Land Rover South Africa

M52 B.M.W.

WORKSHOP

MANUAL


BMW 528i

(change engine oil and oil filter insert)

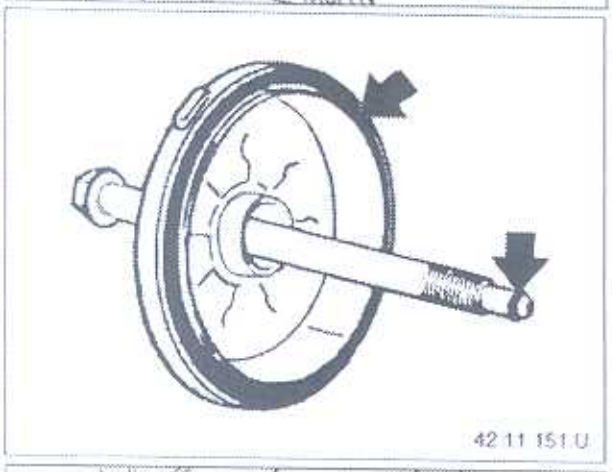
Version with central screw:

Unfasten full-flow oil filter cover.

Engine oil flows out of the oil filter housing and back into the oil pan.

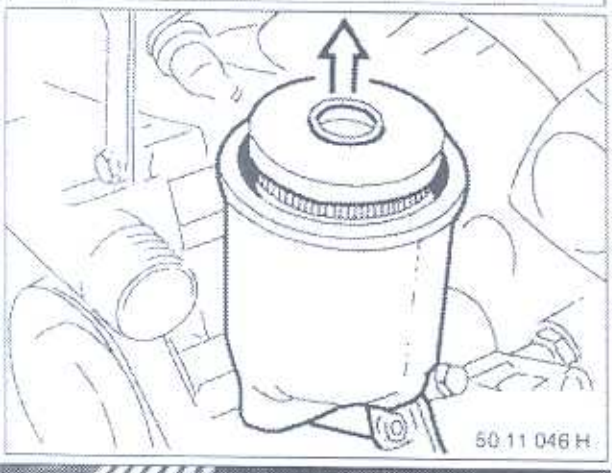
Installation:

Tightening torque,
refer to Technical Data 11 42 2AZ

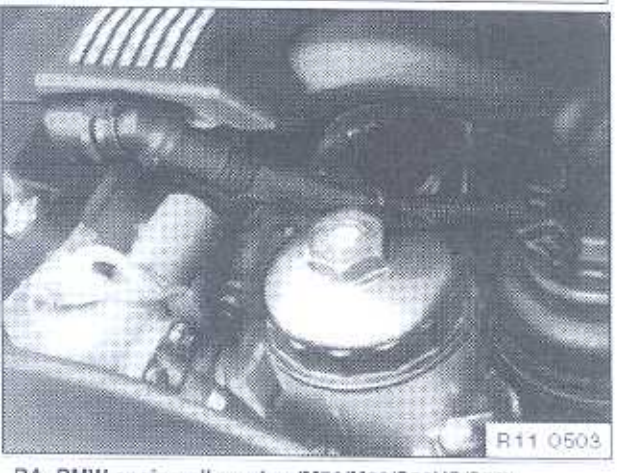


Installation:

Replace seals in full-flow oil filter cover and on the screw.



Remove oil filter insert.



Version with screw cap:

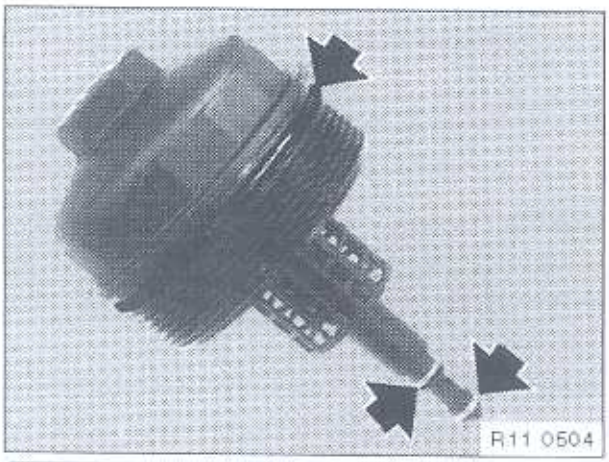
Note:

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

Unfasten full-flow oil filter cover, enabling engine oil to flow out of oil filter and back into the oil pan.

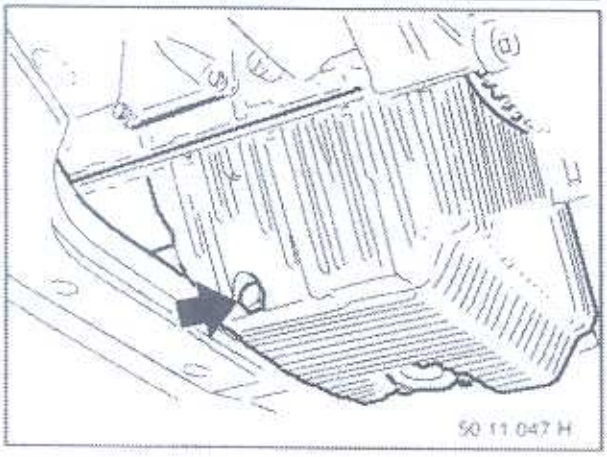
Installation:

Tightening torque,
refer to Technical Data 11 42 2AZ



Installation:

Replace seals and coat with oil.



Open oil drain plug or drain off oil.

Installation:

Replace sealing ring.

Tightening torque,
refer to Technical Data 11 13 1AZ

Top up engine oil.

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

Stop engine and check oil level.

Note:

Park vehicle on level ground.

Caution!

High tension - danger!

Interrupt power supply to ignition coils.

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

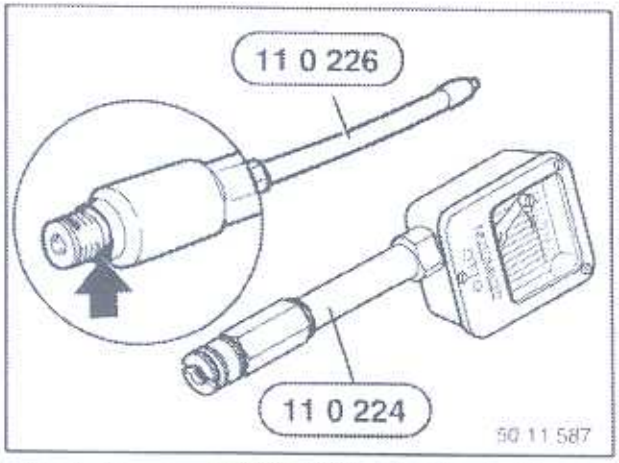
Extract DME master relay.

E36

refer to MG 12, relay assignment on engine wiring harness

E38/E39

refer to 12 63 520

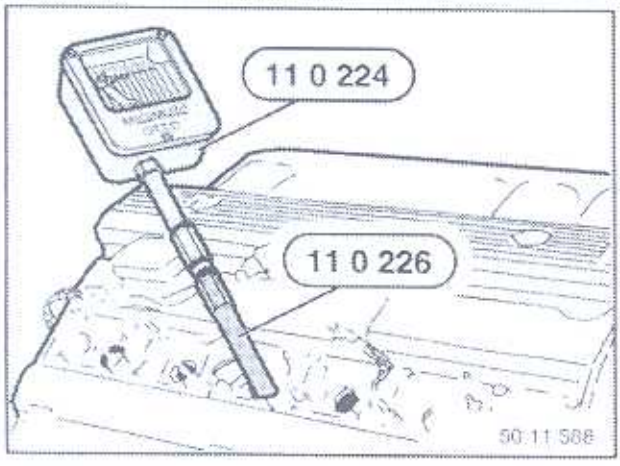


Unscrewing and removing all spark plugs,
refer to 12 12 011

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

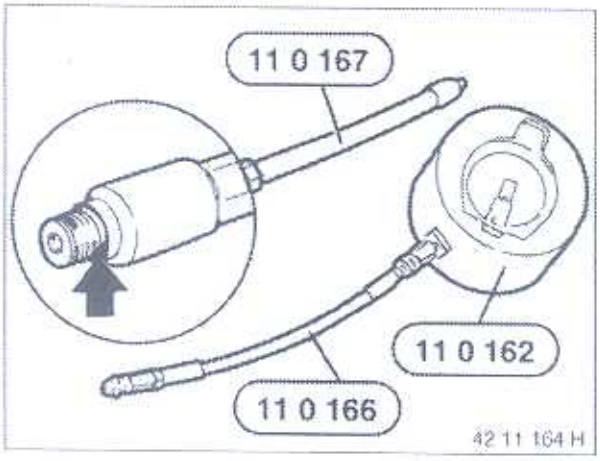
Note:

Check that seal is in perfect condition.



Depress accelerator and actuate starter until compression stops rising.

For compression pressure,
refer to Technical Data



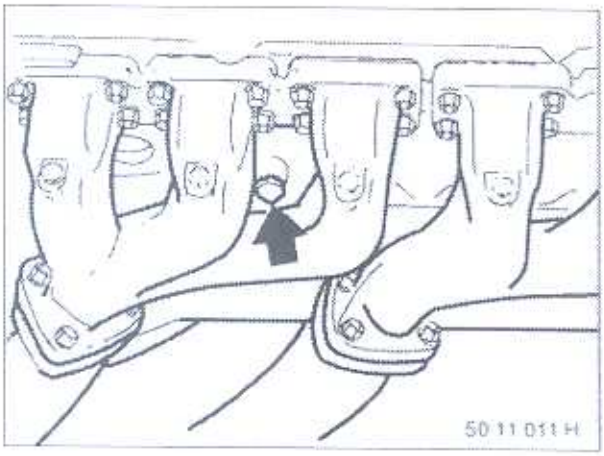
Note:

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

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

Lift engine hood into assembly position and remove firewall (air manifold). These operations are described in section on removing complete wiper console,
refer to 61 61 270

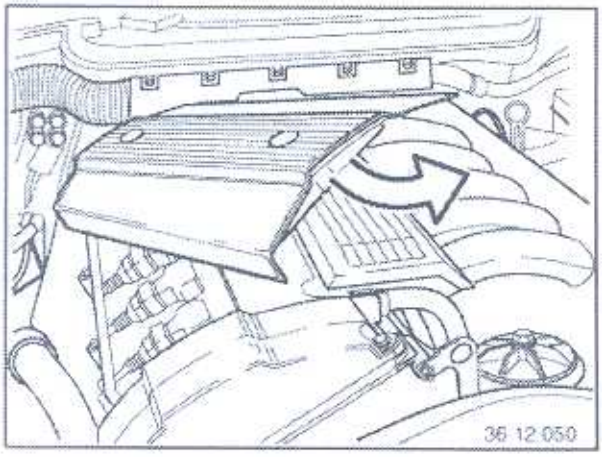
Remove transmission,
refer to MG 23/MG 24
Unscrew and remove splash guard.



Drain off coolant and dispose of correctly.

Installation:

Replace seal.
Tightening torque,
refer to Technical Data 11 11 5AZ
Removing radiator,
refer to 17 11 000

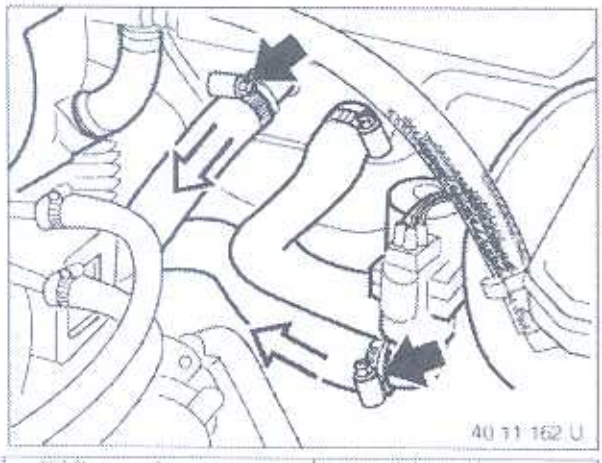


Take off cover.

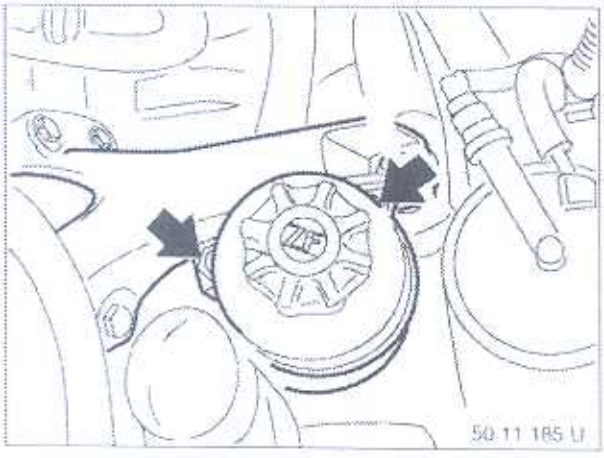
Removing intake air manifold,
refer to 11 61 050

Unfasten engine section of wiring harness and place to one side with cable duct.

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



Disconnect coolant hoses at heating valve and heater.



Unfasten reservoir for power steering unit and tie up to one side.

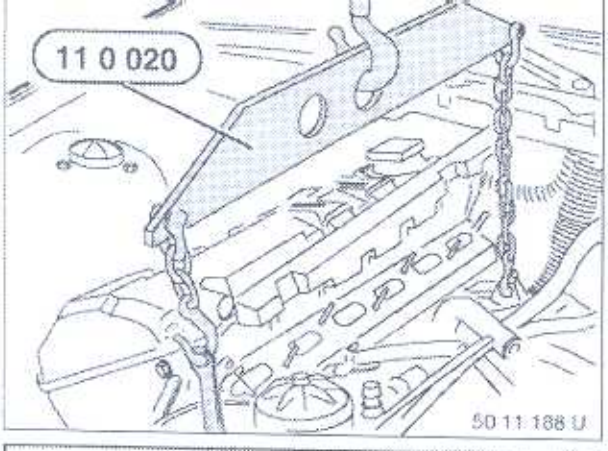
Note:

Lines remain connected.

