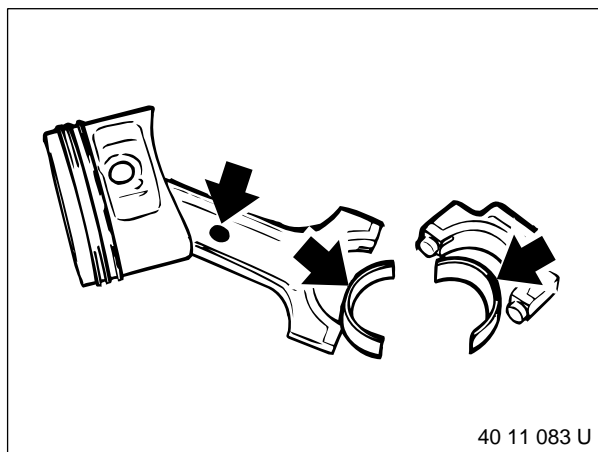
Fit main bearing cover on engine block and tighten down,  
refer to 11 21 531



**Checking axial clearance:**

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

End float,  
refer to Technical Data



**Check connecting-rod bearing clearance:**

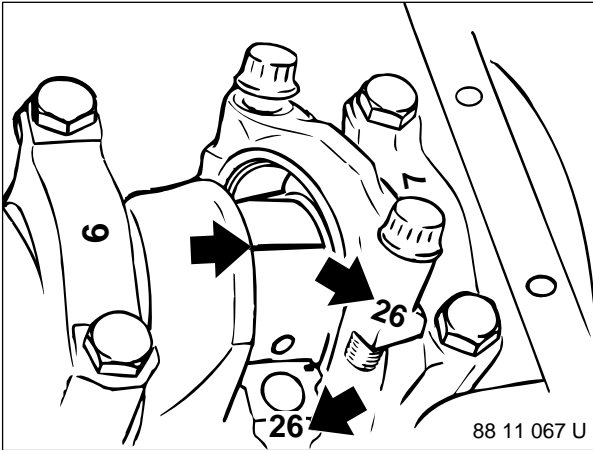
On each conrod, install one red and one blue conrod bearing shell. (Irrespective of color code on conrod shaft.)

**Caution!**  
Note grinding stages on crankshaft.

Grind stages,  
refer to Technical Data

Install piston,  
refer to 11 25 530

# 11/82



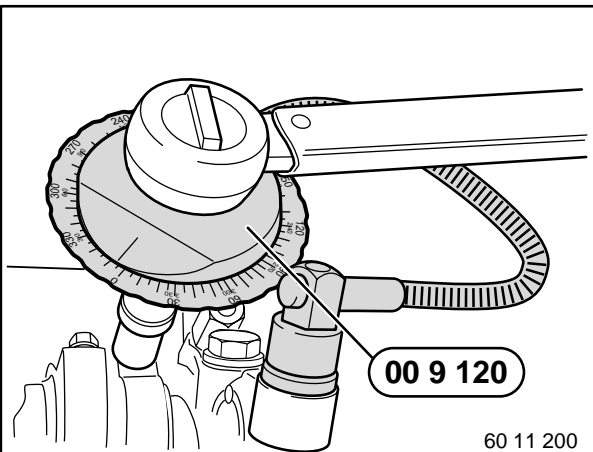
Place piston in BDC setting with special tool 00 2 590 (Plastigage Type PG 1) on oil-free crankshaft.

Install conrod bearing cover in such a way that pair numbers match.

**Note:**

Do not turn the connecting rods or crankshaft.

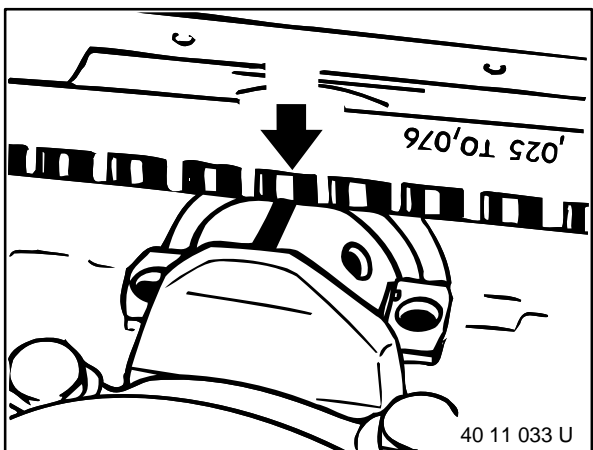
Use the old connecting-rod bolts to check connecting-rod clearance.



**Tightening conrod screws:**

Use special tool 00 9 120 and special tool 11 2 110.

Tightening torque,  
refer to Technical Data 11 24 1AZ

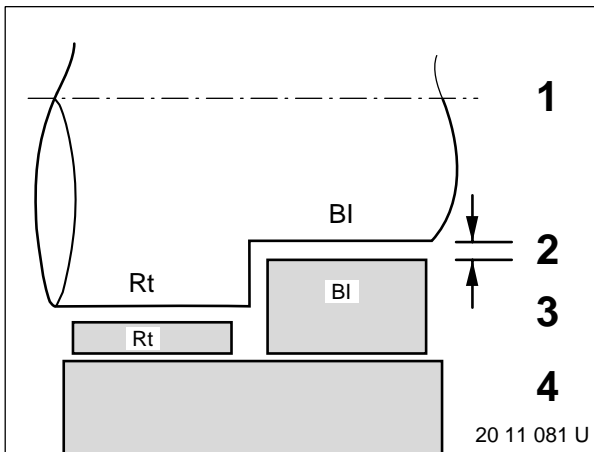


Remove conrod bearing cover and read off conrod bearing clearance on width of compressed plastic thread with the help of the measuring scale.

Remove plastic thread.

Conrod bearing clearance,  
refer to Technical Data

# 11/83



## Summary:

Color code / shaft diameter / bearing strength

Color code 2 classification.

Rt Red

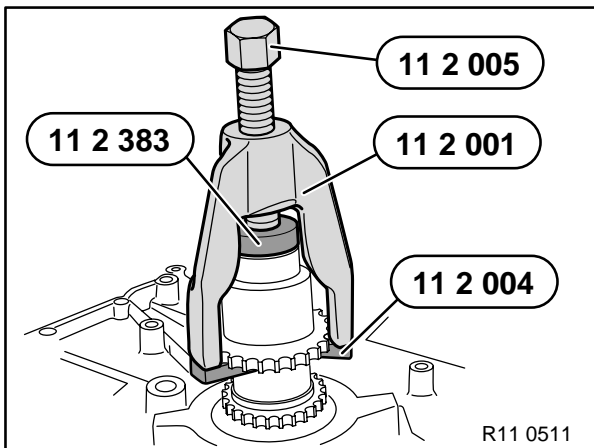
Bl Blue

(1) Crankpin

(2) Bearing clearance

(3) Bearing shells: red or blue

(4) Conrod



If necessary, remove chain wheel from crankshaft.

Fit special tool 11 2 383 to crankshaft.

Remove sprocket with special tool 11 2 001 in conjunction with special tool 11 2 005 and special tool 11 2 004.

## Installation:

Shrink-fit chain wheel to crankshaft.

Check wedge for correct position.

Heat sprocket to max. 150 °C with hot air blower or hotplate.

## Caution!

Do not exceed specified temperature!

Replace main bearing shells on crankshaft,  
refer to 11 21 531

Replace conrod bearing shells,  
refer to 11 24 571

Replace grooved ball bearing in crankshaft,  
refer to 11 21 571



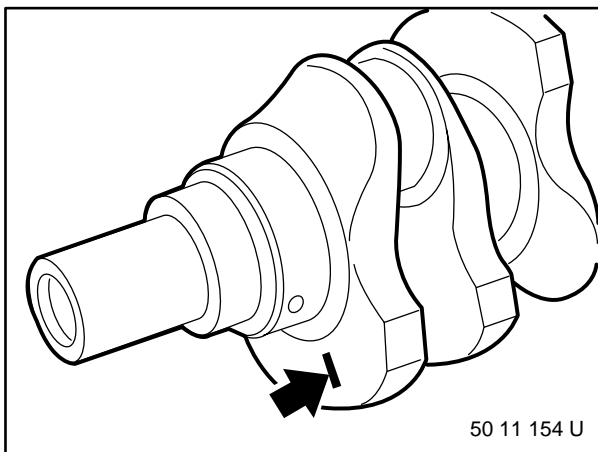
# 11/84

## 11 21 531 Replacing main crankshaft bearing shell (M62)

(engine dismantled)

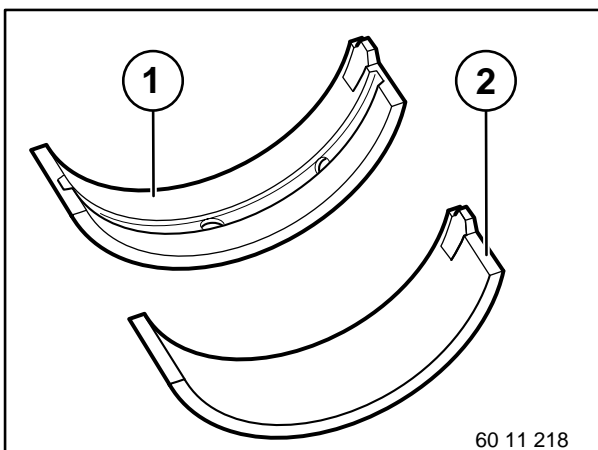
Clean components before installing.

Preparations are described under heading "Replacing crankshaft", refer to 11 21 500



**Caution!**

Observe grinding stage of the crankshaft, refer to Technical Data

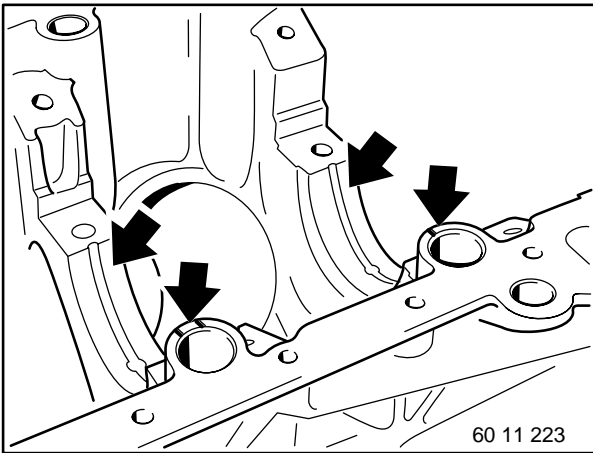


**Note:**

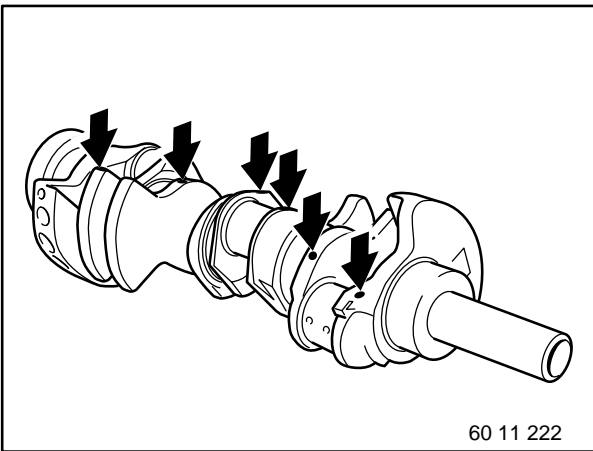
Install main bearing shells (1) in the motor block with lubrication groove.

Install main bearing shells (2) without lubrication groove in the main bearing caps.

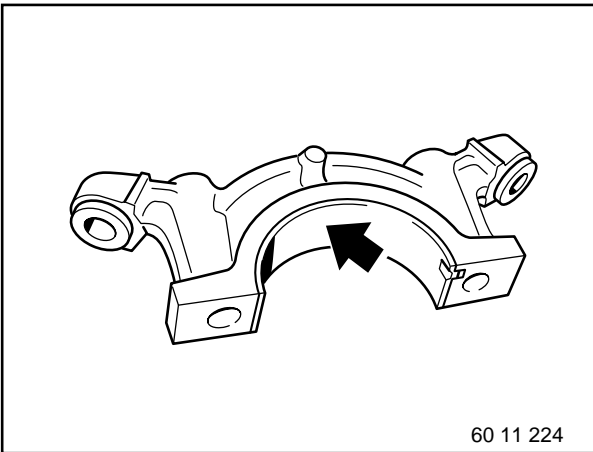
# 11/85



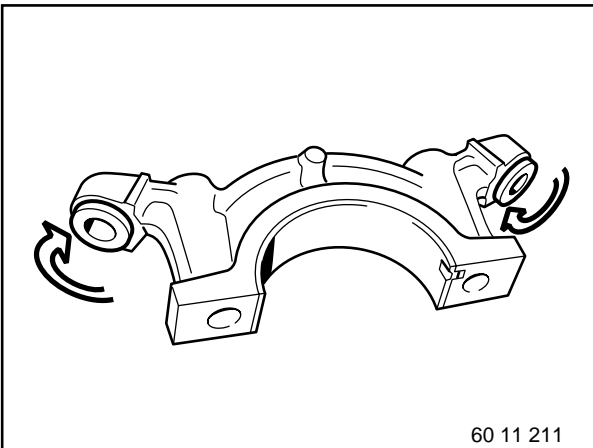
**Note:**  
When crankshaft or main bearing shells are being replaced, the classification for the arrangement of the main bearing shells in the crankcase is no longer of significance. Install yellow main bearing shells in crankcase.



**Note:**  
The crankshaft is marked with yellow, green or white paint according to the tolerance of the main journal.  
Coat bearing shells with oil.  
Install crankshaft.

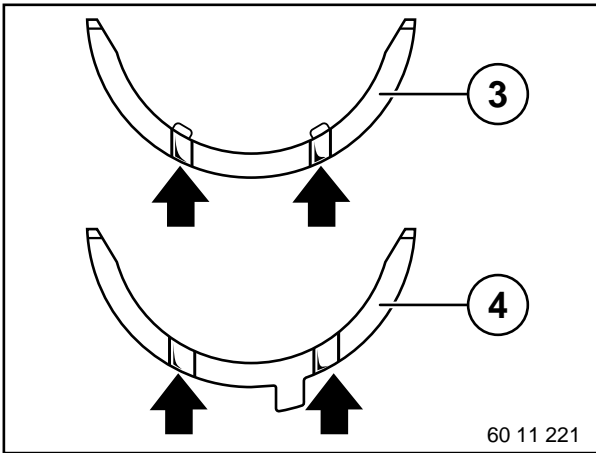


**Note:**  
Place main bearing shells with same color code as that of crankshaft in main bearing caps.



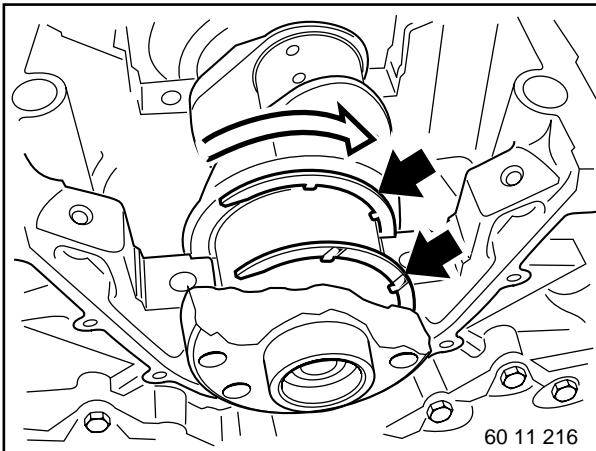
Release hex head in main bearing cap.

# 11/86



**Note:**

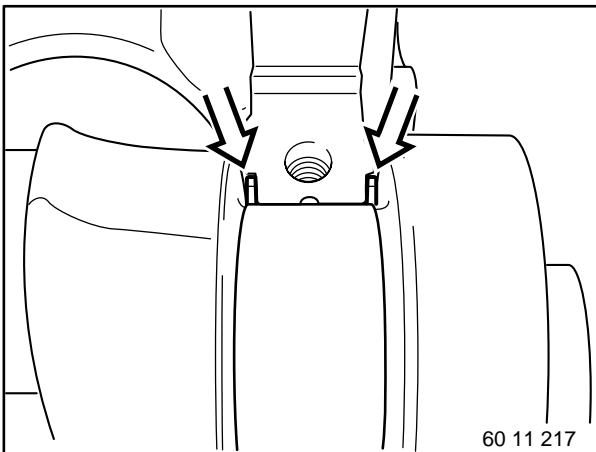
- (3) Install stop disk for collar bearing (in engine block).
- (4) Install stop disk for collar bearing (in main bearing cap).



**Caution!**

Check installed direction. Lubricant groove must be facing crankshaft.

Insert stop disks for collar bearing on both sides between crankshaft and engine block at main bearing 5.



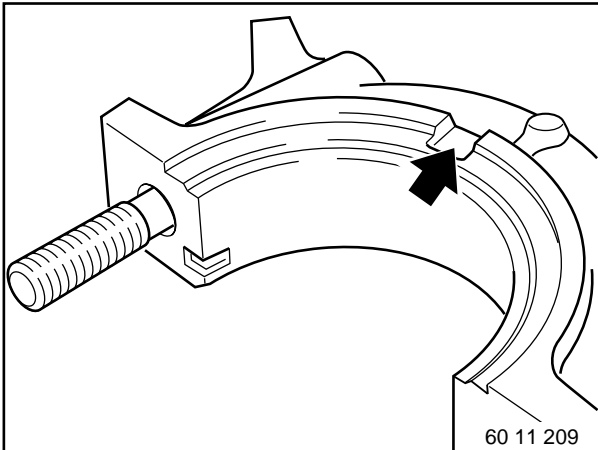
Align thrust washers with contact face of main bearing caps.

**Note:**

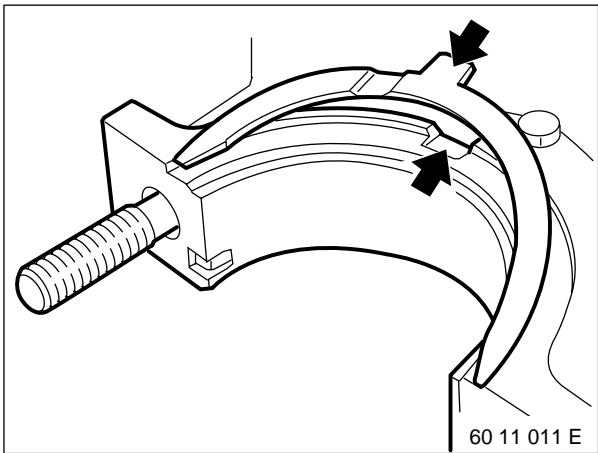
The main bearing caps (1 ... 3) are marked with punched numbers.

The main bearing caps 4 and 5 are not marked.

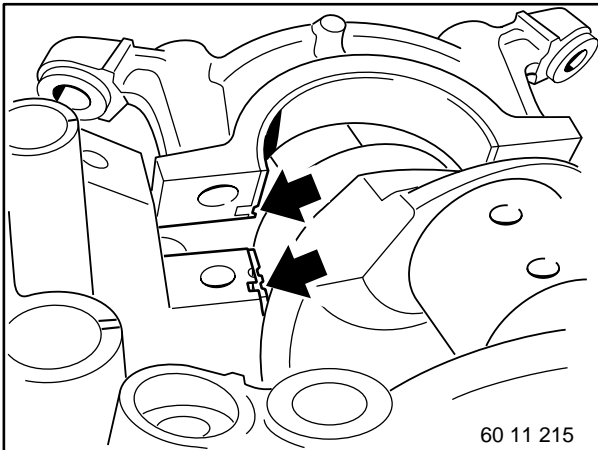
# 11/87



**Note:**  
Main bearing cap no. 5 can be identified by the recesses for the stop disks of the thrust bearing.



Insert stop disks on both sides into grooves of main bearing cap no. 5.



Lubricate crankshaft and main bearing shells.

Position main bearing caps (1 ... 5) so that the retaining grooves of the main bearing shells are on one side.

Align main bearing cap flush with side of bearing seat.

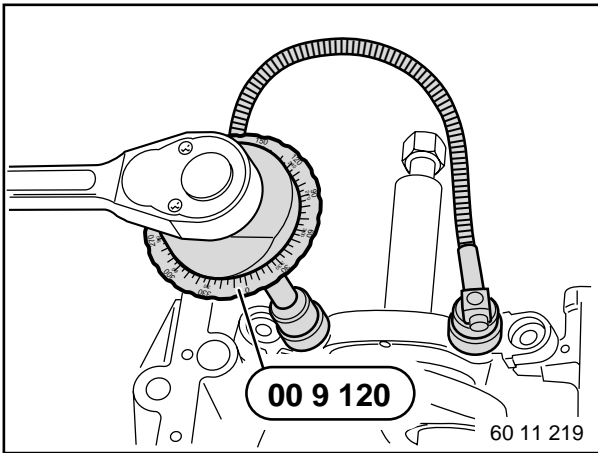
**Note:**

The main bearing cap screws must always be replaced by new ones.

Do not wash off screw coating.

No oil is permitted in the blind bores! (Risk of cracking).

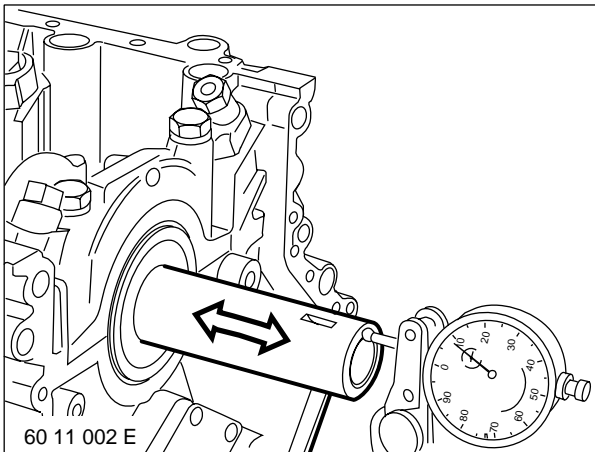
# 11/88



**Tightening specifications for main bearing:**

- 1 Tighten all screws on main bearing cover with jointing torque.
- 2 Unfasten screws on main bearing cover 5
- 3 Strike back and front of crankshaft with plastic hammer to centre thrust bearing (do not damage crankshaft).
- 4 Tighten screws of main bearing cover 5 with jointing torque.
- 5 Tighten all screws of main bearing cover with special tool 11 2 110 or special tool 00 9 120 with torsion angle.

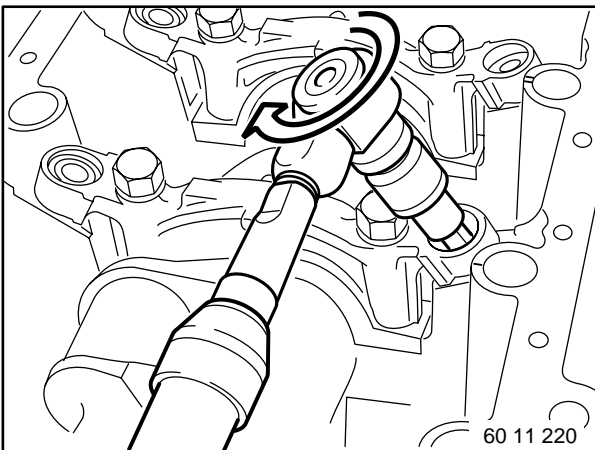
For tightening torque,  
refer to Technical Data 11 11 2AZ



**Check axial play.**

**End float,  
refer to Technical Data**

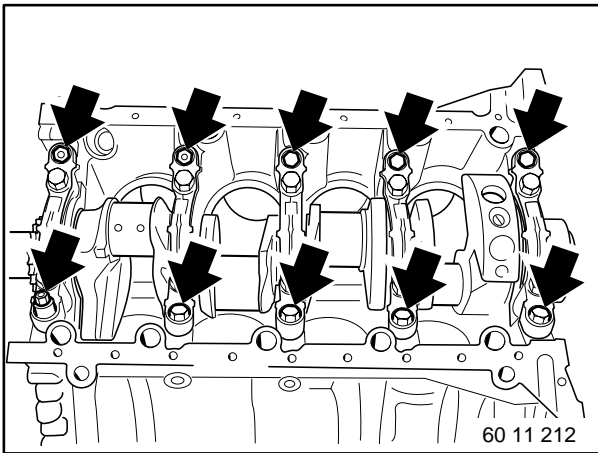
**Check guide bearing shell, crankshaft and crankcase if  
necessary.**



**Tighten threaded protective bushes.**

For tightening torque,  
refer to Technical Data 11 11 3AZ

# 11/89



Replace collar screws.

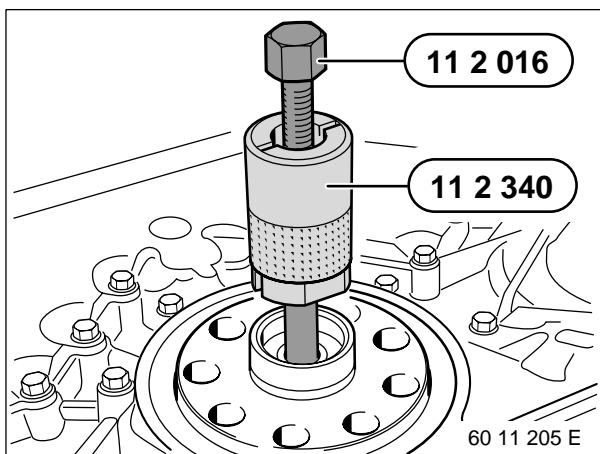
Tighten taper screw mount on main bearing (collar screws and spacer pins).

Tightening torque,  
refer to Technical Data 11 11 3AZ

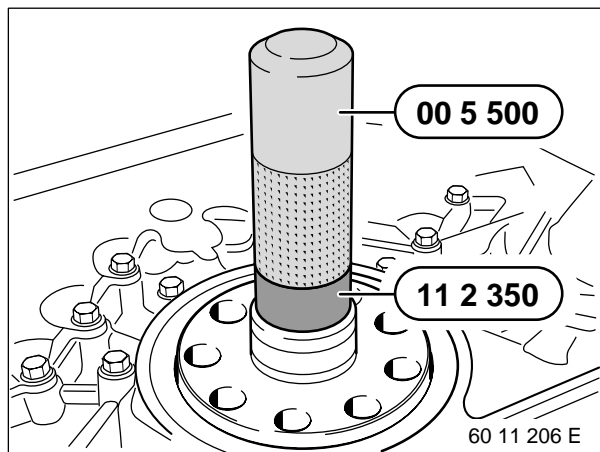
# 11/90

## 11 21 571 Replacing grooved ball bearings in crankshaft (M62)

(clutch removed)



Remove grooved ball bearing with special tool 11 2 340 in conjunction with special tool 11 2 016.



Install new thrust bearing and drive firmly home with special tool 11 2 350 in conjunction with special tool 00 5 500.

# 11/91

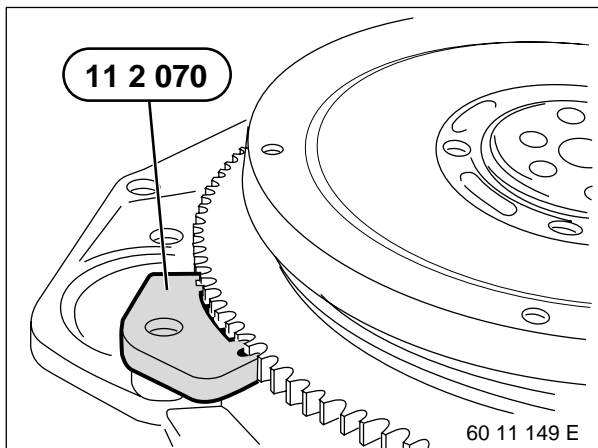
## 11 22 500 Removing and installing/replacing flywheel (M62)

(Clutch removed)

### **Caution!**

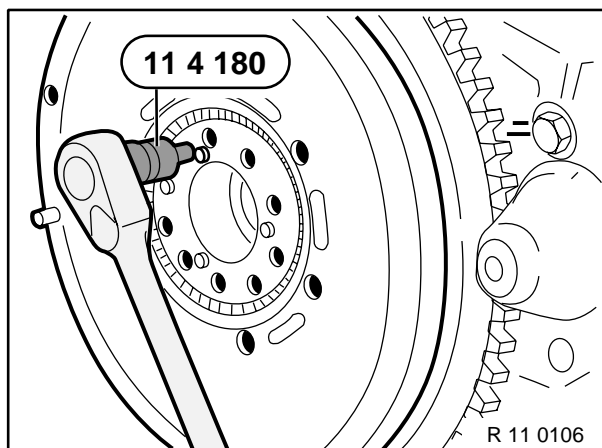
Whenever the flywheel is replaced, the impulse sensor must be reset, refer to 12 14 520

Block flywheel with special tool 11 2 070.



Release and tighten the flywheel (ZMS) only with special tool 11 4 180.

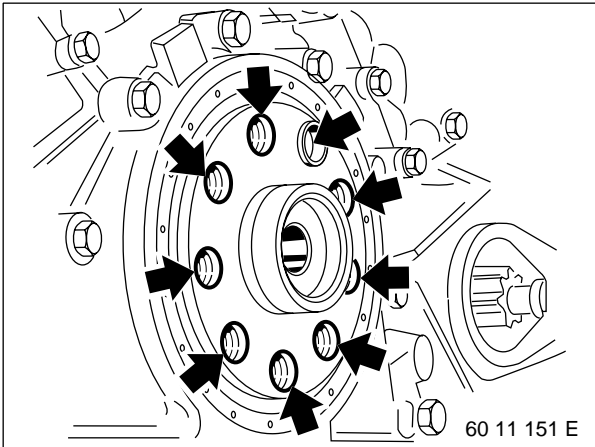
**Installation:**  
Tightening torque,  
refer to Technical Data 11 22 1AZ





# 11/92

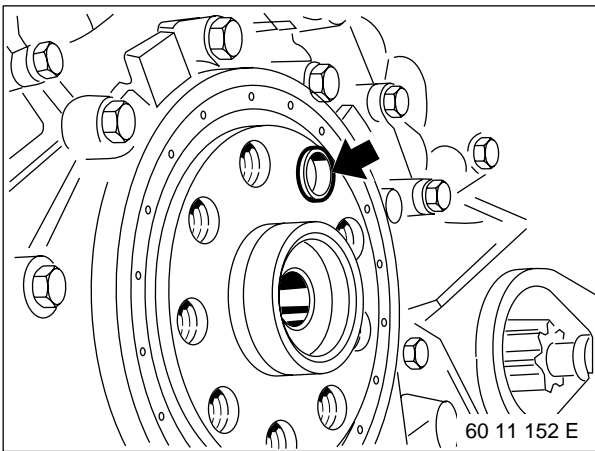
Clean thread for flywheel screws in crankshaft.



The flywheel (ZMS) is located with a special (shorter) dowel sleeve.

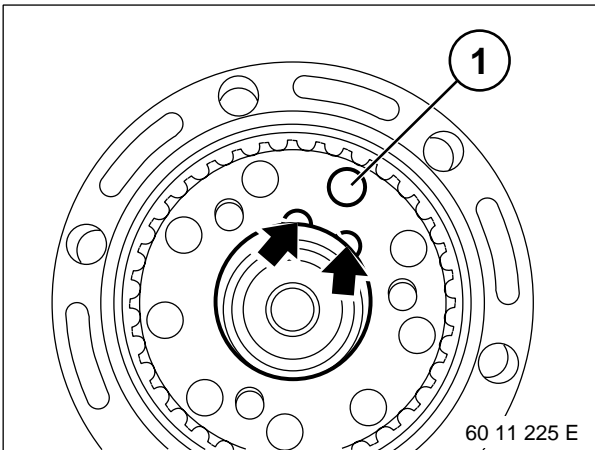
**Caution!**

Replace only with original BMW spare parts.



**Installation:**

The position of the dowel sleeve (1) in the dual-mass flywheel is marked with two notches beside the respective screw bore.

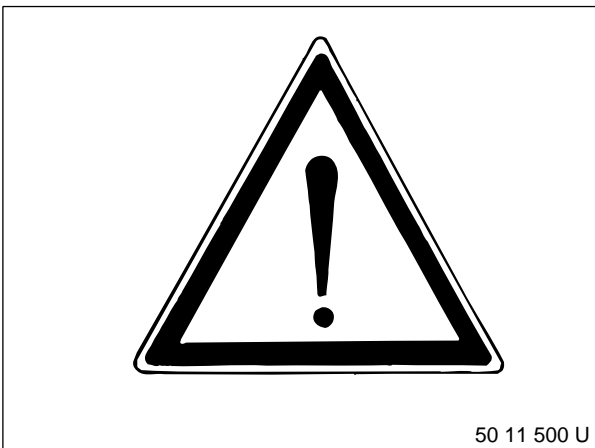


**Caution!**

Flywheel screws are part of the flywheel and must not be installed with screw retaining compound.

Lubricate screw threads lightly.

For tightening torque, refer to Technical Data 11 22 1AZ



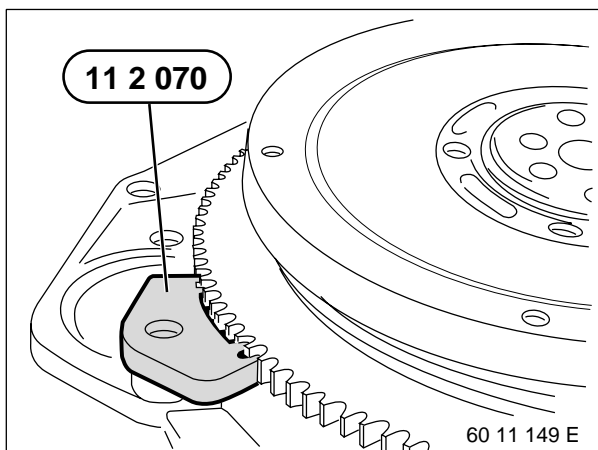
# 11/93

## 11 22 510 Removing and installing/replacing flywheel (M62)

(Transmission removed)

### **Caution!**

Whenever the flywheel is replaced, the impulse sensor must be reset, refer to 12 14 520



Block the flywheel using special tool 11 2 070.