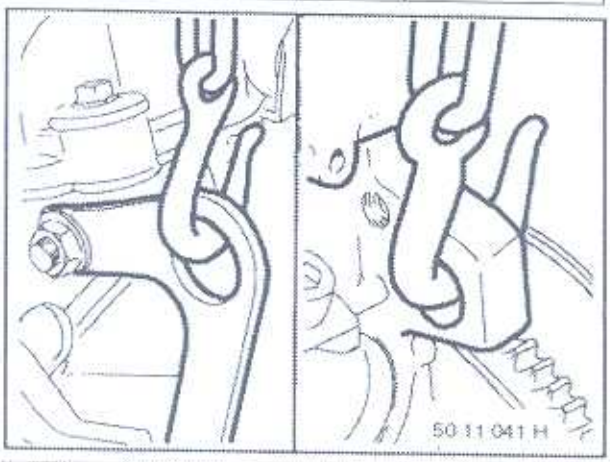
Remove vane pump from power steering unit.

Note:

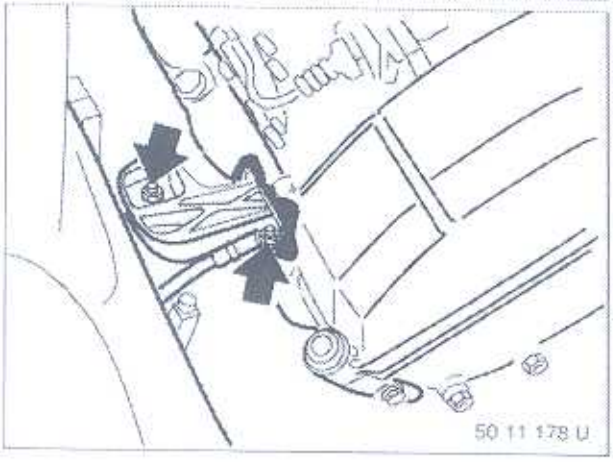
Lines remain connected.



Fit engine to special tool 11 0 020.



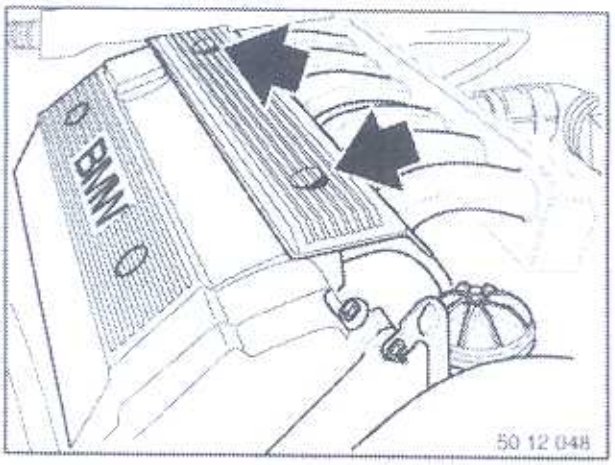
Front and rear suspension arrangement



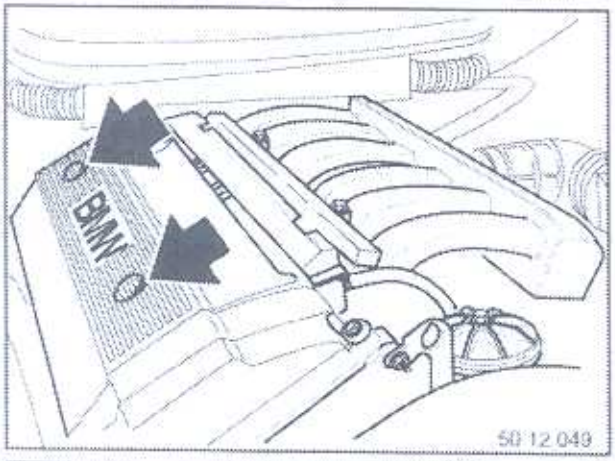
Unfasten right ground wire.

Unscrew left and right engine mounts.

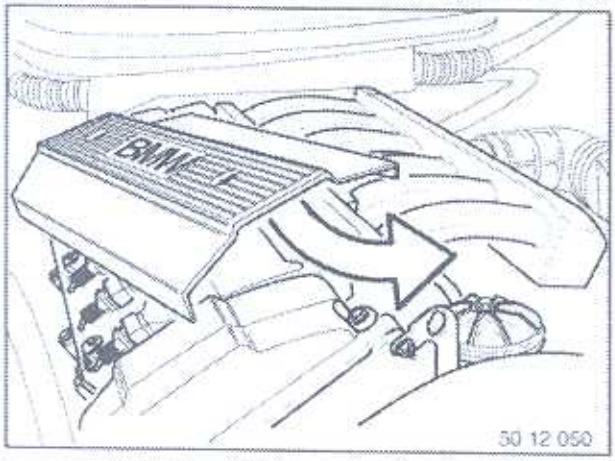
Lift out engine.



Remove cover for injectors.

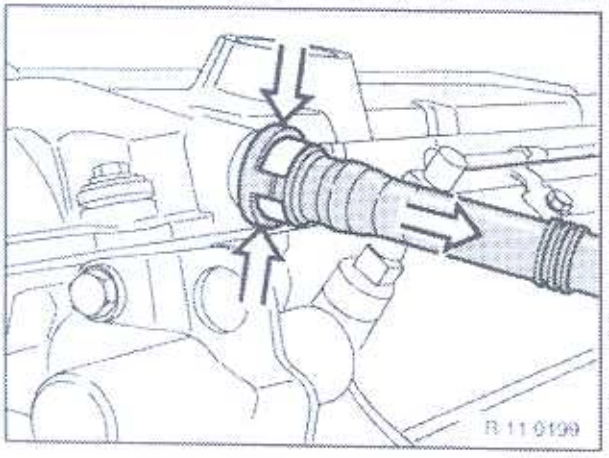


Remove cover from cylinder head cover.

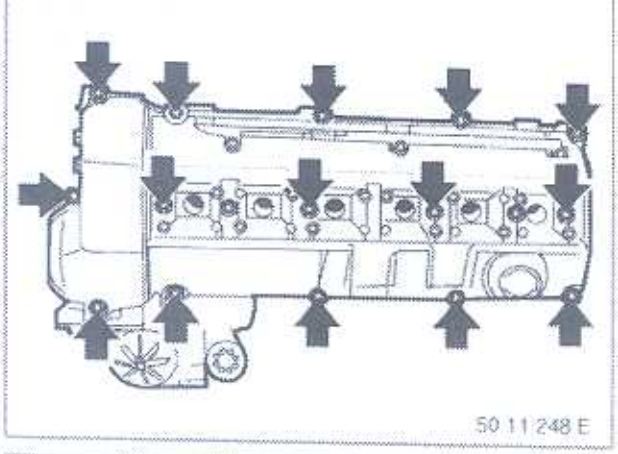


Pull cylinder head cover forwards to remove.

Removing ignition coils,
refer to 12 13 511

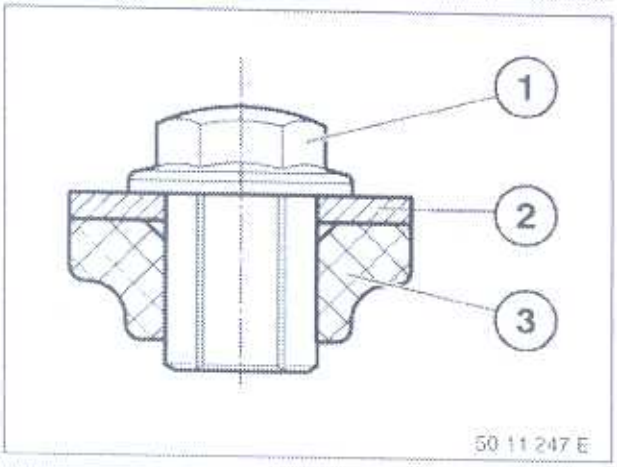


Unclip connection for ventilation.



50 11 248 E

Unfasten cylinder head cover.



50 11 247 E

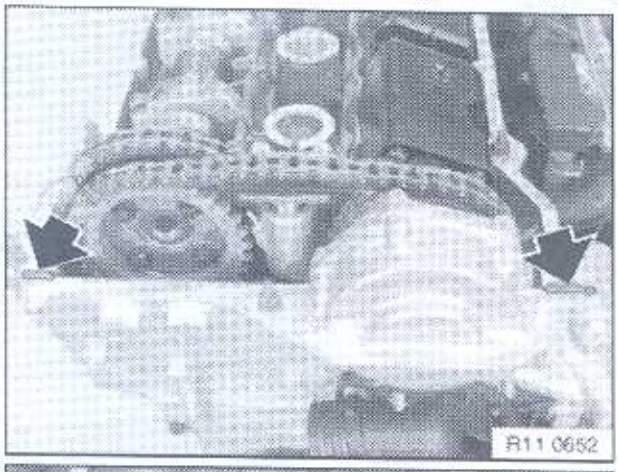
Note:

The cylinder head cover is separated from the cylinder head by rubber mounts and seals to prevent oscillation.

1 Cap nut

2 Washer

3 Rubber

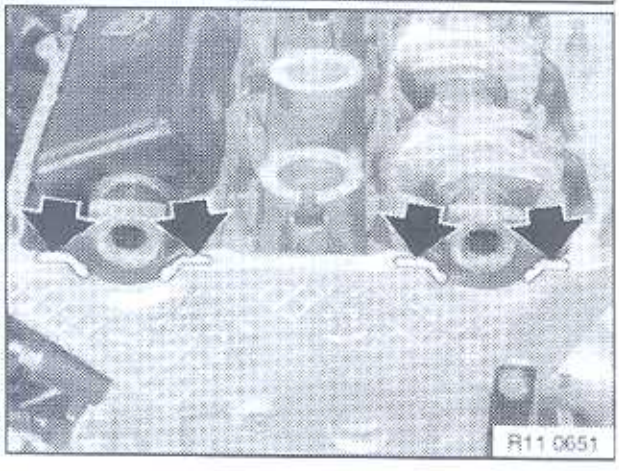


R11 0652

Installation:

Clean gasket residue from sealing surfaces.

Coat contact surfaces of joint with Drei Bond 1209 (refer to BMW Parts Service).

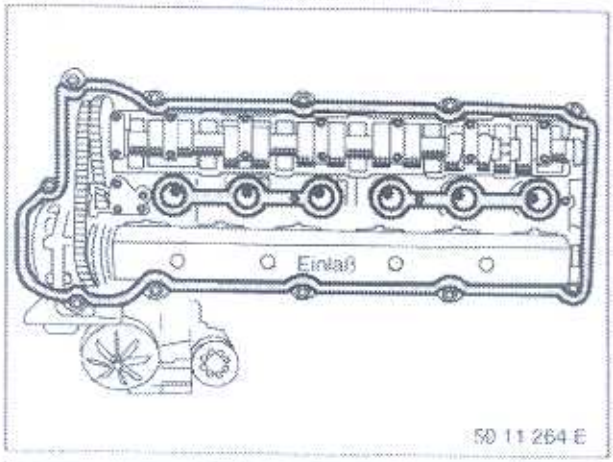


R11 0651

Installation:

Clean gasket residue from sealing surfaces.

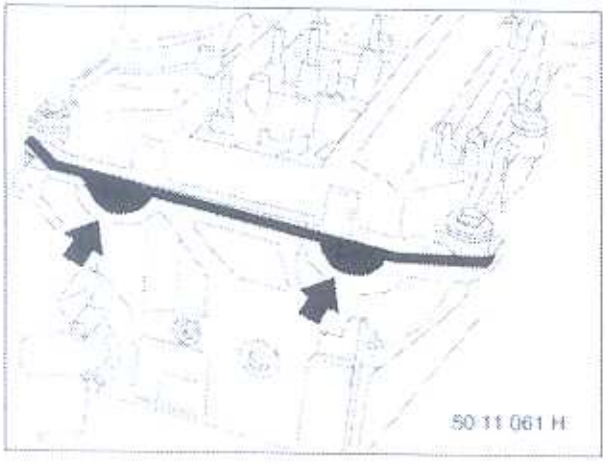
Apply a thin, uniform bead of Drei Bond 1209 sealing agent (refer to BMW Parts Service) to transition area of half-moon sections.



Installation:

Check gaskets and replace if necessary.

Place seals on cylinder head.



Installation:

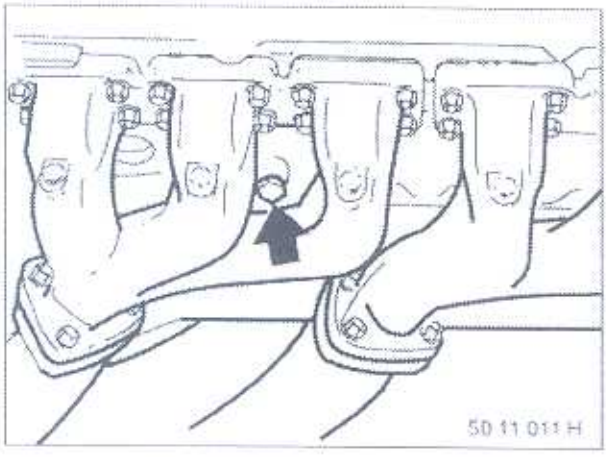
Check for correct seating of seal on back of cylinder head when installing the cylinder head cover.

Install cover bolts and align cylinder head cover.

Hand-tighten all cover bolts without preload. Tighten cap nuts crosswise from inside to outside.

Removing intake filter housing with mass air flow sensor,
refer to 13 71 000
Removing cylinder head cover,
refer to 11 12 000
Removing all spark plugs,
refer to 12 12 011

Removing intake air manifold,
refer to 11 61 050
Removing VANOS adjustment unit,
refer to 11 36 010
Unfastening sensor for cylinder recognition,
refer to 12 14 525



Drain off coolant and dispose of correctly.