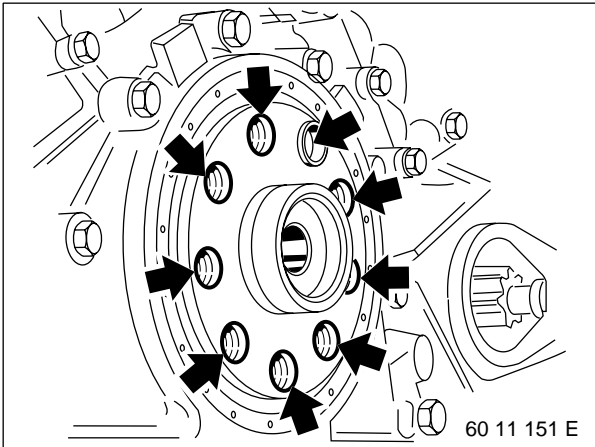
Unfasten flywheel screws.

Remove drive plate (1).

Remove flywheel (2).

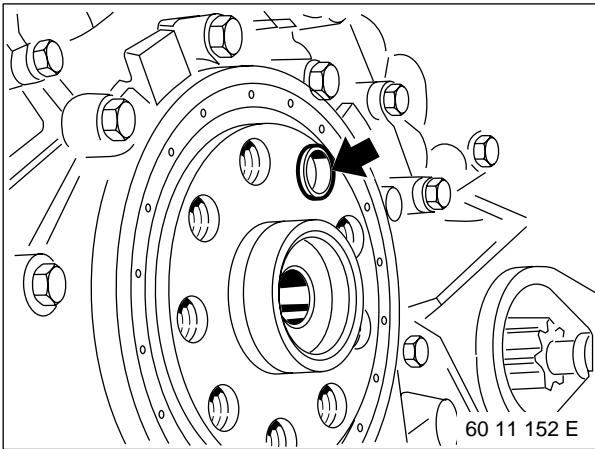
# 11/94

Clean threads on flywheel screws in crankshaft.



**Installation:**

The flywheel is secured with a dowel sleeve.

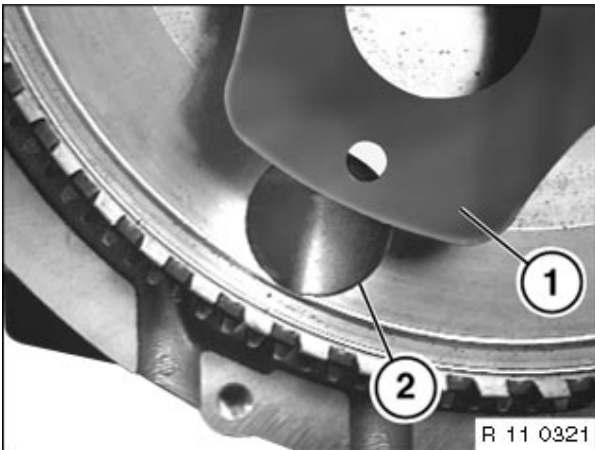


**Installation:**

Fit flywheel (2) and mount drive plate (1) for torque converter correctly. Holes in drive plate (1) and flywheel (2) must be aligned over one another.

Fit new flywheel screws.

Tightening torque,  
refer to Technical Data 11 22 1AZ



# 11/95

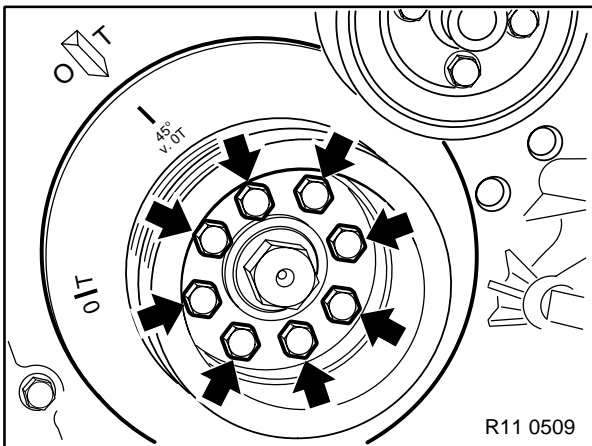
## 11 23 010 Removing and installing/replacing vibration damper (M62)

Unscrew and remove splash guard.

Remove alternator drive belt,  
refer to 11 28 010

Remove drive belt for a/c compressor,  
refer to 11 28 050

Release screws and remove vibration damper.

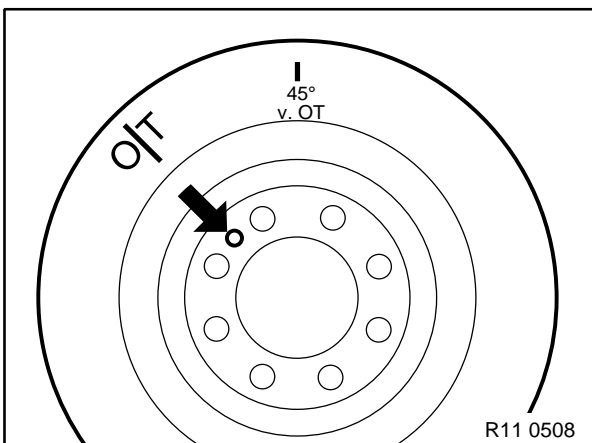


R11 0509

### **Installation:**

The vibration damper is located with a dowel pin.  
Replace screws.

Tightening torque,  
refer to Technical Data 11 23 3AZ

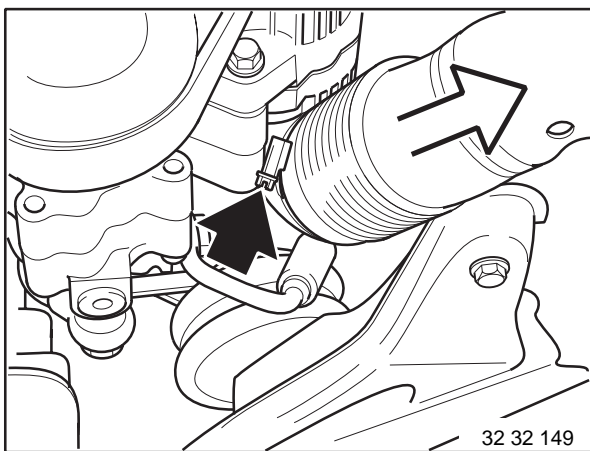


R11 0508

# 11/96

## 11 23 031 Removing and installing/replacing hub for vibration damper (M62)

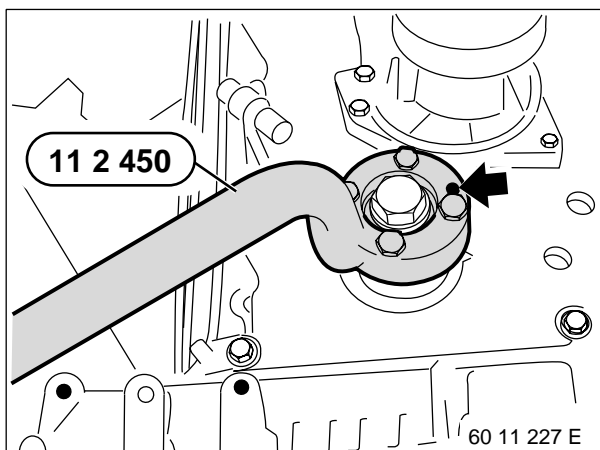
Removing vibration damper,  
refer to 11 23 010



Remove cooling air duct for alternator.

Remove brake air duct, left and right.

Release retainer for pressure line from engine support.



Pay attention to dowel pin.

Secure special tool 11 2 450.

**Note:**

Protect engine bracket from damage.

Insert wood between engine support and special tool 11 2 450.

Unscrew central bolt.

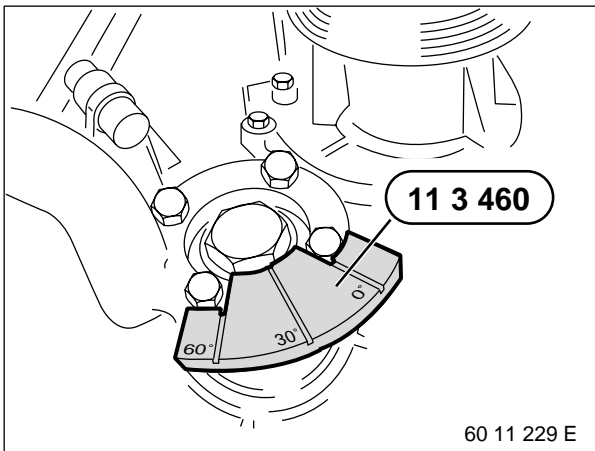
# 11/97

**Installation:**

Replace central screw.

Tighten the central screw with torque.

For tightening torque,  
refer to Technical Data 11 23 2AZ



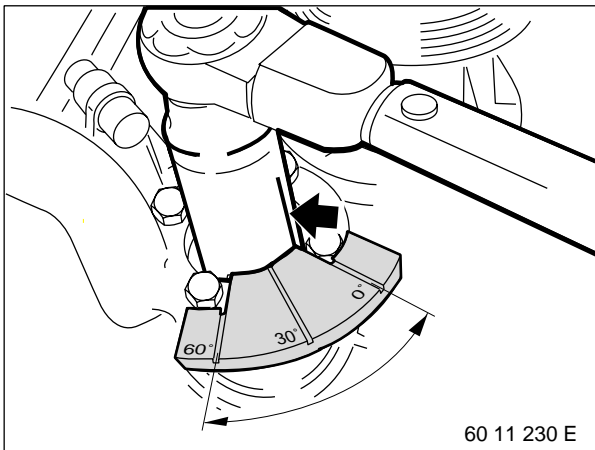
60 11 229 E

**Installation:**

Place special tool 11 3 460 on special tool 11 2 450.

**Note:**

Special tool 11 3 460 is magnetic.



60 11 230 E

**Installation:**

Select 0° location and mark on insertion nut. Tighten the central screw with torsion angle.

For tightening torque,  
refer to Technical Data 11 23 2AZ

# 11/98

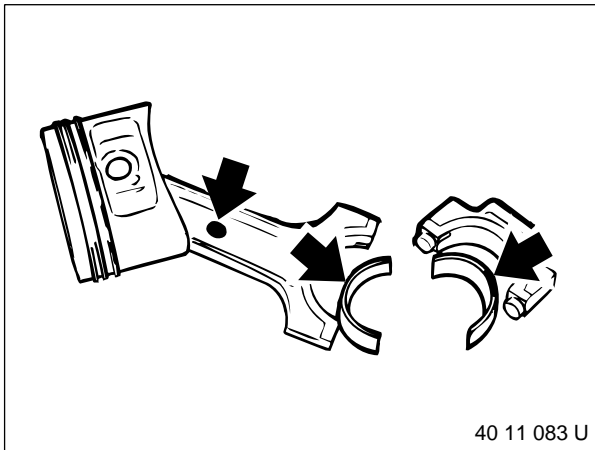
## 11 24 571 Replacing all conrod bearings (M62)

(Piston removed)



### **Caution!**

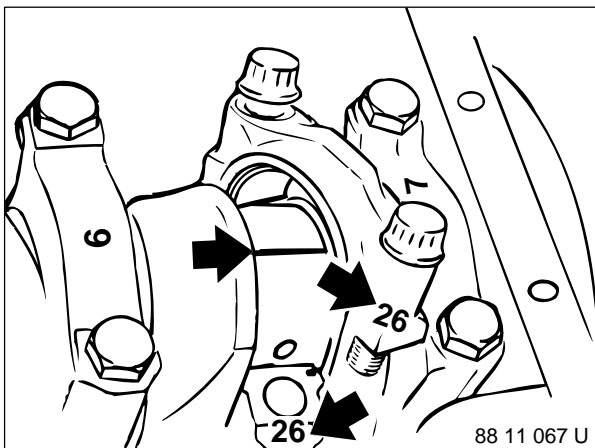
Pay attention to crankshaft grinding stages, refer to Technical Data



Install new conrod bearing shells.

For each conrod, install red and blue bearing shell (irrespective of colour coding on conrod shaft).

Installing pistons, refer to 11 25 530



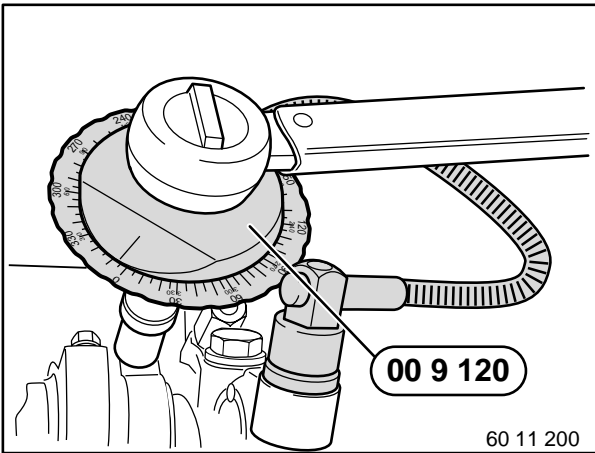
Check connecting-rod bearing clearance:

Piston in BDC position.

Fit special tool 00 2 590 (Plastigage Type PG 1) to the oil-free crankshaft.

Place bearing caps in position, making sure that matching numbers are paired.

# 11/99



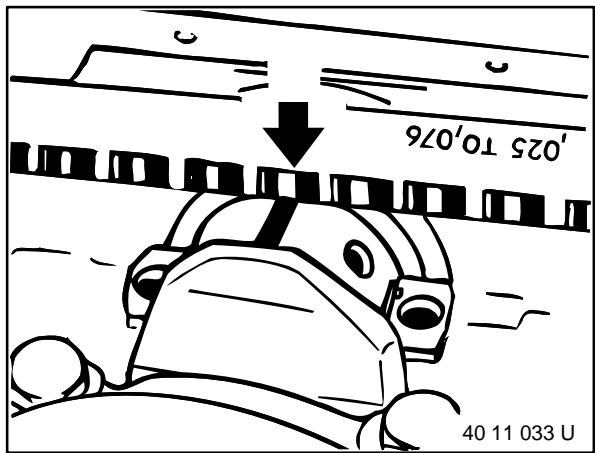
**Caution!**

Do not turn the connecting rods or crankshaft.

Use the old connecting-rod bolts to check connecting-rod clearance.

Tighten down conrod screws with special tool 00 9 120 or special tool 11 2 110, respectively.

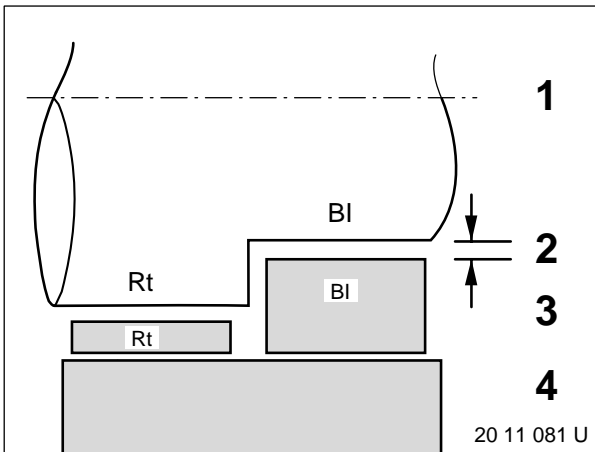
Tightening torque, refer to Technical Data 11 24 1AZ



Removing bearing cover and reading off bearing clearance, refer to Technical Data,

on width of pinched plastic thread with the help of the measuring scale.

Remove plastic thread.



**Summary:**

Colour code / shaft diameter / bearing strength

Rt = red

Bl = blue

- 1 Crankpin
- 2 Bearing clearance
- 3 Bearing shells: red or blue
- 4 Conrod



# 11/100

## 11 25 530 Removing and installing / replacing all pistons (M62)

(engine removed)

### Removal

Removal of pistons is described separately from installation. Assembly sequence for removal and installation is different.

Remove both cylinder heads,  
refer to 11 12 105 / 106

Remove upper section of oil pan,  
refer to 11 13 510

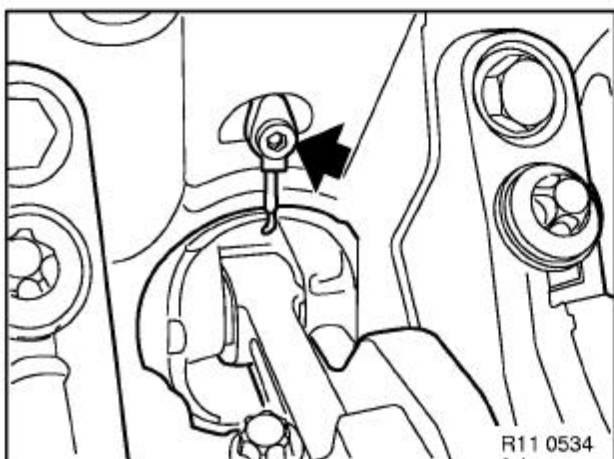
Remove oil pump,  
refer to 11 41 000



### *Important!*

Re-install piston, connecting rod and bearing shells back in the same position and in the same installation location.

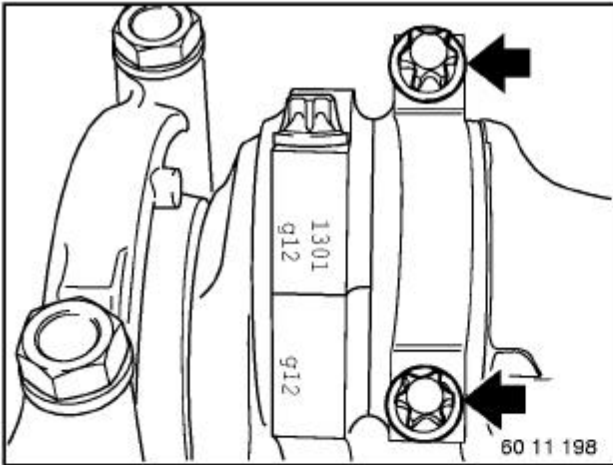
Conrod and conrod bearing cover are designated with same pair number: do not interchange / confuse.



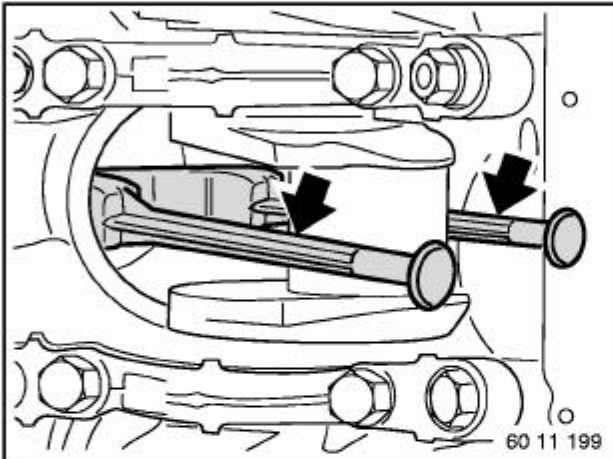
### *Important!*

When removing and installing the pistons, there is a risk of the spray nozzles becoming damaged.

Unfasten screw and remove spray nozzle.

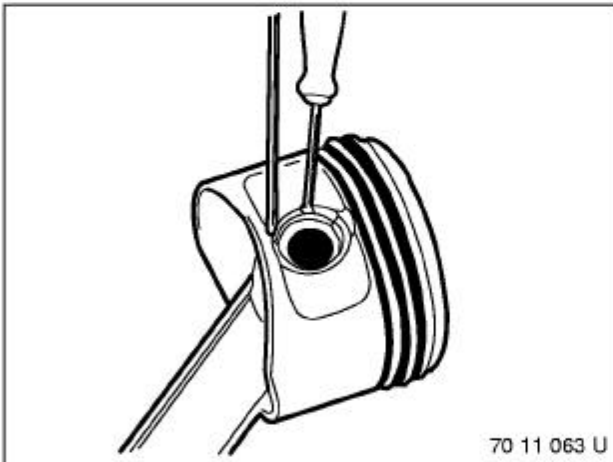


Remove connecting-rod cover.



Insert special tool 11 2 470 in conrod.

Remove connecting rod with piston from cylinder-head side.



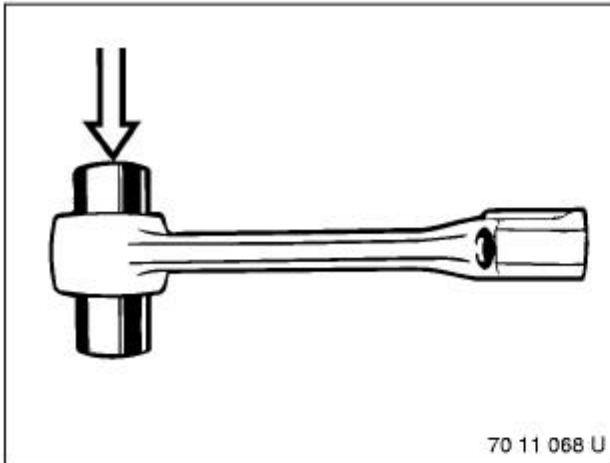
Lift out retaining ring and press out piston pin.

**Important!**

Piston and piston pin are paired and must not be fitted individually.

## Installation

Installation of pistons is described separately from removal. Assembly sequence for removal and installation is different.

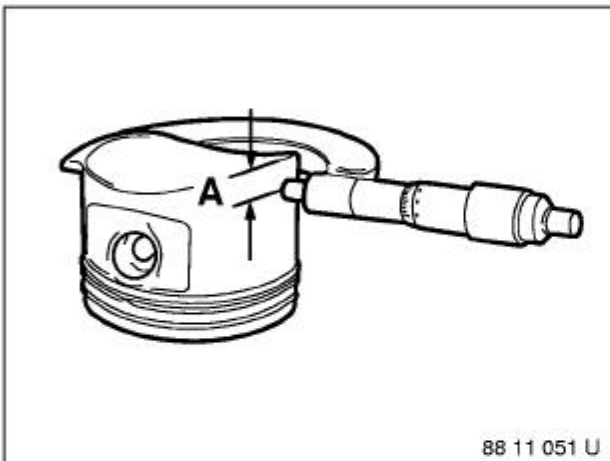


If necessary, replace connecting rods.

**Note:**

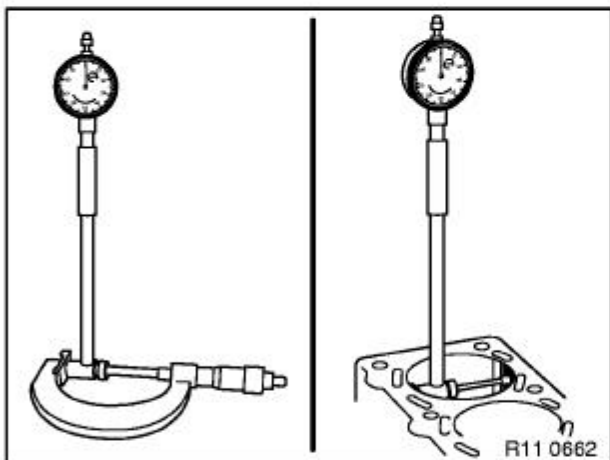
The conrods can also be replaced individually.

It should be possible to press piston pin into bush by hand using only slight pressure. Clearance should then be minimal.



Before installation, measure piston installation clearance. Measure piston diameter with micrometer at measuring point A from bottom edge of piston and offset at 90° to the axis of the piston pin.

Measuring point A, refer to Technical Data

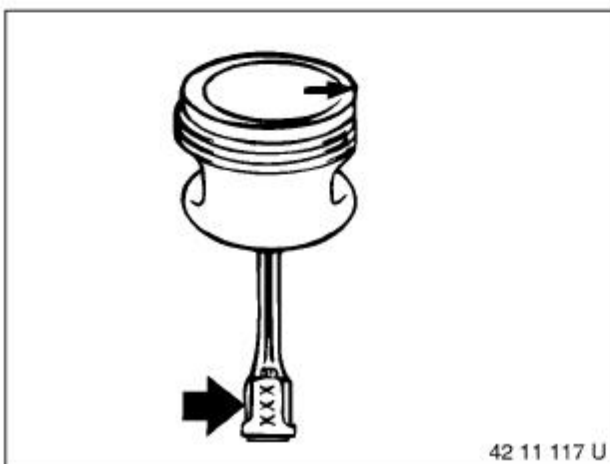


Adjust micrometer on cylinder bore of engine block and set plug gauge on micrometer to zero. Measure bottom, centre and top of cylinder bore in direction of travel and direction of engine rotation.

Diameter of cylinder bore, refer to Technical Data

Piston installation clearance, refer to Technical Data

Max. permissible total wear clearance, refer to Technical Data

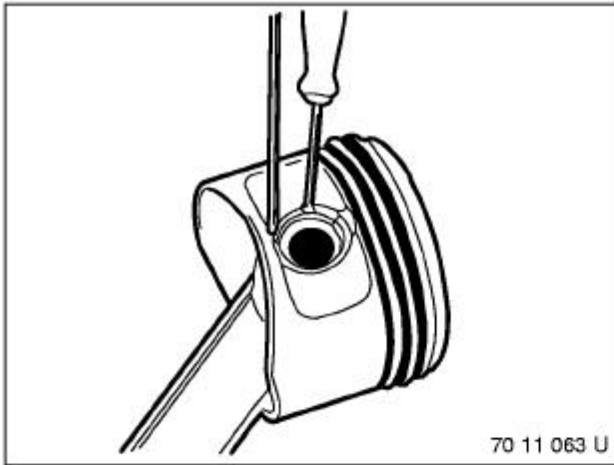


Install conrod bearing, refer to 11 24 571

**Important!**

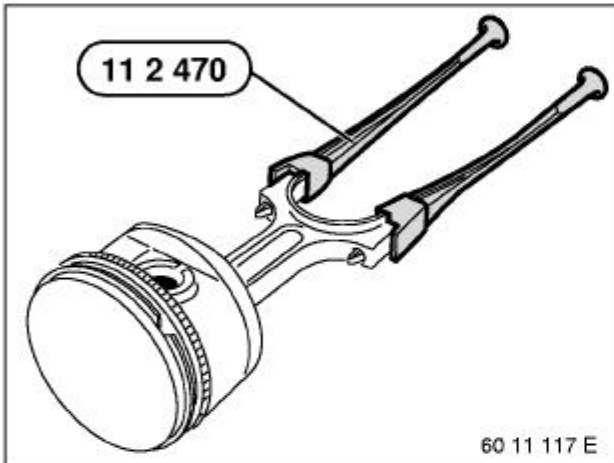
Piston and piston pin are paired and must not be fitted individually.

Fit connecting rod with piston pin to piston in such a way that, with the pair number visible, the installation direction arrow on the piston points to the right.



70 11 063 U

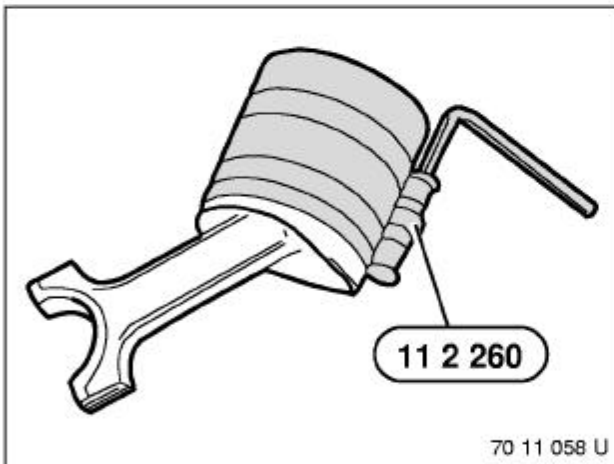
Install retaining ring.



11 2 470

60 11 117 E

Install special tool 11 2 470 in conrod.



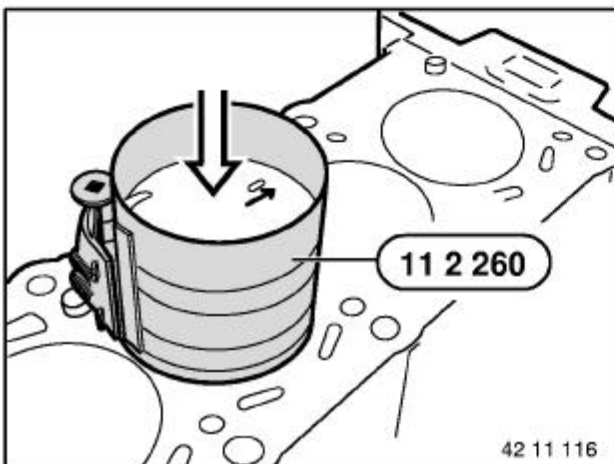
11 2 260

70 11 058 U

Lightly coat pistons and piston rings with oil.

Align contact points of piston rings (offset at approx. 120°, but not over piston pin lug).

Press together piston rings using special tool 11 2 260.



11 2 260

42 11 116

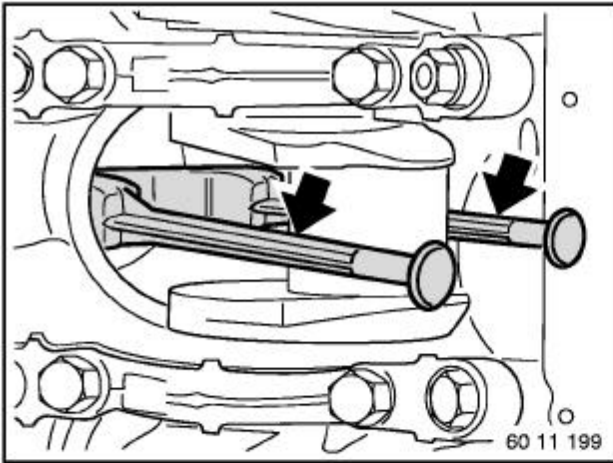
Install pistons with arrows pointing towards camshaft drive.

The tightening strap must locate firmly right around circumference of engine block.

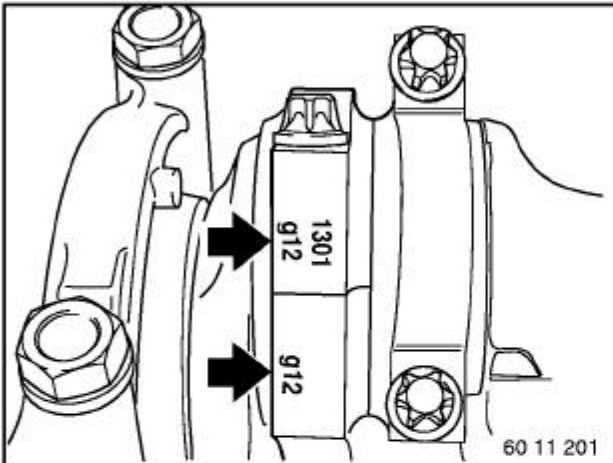
**Important!**

Danger of piston ring failure.

Only press pistons into place with finger force - do not knock in!



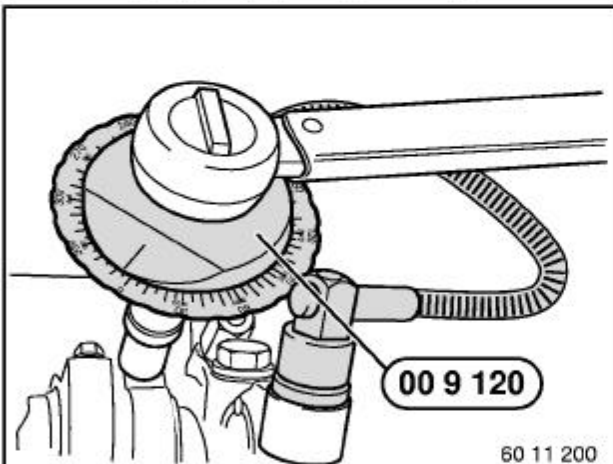
Attach crankpin to connecting rod.



Apply light coat of oil to connecting-rod bearing shells.

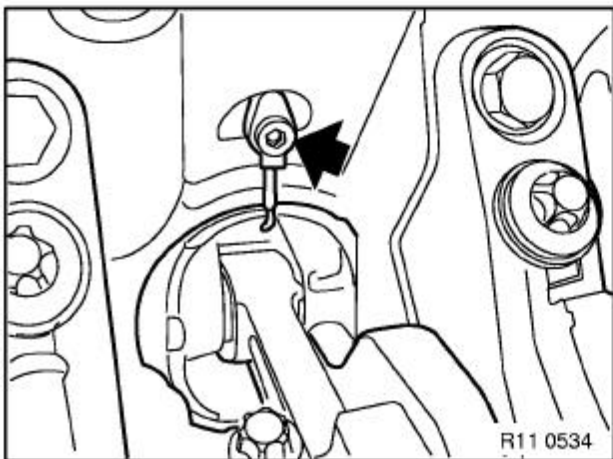
Place bearing caps in position, making sure that matching numbers are paired.

Install new connecting-rod screws.



Tighten down conrod bearing with special tool 00 9 120 or with special tool 11 2 110.

Tightening torque, refer to Technical Data 11 24 1AZ

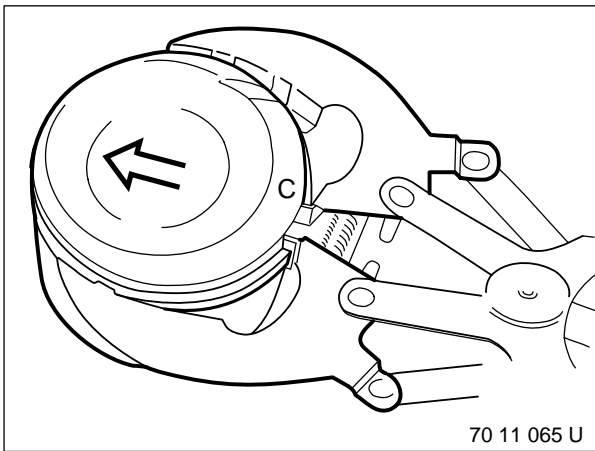


Install spray nozzle and tighten down screw.

# 11/105

## 11 25 671 Replacing piston rings on all pistons (M62)

(Piston removed)



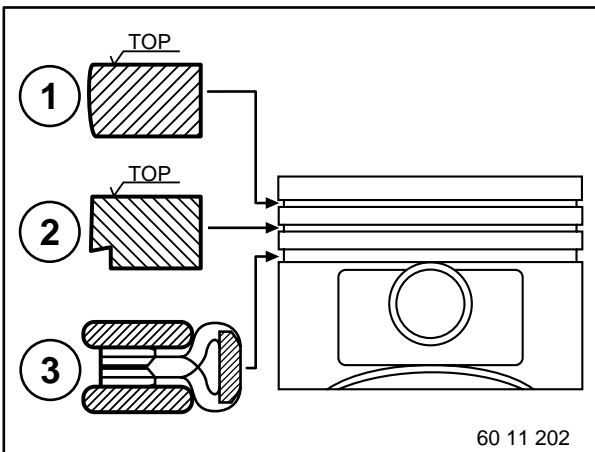
Remove piston rings with a piston-ring compressing pliers.

**Note:**

It might not be possible to find the identification on used piston rings.

Put aside piston rings in correct sequence and installation position.

New pistons may only be installed together with new piston rings.

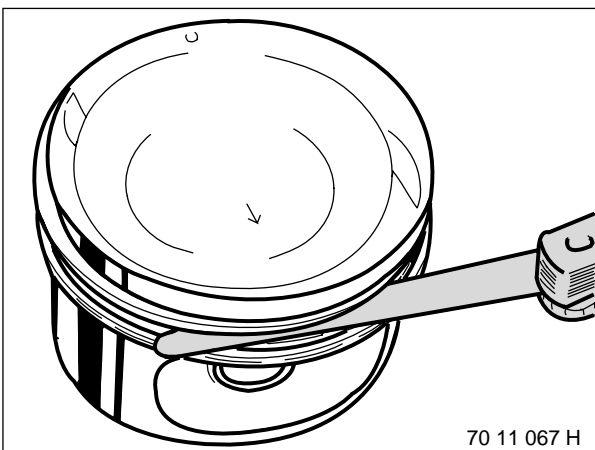


**Installation:**

Insert piston rings with the word "TOP" facing piston crown.

- (1) Plain compression ring
- (2) Stepped taper-face ring "TOP"
- (3) Three-piece steel band ring

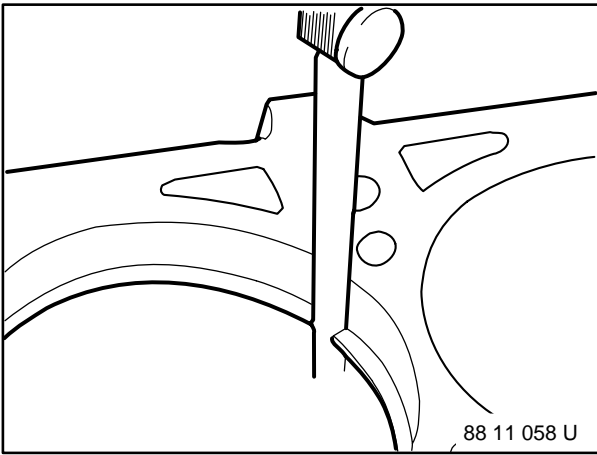
Arrange piston ring contact points with offset of approx. 120° to one another, but not over piston pin eye.



End float,  
refer to Technical Data

# 11/106

Gap in cylinder,  
refer to Technical Data



88 11 058 U

# 11/107

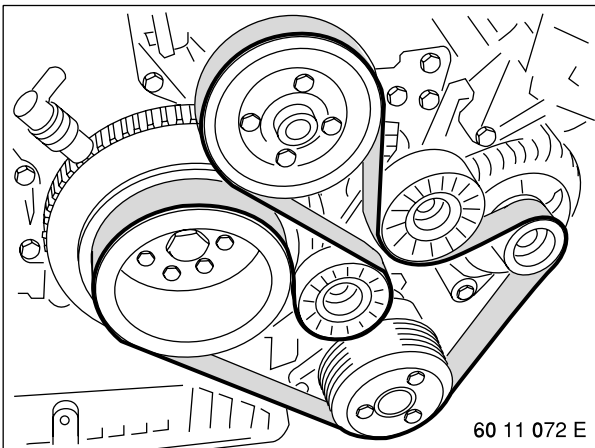
## 11 28 010 Replacing alternator drive belt (M62)

**Note:**

If the drive belt is to be reused, mark direction of travel and reinstall drive belt in same direction of rotation.

Remove fan coupling with fan wheel, refer to 11 52 020

Layout of drive belt.

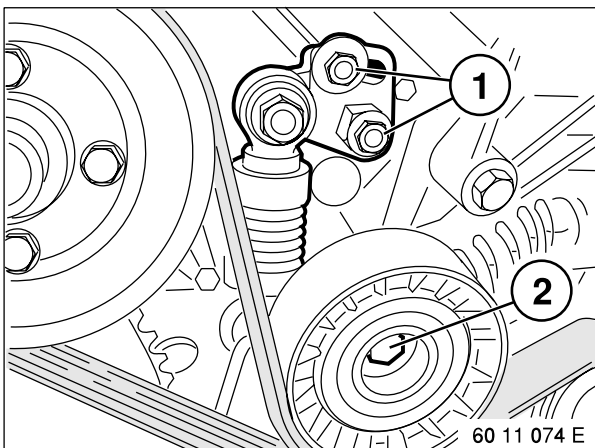


Loosen nuts (1) and (2) and loosen belt drive.

Remove drive belt.

**Installation:**

Check drive belt for coolant and oil residue and replace if necessary.



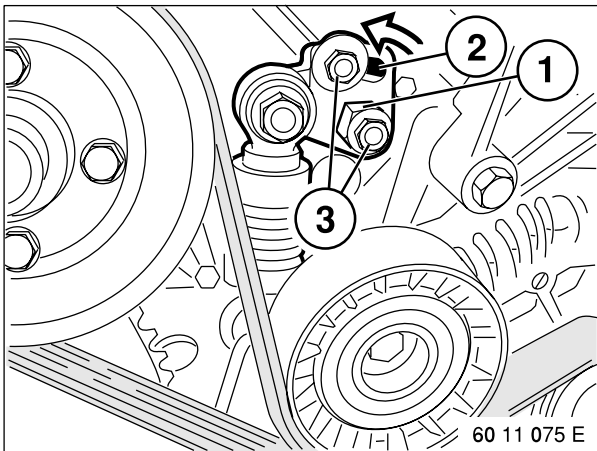


# 11/108



**Caution!**

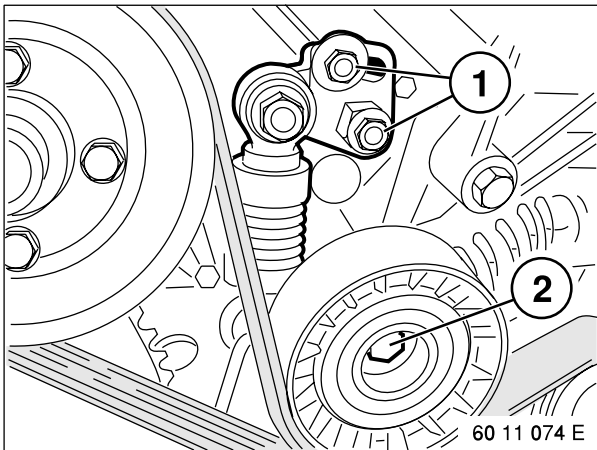
It is essential to replace drive belt if it comes into contact with hydraulic fluid.



**Installation:**

Fit drive belt and check it is correctly located on pulleys.

Use hex head (1) to preload adjusting plate to end of long bore (2) and tighten nuts (3).



**Note:**

For removal of complete belt tensioning fixture, unfasten nuts (1) and screw (2).

# 11/274

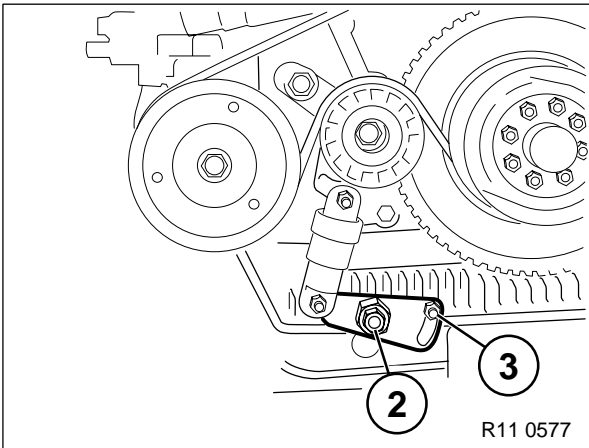
## 11 28 050 Replacing drive belt for a/c compressor (M60 / M62 / M73)

**Note:**

If the drive belt is to be reused, mark direction of travel and reinstall drive belt in same direction of rotation.

If necessary, remove splash guard.

Remove alternator drive belt,  
refer to 11 28 010



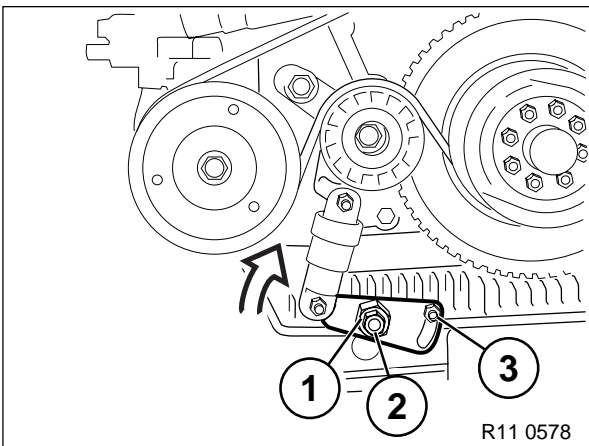
Loosen nuts (2 and 3) and remove compressor drive belt.

**Installation:**

Check drive belt for coolant and oil residue and replace if necessary.

**Caution!**

It is essential to replace drive belt if it comes into contact with hydraulic fluid.



**Installation:**

Fit drive belt and check it is correctly located on pulleys.

Tighten hex head (1) to remove adjustment plate up to end of long bore, then tighten nut (3) followed by nut (2).

# 11/110

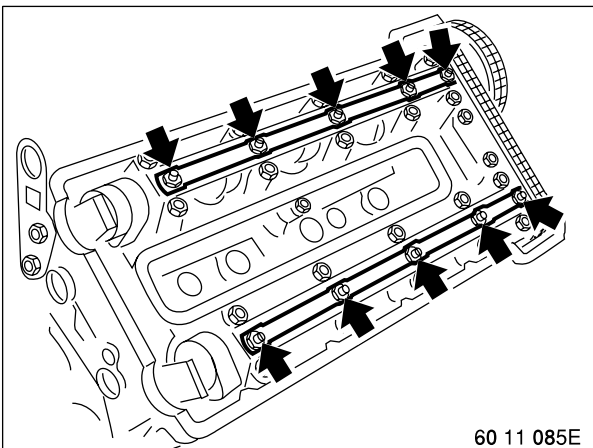
## 11 31 010 Adjusting timing of camshaft(s) (M62)

Remove both cylinder head covers,  
refer to 11 12 004

Remove all spark plugs,  
refer to 12 12 011

Remove fan coupling with fan wheel,  
refer to 11 52 020

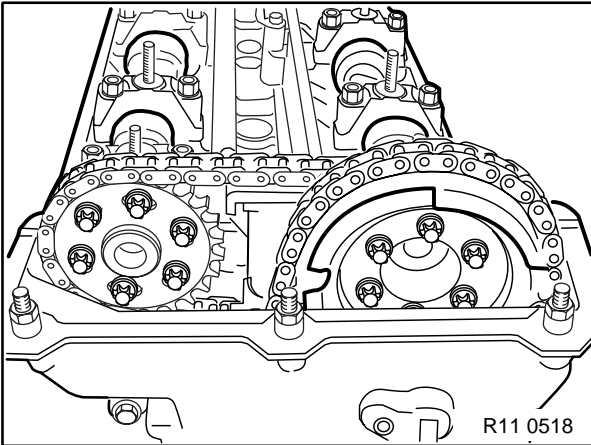
Unscrew and remove splash guard.



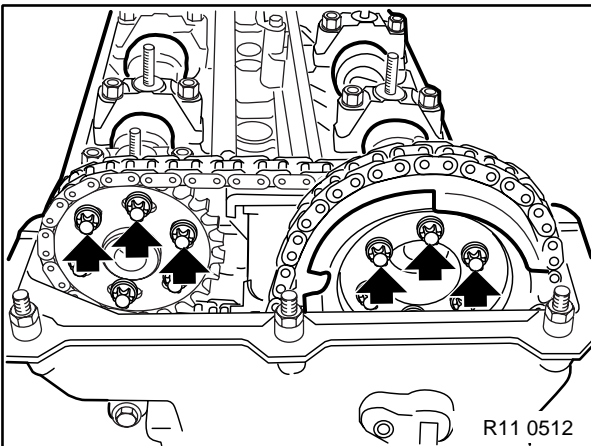
60 11 085E

Remove all oil lines to left and right cylinder head.

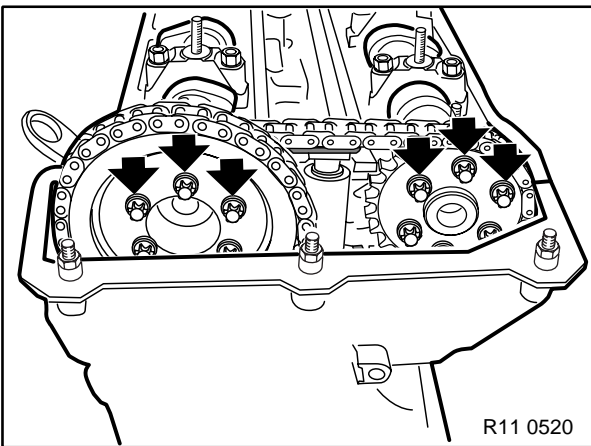
# 11/111



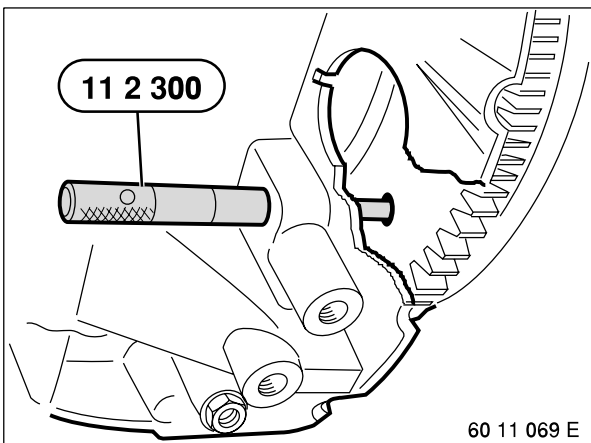
Crank engine at central bolt in direction of rotation until the first cylinder is in TDC position.



Unfasten the accessible three screws in the exhaust and intake camshaft on cylinder bank 1-4 approx. 1/2 a turn.



Unfasten the accessible three screws in the exhaust and intake camshafts on cylinder bank 5-8 approx. 1/2 a turn.



Turn over engine once.

**Caution!**

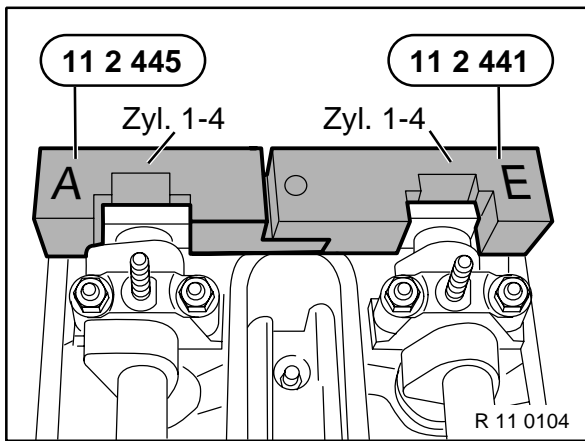
Do not turn the engine back.

Secure crankshaft with special tool 11 2 300 in TDC position of first cylinder.

Remove special tool 11 2 300 before switching on the engine.

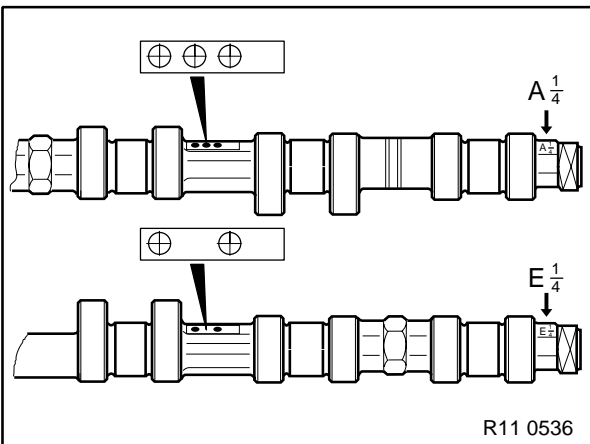
# 11/112

Fit special tool 11 2 445 / 441 to camshafts on cylinder bank 1-4.

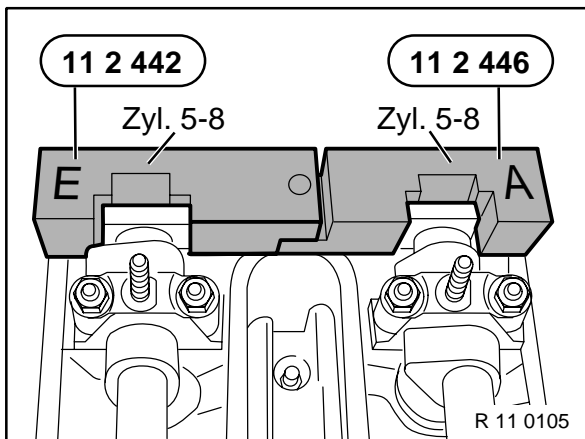


**Note:**

In TDC position of first cylinder, marker bores of camshafts point upwards.

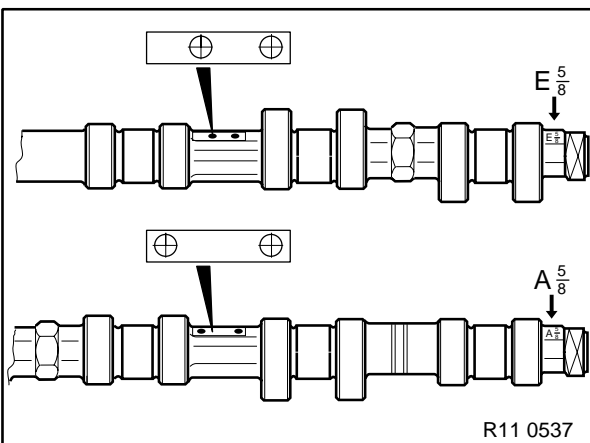


Fit special tool 11 2 446 / 442 to camshafts on cylinder bank 5-8.

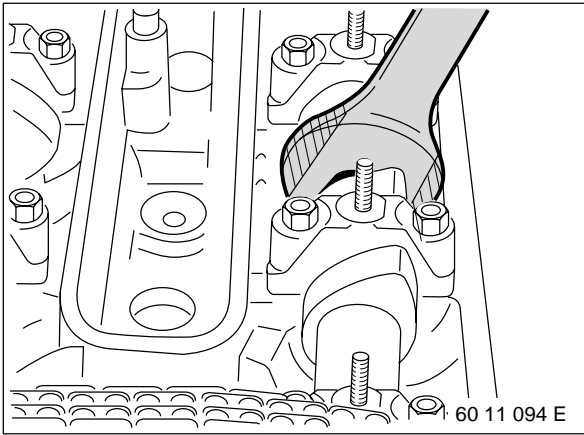


**Note:**

In TDC position of first cylinder, marker bores of camshafts point upwards.



# 11/113



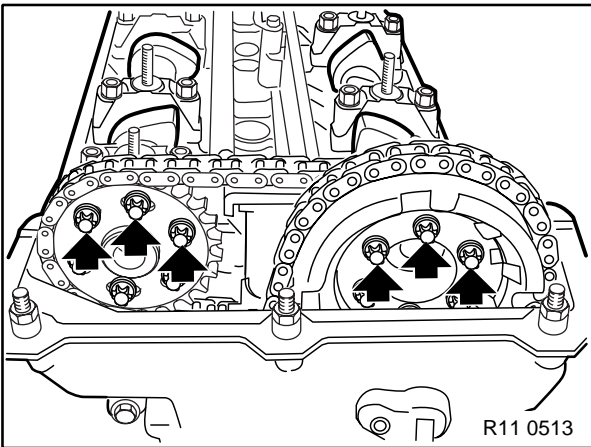
**Note:**

When unfastening screw connection on camshaft, brace camshaft on hex head.

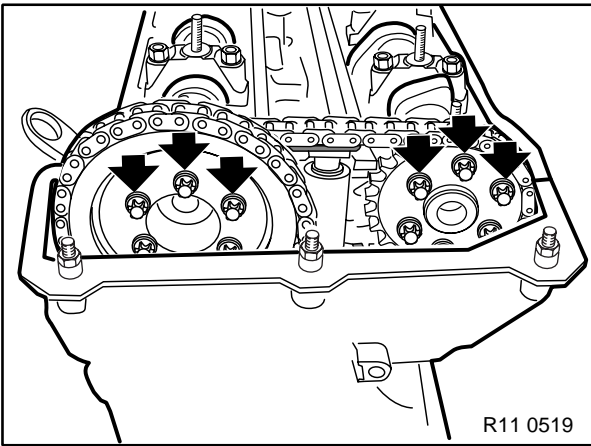
**Caution!**

Do not damage the cylinder head.

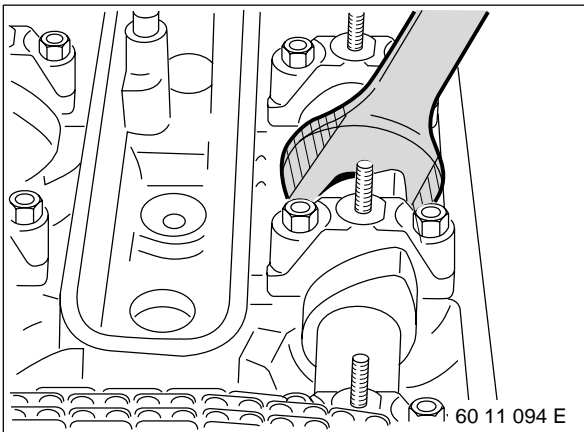
Machine open-end wrench accordingly if necessary.



Unfasten the remaining three screws on the exhaust and intake camshafts on cylinder bank 1-4 approx. 1/2 a turn.



Loosen the remaining three screws in the exhaust and intake camshafts on cylinder bank 5-8 approx. 1/2 a turn.

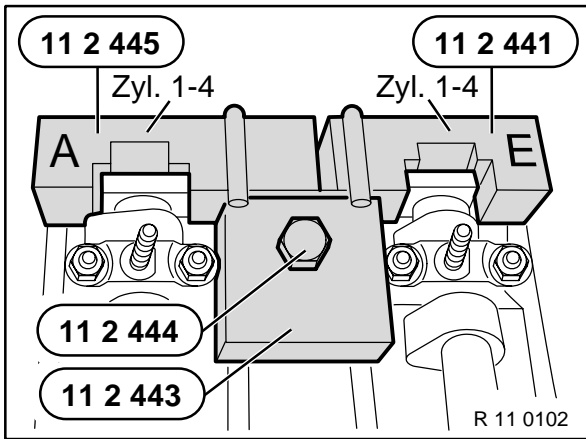


Align all camshafts with open-end wrench in such a way that special tools 11 2 445 / 441 / 446 / 442 locate firmly against cylinder heads.

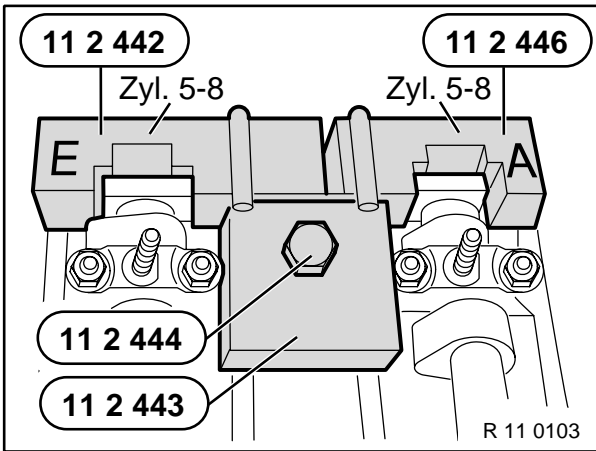
**Caution!**

Do not damage the cylinder head.

# 11/114

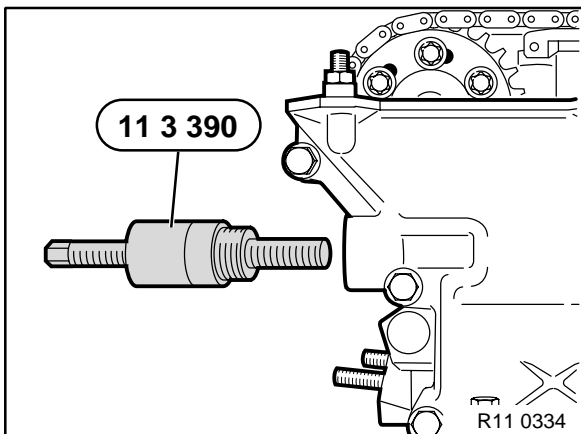


Fit special tool 11 2 443 to special tool 11 2 445 / 441 and secure with special tool 11 2 444 using the spark plug thread.



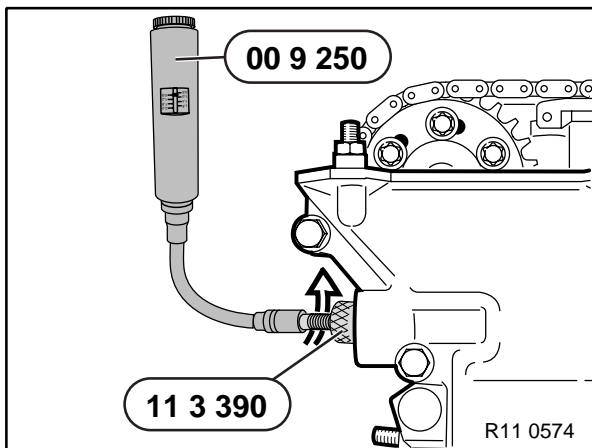
Fit special tool 11 2 443 to special tool 11 2 446 / 442 and secure with special tool 11 2 444 using the spark plug thread.

Remove piston for chain tensioner, refer to 11 31 090



Install special tool 11 3 390 in right timing case cover.

# 11/115



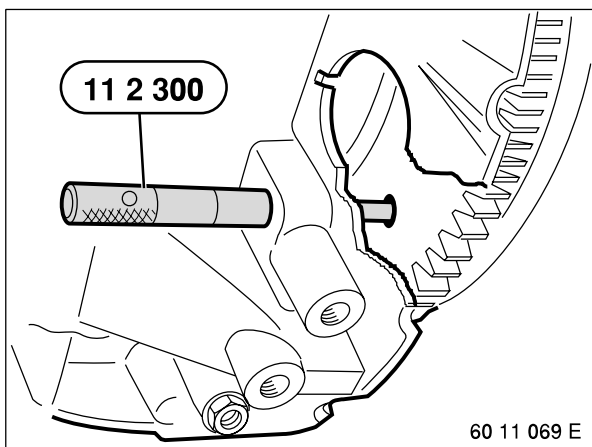
Tighten tensioning rail by turning the adjusting screw on the special tool 11 3 390 with special tool 00 9 250 to 0.7 Nm.

**Note:**  
If installation tolerance is unfavorable, attach special tool 00 9 250 from underside.

Tighten sprocket wheels in following sequence.

The three accessible screws on left exhaust camshaft (5-8), right exhaust camshaft (1-4), left intake camshaft (5-8), right intake camshaft (1-4).

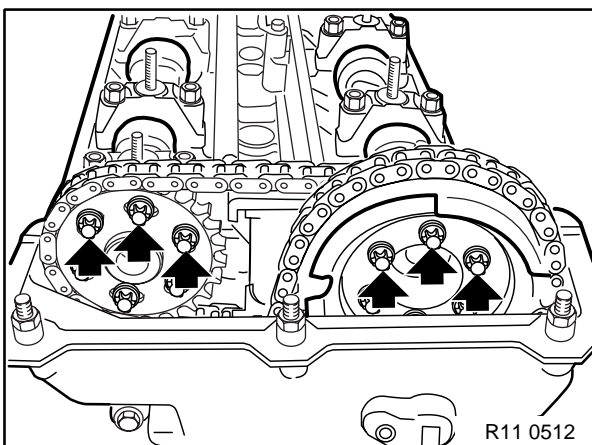
Tightening torque,  
refer to Technical Data 11 31 3AZ



Remove special tool 11 2 300.

Remove special tools from camshafts.

Turn over engine once.

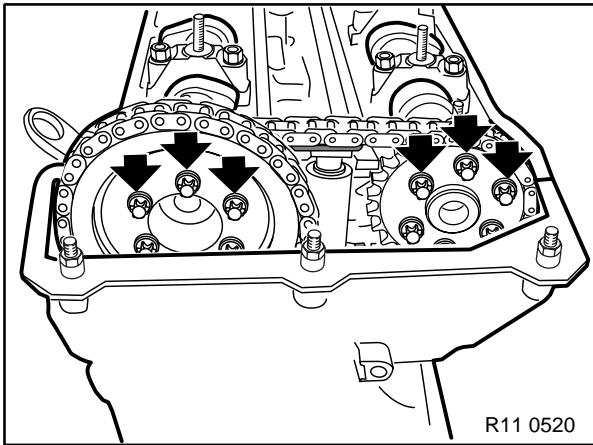


Tighten down the remaining three screws in exhaust and intake camshafts in cylinder bank 1-4 firmly.

Tightening torque,  
refer to Technical Data 11 31 3AZ

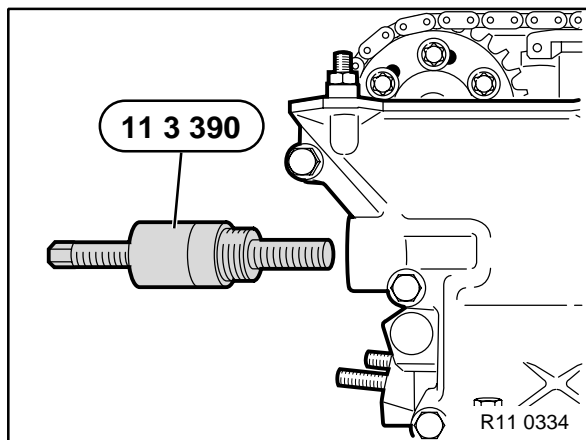


# 11/116



Tighten down the remaining three screws in the exhaust and intake camshafts in cylinder bank 5-8 firmly.

Tightening torque, refer to Technical Data 11 31 3AZ



Unfasten and remove special tool 11 3 390.

Assemble engine.

# 11/117

## 11 31 011 Replacing left camshaft (M62)

(intake or exhaust side as applicable)

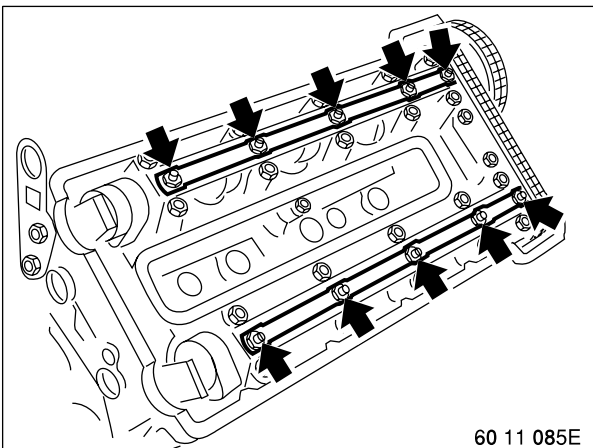
Cylinder bank 5-8

Remove both cylinder head covers,  
refer to 11 12 004

Remove all spark plugs,  
refer to 12 12 011

Remove piston for chain tensioner,  
refer to 11 31 090

Unscrew and remove splash guard.



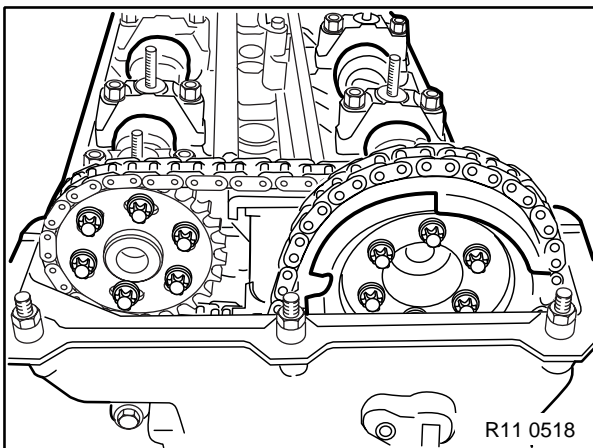
60 11 085E

Remove all oil lines to left and right cylinder head.

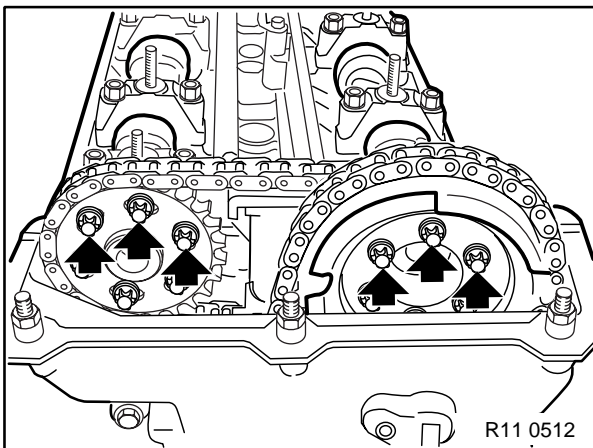
# 11/118

## Removal

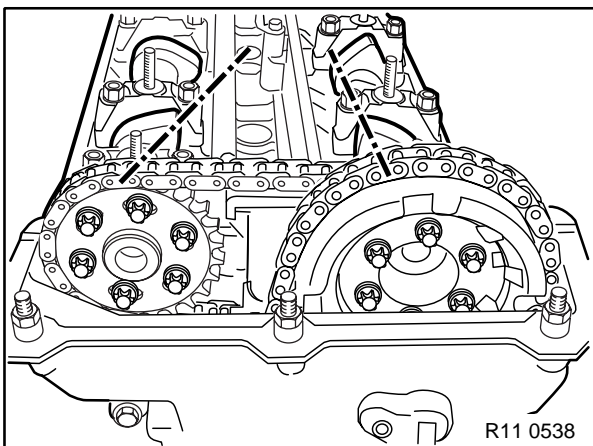
Removal of camshaft is described separately from installation. Assembly sequence for removal and installation is different.