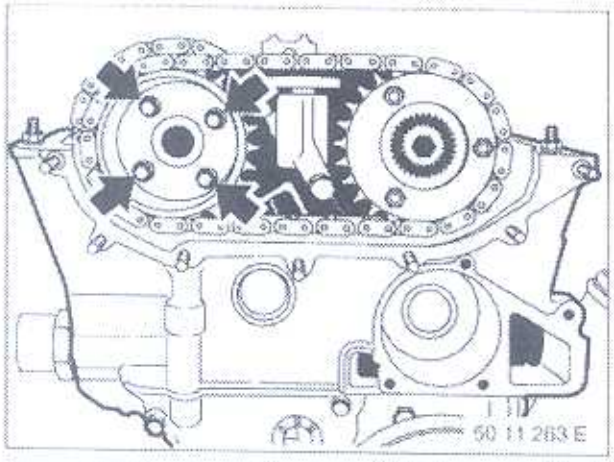
Installation:

Tightening torque,
refer to Technical Data 11 11 5AZ
Bleeding cooling system and checking for water leaks,
refer to 17 00 039

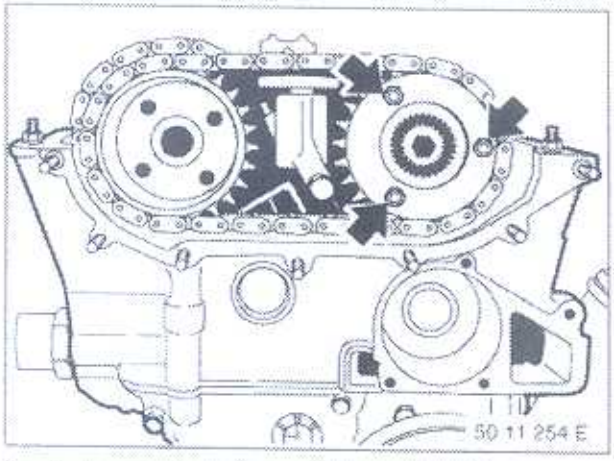
Remove exhaust pipe from exhaust manifold.
Release water hose from branch flange.
Unfasten heating intake and heating return hoses.

Removal

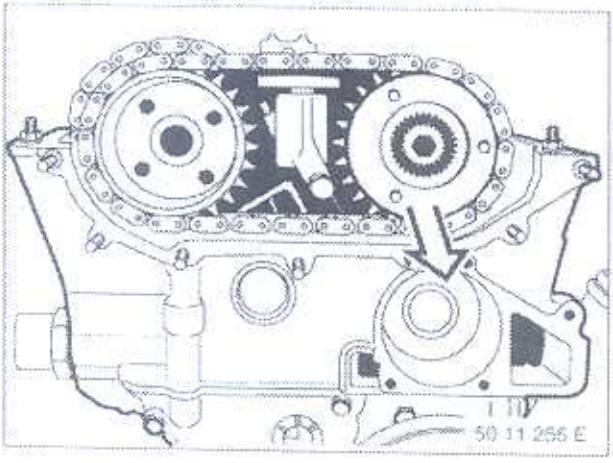
Removal of cylinder head is described separately from installation. Assembly sequence for removal and installation is different.



Unfasten screws and remove washer from exhaust camshaft.

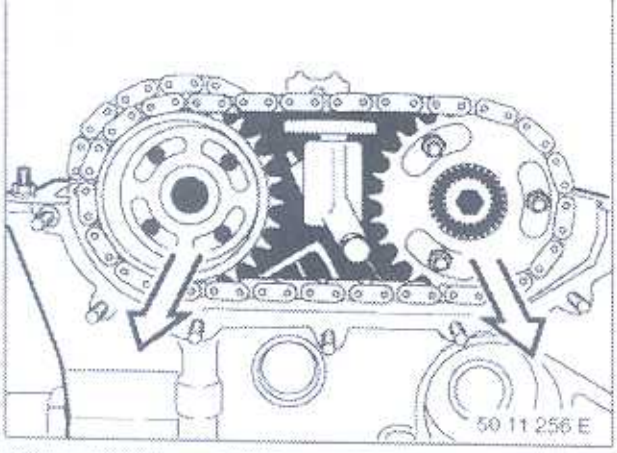


Unfasten nuts from thrust washer (intake camshaft).

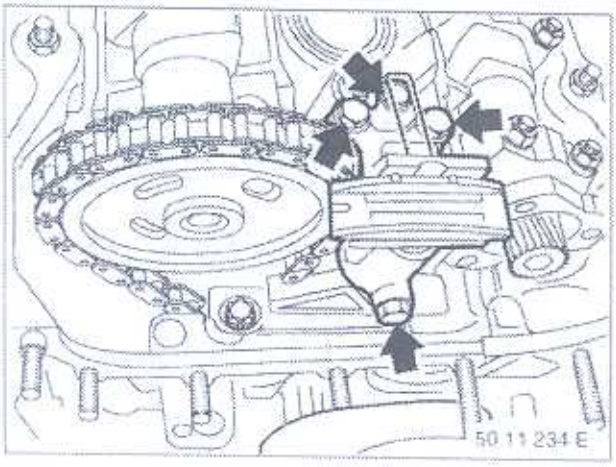


Remove thrust washer.

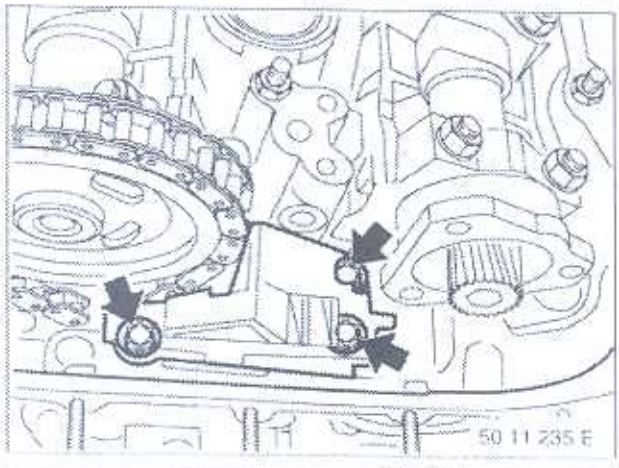
Remove sprockets and chain.



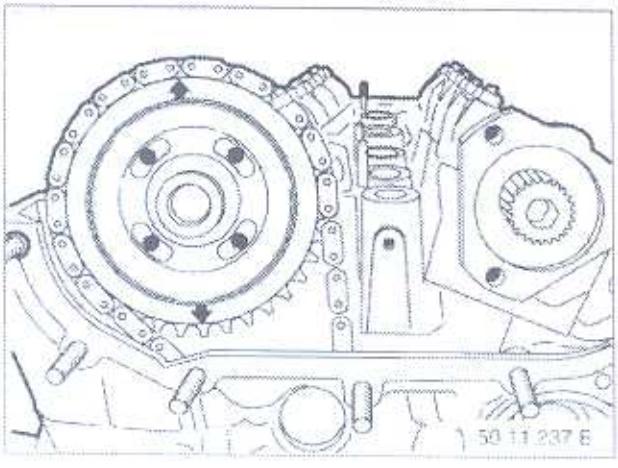
Remove secondary chain tensioning device.

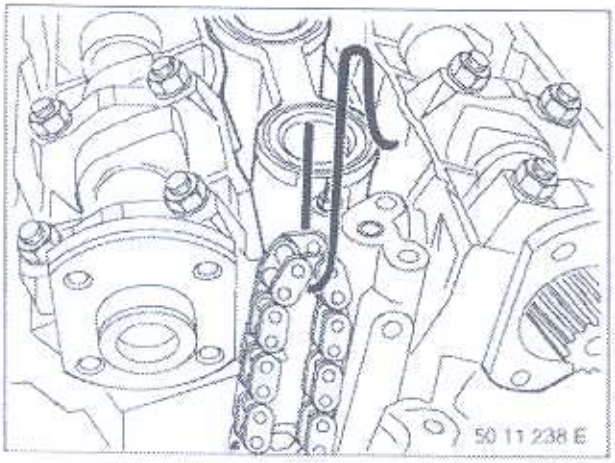


Unscrew chain guide.



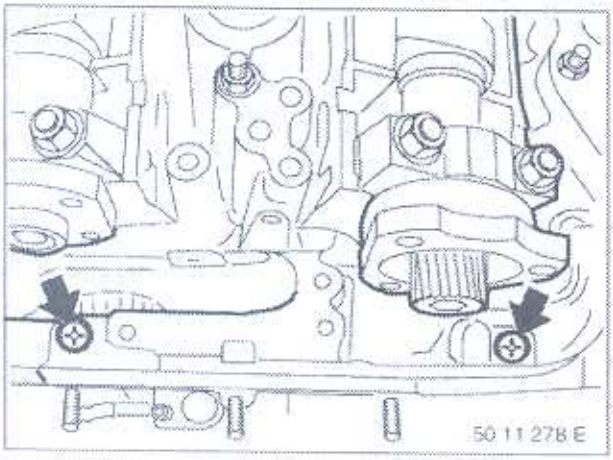
Lift off sprocket with chain.



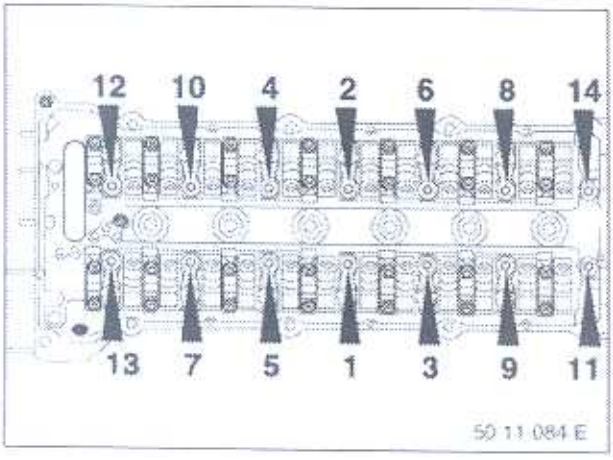


Note:

Secure chain with wire to prevent it from dropping.



Unscrew timing-case cover to cylinder head bolts.



Untighten cylinder head screws from outside to inside with special tool 11 2 250 in the sequence 14 ... 1.

Lift off cylinder head.

Installation

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

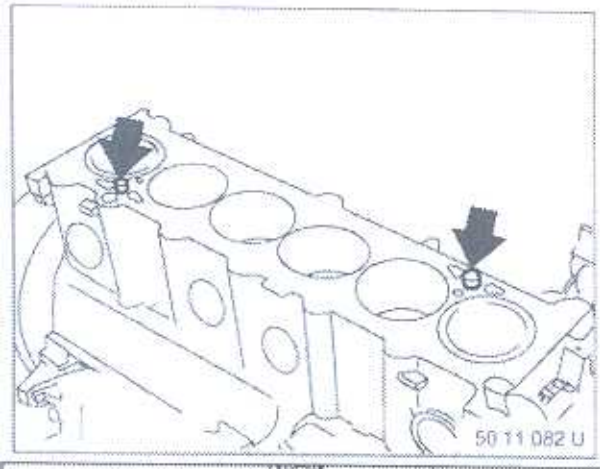
50 11 500 U

Caution!

Rotate engine on central screw counter-clockwise to approx. 30 ° before TDC.

This prevents contact between valves and pistons.

Clean sealing faces of cylinder head and crankcase; if necessary, remove traces of sealing compound with hardwood spatula. Make sure that no sealing compound falls into the oil or coolant channels.

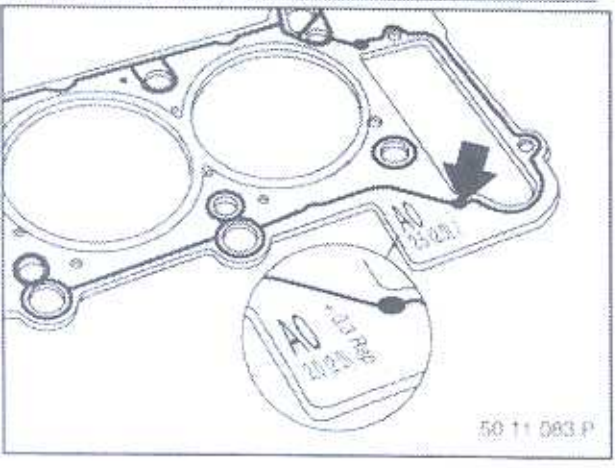


50 11 082 U

Check that dowel sleeves are undamaged and correctly located.

Apply flexible sealing compound three Bond 1209 to timing case cover, refer to BMW Parts Service.

Fit new cylinder head gasket.



50 11 083 P

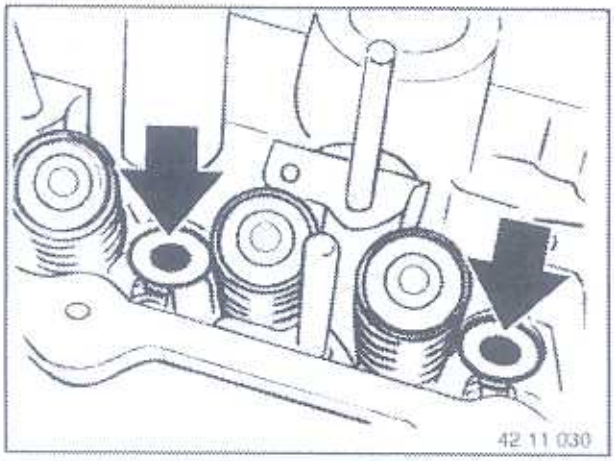
M52

For machined (milled) cylinder heads, the M52 is provided with a cylinder head gasket 0.3 mm thicker than usual.

S52

Caution!

On the S52, the milled surface of the cylinder head must not be machined.



Note:

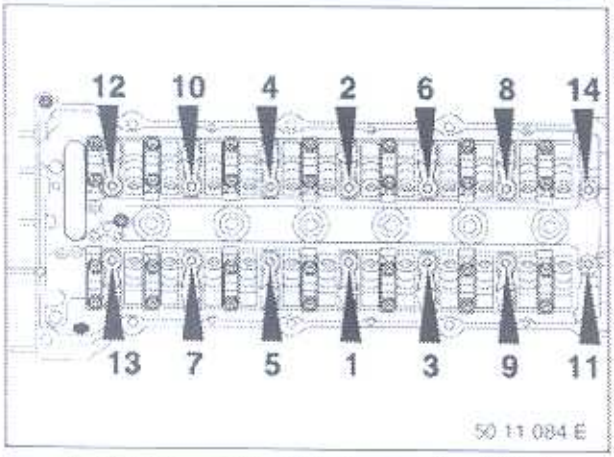
Check that all washers are in place.