Crank engine at central bolt in direction of rotation until the first cylinder is in TDC position.

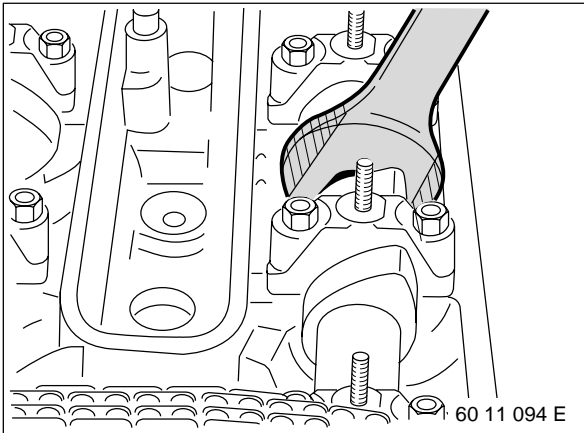


Unfasten the accessible three screws on exhaust and intake camshafts on cylinder bank 1-4 approx. 1/2 a turn.



Crank engine once engine wise up to TDC position of first cylinder.

# 11/119



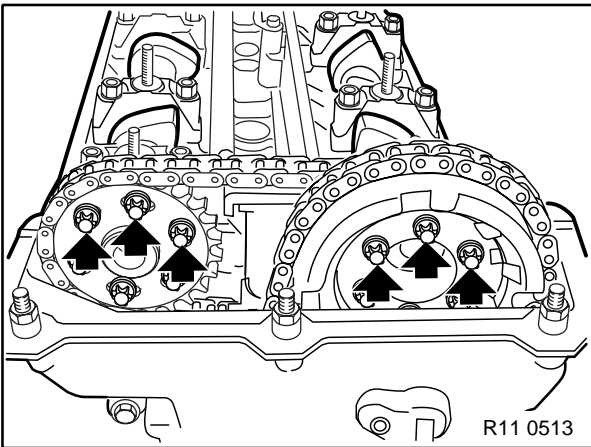
**Note:**

When camshaft screw connection is unfastened, brace camshaft on hex head.

**Caution!**

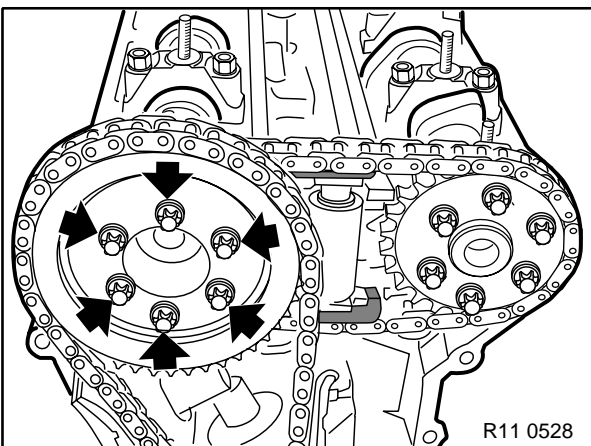
Do not damage the cylinder head.

Machine open-end wrench accordingly if necessary.



Unfasten the remaining three screws on the exhaust and intake camshafts on cylinder bank 1-4 approx. 1/2 a turn.

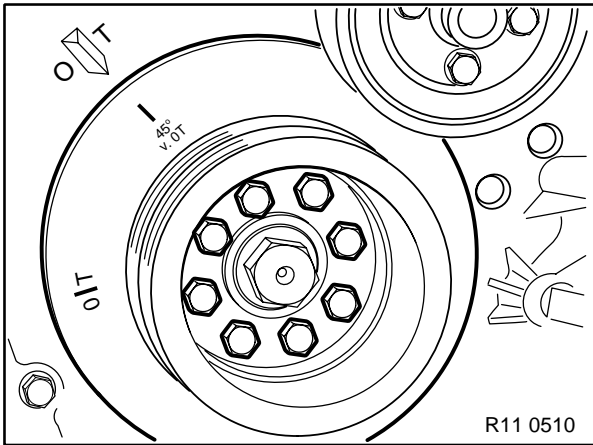
Remove top left timing case cover, refer to 11 14 080



Remove sprocket on left intake camshaft (cylinder bank 5-8).

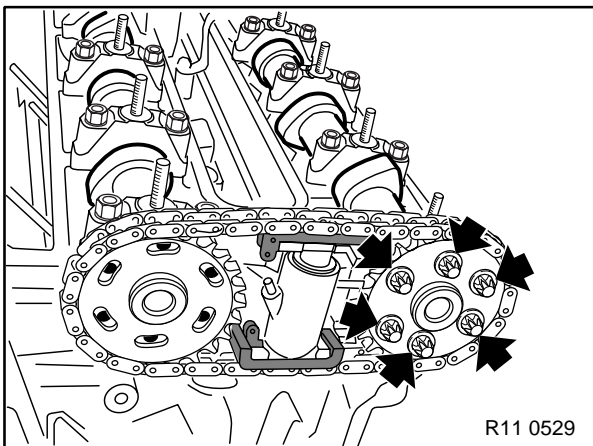
Secure chain to prevent it from dropping.

# 11/120

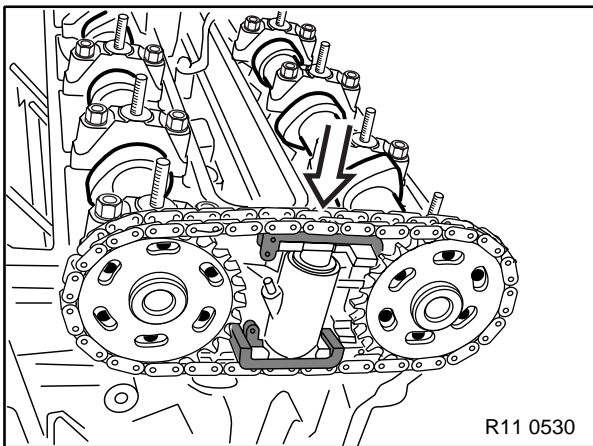


Crank engine counter-enginewise on central screw into 45° before TDC position.

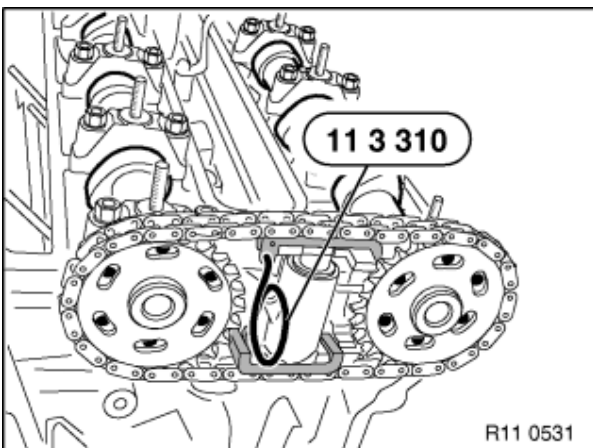
Note markings!



Unfasten sprocket wheel screw connection.

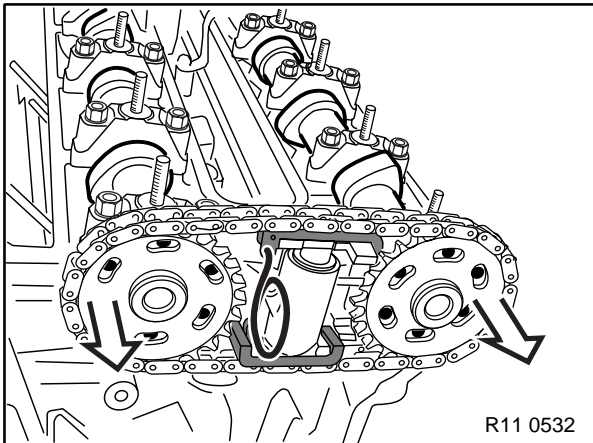


To relieve load on chain, compress chain tensioner.

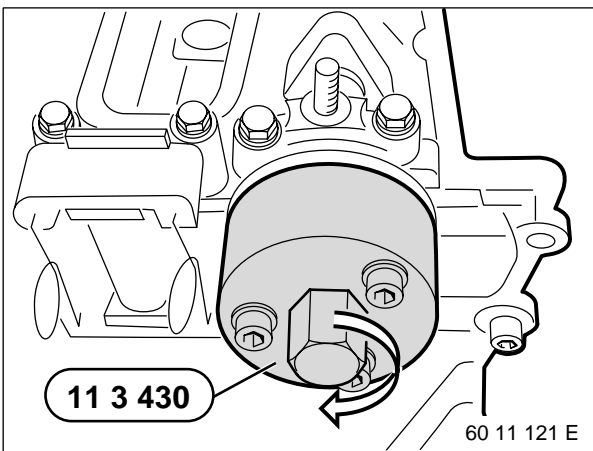


Lock chain tensioner with special tool 11 3 310.

# 11/121

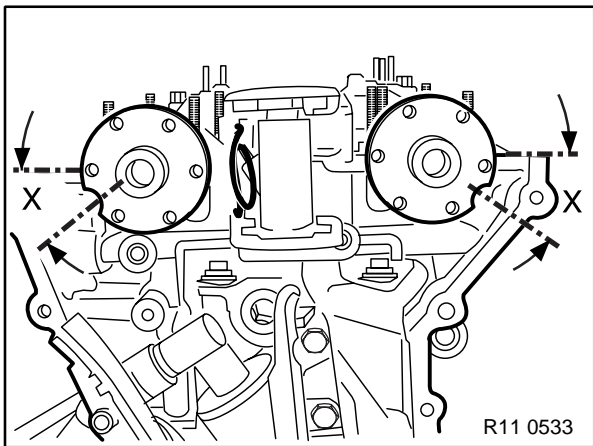


Lift off both sprockets complete with chain.

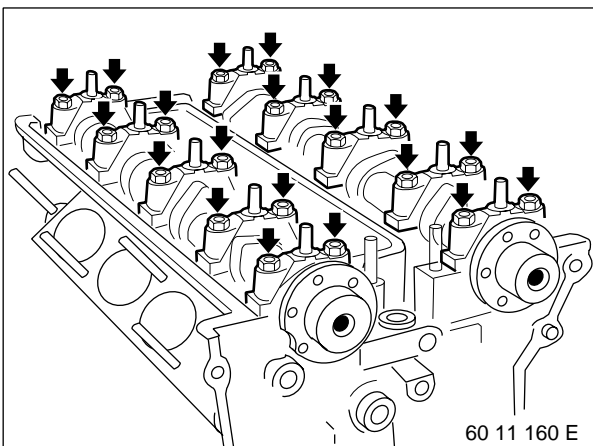


Move camshafts on cylinder bank 5 - 8 into installation position.

Rotate exhaust and intake camshafts with special tool 11 3 430.



In insertion position (removal position), recesses in camshafts point approx. 30 ... 40° downwards from surface of cylinder head.



Uniformly untighten bearing covers on camshafts for cylinder bank 5-8 in 1/2 turn stages from outside to inside.

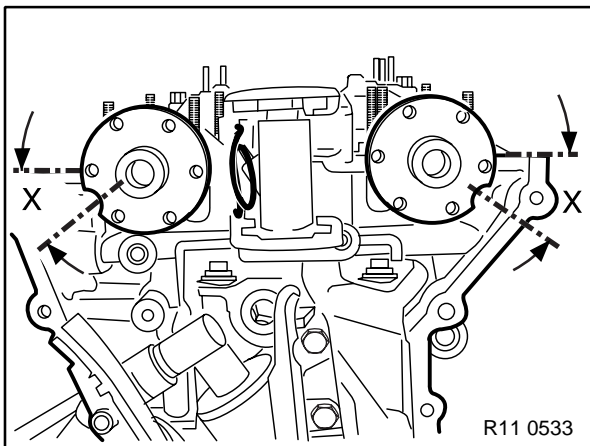
Remove bearing covers and place to one side in orderly fashion.

Lift out camshafts.

# 11/122

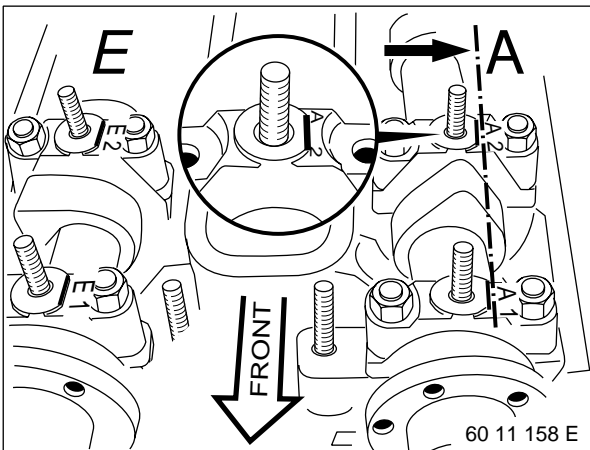
## Installation

Installation of camshaft is described separately from removal. Assembly sequence differs between removal and installation.



Install camshafts.

In insertion position, recesses in camshafts point approx. 30 ... 40° downwards from surface of cylinder head.



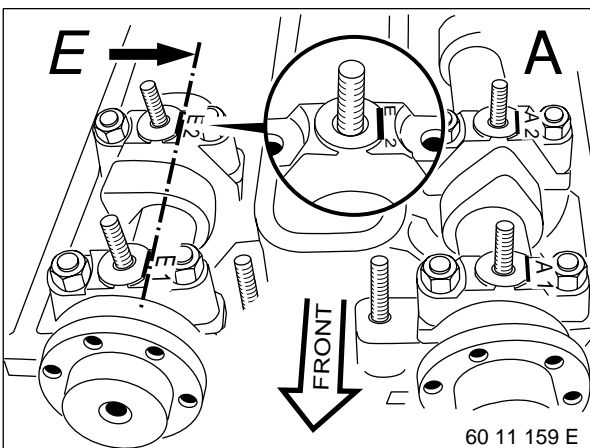
**Caution!**

Do not confuse camshaft bearing covers of cylinders 1-4 and 5-8.

Fit bearing covers.

**Note:**

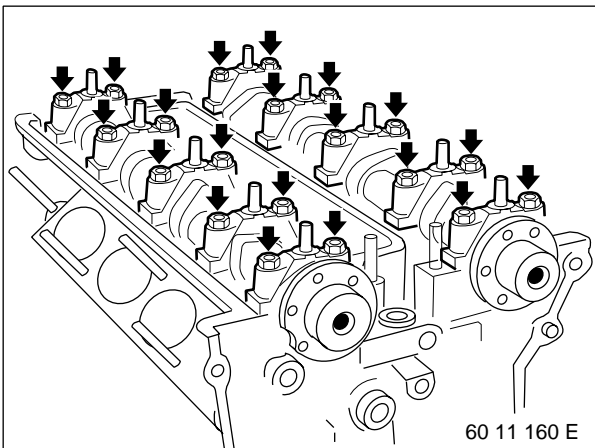
The exhaust camshaft bearing covers are legibly designated from the intake side with the letters A1 ... A5.



**Note:**

The intake camshaft bearing covers are legibly designated from the intake side with the letters E1 ... E5.

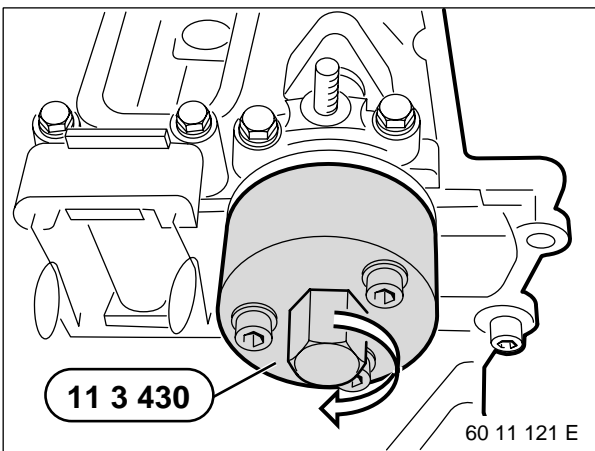
# 11/123



60 11 160 E

Evenly tighten down bearing covers on camshafts for cylinder bank 5-8 in 1/2 turn steps from outside to inside.

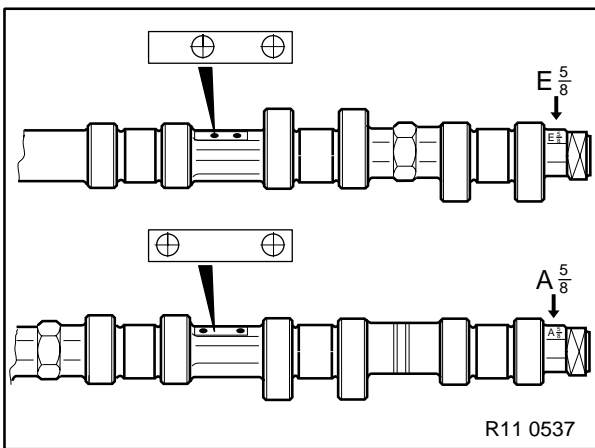
Tightening torque, refer to Technical Data 11 31 1AZ



11 3 430

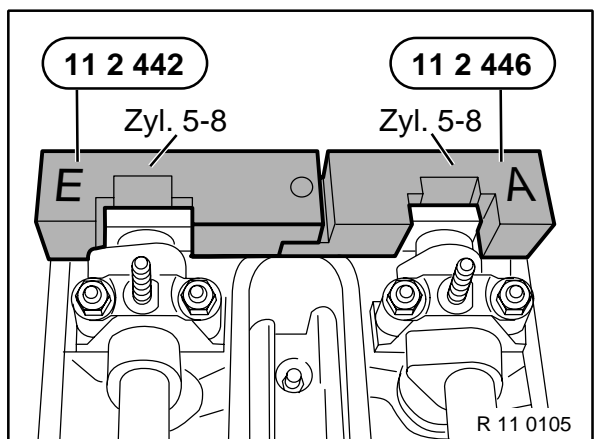
60 11 121 E

Secure special tool 11 3 430 to camshaft.



R11 0537

Rotate camshafts until marker bores face upwards.



11 2 442

Zyl. 5-8

E

11 2 446

Zyl. 5-8

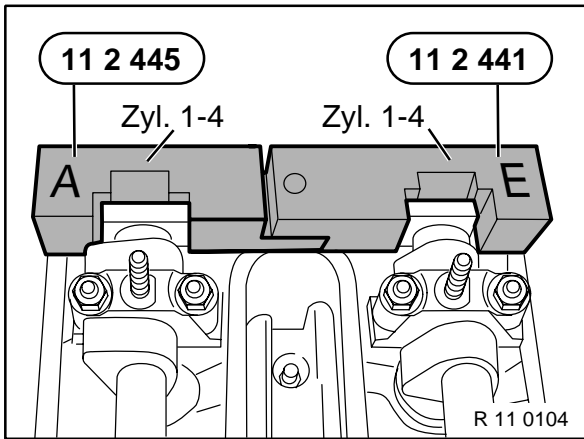
A

R 11 0105

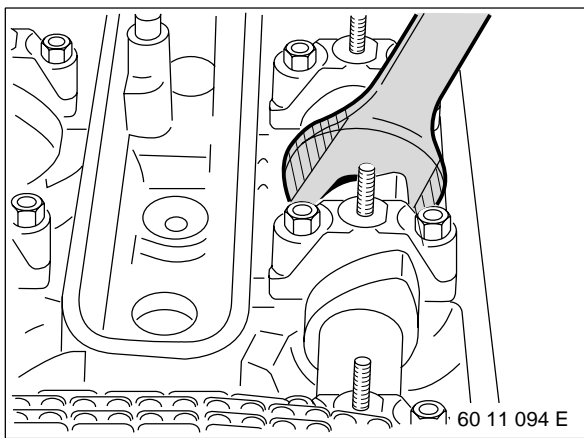
Fit special tool 11 2 446 / 442 to camshafts on cylinder bank 5-8.



# 11/124



Fit special tool 11 2 445 / 441 to camshafts on cylinder bank 1-4.

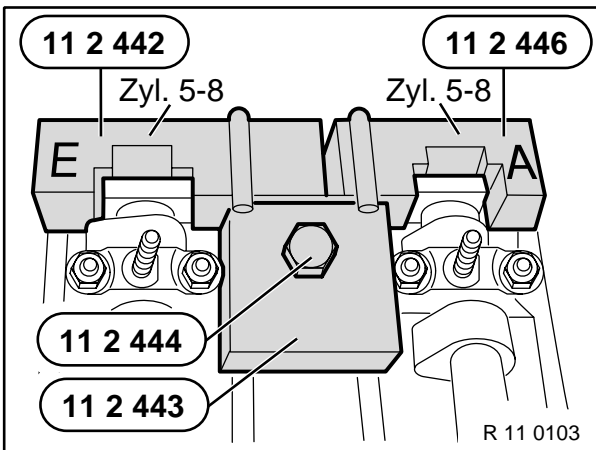


Align all camshafts with open-end wrench in such a way that special tools 11 2 445 / 441 / 446 / 442 fit on cylinder heads without gaps.

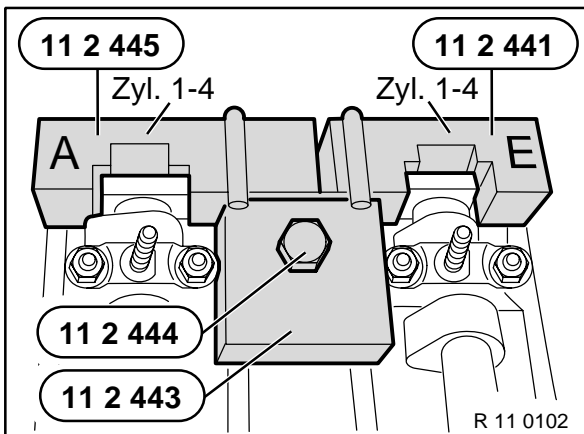
**Caution!**

Do not damage the cylinder head.

Machine open-end wrench accordingly if necessary.

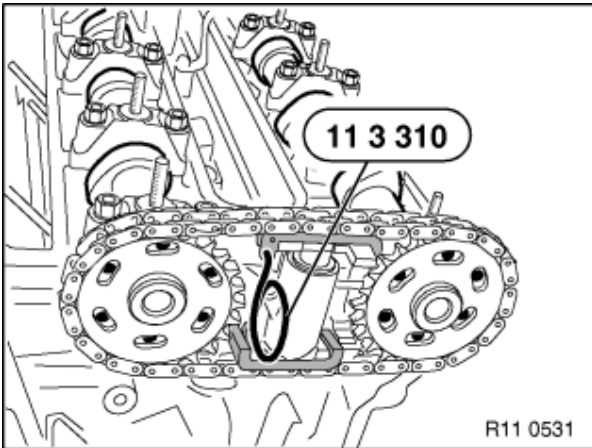


Fit special tool 11 2 443 to special tool 11 2 446 / 442 and secure with special tool 11 2 444 using the spark plug thread.



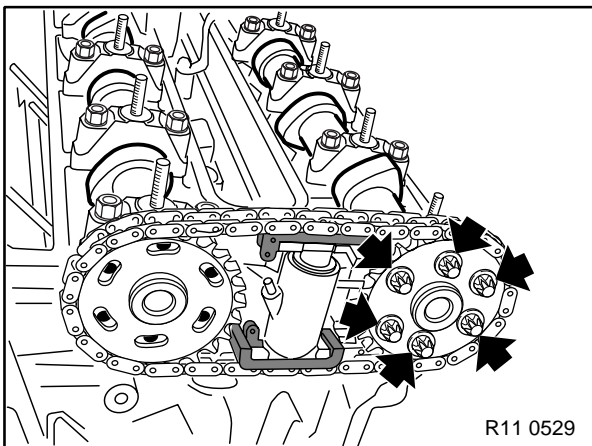
Fit special tool 11 2 443 to special tool 11 2 445 / 441 and secure with special tool 11 2 444 using the spark plug thread.

# 11/125

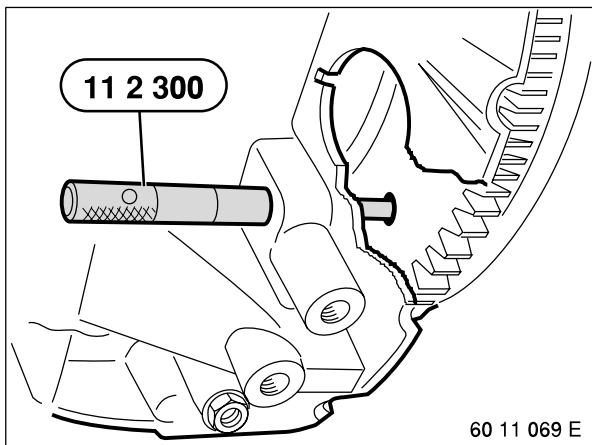


Fit secondary sprockets and chain to camshafts on cylinder bank 5-8. Align long bores centrally.

Remove special tool 11 3 310 from chain tensioner.



Install screws in exhaust camshaft on cylinder bank 5-8 and fit flush.

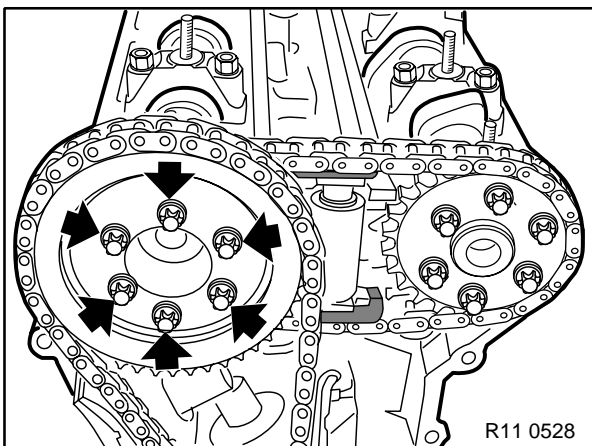


Rotate engine from 45° before TDC position engine-wise until in TDC position.

Hold crankshaft in TDC position with special tool 11 2 300.

**Caution!**

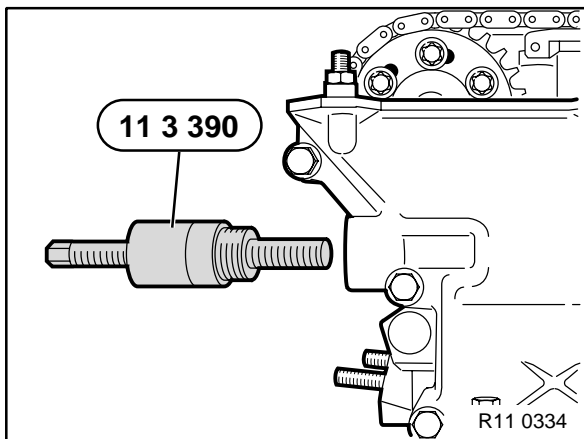
Remove special tool 11 2 300 before switching on the engine.



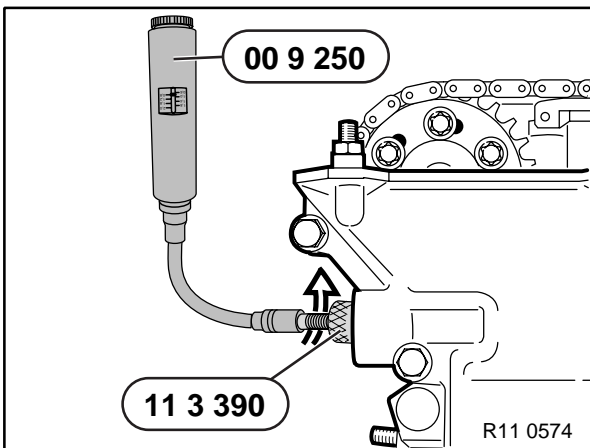
Fit sprocket with chain to intake camshaft on cylinder bank 5-8 with long holes aligned centrally.

Insert screws and fit flush.

# 11/126



Install special tool 11 3 390 in right timing case cover.



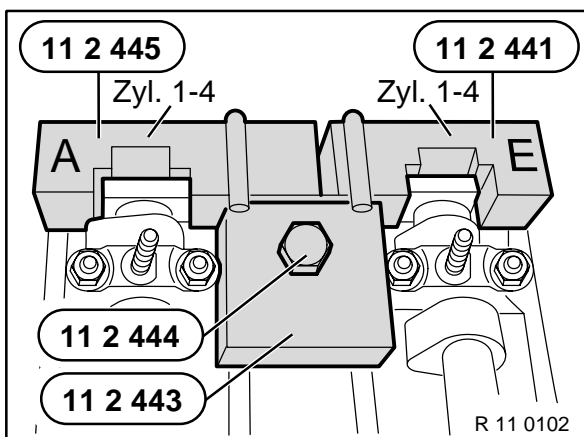
Tighten tensioning rail by turning the adjusting screw on the special tool 11 3 390 with special tool 00 9 250 to 0.7 Nm.

**Note:**  
If installation tolerance is unfavorable, attach special tool 00 9 250 from underside.

Tighten sprockets in following order:

All screws on left exhaust camshaft, three screws on right exhaust camshaft, all screws on left intake camshaft, three screws on right intake camshaft.

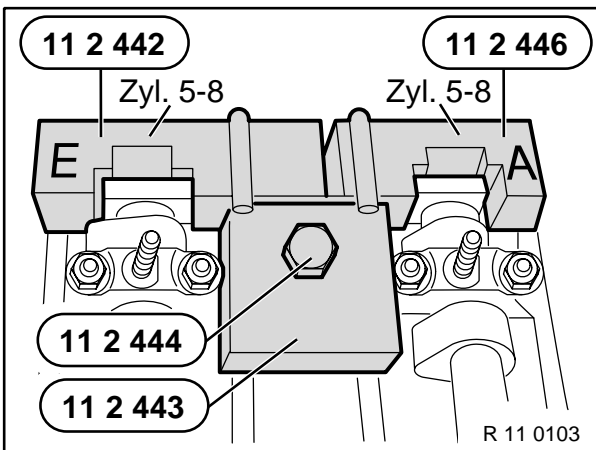
Tightening torque,  
refer to Technical Data 11 31 3AZ



Remove special tools 11 2 444 / 443 / 441 / 445.

# 11/127

Remove special tools 11 2 444 / 443 / 442 / 446.

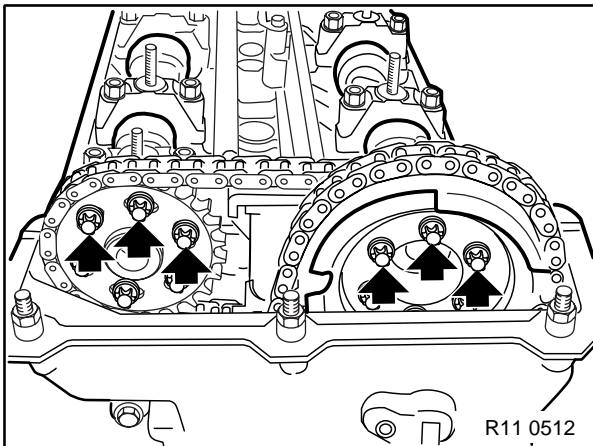


Remove special tool 11 2 300.

Turn over engine once.

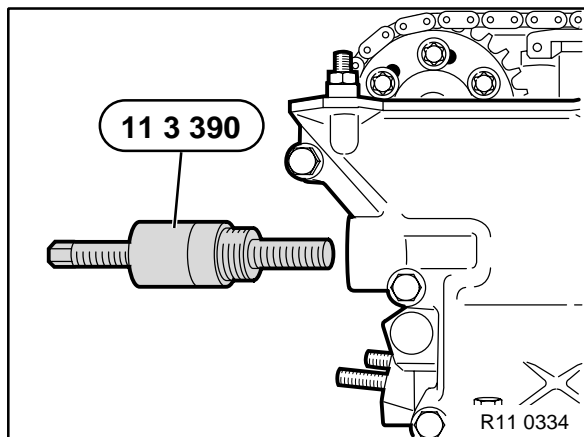
Tighten down remaining three screws on exhaust and intake camshafts on cylinder bank 1-4 firmly.

Tightening torque,  
refer to Technical Data 11 31 3AZ



Loosen special tool 11 3 390 and remove.

Assemble engine.



# 11/128

## 11 31 015 Replacing right camshaft (M62)

(intake or exhaust side as applicable)

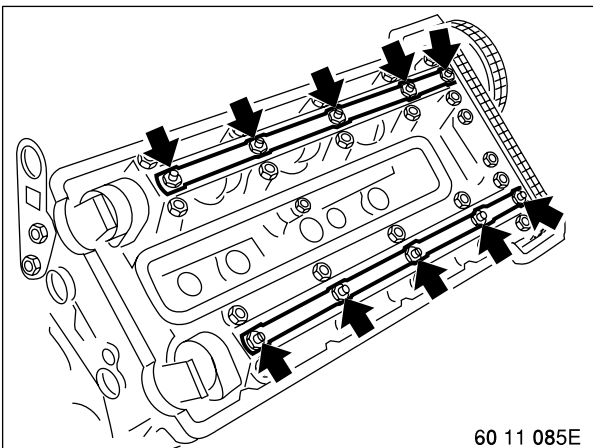
Cylinder bank 1-4

Remove both cylinder head covers,  
refer to 11 12 004

Remove all spark plugs,  
refer to 12 12 011

Remove fan coupling with fan wheel,  
refer to 11 52 020

Unscrew and remove splash guard.



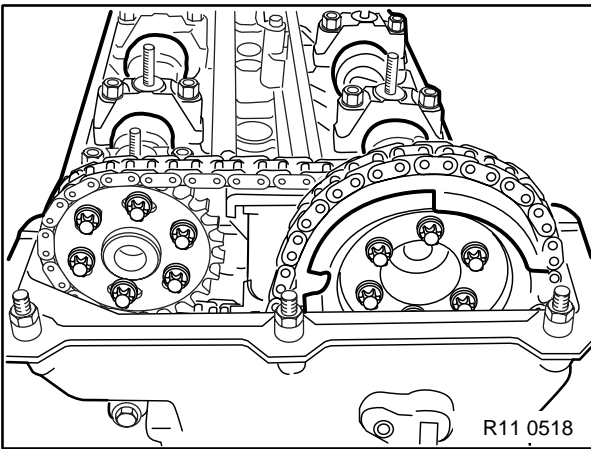
60 11 085E

Remove all oil lines to left and right cylinder head.