Caution!

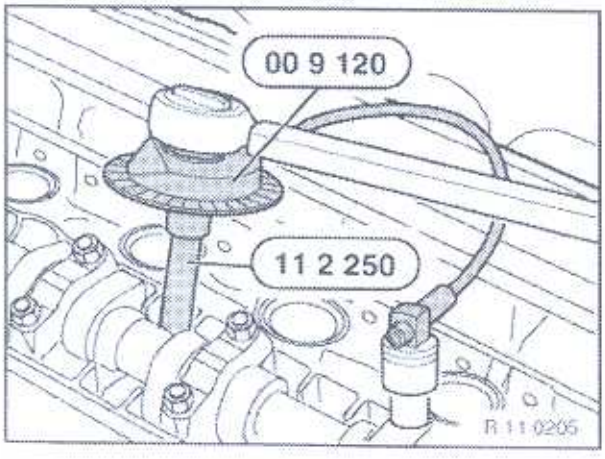
Cylinder head bolts must only ever be used once.

No oil must be located in the threaded bores of the crankcase and the timing case cover.

Risk of cracking, incorrect tightening values.



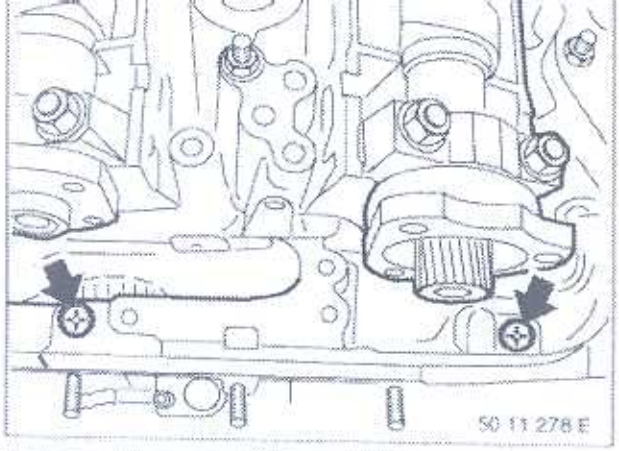
Fit cylinder head and tighten with new cylinder head screws (slightly oiled) in sequence 1 ... 14.



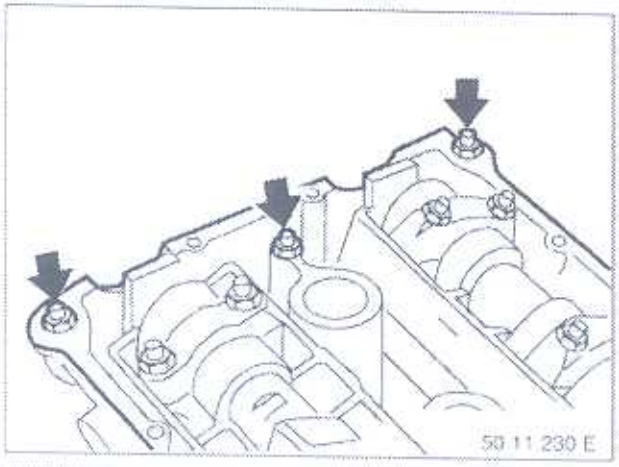
Note:

For torsion angle adjustment, connect special tool 11 2 250 to special tool 00 9 120.

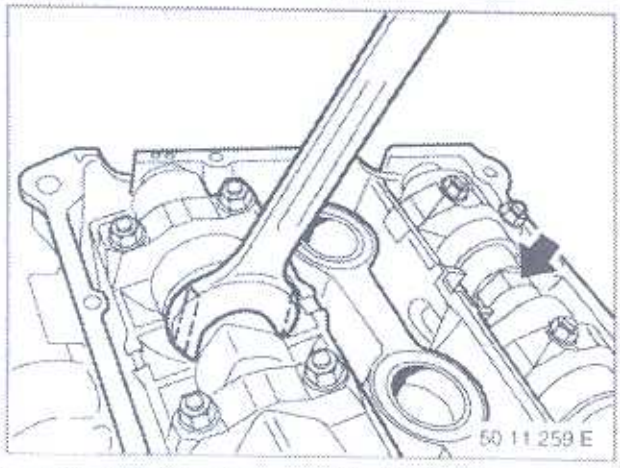
Tightening torque,
refer to Technical Data 11 12 6AZ



Tighten screw connection for timing case cover on cylinder head.



Unscrew and remove the rear back screw pins which secure the cylinder head cover.

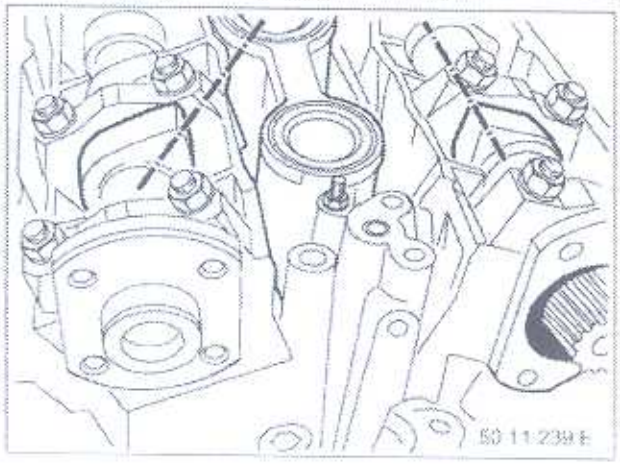


If necessary, align the camshafts on the hexagon.

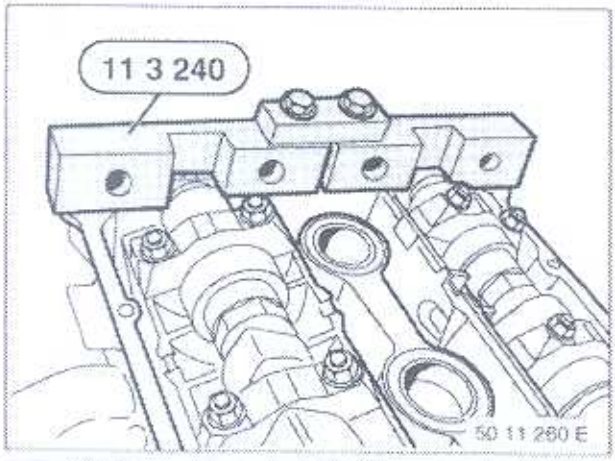
Caution!

Do not damage the cylinder head.

Machine open-end wrench accordingly if necessary.



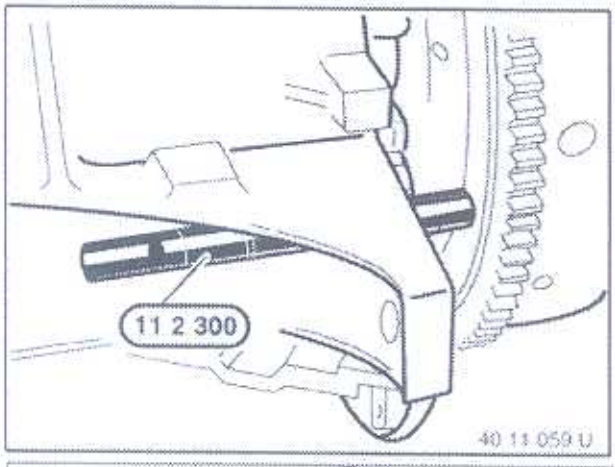
Rotate camshaft until cam tips on intake and exhaust camshafts of 1st cylinder point towards one another.



Fit special tool 11 3 240 to camshafts on cylinder 6.

Note:

Camshaft setting is OK if special tool 11 3 240 can lie flush on the cylinder head.

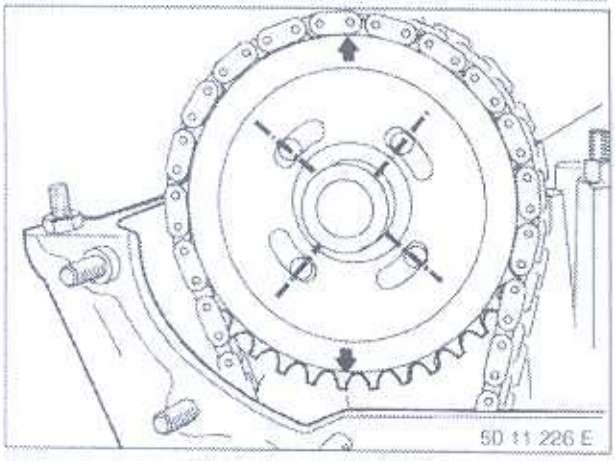


Rotate engine from 30 ° before TDC position enginewise to TDC position.

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

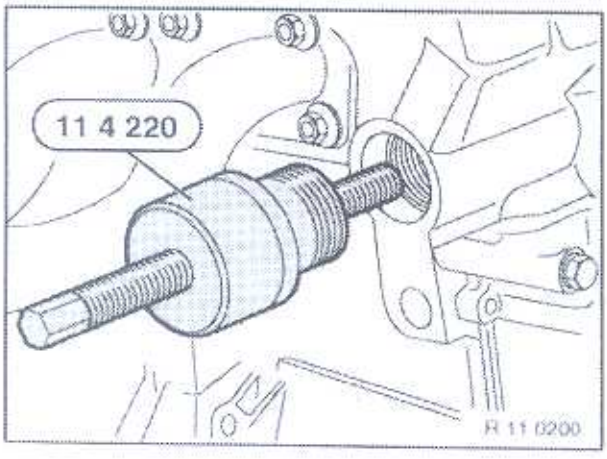
Caution!

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



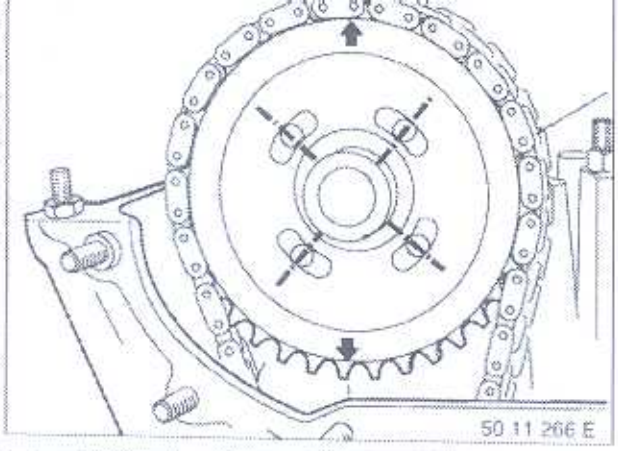
Fit primary timing chain to sprocket.

Fit sprocket to exhaust camshaft with threaded bores on left side aligned down the deep bores.



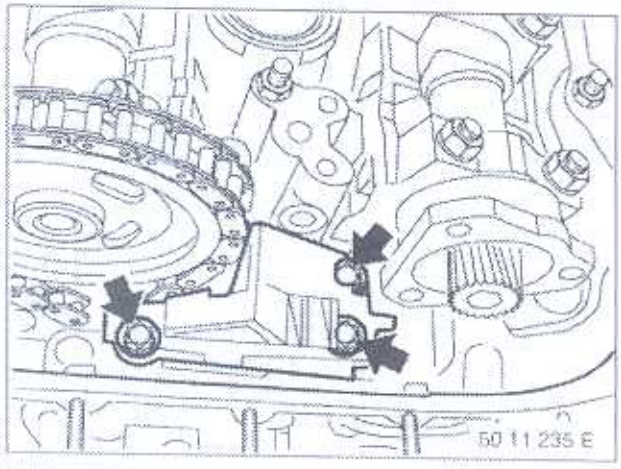
Install special tool 11 4 220.

Screw in the adjusting screw to touch the tensioning rail, but do not yet tighten it.

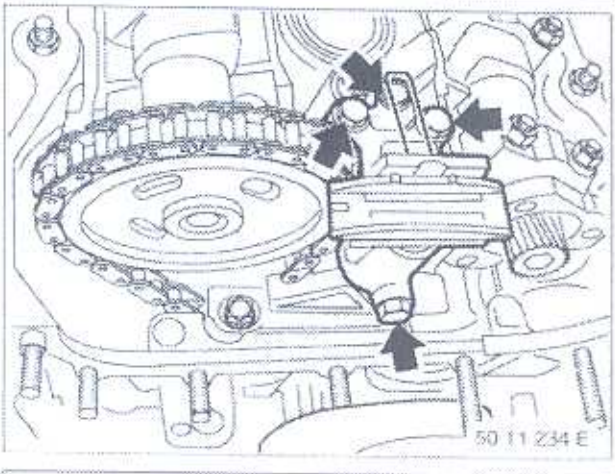


Note:

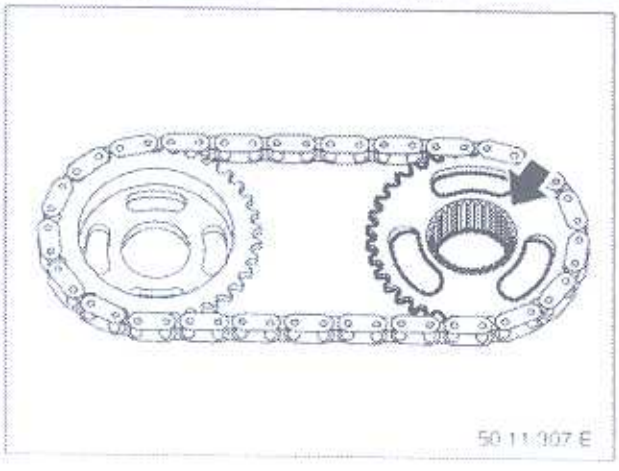
Long bores in sprocket are now centered.



Install chain guide.



Install secondary chain tensioner.