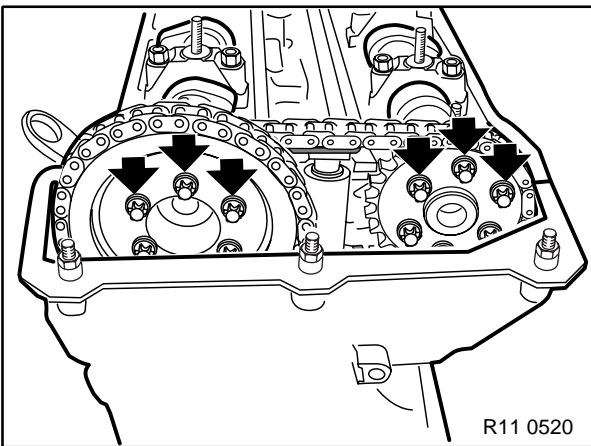
# 11/129

## Removal

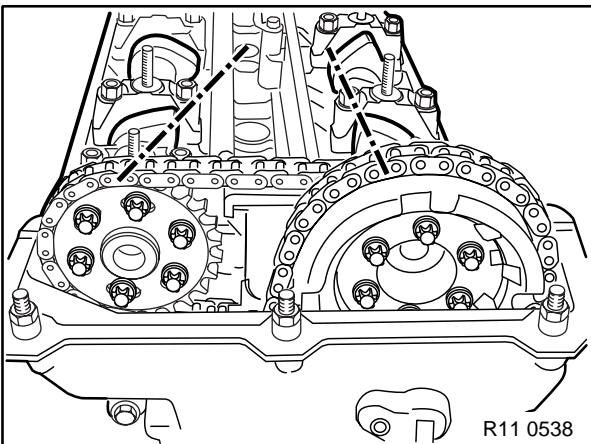
Removal of camshaft is described separately from installation. Assembly sequence for removal and installation is different.



Crank engine at central bolt in direction of rotation until the first cylinder is in TDC position.

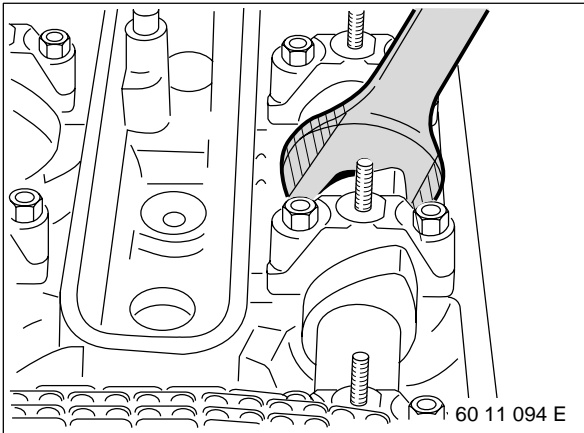


Unfasten the accessible three screws in the exhaust and intake camshaft on cylinder bank 5-8 approx. 1/2 a turn.



Crank engine once engine wise up to TDC position of first cylinder.

# 11/130



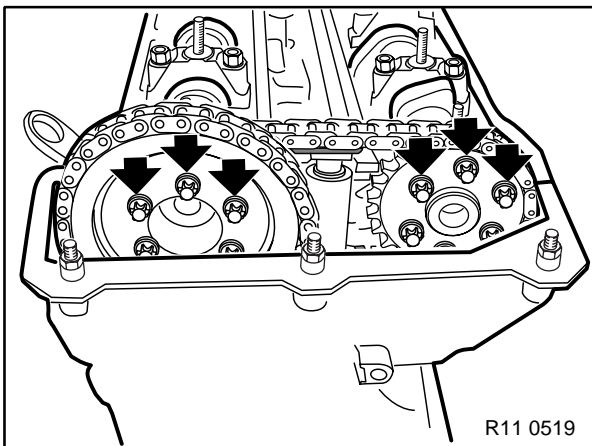
**Note:**

When camshaft screw connection is unfastened, brace camshaft on hex head.

**Caution!**

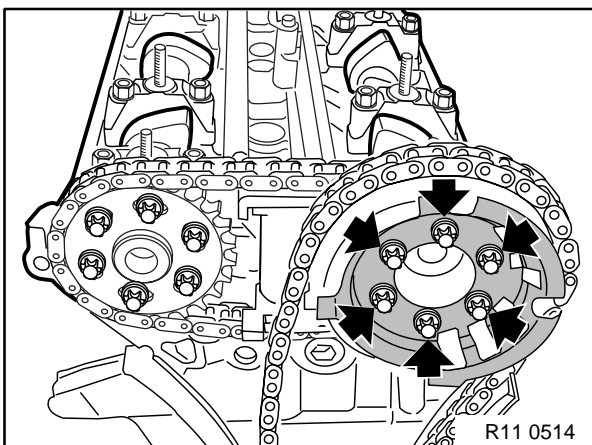
Do not damage the cylinder head.

Machine open-end wrench accordingly if necessary.



Unfasten remaining three screws in exhaust and intake camshafts in cylinder bank 5-8 approx. 1/2 a turn.

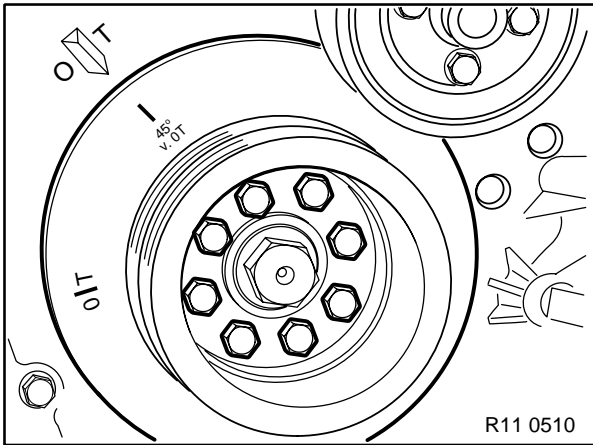
Remove top right timing case cover, refer to 11 14 085



Remove sprocket on right intake camshaft (cylinder bank 1-4).

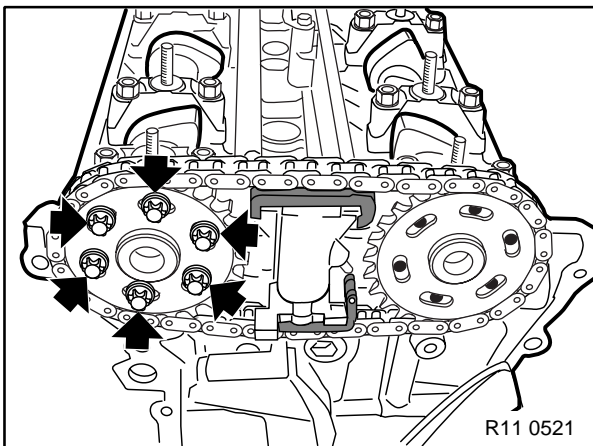
Secure chain to prevent it from dropping.

# 11/131

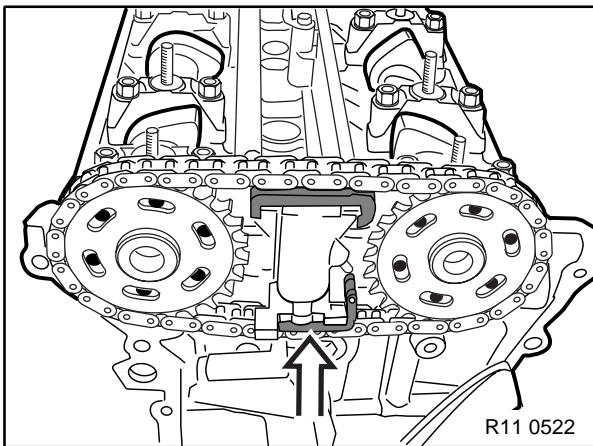


Crank engine counter-enginewise on central screw into 45° before TDC position.

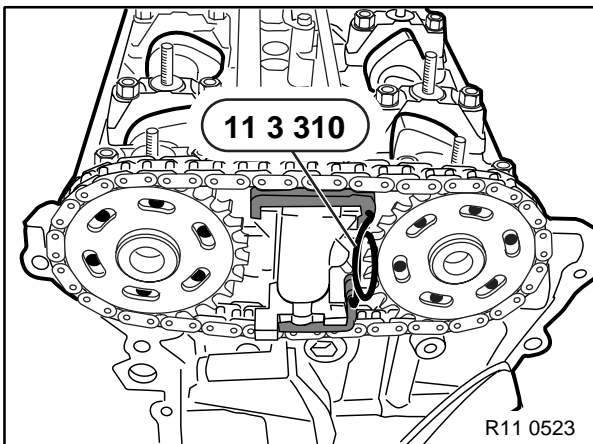
Note markings!



Unfasten sprocket wheel screw connection.



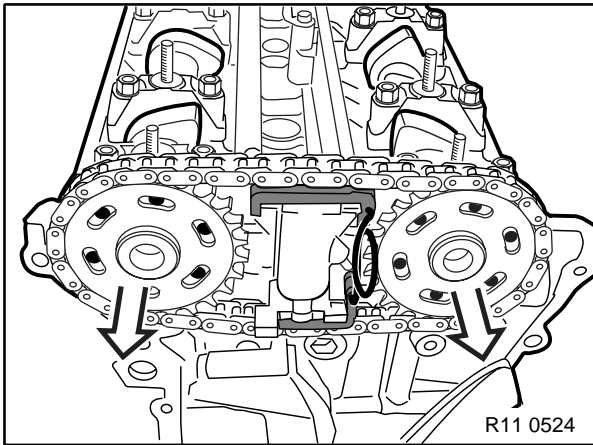
To relieve load on chain, compress chain tensioner.



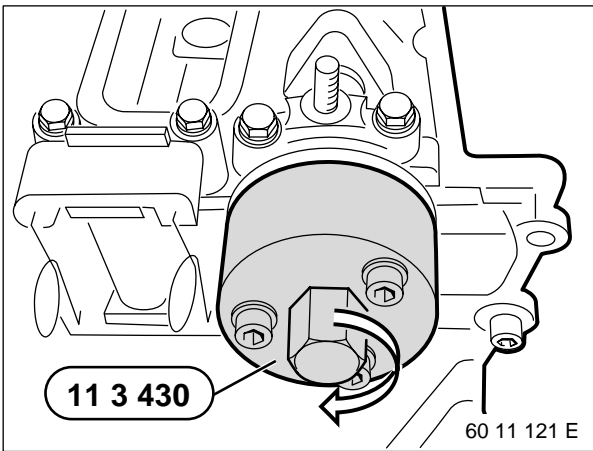
Lock chain tensioner with special tool 11 3 310.



# 11/132

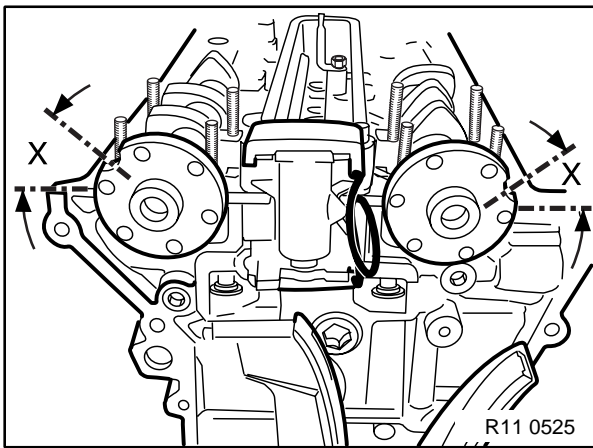


Lift off both sprockets complete with chain.

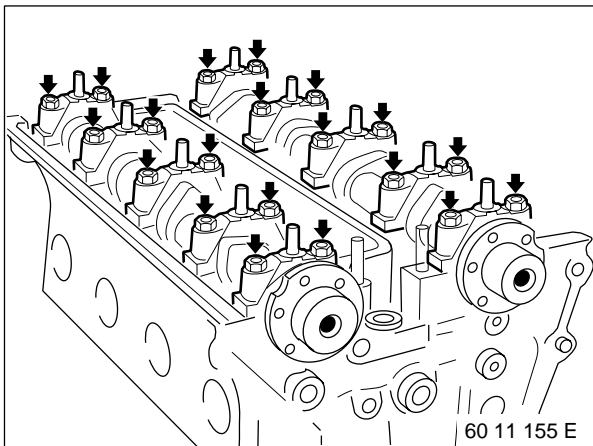


Move camshafts on cylinder bank 1-4 into installation position.

Rotate exhaust and intake camshafts with special tool 11 3 430.



In insertion position (removal position), recesses in the camshafts point upwards approx. 30 ... 40° from surface of cylinder head.



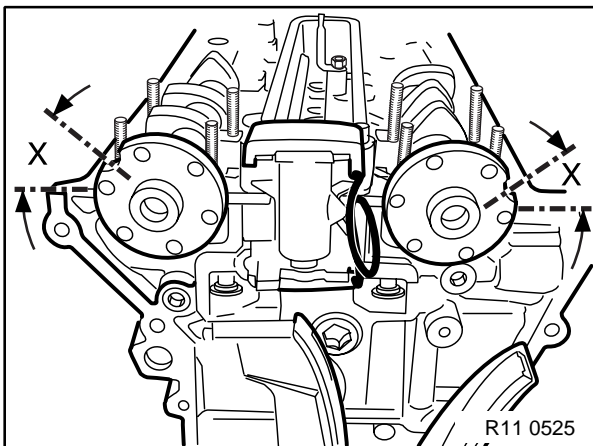
Uniformly untighten bearing covers on camshafts for cylinder bank 1-4 in 1/2 turn steps from outside edge to inside.

Remove bearing covers and place to one side in orderly fashion. Lift out camshafts.

# 11/133

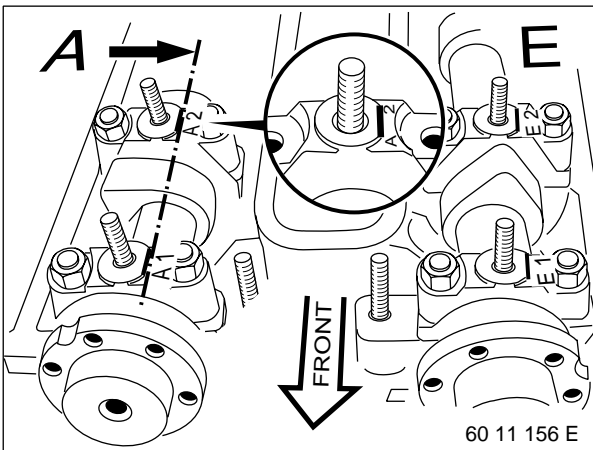
## Installation

Installation of camshaft is described separately from removal. Assembly sequence differs between removal and installation.



Install camshafts.

In insertion position, recesses in the camshafts point upwards approx. 30 ... 40° from surface of cylinder head.



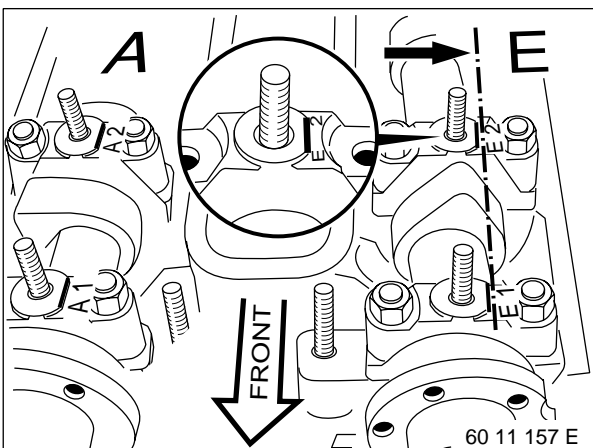
**Caution!**

Do not confuse camshaft bearing covers of cylinders 1-4 and 5-8.

Fit bearing covers.

**Note:**

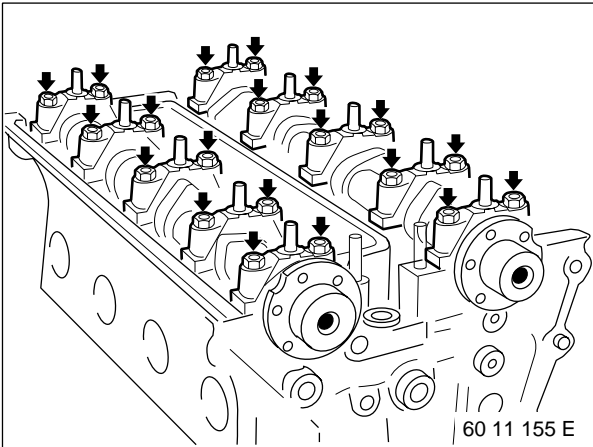
The exhaust camshaft bearing covers are legibly designated from the intake side with the letters A1 ... A5.



**Note:**

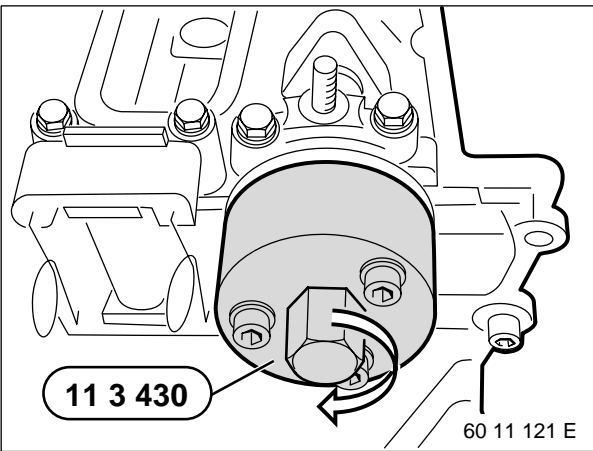
The intake camshaft bearing covers are legibly designated from the intake side with the letters E1 ... E5.

# 11/134

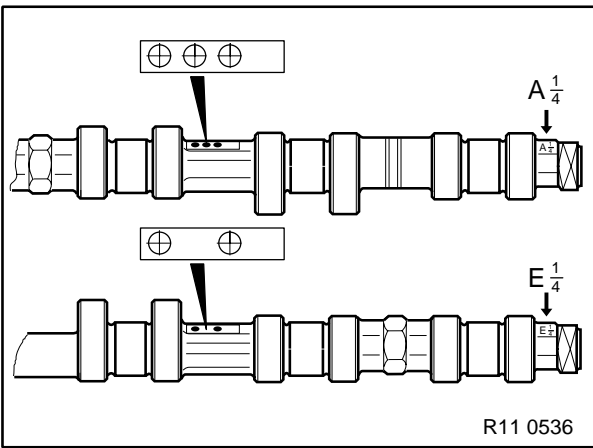


Evenly tighten down bearing covers on camshafts for cylinder bank 1-4 in 1/2 turn steps from outside to inside.

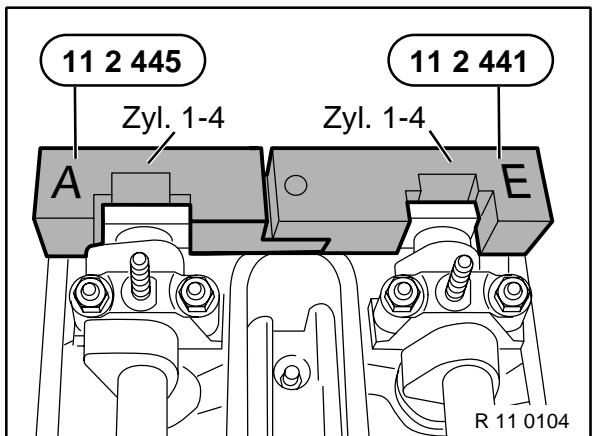
Tightening torque, refer to Technical Data 11 31 1AZ



Secure special tool 11 3 430 to camshaft.

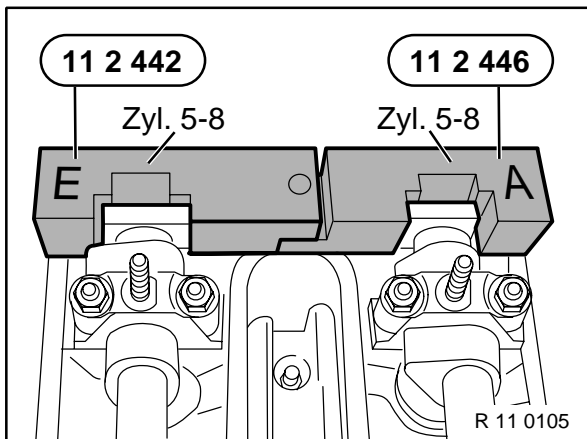


Rotate camshafts until marker bores face upwards.

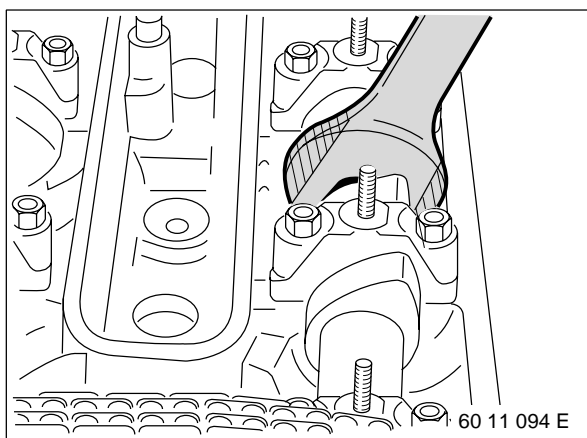


Fit special tool 11 2 445 / 441 to camshafts on cylinder bank 1-4.

# 11/135



Fit special tool 11 2 446 / 442 to camshafts on cylinder bank 5-8.

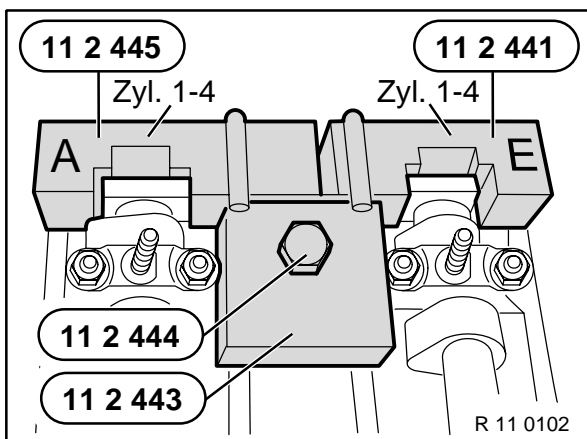


Align all camshafts with open-end wrench in such a way that special tools 11 2 445 / 441 / 446 / 442 locate without gap against cylinder heads.

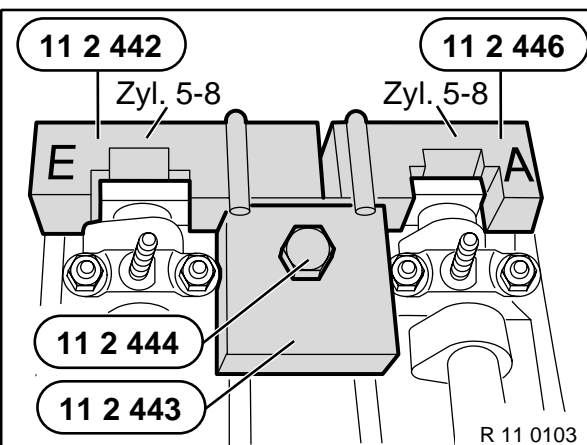
**Caution!**

Do not damage the cylinder head.

Machine open-end wrench accordingly if necessary.

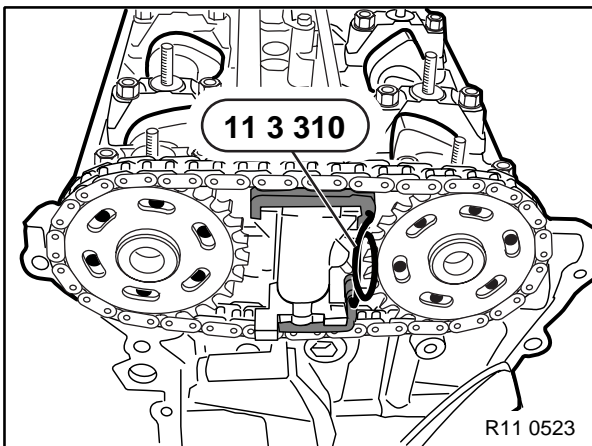


Fit special tool 11 2 443 to special tool 11 2 445 / 441 and secure with special tool 11 2 444 using the spark plug thread.



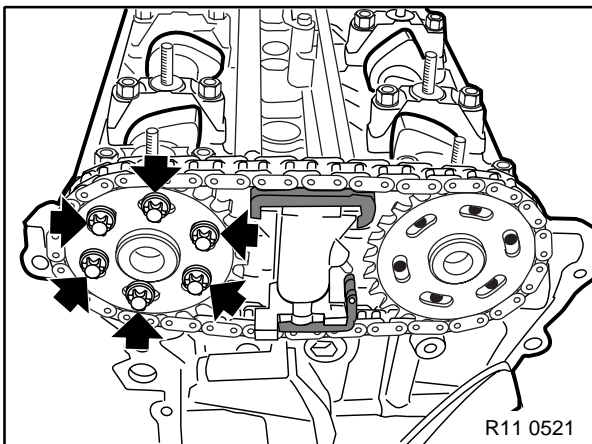
Fit special tool 11 2 443 to special tool 11 2 446 / 442 and secure with special tool 11 2 444 using the spark plug thread.

# 11/136

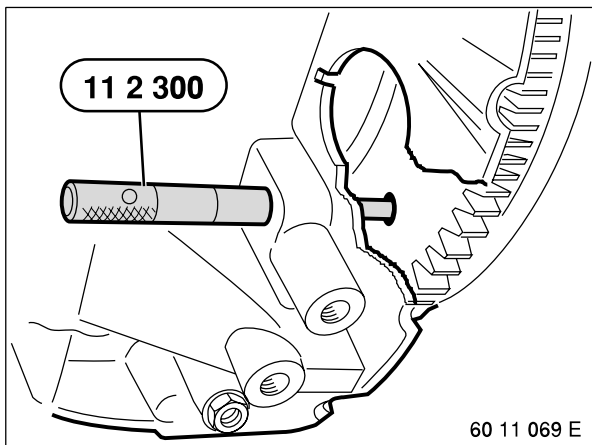


Fit secondary sprocket wheels with chain to camshafts on cylinder bank 1-4. Align long bores centrally.

Remove special tool 11 3 310 from chain tensioner.



Install screws in exhaust camshaft on cylinder bank 1-4 and fit flush.

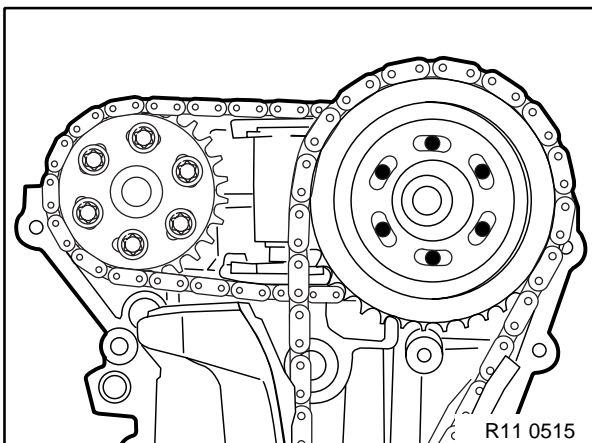


Rotate engine from 45° before TDC position engine-wise until in TDC position.

Hold crankshaft in TDC position with special tool 11 2 300.

**Caution!**

Remove special tool 11 2 300 before switching on the engine.

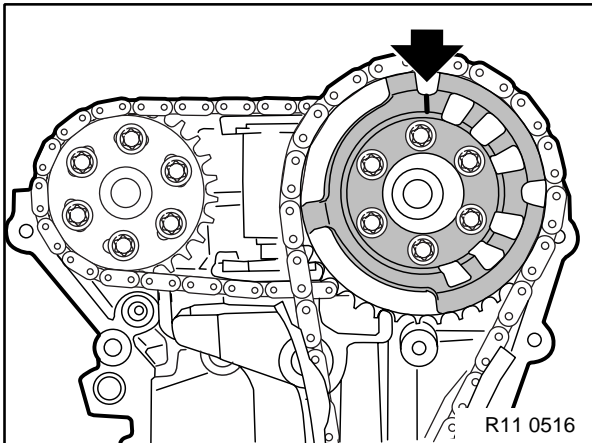


Fit sprocket with chain on intake camshaft of cylinder bank 1-4 with long bores centrally aligned.

Brace sprocket, press tensioning rail against the timing chain and check the position of the long bores.

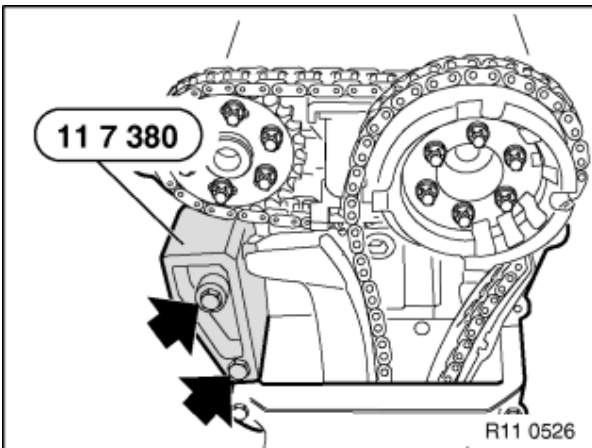
If necessary, remove sprocket once again and align position of long bores centrally.

# 11/137

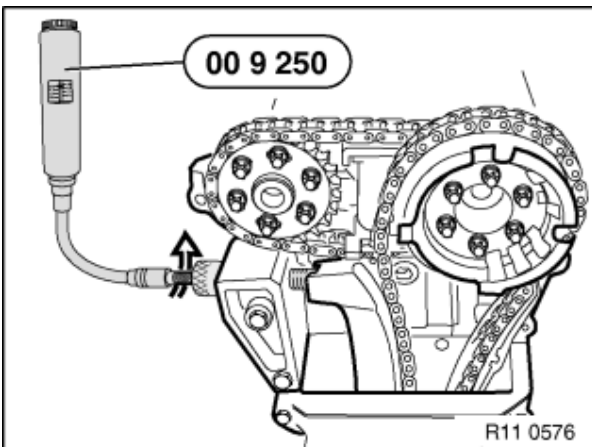


Fit sensor gear with mark on sensor gear in cylinder shaft pointing upwards.

Insert screws and fit flush.



Fit special tool 11 7 380 to right cylinder head (cylinder bank 1-4).



Install special tool 11 3 390 in special tool 11 7 380.

Tighten tensioning rail by turning the adjusting screw on the special tool 11 3 390 with special tool 00 9 250 to 0.7 Nm.

*Note:*

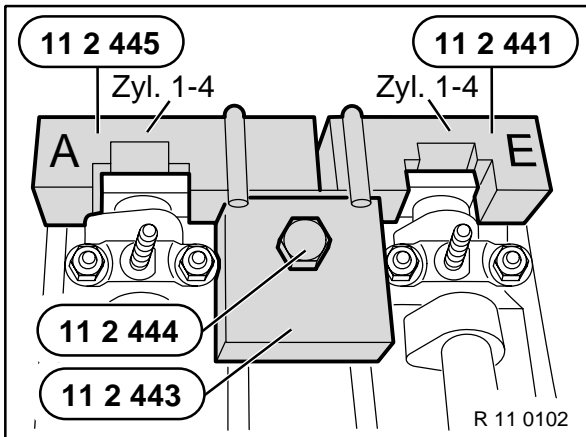
If installation tolerance is unfavorable, attach special tool 00 9 250 from underside.

Tighten sprockets in following order:

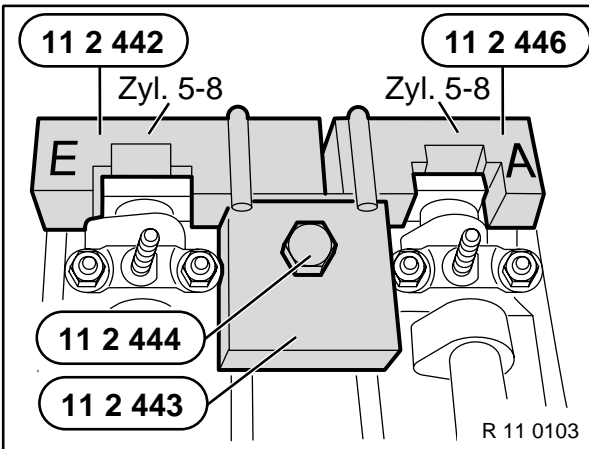
Three screws on left exhaust camshaft, all screws on right exhaust camshaft, three screws on left intake camshaft, all screws on right intake camshaft.

Tightening torque,  
refer to Technical Data 11 31 3AZ

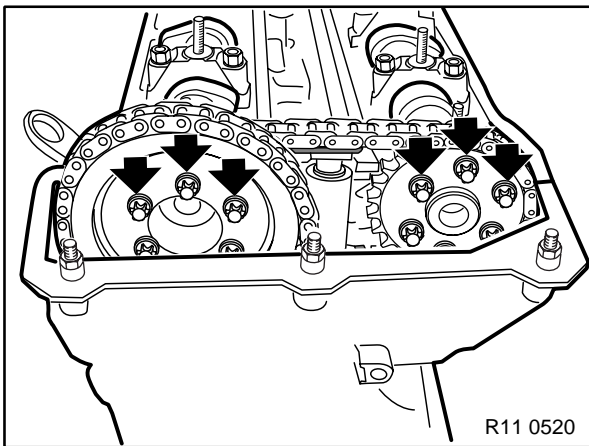
# 11/138



Remove special tools 11 2 444 / 443 / 441 / 445.



Remove special tools 11 2 444 / 443 / 442 / 446.

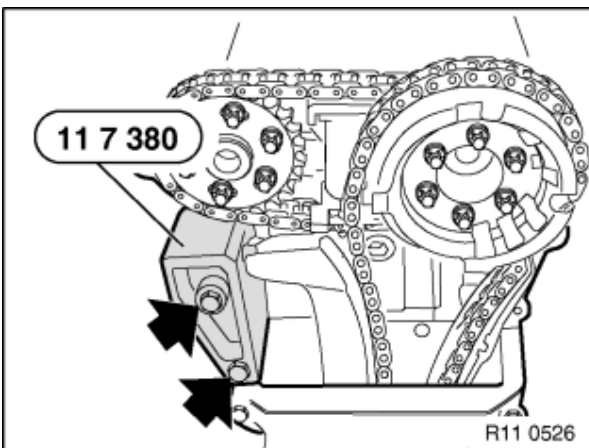


Remove special tool 11 2 300.