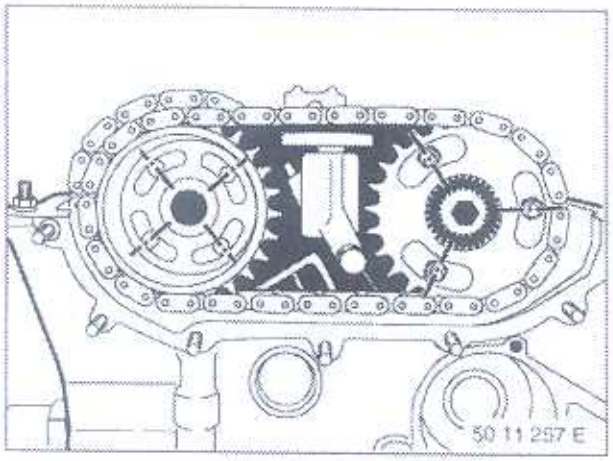


Caution!

Fit sprocket to intake camshaft correctly.

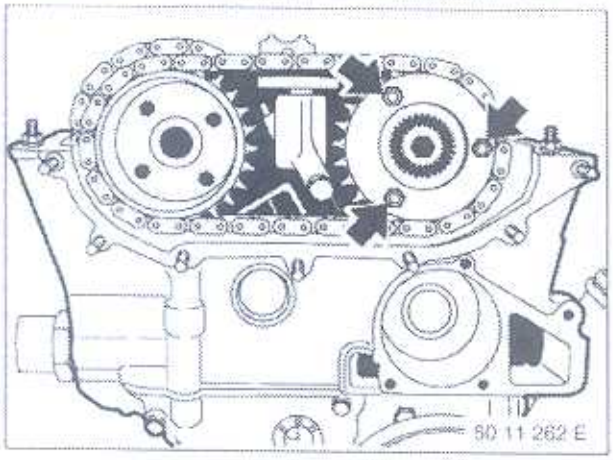
Flat side facing VANOS adjustment unit.

Collar facing camshaft.



Mount both sprockets together with chain.

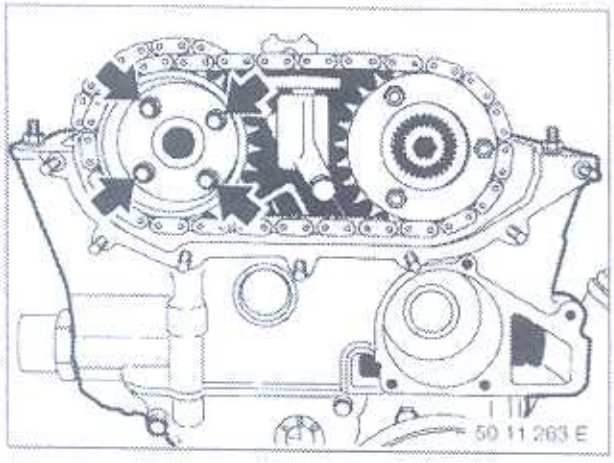
Slots centered.



Fit thrust washer to the intake camshaft and tighten down with nuts.

Tightening torque,

refer to Technical Data 11 31 3AZ



Fit washer and screws to the exhaust camshaft.

Fit screws with zero backlash: sprocket remains able to move.

Installing VANOS adjustment unit,

refer to 11 36 010

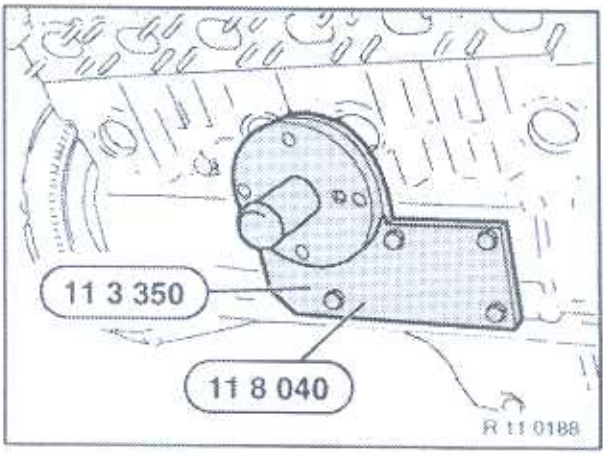
Assemble engine.

Operation is identical to removing and installing the cylinder head,

refer to 11 12 100

(engine removed)

Remove both exhaust manifolds,
refer to 11 62 140



Secure engine to assembly frame, special tool 00 1 490, with retaining plate, special tool 11 8 040.

Note:

Special tool 11 3 350 can be used again after first being reworked.

Subsequent procedure is described in section on removing the cylinder head,
refer to 11 12 100

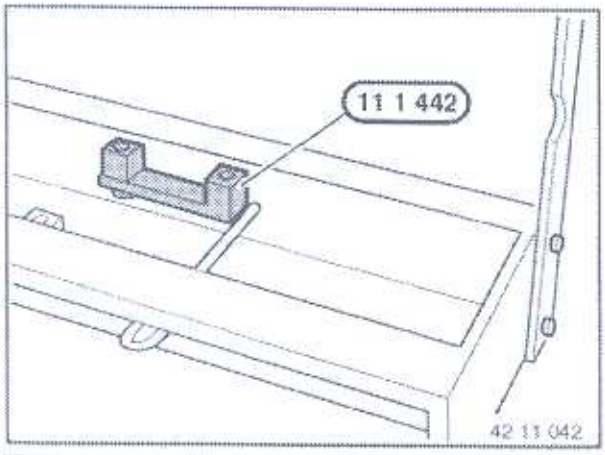
(engine removed)

Operation is identical to removing and installing cylinder head,

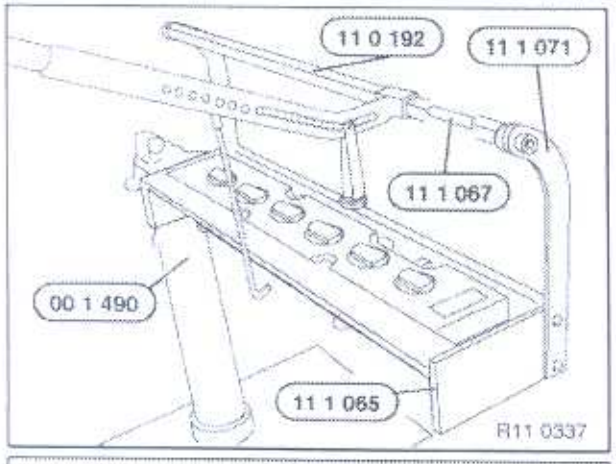
refer to 11 12 500

(cylinder head removed)

Removing coolant thermostat,
refer to 11 53 000

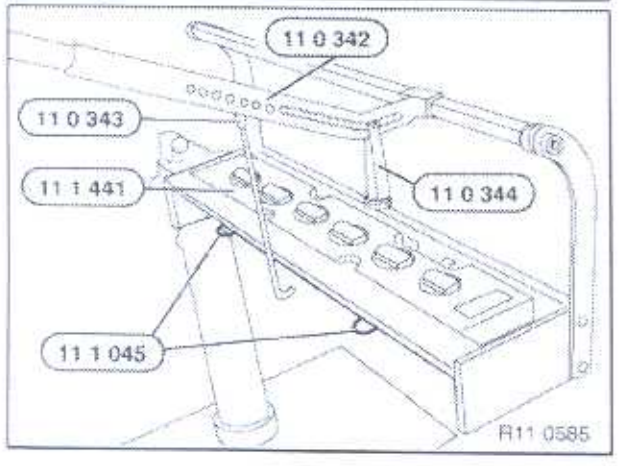


Note:
If special tools (assembly fixtures) have been supplied, screw on special tool 11 1 442.



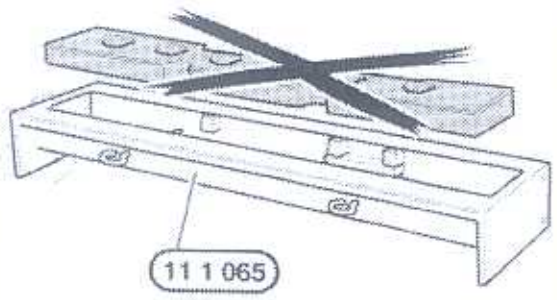
Secure special tool 11 1 065 to special tool 00 1 490.
Prepare special tools for cylinder-head disassembly:

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



- Special tool 11 1 045
- Special tool 11 0 342
- Special tool 11 0 343
- Special tool 11 0 344
- Special tool 11 1 441

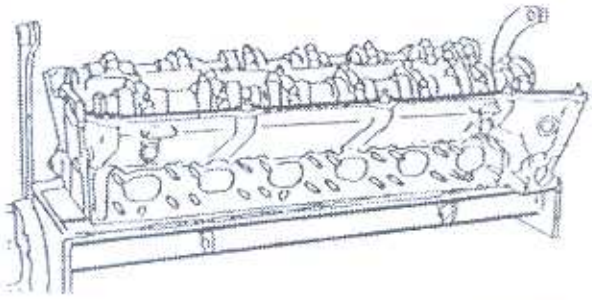
Assemble special tool.



42 11 041

Note:

Do not install special tool 11 1 441 (locating board) in special tool 11 1 065 at this stage.



50 11 086 E

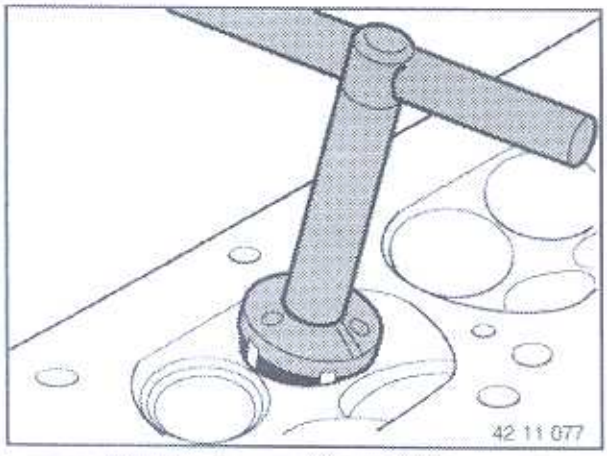
Fit cylinder head to special tool 11 1 065 and secure with two screws.

Unfasten temperature sensor and pull branch flange backwards to remove.

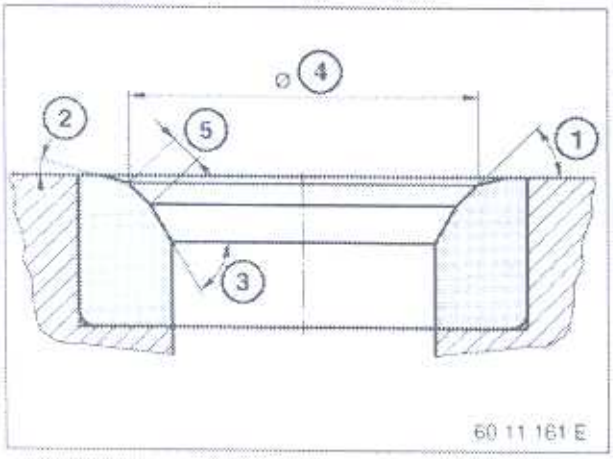
Removing all valve stem seals,

refer to 11 34 560

(cylinder head dismantled)



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



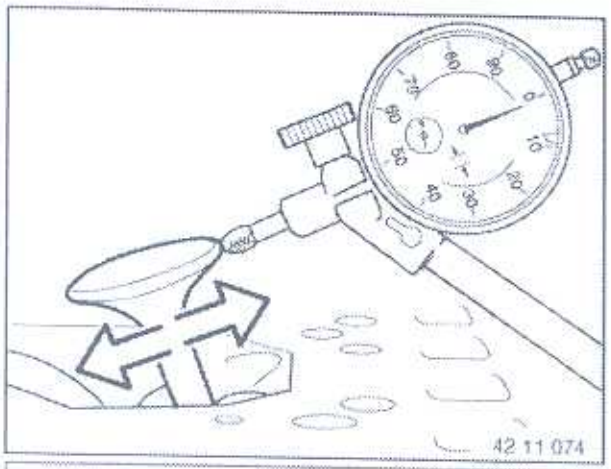
Note:

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

1. Valve-seat angle
2. Correction angle, outside
3. Correction angle, inside
4. Outside diameter seat face
5. Valve-seat width

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

(valve removed)

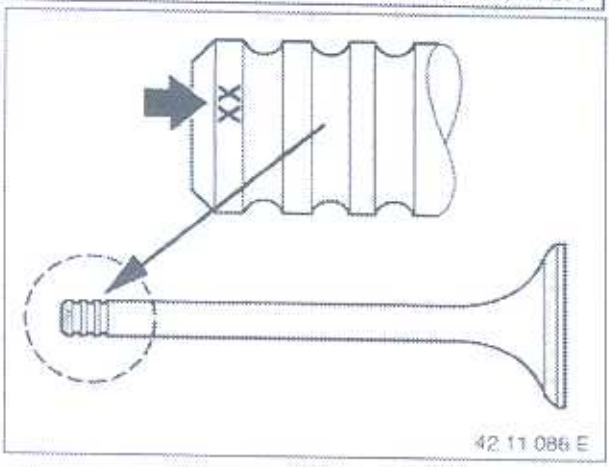


To measure tilt clearance, insert new valve so that valve stem end is flush with valve guide.

Mount dial gauge and measure tilt clearance.

Note:

Maximum permitted tilt clearance,
refer to Technical Data

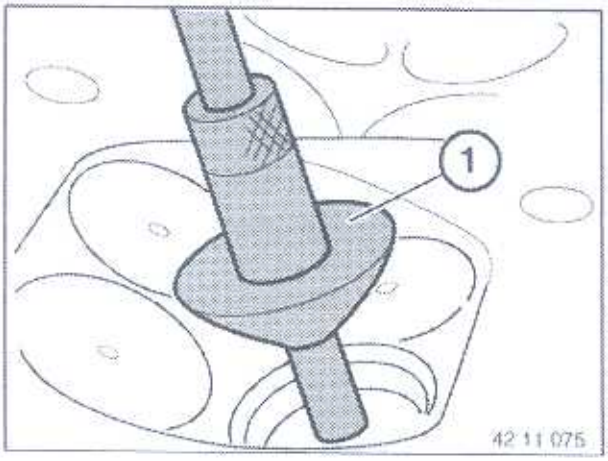


Note:

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

(valve removed)



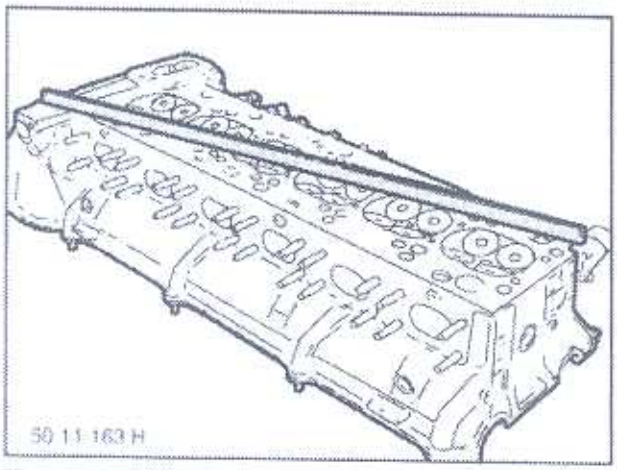
Assemble special tool 00 4 220 depending on stem ∅.

Fit special tool 00 4 223 (1) to the valve seat and dry-ream valve guide from combustion chamber side. In the process, push reamer downwards once, rotating it as you push.

Note:

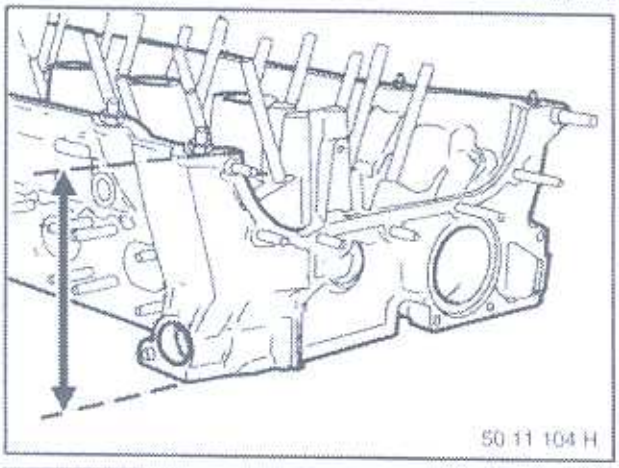
After the reaming operation, rework the valve seat, refer to 11 12 527

(cylinder head dismantled)



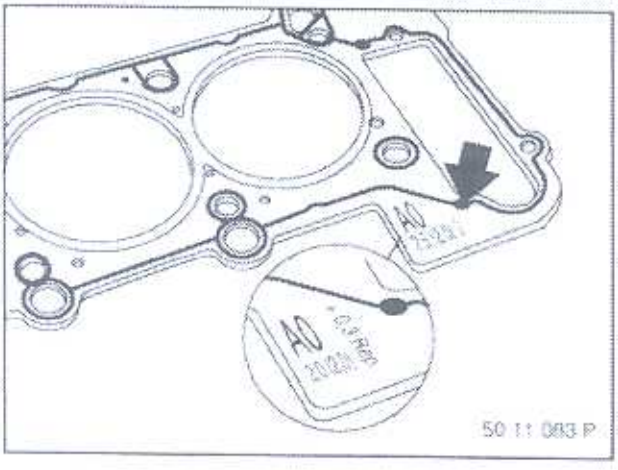
Check evenness of cylinder-head ceiling surface with straight edge (commercially available).

Deviation from plane-ness max. 0.05 mm.



Note:

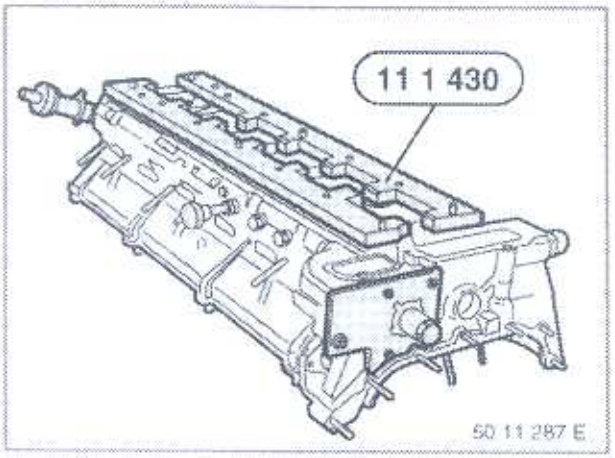
Machining limit,
refer to Technical Data



Note:

For compression comparison check, a repair cylinder head gasket is provided.

(cylinder head dismantled)

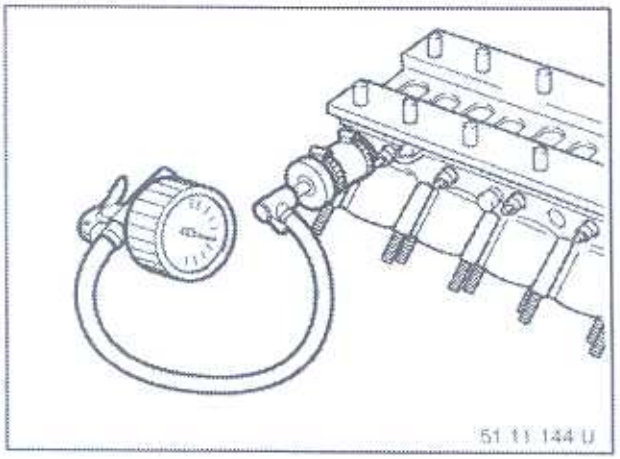


Seal coolant apertures with special tool kit 11 1 430 in conjunction with special tool 11 1 450.

Note:

Special tool 11 1 430 comprises:

11 1 431/433/437/438/439



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

Check cylinder head for escaping air (cracks).

Note:

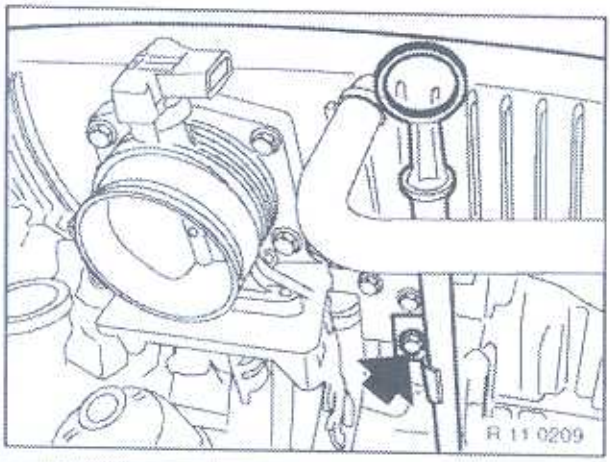
If necessary, add cleaning agent to water bath.

Note:

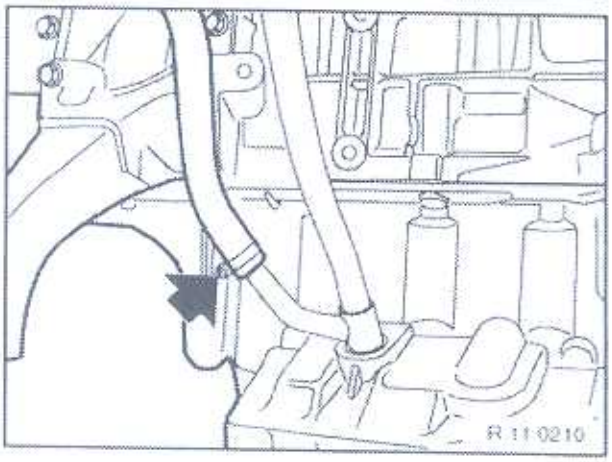
For removal of oil pan, front axle support must be lowered.

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

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

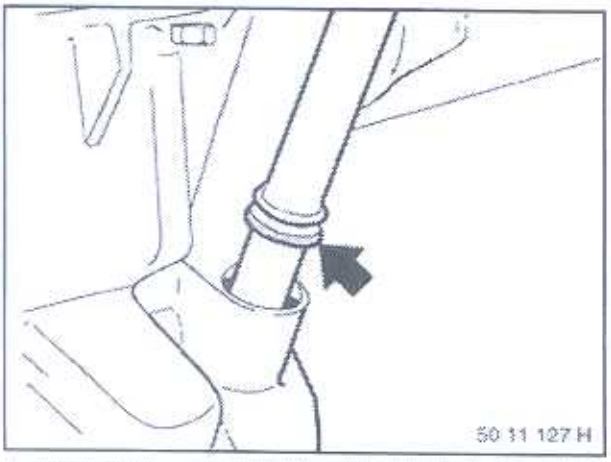


Loosen guide pipe for dipstick.



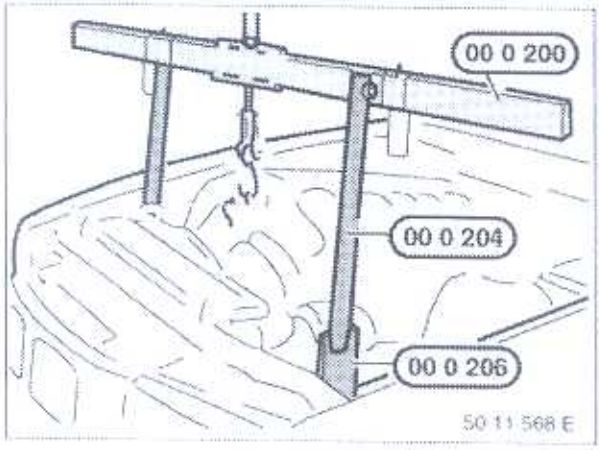
Remove oil return hose from cyclone oil separator.

Pull dipstick tube upwards to remove.

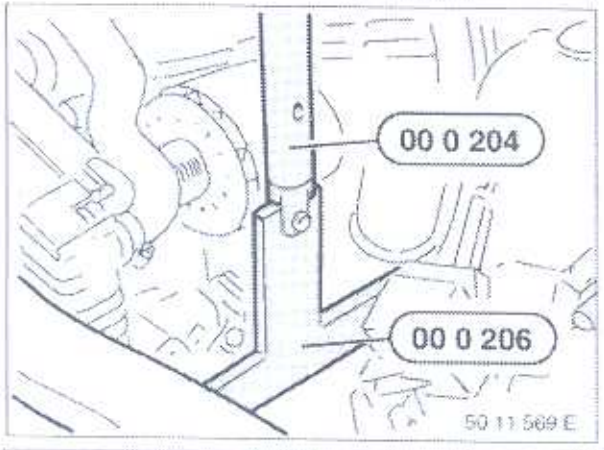


Installation:

Check O-ring, replace if necessary.

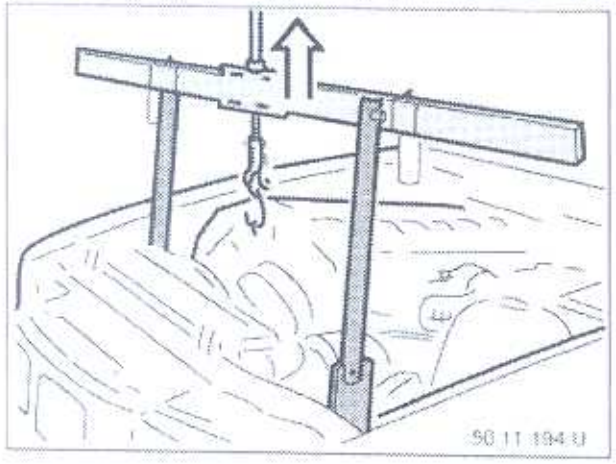


Prepare special tool 00 0 200, consisting of special tool 00 0 201/202/204/206.



Unclip oil lines for hydraulic steering from holder on engine carrier and place aside.

Fit special tool 00 0 206 to engine mounting.

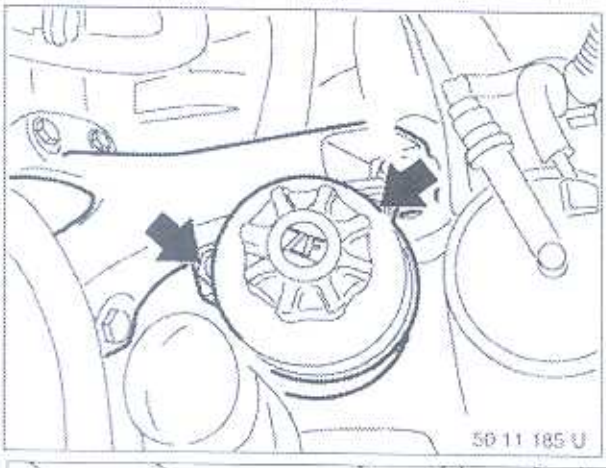


Carefully raise engine approx. 5 mm.

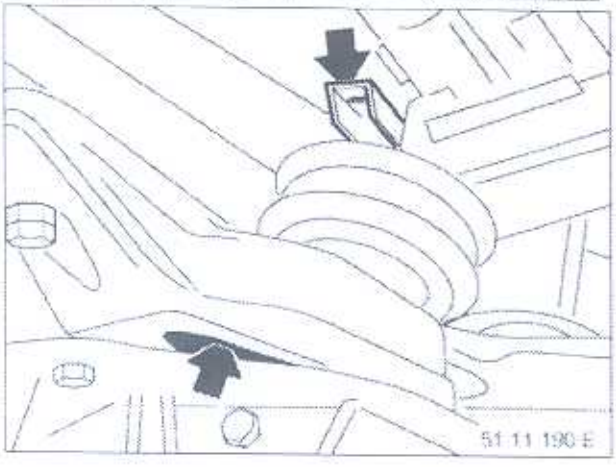
Remove engine splash guard.

Unfastening steering spindle from steering gear,
refer to 32 31 070

Unfasten vane pump for power steering unit and tie up to one side (lines remain connected).



Unfasten supply tank for power steering unit from engine support arm on left and tie to one side.