Turn over engine once.

Tighten down remaining three screws in exhaust and intake camshafts on cylinder bank 5-8.

Tightening torque,  
refer to Technical Data 11 31 3AZ



Relieve load on special tool 11 3 390 and remove with special tool 11 7 380.

Assemble engine.

# 11/139

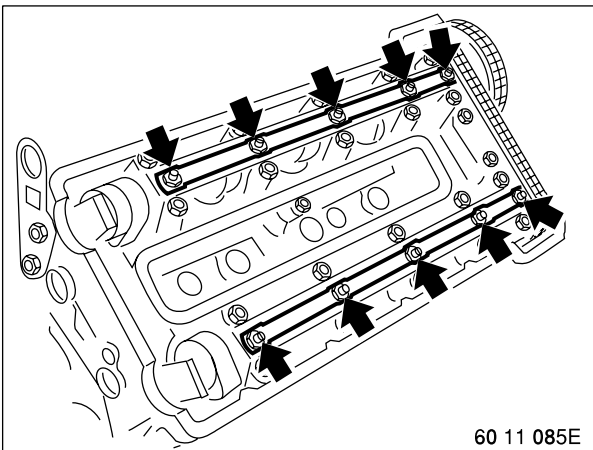
## 11 31 051 Replacing timing chain (M62)

### Removal

Removal of timing chain is described separately from installation. Assembly sequence for removal and installation is different.

Removing spark plugs,  
refer to 12 12 011

Remove both cylinder head covers,  
refer to 11 12 004



60 11 085E

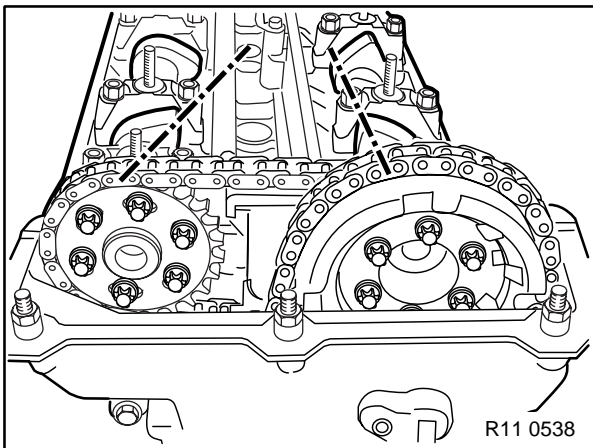
Remove oil lines on left and right of cylinder head.

Remove vibration damper,  
refer to 11 23 010

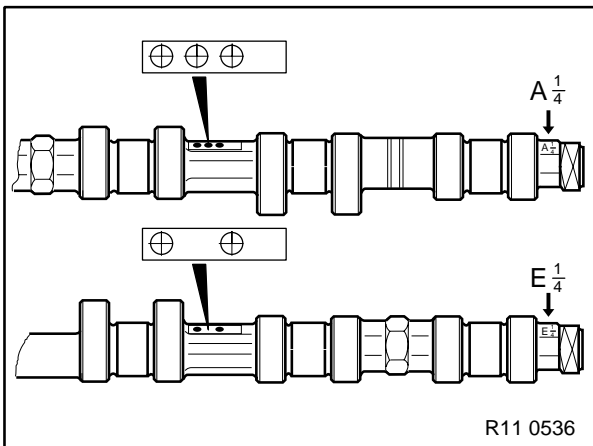
Loosen central screw on hub for vibration damper,  
refer to 11 23 031



# 11/140

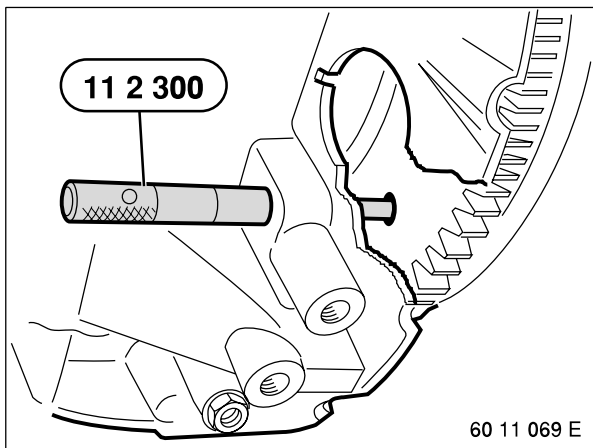


Turn engine engine-wise on loosened central screw until the first cylinder is in TDC position.



**Note:**

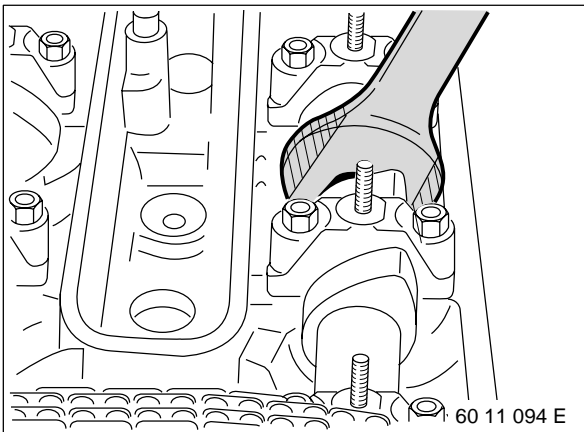
In TDC position of first cylinder, marker bores of camshafts point upwards.



Secure crankshaft in TDC position with special tool 11 2 300.

Remove top left and right timing case cover, refer to 11 14 080 / 11 14 085

# 11/141



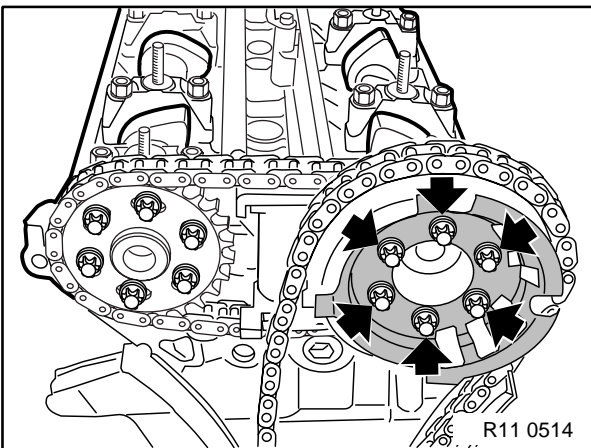
**Note:**

When camshaft screw connection is unfastened, brace camshaft on hex head.

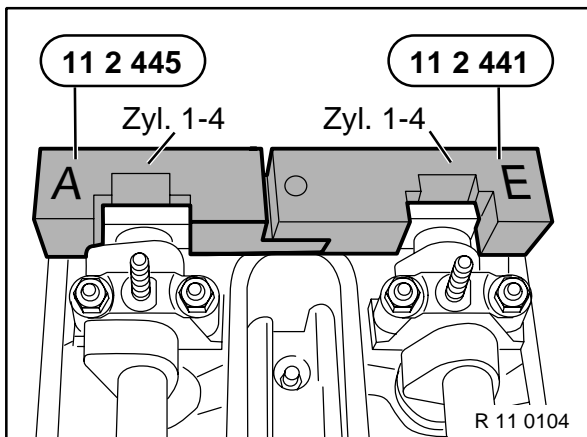
**Caution!**

Do not damage the cylinder head.

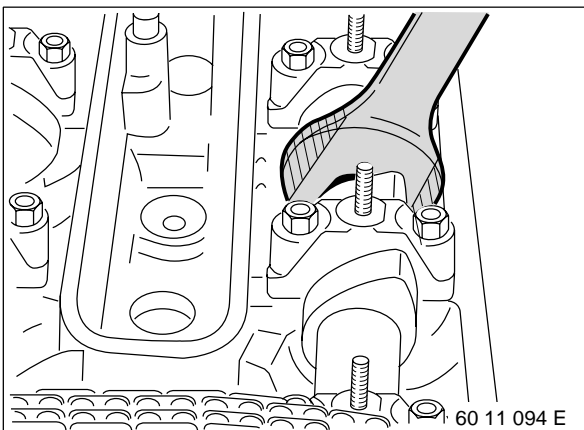
Machine open-end wrench accordingly if necessary.



Loosen sprocket on right intake camshaft (cylinder bank 1-4).



Fit special tool 11 2 445 / 441 to camshafts on cylinder bank 1-4.

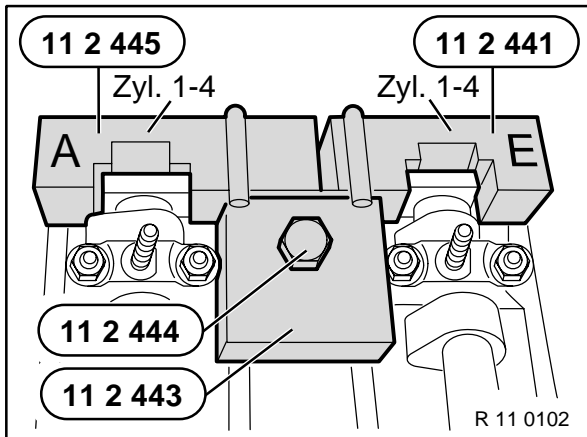


Align camshaft with open-end wrench in such a way that special tool 11 2 441 / 445 locates flush against the cylinder head.

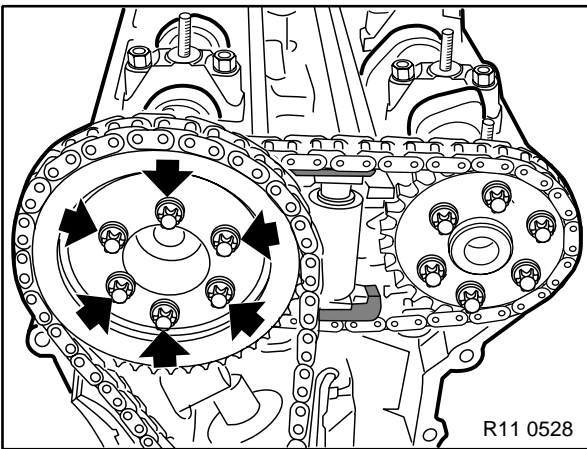
**Caution!**

Do not damage the cylinder head.

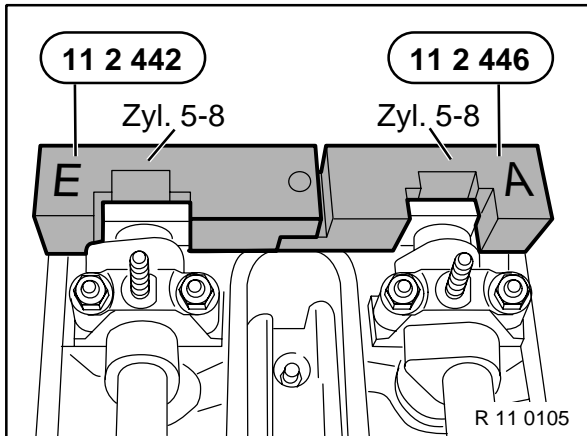
# 11/142



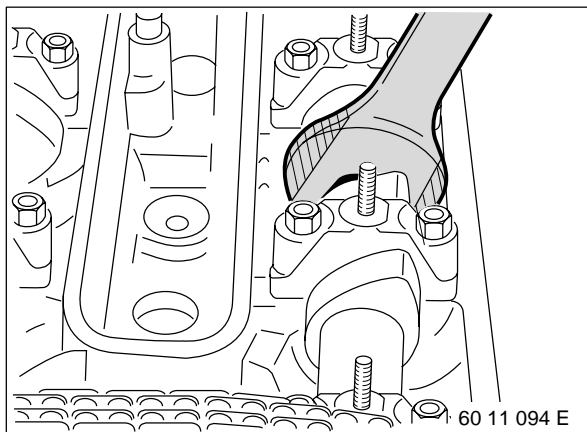
Fit special tool 11 2 443 to special tool 11 2 445 / 441 and secure with special tool 11 2 444 using the spark plug thread.



Loosen sprocket on left intake camshaft (cylinder bank 5-8).



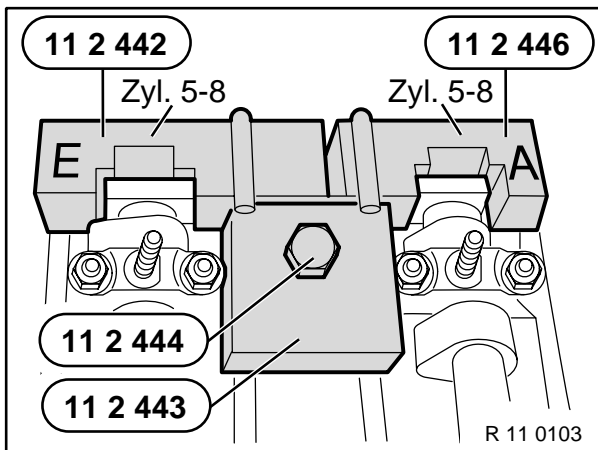
Fit special tool 11 2 446 / 442 to camshafts on cylinder bank 5-8.



Align camshaft with open-end wrench in such a way that special tool 11 2 442 / 446 locates flush against the cylinder head.

**Caution!**  
Do not damage the cylinder head.

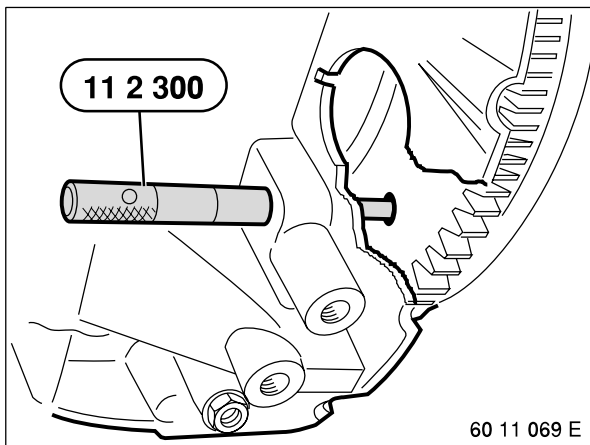
# 11/143



Fit special tool 11 2 443 to special tool 11 2 446 / 442 and secure with special tool 11 2 444 using the spark plug thread.

Remove loosened central screw and lift out hub for vibration damper,

Remove water pump with thermostat housing, refer to 11 51 000



**Caution!**

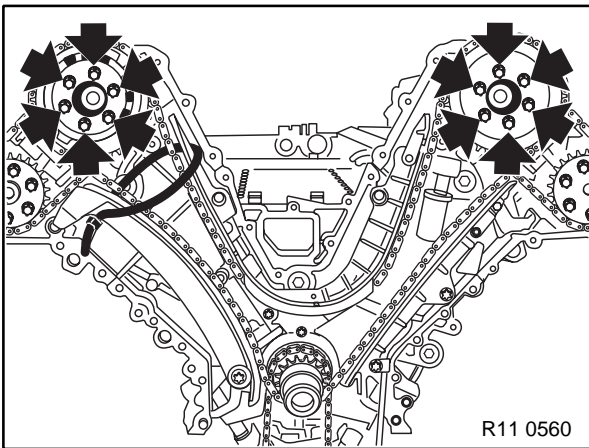
Do not turn engine any more.

Remove special tool 11 2 300.

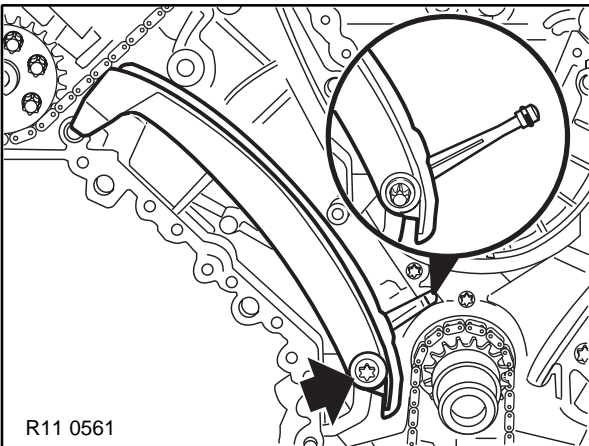
Remove upper section of oil pan, refer to 11 13 010

Removing gear case cover, bottom, refer to 11 14 110

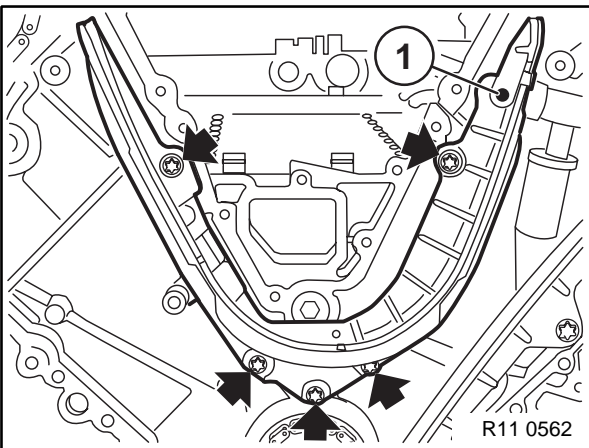
# 11/144



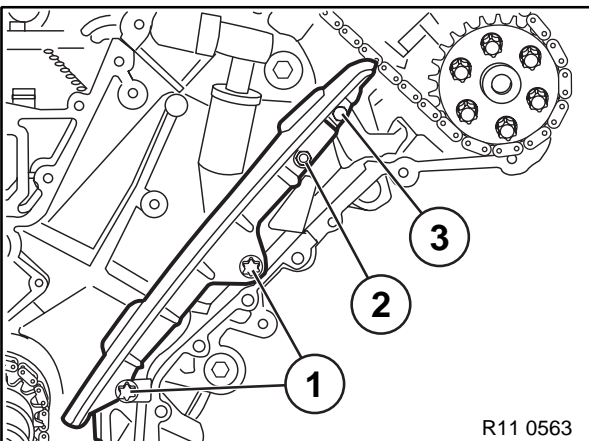
Remove sprockets from intake camshaft.  
Remove timing chain.



Unfasten tensioning rail.



Unfasten grub screw (1).  
Unfasten pivot rail.



First loosen screw (2) for oil separator.  
Unfasten screws (1 and 3) and remove guide rail.

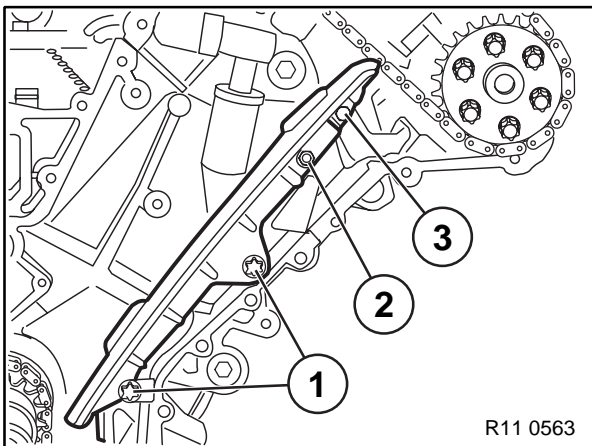
# 11/145

## Installation

Installation of the timing chain is described separately from removal. Assembly sequence for removal and installation is different.

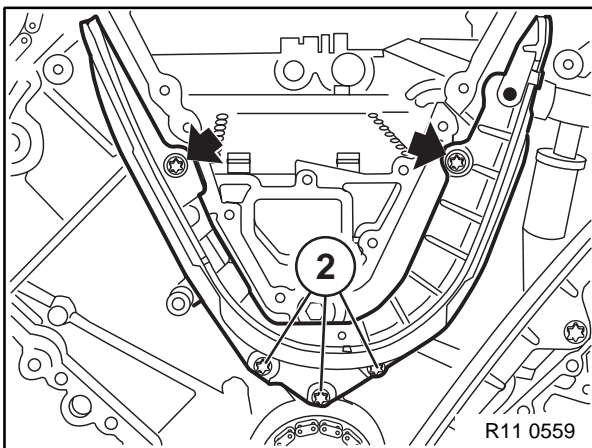
Check guide, reversing and tensioning rails and replace if necessary.

Check sprockets and replace if necessary.



Install guide rail.

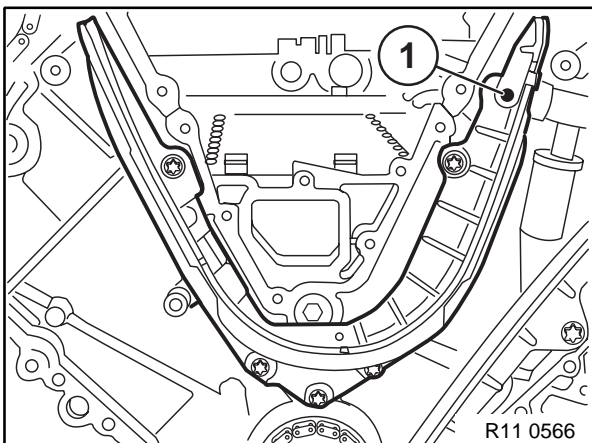
- Install all screws
- Tighten screws (1)
- Tighten screw (3)
- Tighten down screw (2) for oil separator



Replace O-rings on pivot rail.

Tightening torque of screws (2), refer to Technical Data 11 31 10AZ

Install and tighten down screws.



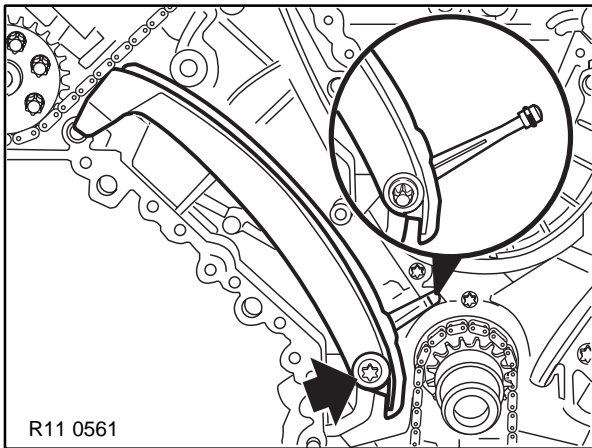
Replace grub screw (1).

Only tighten down grub screw (1) until it is flush with angle section: do not tighten down fully.

**Note:**

The grub screw (1) secures the angle bracket in the cylinder head.

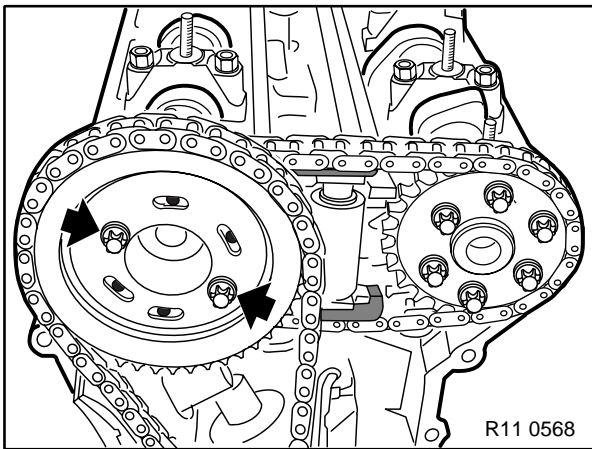
# 11/146



Replace O-ring.

Install oil guide for tensioning rail in the pivot rail.

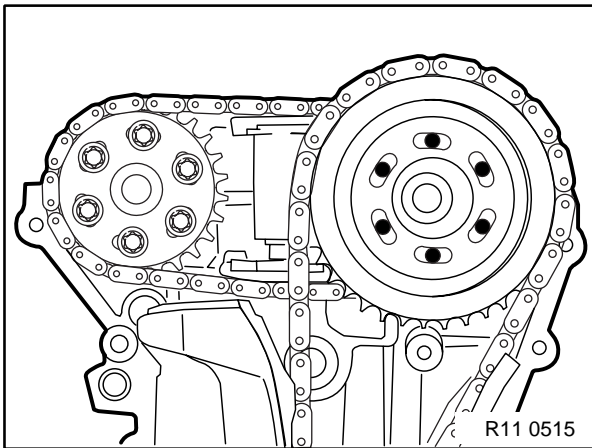
Tighten down tensioning rail.



Install new timing chain.

Fit sprocket with chain on intake camshaft of cylinder bank 5-8 with long bores centrally aligned.

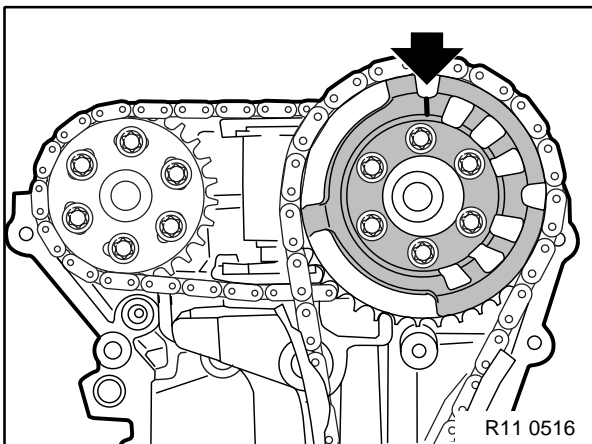
Install two screws and fit flush.



Fit sprocket with chain on intake camshaft of cylinder bank 1-4 with long bores centrally aligned.

Brace sprocket, press tensioning rail against the timing chain and check position of long bores on both cylinder banks.

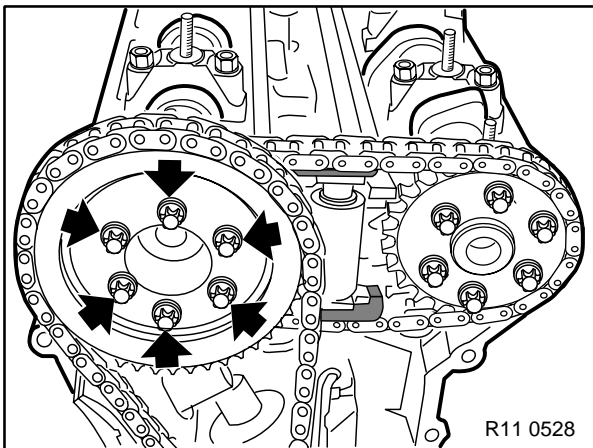
If necessary, remove sprockets once again and align long bores centrally.



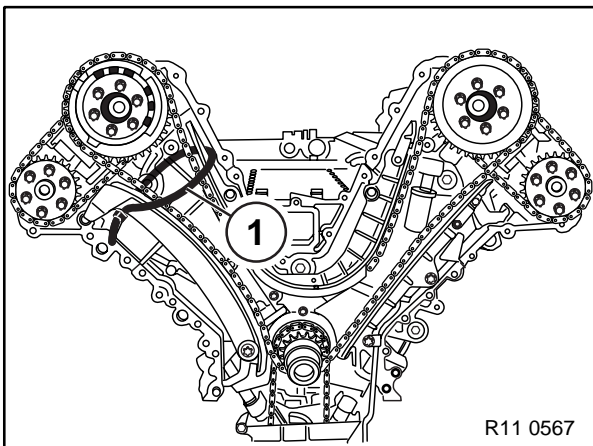
Fit sensor gear with mark on sensor gear in cylinder shaft pointing upwards.

Insert screws and fit flush.

# 11/147



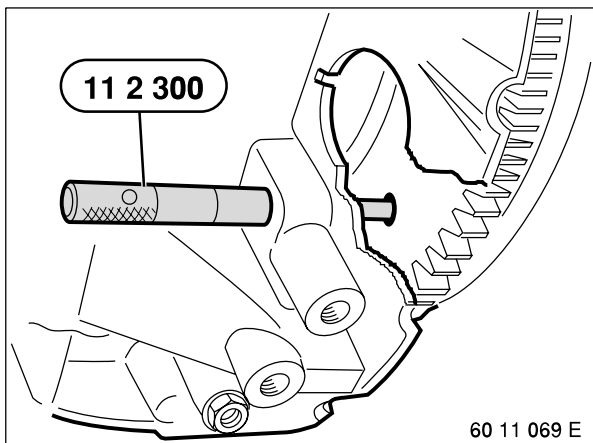
Install the remaining screws on the intake camshaft of cylinder bank 5-8 and fit flush.



Press tensioning rail against the timing chain. Secure tensioning rail with a plastic strap (1).

Install timing case cover underneath, refer to 11 14 110

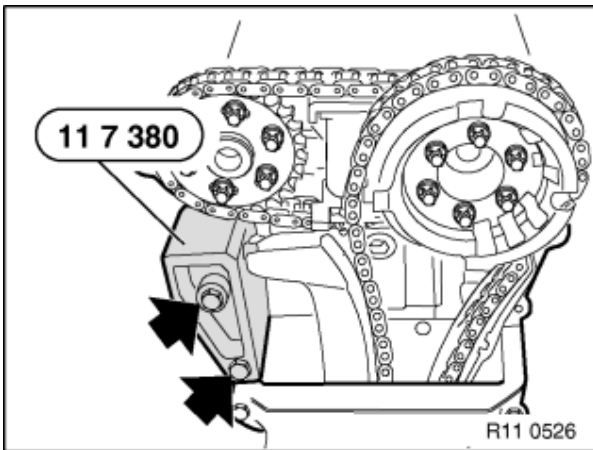
Install upper section of oil pan, refer to 11 13 010



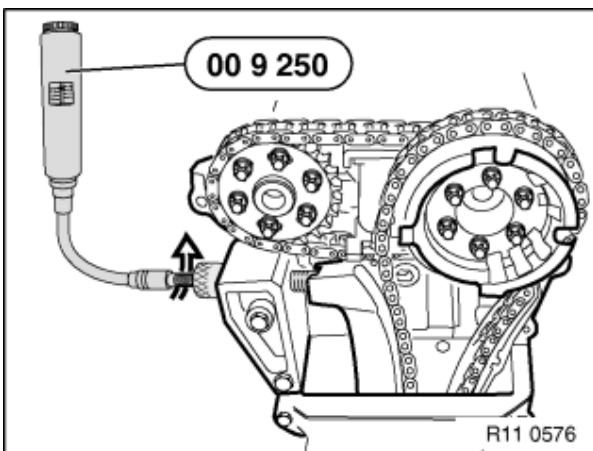
Secure crankshaft in TDC position with special tool 11 2 300.



# 11/148



Fit special tool 11 7 380 to right cylinder head (cylinder bank 1-4).

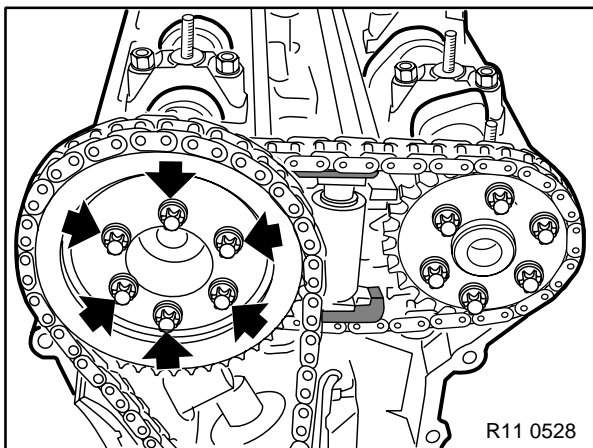


Install special tool 11 3 390 in special tool 11 7 380.

Tighten tensioning rail by turning the adjusting screw on the special tool 11 3 390 with special tool 00 9 250 to 0.7 Nm.

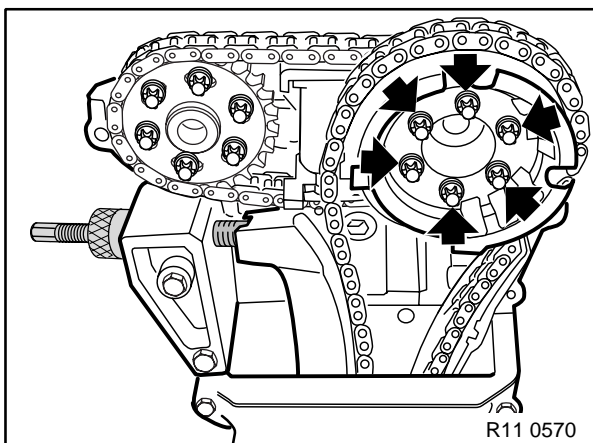
**Note:**

If installation tolerance is unfavorable, attach special tool 00 9 250 from underside.



Tighten sprocket of intake camshaft on cylinder bank 5-8.

Tightening torque, refer to Technical Data 11 31 3AZ

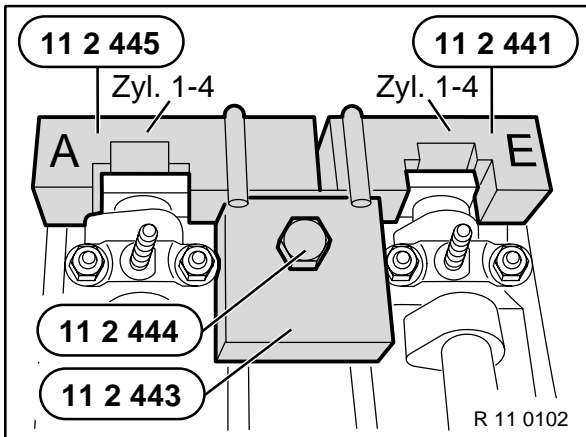


Tighten sprocket of intake camshaft on cylinder bank 1-4.

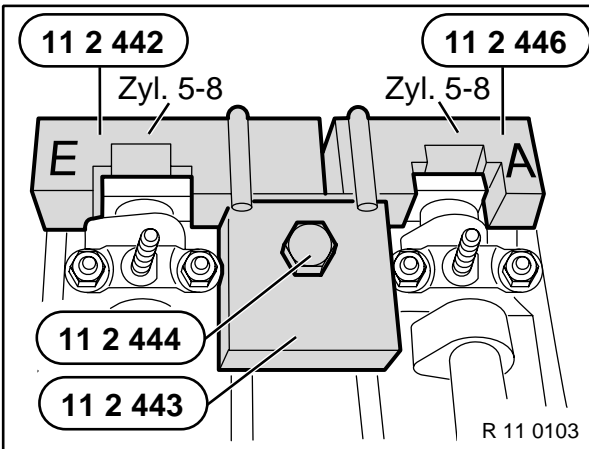
Tightening torque, refer to Technical Data 11 31 3AZ

# 11/149

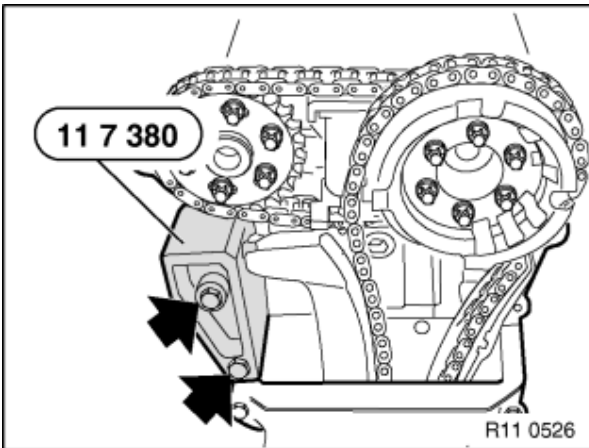
Remove special tools 11 2 444 / 443 / 441 / 445.