Loosen top and unfasten bottom of left and right engine mounts.

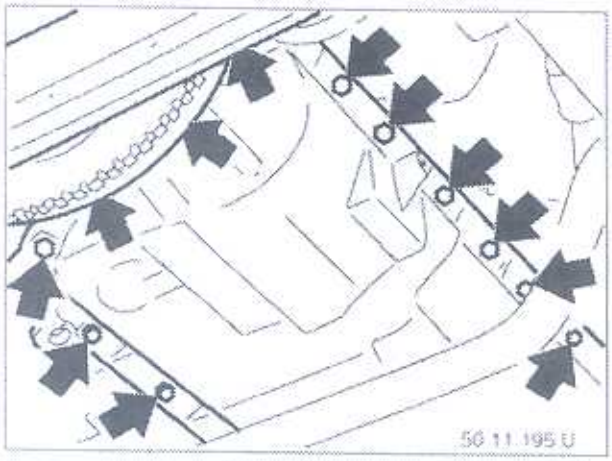
Unfasten left and right control arm from engine carrier.
Unfasten screw connection on front axle support and lower the front axle support.

These operations are described as part of the procedure for replacing front-axle carrier,
refer to 31 11 001

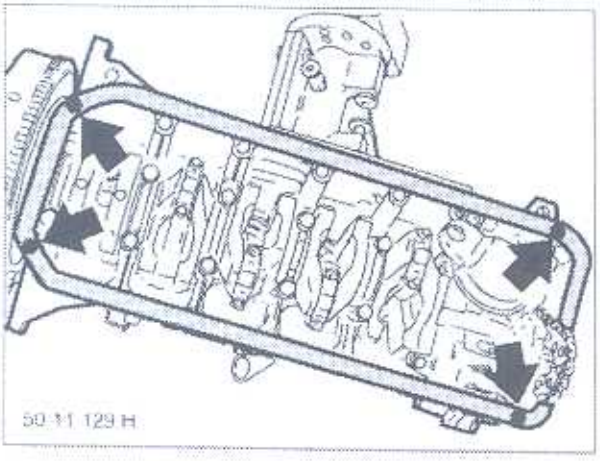
Note:

The steering gear must not be disconnected from the front axle support.

Draining off engine oil,
refer to 00 00 249
Automatic transmission:
Remove oil pipes from oil pan.



Unfasten oil pan screws at transmission and engine ends.
Lower oil pan and pull forwards to remove.



Installation:
Sealing faces clean and free of seal debris.
Check seal, replace if necessary.
Apply Drei Bond 1209 sealing compound to area around joint (refer to BMW Parts Service): approx. 3 mm wide and 2 mm high.

Installation:
Insert all screws in oil pan.
Fit screws on transmission end, without preload at this stage.
Tighten down screws on engine end.
Tighten screws on transmission end.

(engine removed)

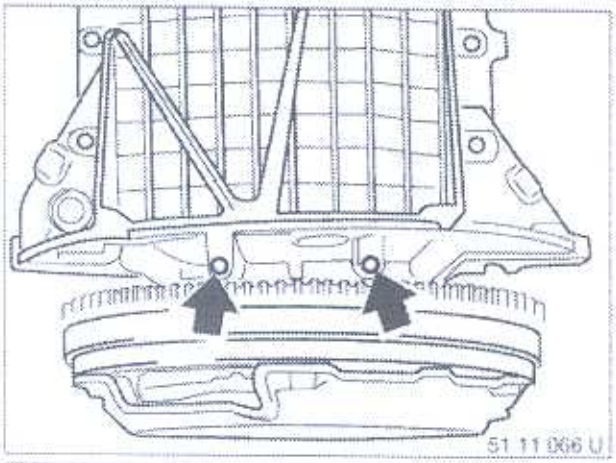
Secure engine to assembly frame.

This operation is described in section on removing and installing the cylinder head,

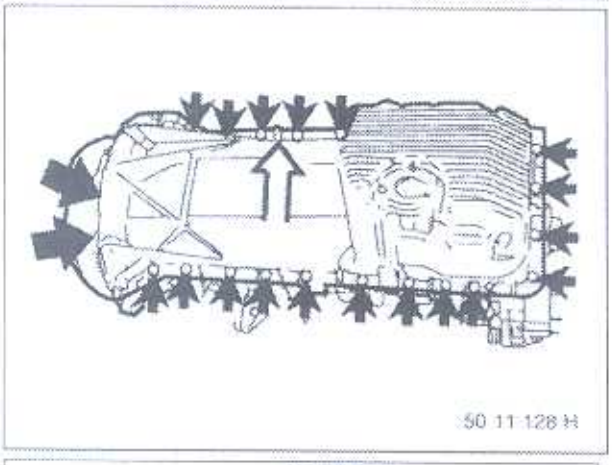
refer to 11 12 500

Draining engine oil,

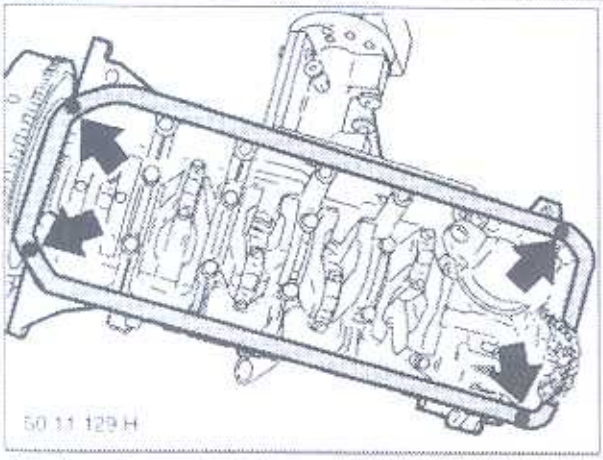
refer to 00 00 249



Unfasten oil pan screws on transmission end.



Unfasten oil pan screws on engine and lift off oil pan.

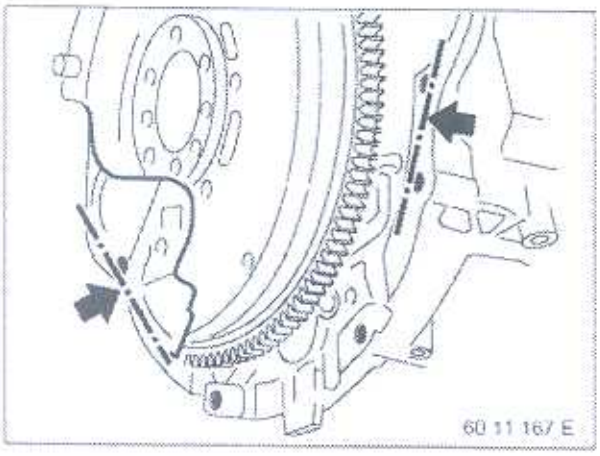


Installation:

Sealing faces clean and free of seal debris.

Check seal, replace if necessary.

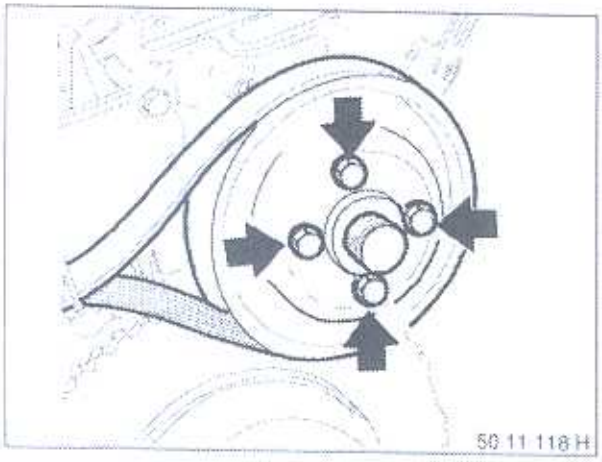
Apply Drei Bond 1209 sealing compound to area around joint (refer to BMW Parts Service): approx. 3 mm wide and 2 mm high.



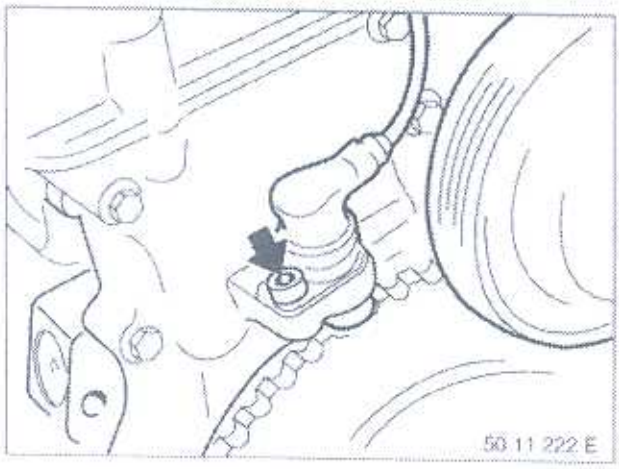
Installation:

To prevent any possibility of torsion stress during subsequent transmission assembly, align oil pan flush with side of transmission.

Remove VANOS adjustment unit,
refer to 11 36 010
Removing coolant thermostat,
refer to 11 53 000
Removing alternator drive belt tensioner,
refer to 11 28 020

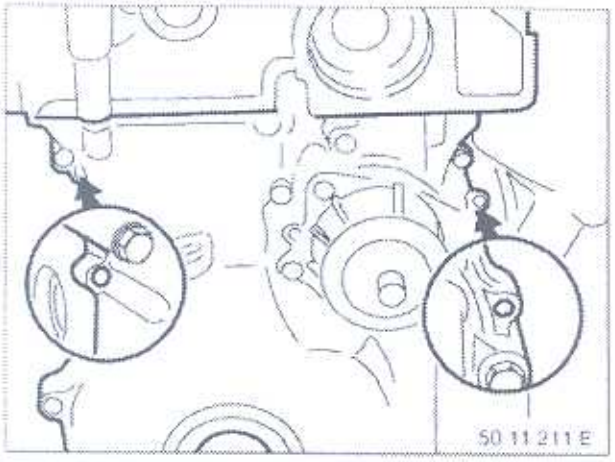


Brace pulley for water pump with drive belt and unfasten screws.



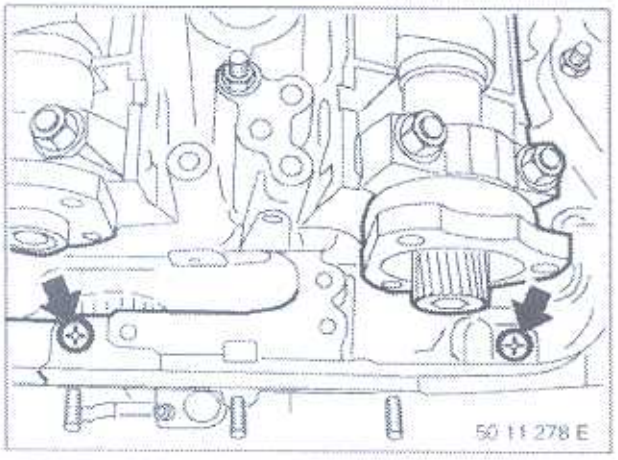
Unfasten engine speed sensor.

Removing hub for vibration damper,
refer to 11 23 031
Removing oil pan,
refer to 11 13 000

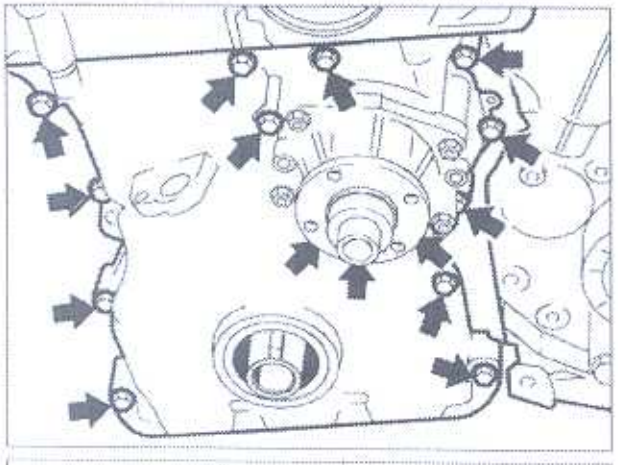


Drive out dowel pins on timing case cover towards rear of vehicle.

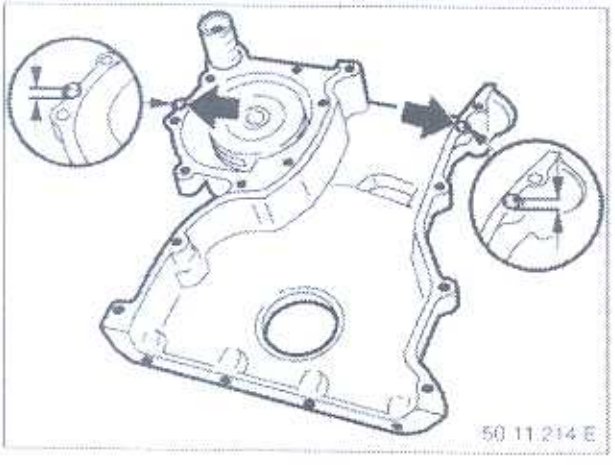
(diameter of punch less than 5 mm)



Unscrew timing case cover to cylinder head bolts.



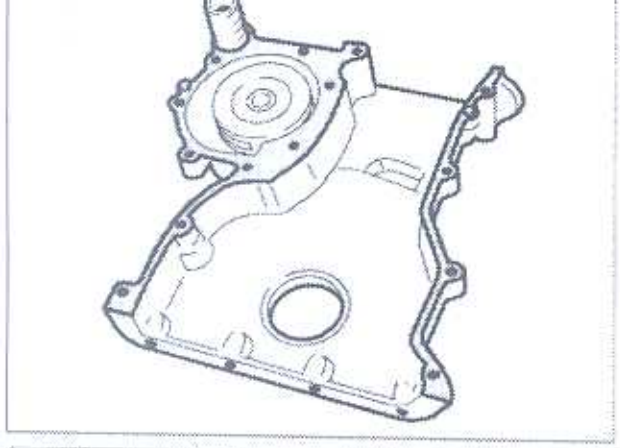
Unfasten screws and remove timing case cover.