Remove special tools 11 2 444 / 443 / 442 / 446.

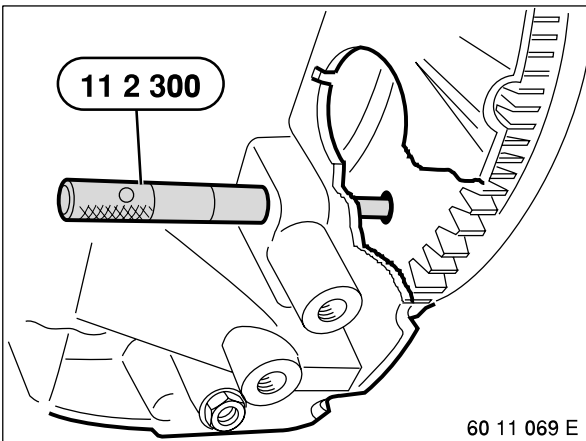


Relieve load on special tool 11 3 390 and remove with special tool 11 7 380.



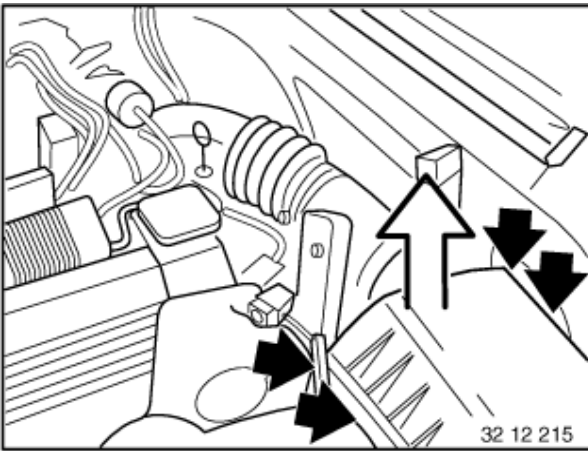
Remove special tool 11 2 300.

Assemble engine.



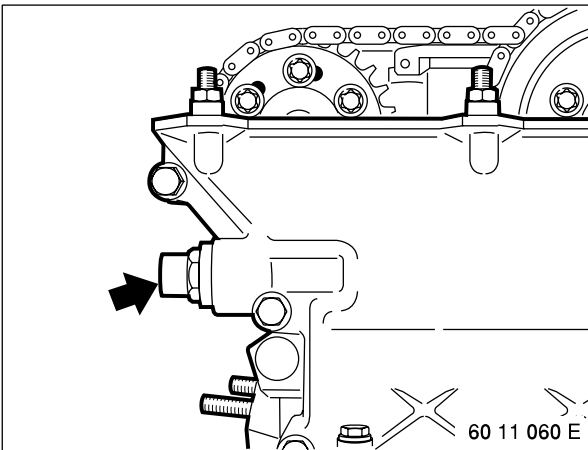
# 11/150

## 11 31 090 Installing and removing / replacing piston for chain tensioner (M62)



Remove upper section of suction filter housing style with mass air flow sensor.

Remove lower section of suction filter housing.

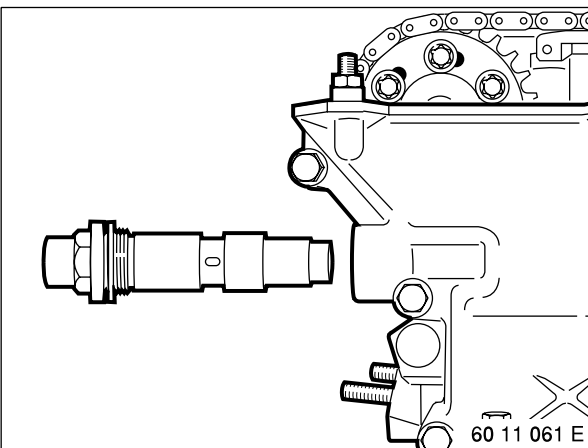


Unfasten screw connection.

*Installation:*

Replace sealing ring.

For tightening torque, refer to Technical Data 11 31 7AZ



Remove screw connection and piston for chain tensioner.



# 11/152

## 11 31 501 Replacing camshaft (M62)

(cylinder head removed)

Intake or exhaust end, as applicable.

Preliminary work is described in section on dismantling and assembling the cylinder head, refer to 11 12 503

Remove camshaft,  
refer to 11 31 011 / 11 31 015

# 11/153

## 11 34 552 Removing and installing / replacing all valves (M62)

(cylinder head removed)

Preliminary work is described in section on dismantling and assembling the cylinder head, refer to 11 12 503

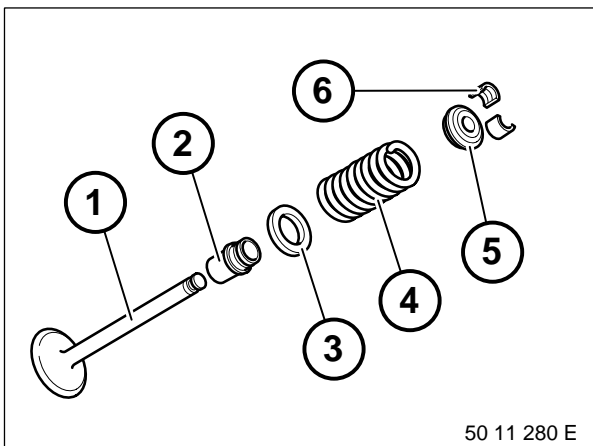
Replacing valve stem seals,  
refer to 11 34 560

Remove valves from cylinder head.

If necessary, check valve guide for wear,  
refer to 11 12 595

If necessary, ream the valve guide,  
refer to 11 12 600

If necessary, rework valve seat,  
refer to 11 12 527



Installation sequence:

- (1) Valve
- (2) Valve-stem seal
- (3) Lower plate spring
- (4) Valve spring
- (5) Upper plate spring
- (6) Valve tapers

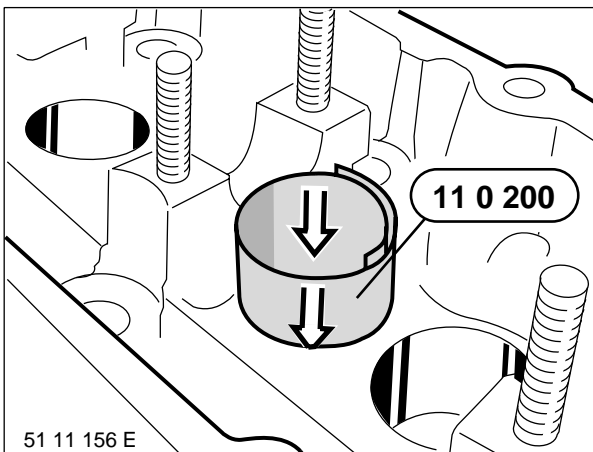
# 11/154

## 11 34 560 Replacing all valve-shaft seals (M62)

(cylinder head removed)

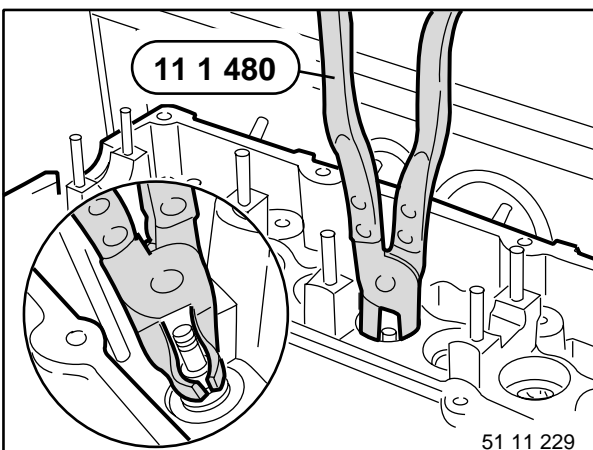
Preliminary work is described in section on dismantling  
and assembling the cylinder head,  
refer to 11 12 503

Removing all valve springs,  
refer to 11 34 715



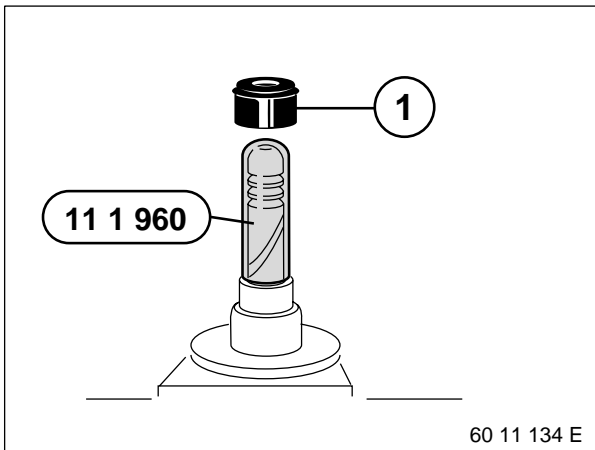
### **Caution!**

Do no damage races on bucket tappets. Fit protective  
film to special tool 11 0 200.

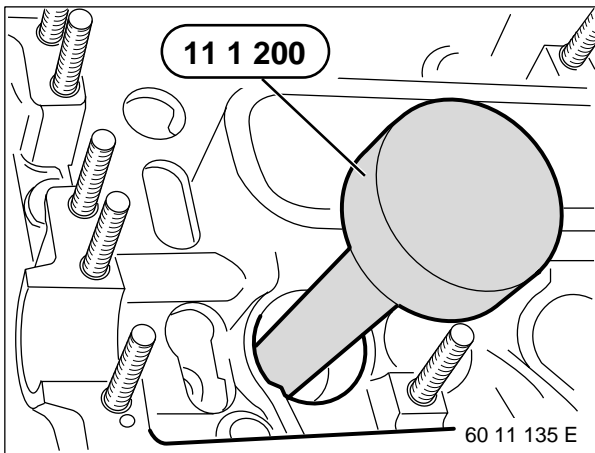


Remove valve stem seal with special tool 11 1 480.

# 11/155



Lubricate valve stem with oil and insert valve. Fit special tool 11 1 960. Coat new valve stem seal (1) with oil and install.



Press-fit valve stem seal firmly home by hand using special tool 11 1 200.



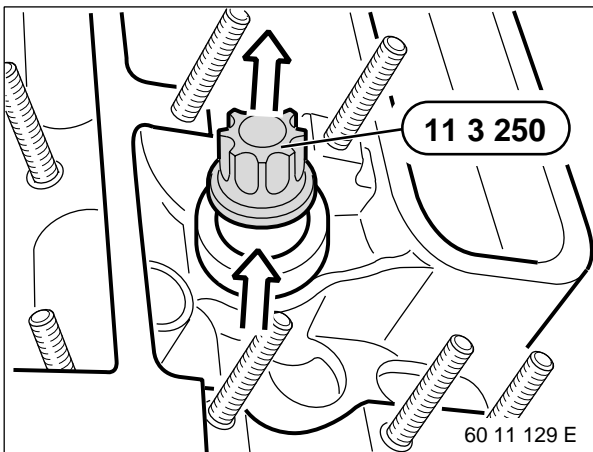
# 11/156

## 11 34 715 Replacing all valve springs (M62)

(cylinder head removed)

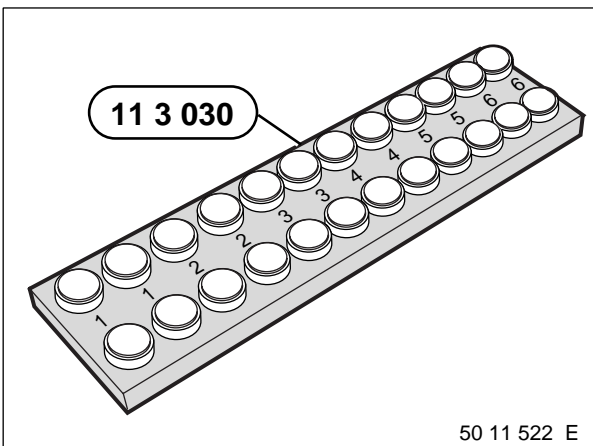
Preliminary work is described in section on dismantling and assembling the cylinder head, refer to 11 12 503

Removing camshaft,  
refer to 11 31 501



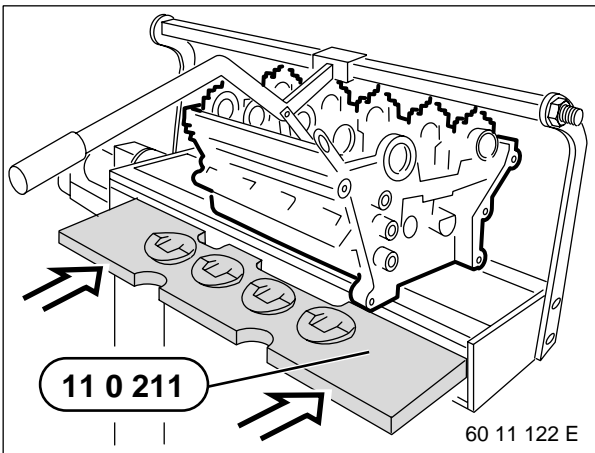
Remove bucket tappet with special tool 11 3 250.

**Installation:**  
Worn bucket tappets may only be reused in the same tappet bore.

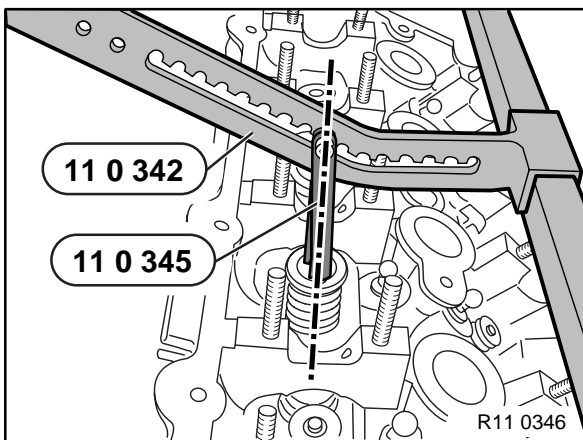


Arrange bucket tappets by cylinder and place on special tool 11 3 030 in correct order.

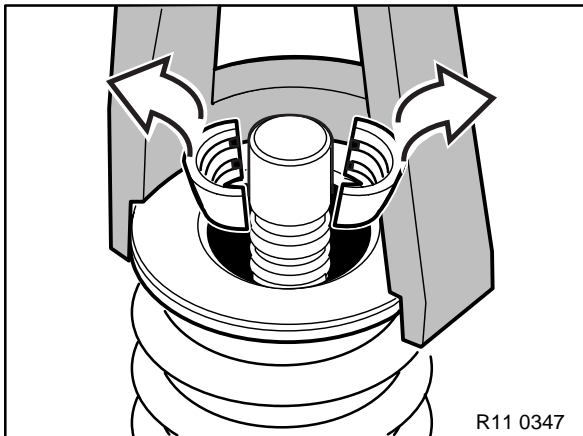
# 11/157



Fit special tool 11 0 211 from below in special tool 11 1 065 and secure with special tool 11 1 045.

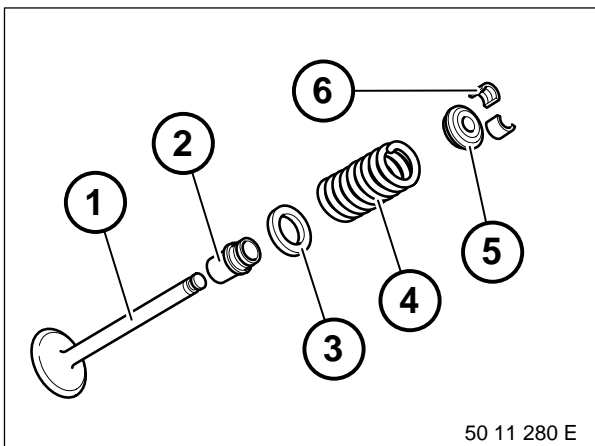


Align special tool 11 0 345 in direction of valve shaft and select appropriate groove in special tool 11 0 342.



Press down valve spring on spring cap, top, and remove valve keys.

Remove valve spring and plate spring.



Installation sequence:

- (1) Valve
- (2) Valve-stem seal
- (3) Lower plate spring
- (4) Valve spring
- (5) Upper plate spring
- (6) Valve tapers

# 11/288

## 11 40 000 Checking engine oil pressure (all 6- / 8- and 12-cylinder engines)

**Note:**

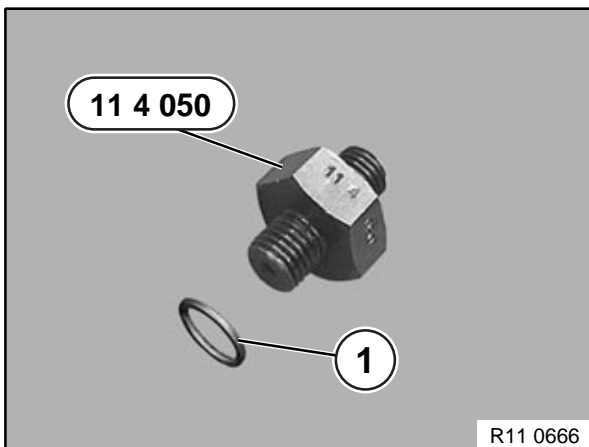
To check the engine oil pressure, remove oil pressure switch, install and connect special tools.

Unscrew oil filter cap, the engine oil flows out of the oil filter housing into the oil sump.

**Installation:**

Replace sealing ring.

Tightening Torque,  
refer to Technical Data 11 42 2AZ

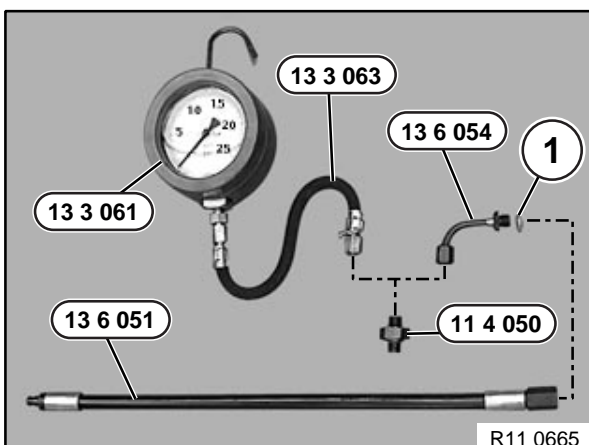


Remove oil pressure switch.

**Installation:**

Tightening Torque,  
refer to Technical Data 12 61 1AZ

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).

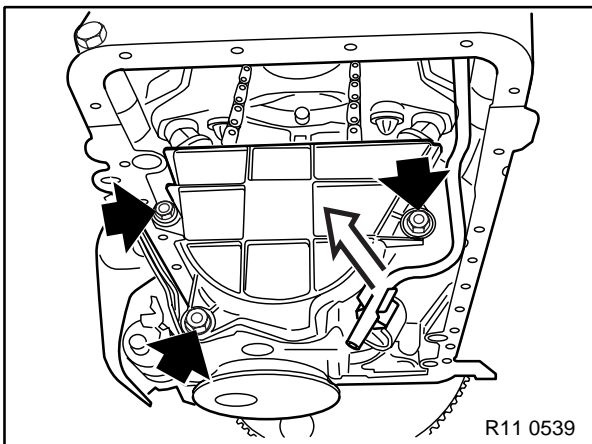
Start engine and check engine oil pressure.

Specified value,  
refer to Technical Data

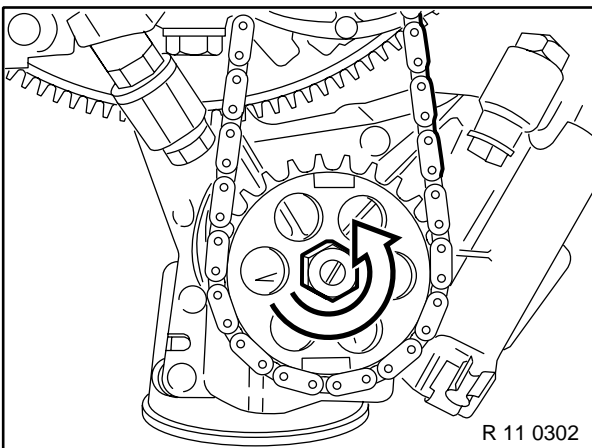
# 11/159

## 11 41 000 Removing and installing/replacing oil pump (M62)

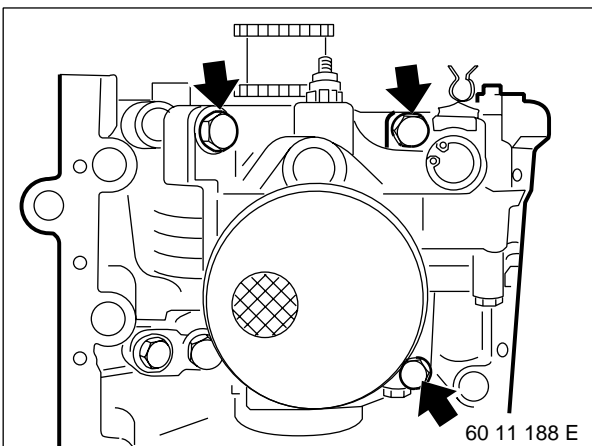
Remove lower section of oil pan,  
refer to 11 13 020



Unclip and remove oil return line.  
Unfasten cover for oil pump sprocket.



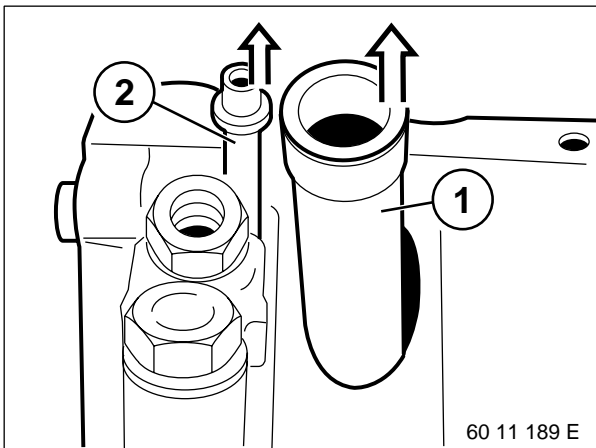
Unfasten oil pump sprocket and remove together with chain.



Unfasten oil pump screws.  
Remove oil pump.

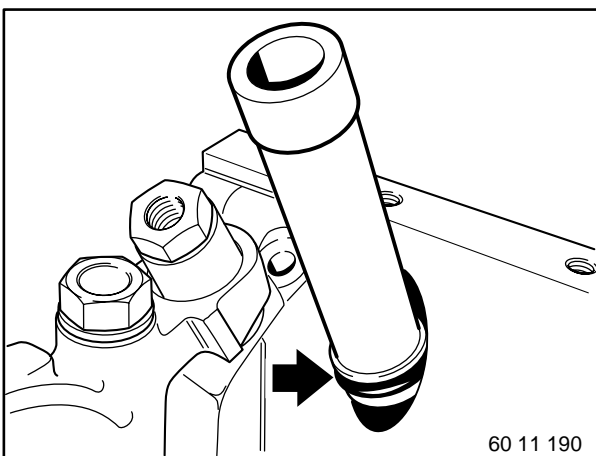
# 11/160

- (1) Remove upstream oil line (before filter) and
- (2) governing line (filtered oil) from engine block.



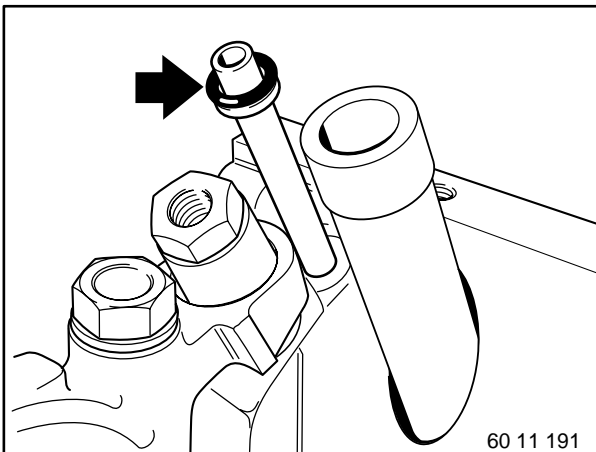
**Installation:**  
Replace sealing ring and apply light coat of oil.

**Caution!**  
Do not shear sealing ring on edge of housing.

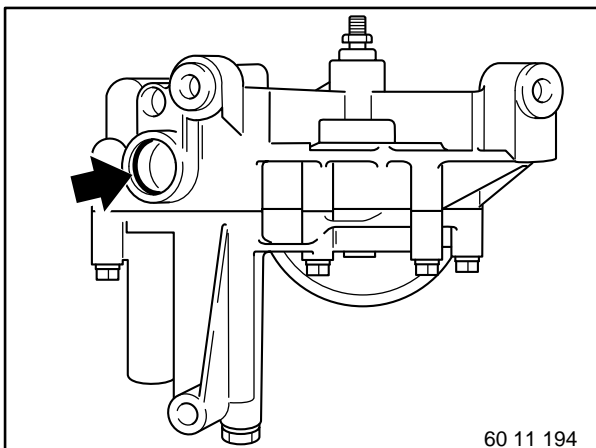


**Installation:**  
Install governing line (filtered oil) in engine block.  
Replace sealing ring.

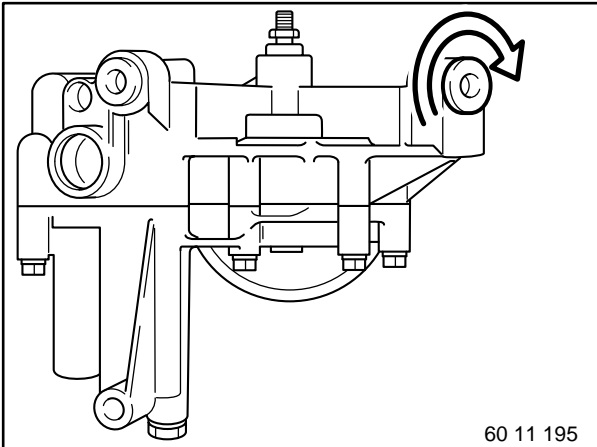
**Note:**  
Preassemble sealing ring on governing line.



**Installation:**  
Replace sealing ring in oil pump.

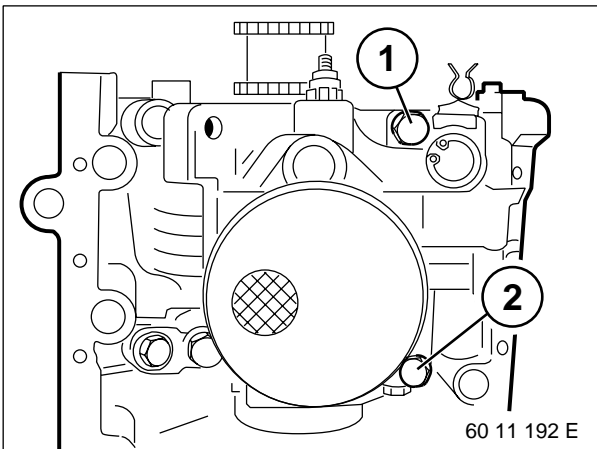


# 11/161



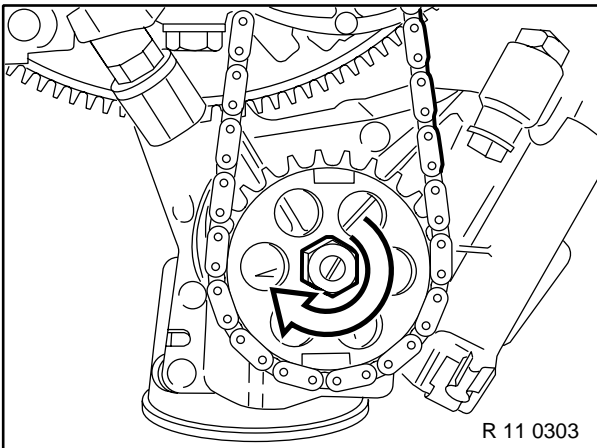
**Installation:**

Tighten cap screw firmly home in oil pump.



**Installation:**

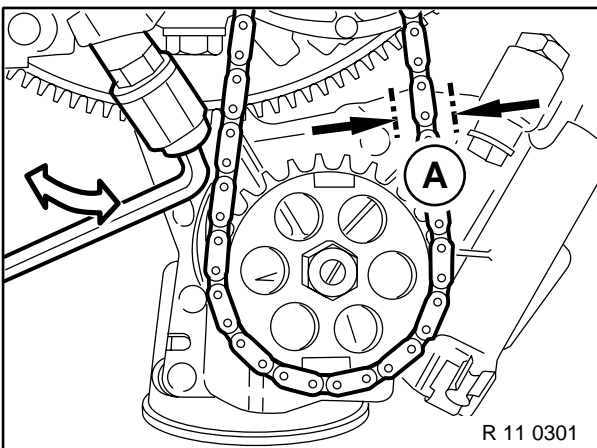
Fit oil pump and tighten down with nuts (1) and (2).



**Installation:**

Fit sprocket with chain and tighten nut.

Tightening torque,  
refer to Technical Data 11 41 4AZ



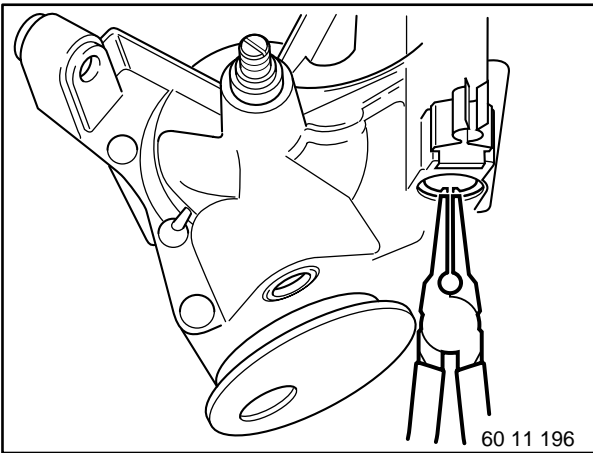
**Installation:**

Adjust chain deflection ( $A = 10 \pm 2$  mm) by turning adjustment hex screw in the oil pump. Install screw and tighten down.

**Note:**

Use screwdriver insert (bit), Allen key (long version) or similar tools with long hex head. In the procedure illustrated in this diagram, the short leg of a standard Allen key is shortened to approx. 32 mm.

# 11/162

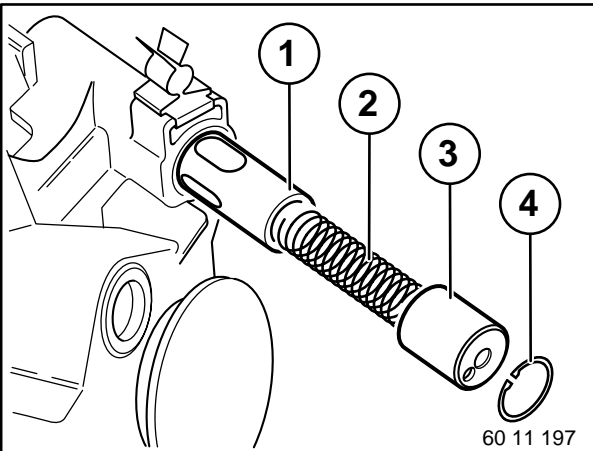


If necessary, remove oil pressure control piston.

Press sleeve downwards with suitable drift.

**Caution!**  
High spring pressure.

Remove circlip.

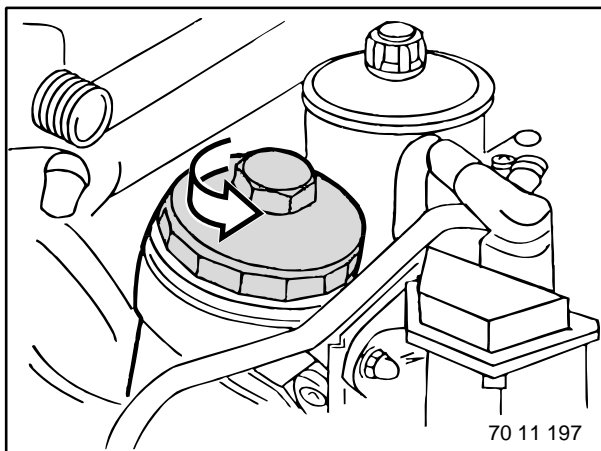


**Installation:**

- (1) Control piston
- (2) Spring
- (3) Sleeve
- (4) Circlip

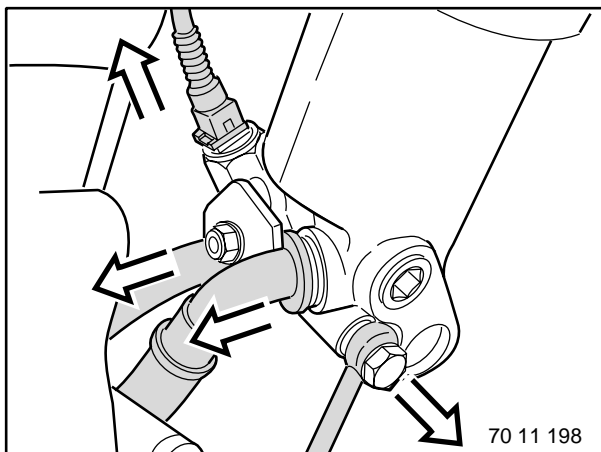
# 11/163

## 11 42 020 Removing and installing / replacing complete full flow oil filter (M62)



Unfasten oil filter cover to allow oil to flow out of full-flow oil filter housing and back into oil pan.

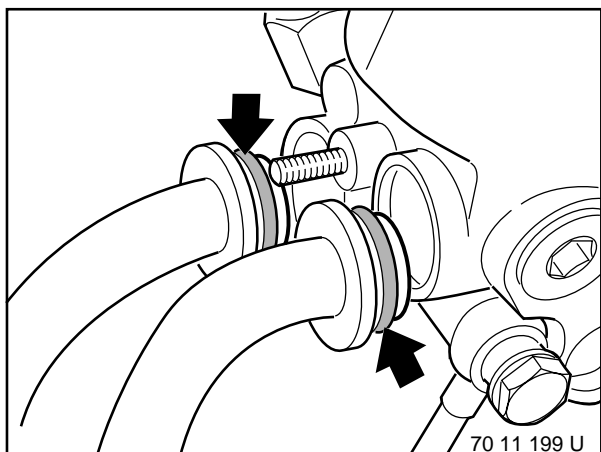
This operation is described in section on BMW engine oil service, refer to 00 00 249



Disconnect plug connection on oil pressure switch.

Unfasten bracket on oil lines.

Remove oil lines from main flow oil filter housing.



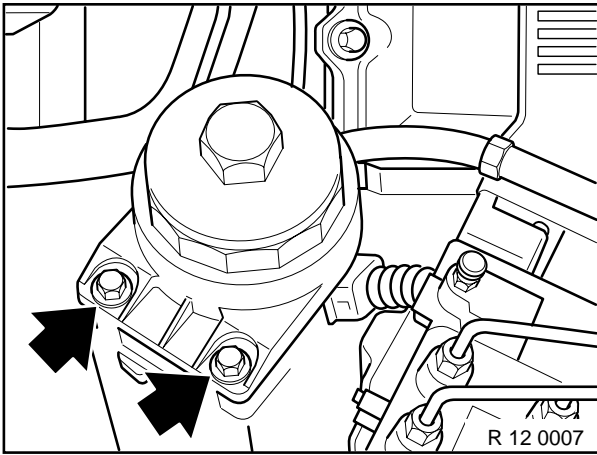
**Installation:**

Replace sealing rings.



# 11/164

Unfasten main flow oil filter housing from bracket.



# 11/165

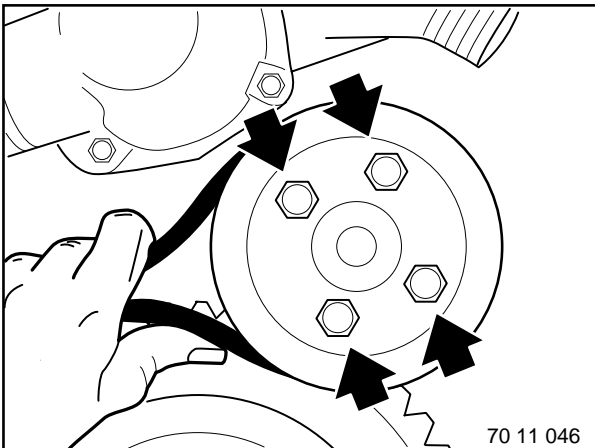
## 11 51 000 Removing and installing / replacing water pump (M62)

Drain off coolant and dispose of correctly.

***Installation:***

Bleeding cooling system and checking for water leaks, refer to 17 00 039

Remove vibration damper, refer to 11 23 010



Release belt pulley.

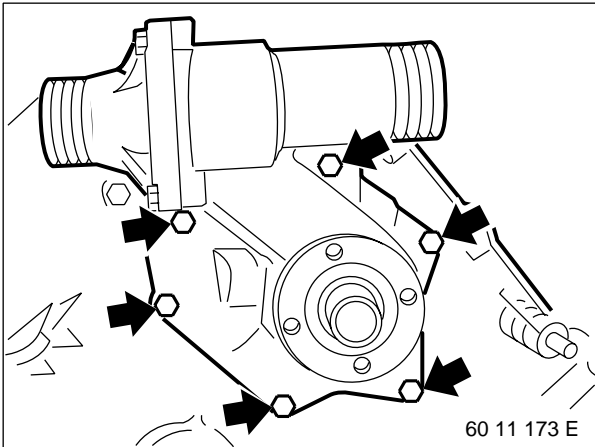
Remove coolant hose between expansion tank and water pump.

Remove coolant hose to lid on thermostat housing.

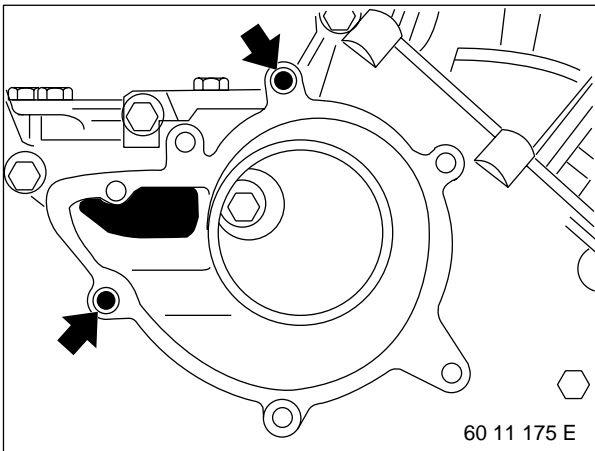
Remove lid to thermostat housing and thermostat.

# 11/166

Unfasten screws and remove water pump.

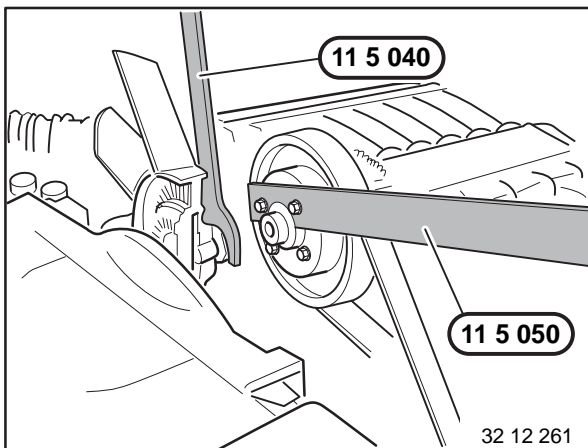


**Installation:**  
Make sure that sleeves are correctly seated.  
Clean sealing faces, replace gasket.



# 11/167

## 11 52 020 Removing and installing or replacing fan coupling (M62)

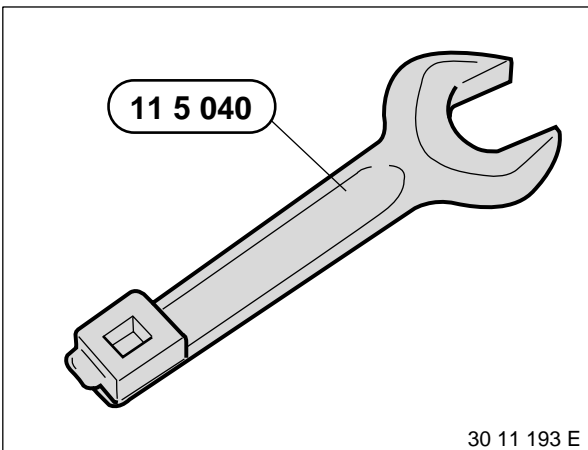


### **Caution!**

Left-hand threads.

Using special tool 11 5 050 brace against pulley and unfasten cap nut from water pump using special tool 11 5 040.

Remove fan wheel with fan coupling from water pump.



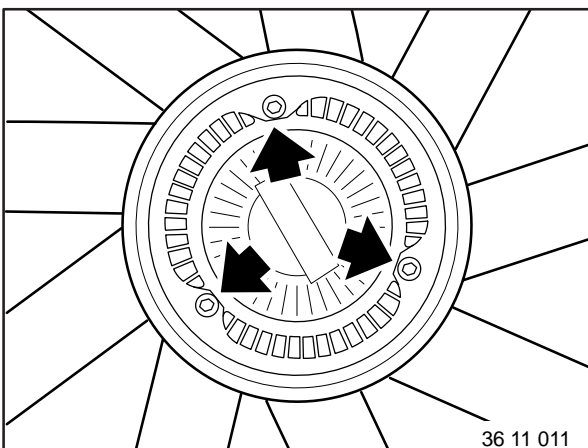
### **Installation:**

Tighten down fan wheel using special tool 11 5 040.

Tightening torque, refer to Technical Data 11 52 1AZ

### **Note:**

When using special tool 11 5 040, 30 Nm on the torque wrench scale are equivalent to a tightening torque of 40 Nm.



Unfasten screws and detach fan from fan coupling.

# 11/168

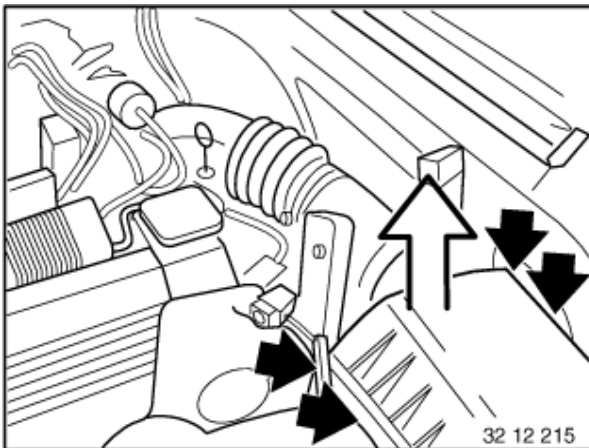
## 11 53 000 Removing and installing / replacing coolant thermostat (M62)

Unscrew and remove splash guard.

Drain off coolant and dispose of correctly.

***Installation:***

Bleed cooling system and check for water leaks, refer to 17 00 039



Remove upper section of suction filter housing style with mass air flow sensor.

Disconnect coolant hose.

Disconnect plug-in connection.

Unfasten thermostat housing cover with integral thermostat.

***Installation:***

Replace sealing ring.

# 11/169

## 11 53 325 Removing and installing/replacing coolant manifold (M62)

Remove intake air manifold,  
refer to 11 61 050

Unscrew and remove splash guard.

Drain off coolant and dispose of correctly.

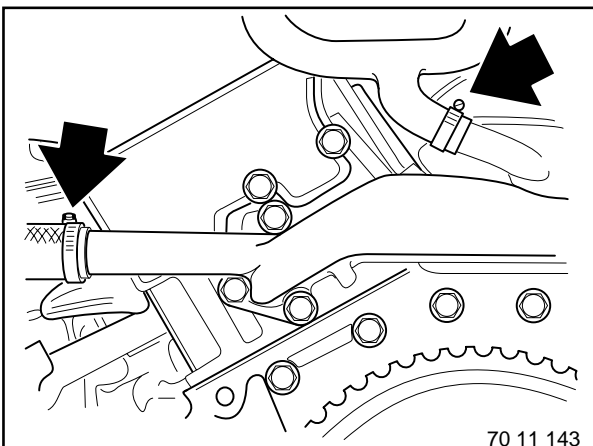
**Installation:**

Replace sealing ring.

Tightening torque,  
refer to Technical Data 11 11 5AZ

**E38 only:**

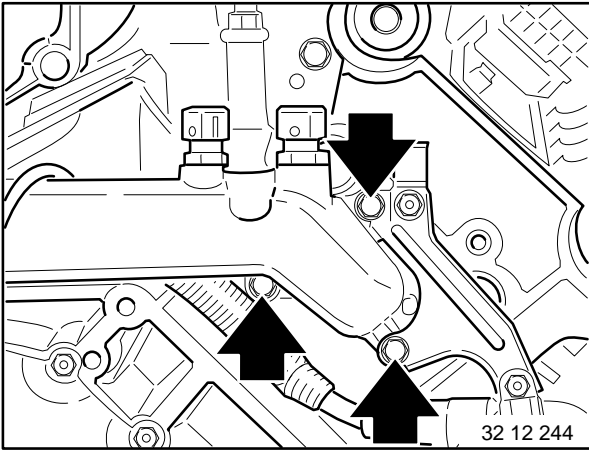
To improve access to the coolant manifold, lift water  
valve out of mounting and press to one side.



70 11 143

Remove all coolant hoses from coolant manifold.

# 11/170



Unfasten left and right screw connection on coolant manifold.

***Installation:***

Clean sealing faces and replace gaskets and seals.

# 11/171

## 11 61 050 Removing and installing intake air manifold (M62)

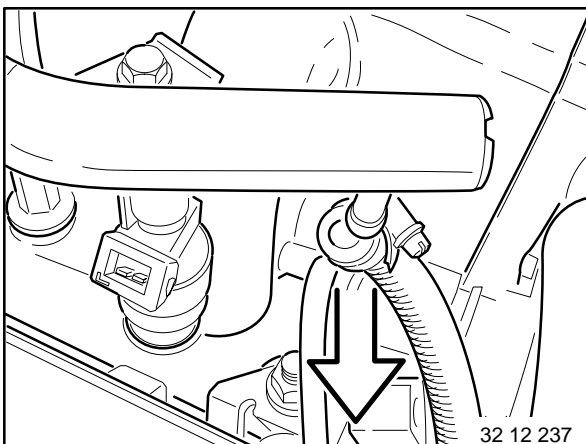
Follow instructions for connecting/disconnecting battery,  
refer to General Information, MG12  
Disconnect negative battery lead.

Unfasten engine section of wiring harness from intake air manifold and place to one side with cable ducts,  
refer to 12 51 001

Remove ASC+T throttle body,  
refer to 13 54 060

Disconnect Bowden cables for throttle valve actuation.

This operation is described in section on removing and installing / sealing throttle body,  
refer to 13 54 030



**Caution!**

Catch and dispose of escaping fuel.

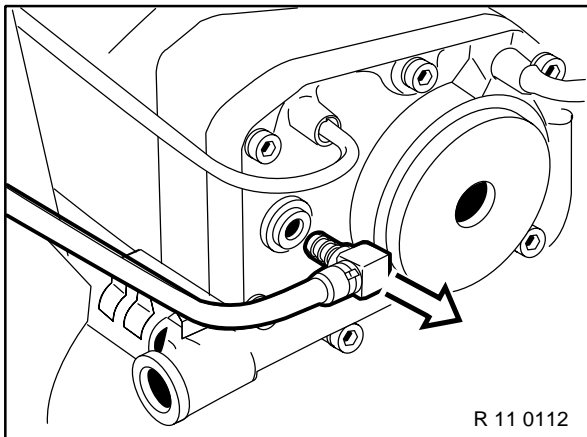
Remove fuel supply and return lines on injection pipe.

Note instructions on removal and installation of fuel hoses,  
refer to 13 53 540



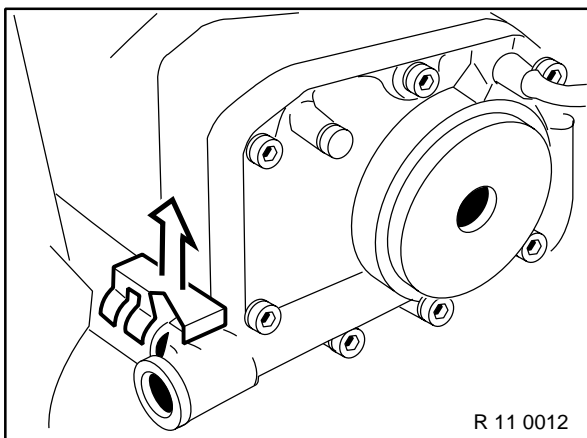
# 11/172

Remove connector for brake force booster.

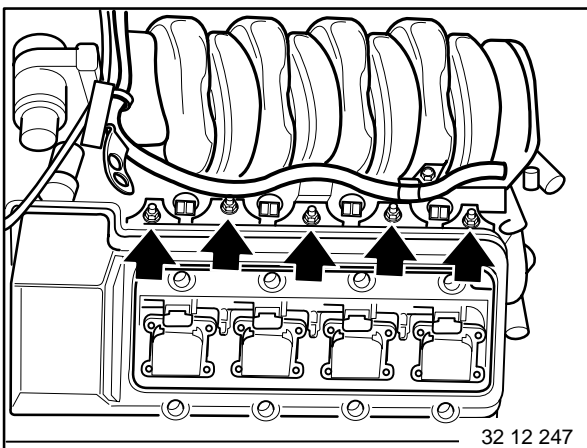


Remove clip and slide engine vent tube forwards.

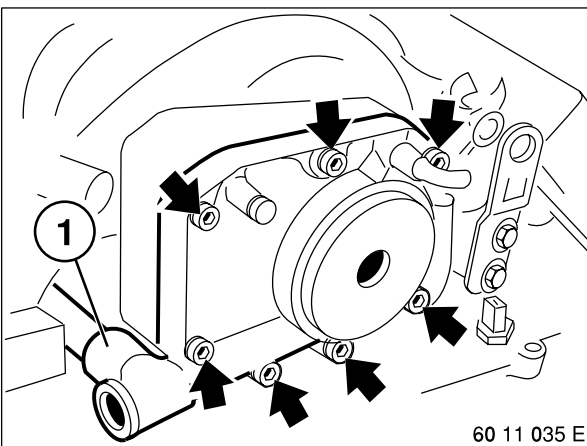
*Installation:*  
Check/replace sealing ring.



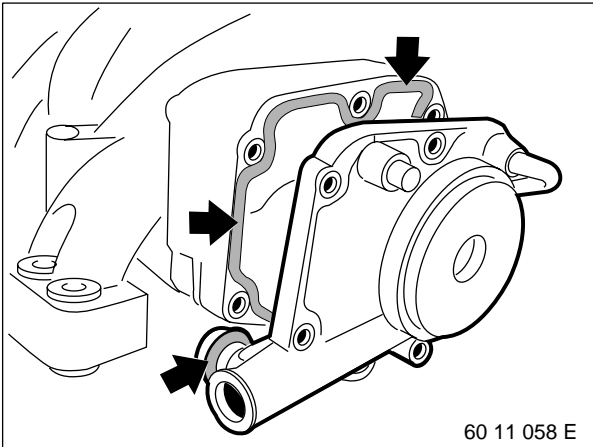
Unfasten nuts (left and right). Remove decoupling elements and lift intake air manifold upwards to remove.



If necessary, remove cover (1) with non-return valve.

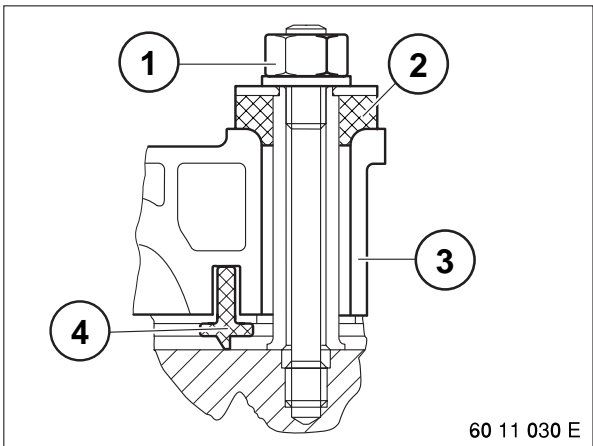


# 11/173



**Installation:**

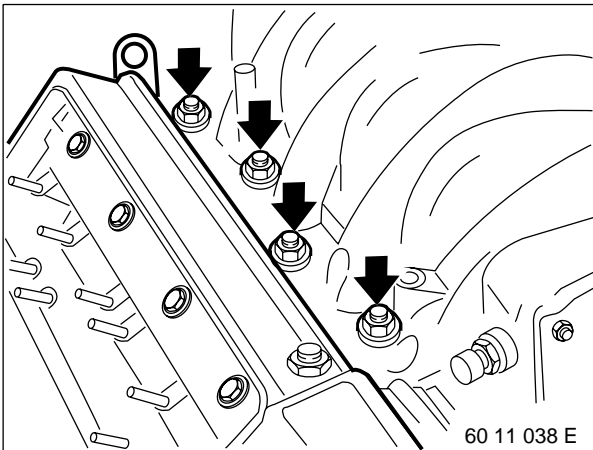
Check seal and gasket and replace if necessary.



**Note:**

To prevent the propagation of vibration, the intake manifold is separated from the cylinder head by decoupling elements and gaskets.

- (1) Nut
- (2) Decoupling element
- (3) Intake air manifold
- (4) Seal



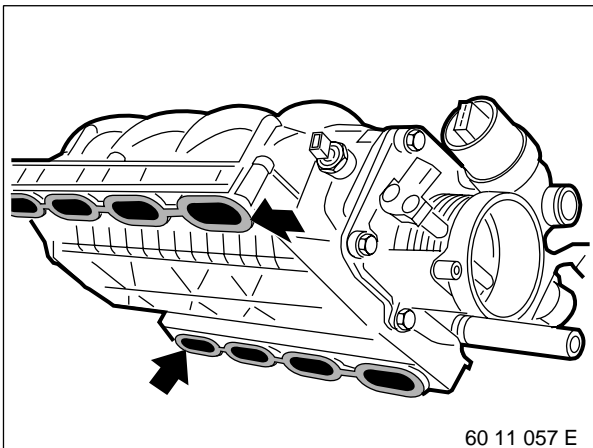
**Installation:**

Fit two decoupling elements on left and right with nuts and do not tighten (i.e. no preload).

Align intake air manifold.

Fit all other decoupling elements with nuts and tighten crosswise from inside to outside.

Tightening torque, refer to Technical Data 11 61 1AZ



**Installation:**

Check gaskets and replace if necessary.

**Caution!**

Ensure that gaskets are correctly seated.

# 11/174

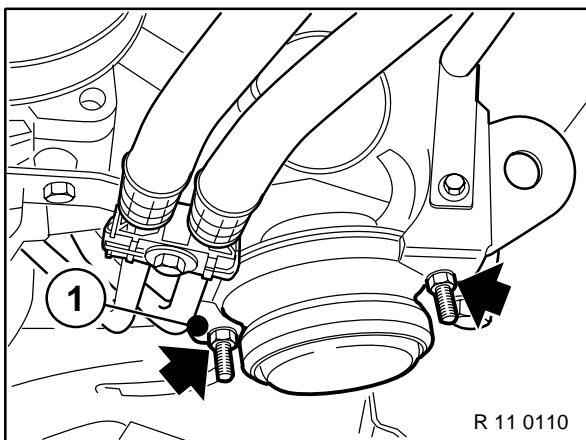
## 11 62 142 Removing and installing/replacing both left exhaust manifolds (M62)

(Cylinder bank 5-8)

Unscrew and remove splash guard.

Remove exhaust system.

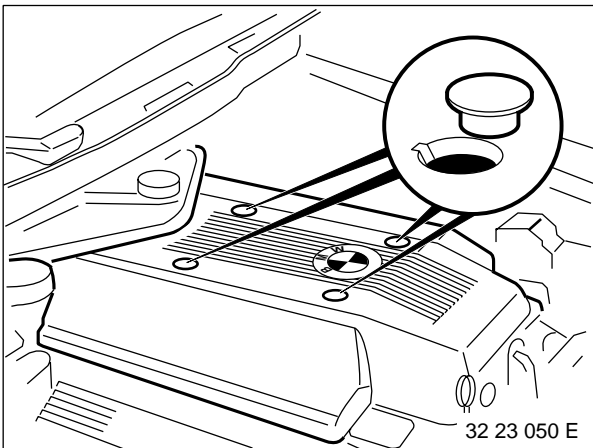
Remove left heat baffle plate.



Unfasten nuts from left engine mount approx. 8 mm.

*Installation:*

Note guide lug (1).

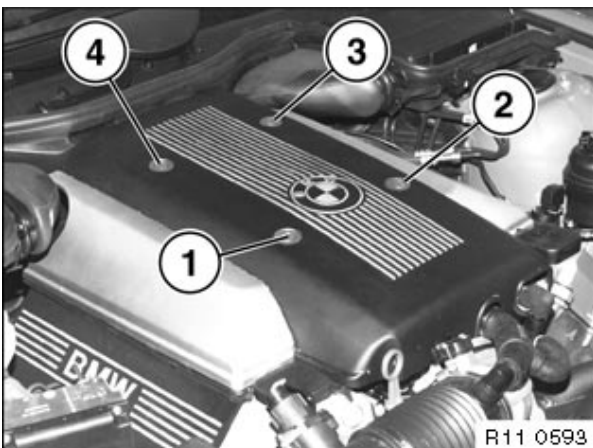


### Version 1

(acoustic cover screwed down)

Pry out sealing cap. Unscrew nuts.

Remove acoustic cover.



### Version 2

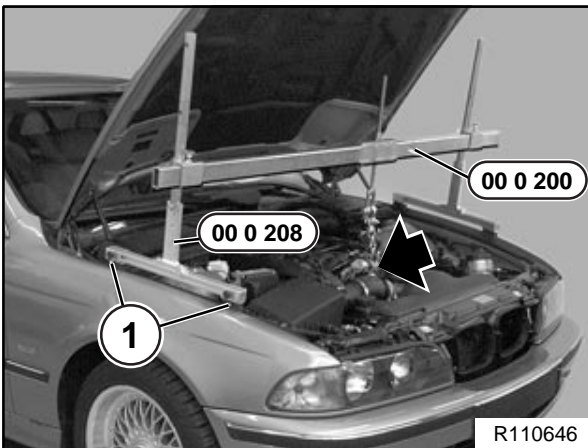
(acoustic cover with press-stud fastener)

Open press-studs (1 ... 4) one at a time, at the same time lifting the acoustic cover slightly. Once all four press-studs have been opened, remove the acoustic cover.

*Installation:*

Position acoustic cover and press downwards until press-studs (1 ... 4) click into place.

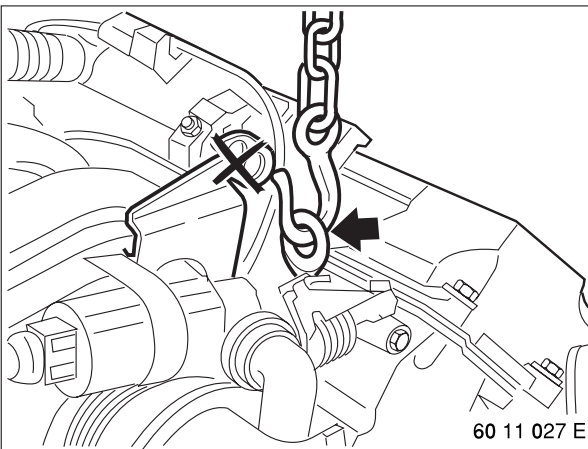
# 11/175



Fit special tool 00 0 200 to special tool 00 0 201 / 202 / 204 / 208 and attach.

**Note:**

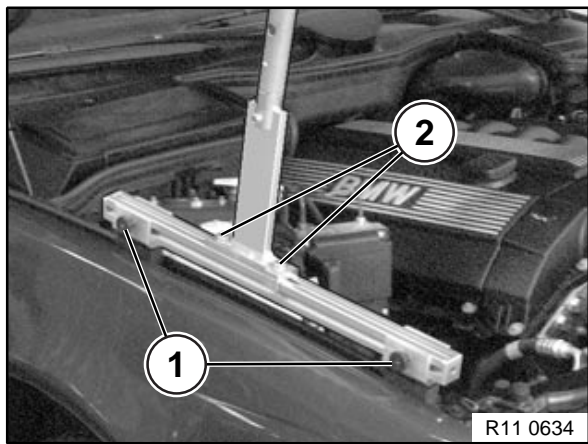
The supports (1) of special tool 00 0 208 must make contact with the screws on the side walls.



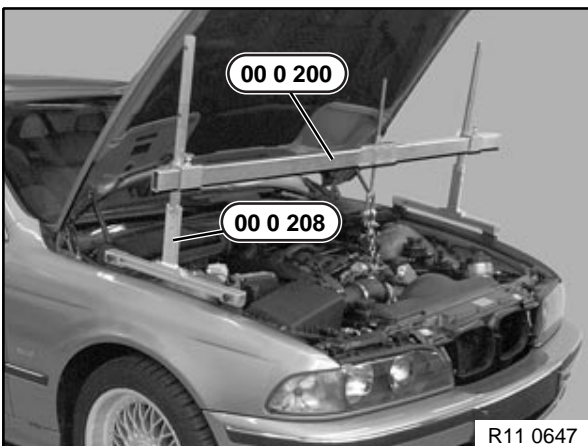
**Caution!**

Only attach engine to relevant suspension lugs.

Attach special tool 00 0 200 to the front suspension lug.



Tighten the screws (1 and 2).



Raise engine approx. 6-8 mm with special tool 00 0 200 on front suspension lug.

**Note:**

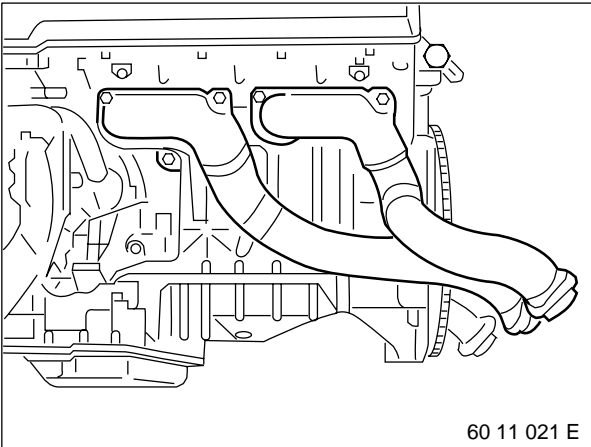
With transmission removed, engine must also be raised on flywheel end an additional 10 mm approx.

# 11/176

Unfasten screw connection on exhaust manifold.

**Note:**

First remove the front exhaust manifold, then the rear exhaust manifold (pull downwards to remove).



60 11 021 E

**Installation:**

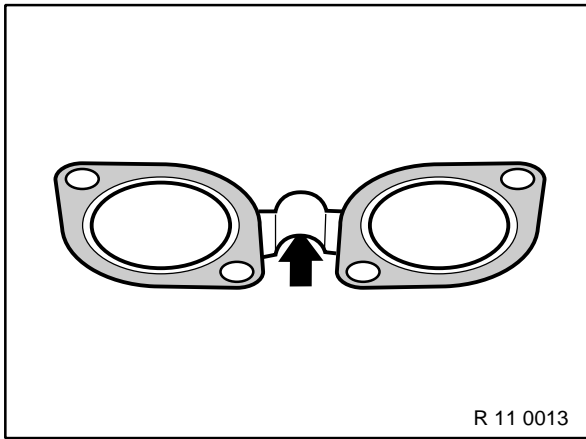
Replace gaskets.

Beads of seals face the exhaust manifold.

Coat thread with copper paste -CRC-.

Replace nuts.

Tightening torque,  
refer to Technical Data 11 62 1AZ



R 11 0013

# 11/177

## 11 62 143 Removing and installing / replacing both right exhaust manifolds (M62)

(Cylinder bank 1-4)

Unscrew and remove splash guard.

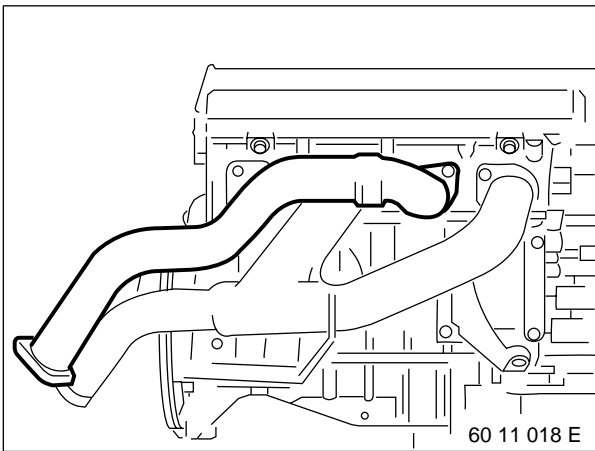
Remove exhaust system.

Remove right heat baffle plate.

Unfasten screw connection on exhaust manifold.

**Note:**

First remove rear exhaust manifold, then front one: pull downwards to remove.



**Installation:**

Replace gaskets.

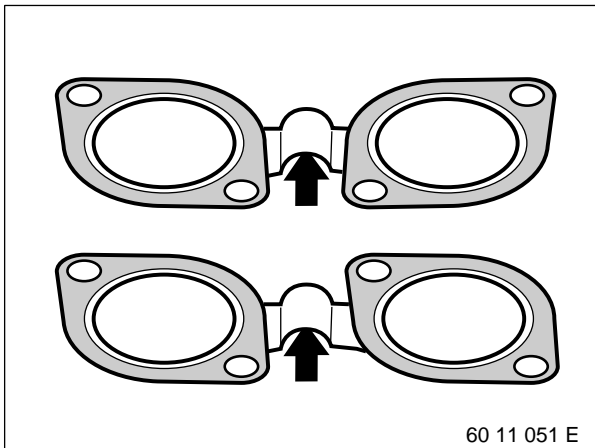
Beads of seals face the exhaust manifold.

Coat thread with copper paste -CRC-.

Replace nuts.

Tightening torque,

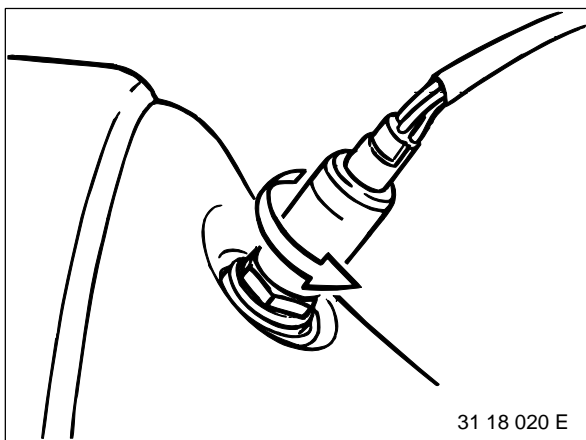
refer to Technical Data 11 62 1AZ



# 11/178

## 11 78 513 Replacing oxygen sensor (M62)

(refer Oper. No. 13 00 002)



Disconnect connector for oxygen sensor.

Unclip Lambda oxygen sensor cable from bracket.

**Note:**

Use special tool 11 7 020 or special tool 11 7 030 to unfasten and tighten down the oxygen sensor.

Tightening torque,  
refer to Technical Data 11 78 1AZ

**Installation:**

Coat thread of new oxygen sensors with Anti-Seeze.

If one Lambda oxygen sensor is reused, only apply light coat of Loctite Anti-Seeze to thread (obtainable from any specialist shop).

Do not clean the Lambda oxygen sensor section which protrudes into the exhaust line and ensure that it avoids all contact with lubricants.

Protect (mask) Lambda oxygen sensor when applying underseal.

Note cable routing of Lambda oxygen sensor,  
refer to 12 51 001