Installation:

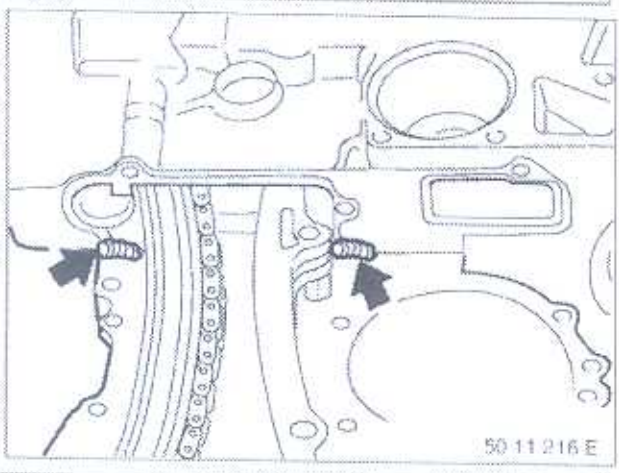
Clean sealing surfaces.

Drive dowel pins into timing case cover in such a way that they protrude by about 2 to 3 mm.



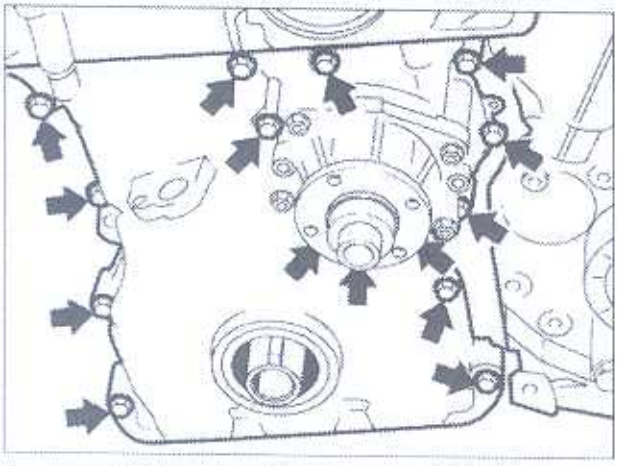
Installation:

Secure new gaskets to timing case cover with a little grease.



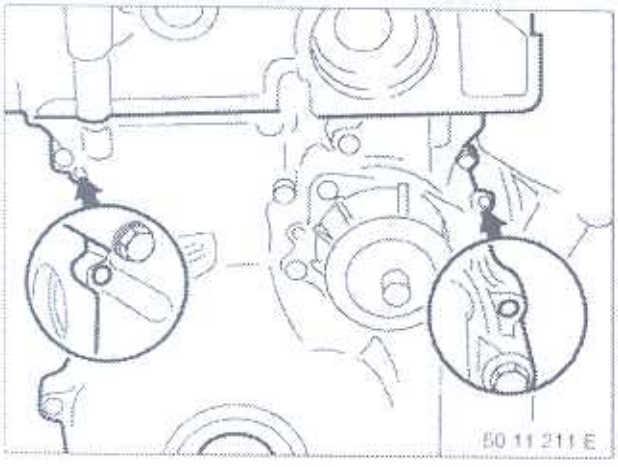
Installation:

Apply coat of Drei Bond 1209 sealing compound (refer to BMW Parts Service) to the transition points on left and right of cylinder head gasket.



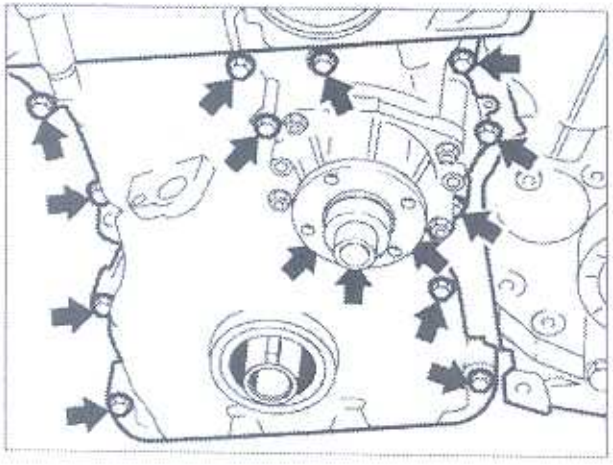
Installation:

Fit timing case cover and insert screws.



Installation:

Drive in dowel pins flush from front end.

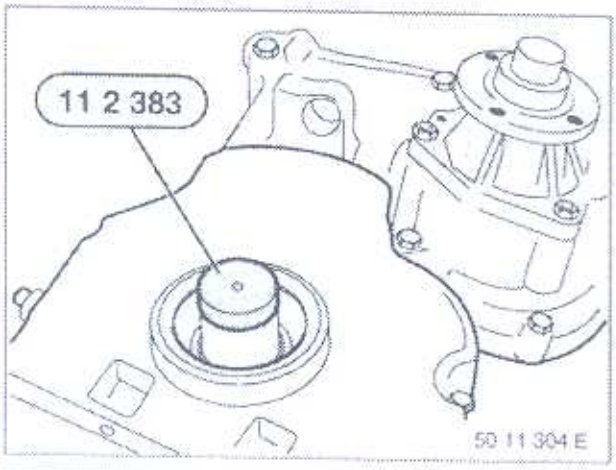


Installation:

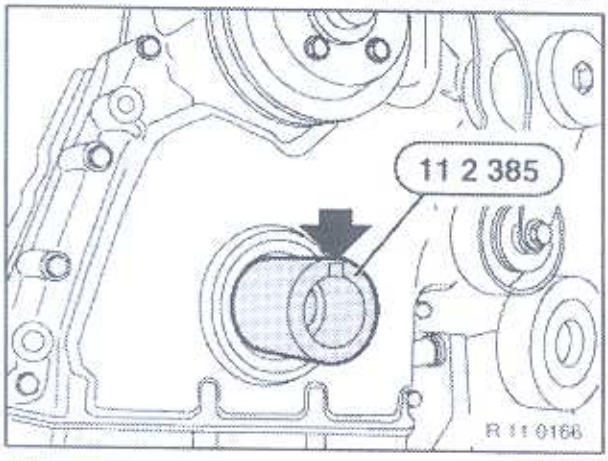
Tighten screws on cylinder head and engine block uniformly in several passes.

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

Removing hub for vibration damper,
refer to 11 23 031



Fit special tool 11 2 383 to crankshaft.

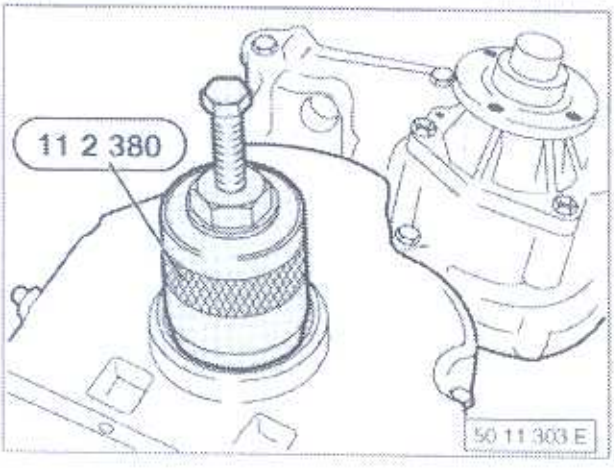


Fit special tool 11 2 385 to crankshaft.

Align groove in special tool 11 2 385 with woodruff keyin crankshaft.

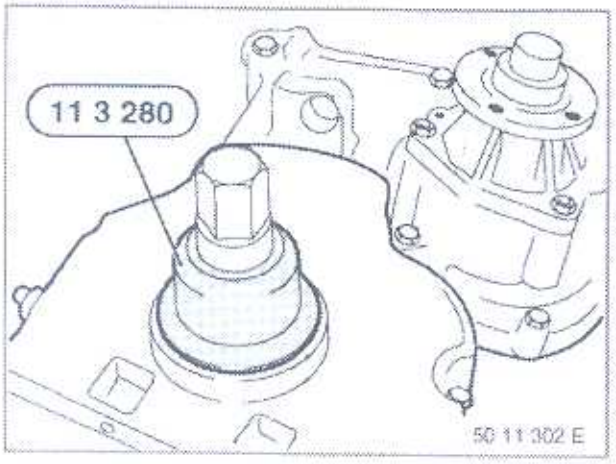
Note:

Special tool 11 2 385 centers special tool 11 2 380



Screw in special tool 11 2 380 until it has made firm contact with radial sealing ring.

Remove radial seal by tightening screw on special tool.



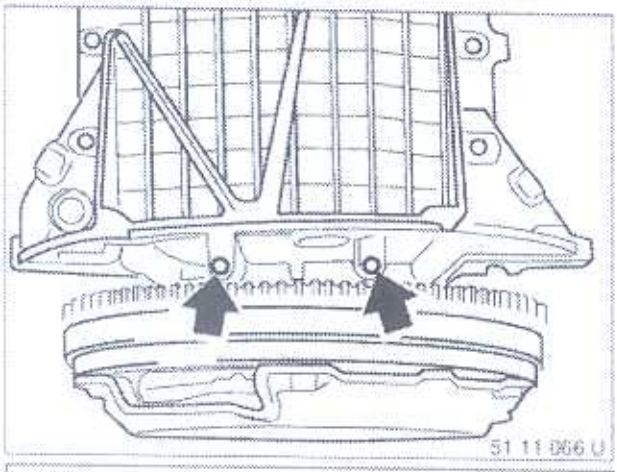
Installation:

Coat sealing lips of new radial sealing ring with oil.

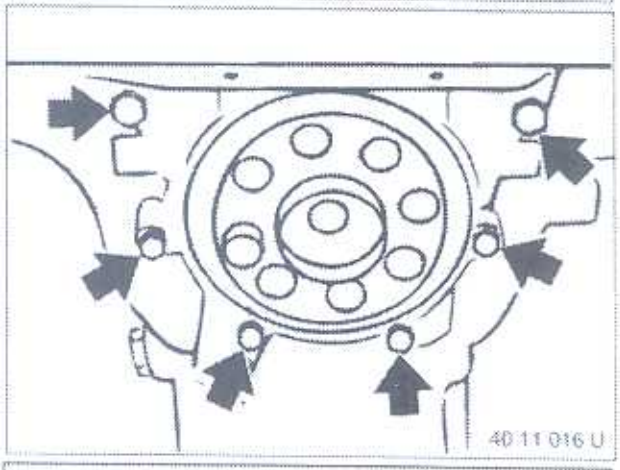
Using special tool 11 3 280 and centring screw, install new radial seal flush with timing case cover.

(transmission side)

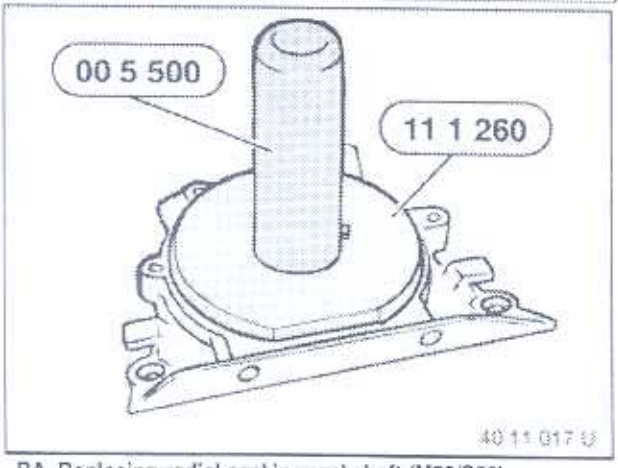
Remove transmission.
Draining off engine oil,
refer to 00 0 249
Removing flywheel,
refer to 11 22 500



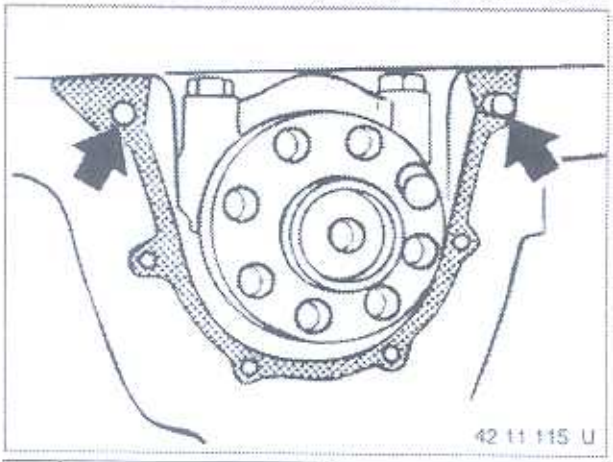
Unfasten oil pan screws on transmission end.
Loosen oil pan.



Unfasten screw on rear end cover.
Carefully unfasten oil pan gasket from end cover and remove end cover.



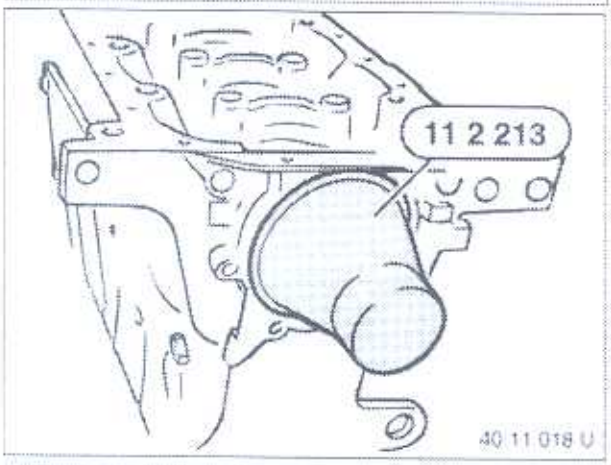
Note:
The end cover is in the set with the radial sealing ring.
If necessary, lift out the radial sealing ring and drive in new sealing ring using special tool 11 1 260 in conjunction with special tool 00 5 500.



Check for correct fit of hollow bushes.

Replace seal.

Apply thin, uniform coat of three Bond 1209 sealing compound (refer to BMW Parts Service) to edges of joint on oil pan.

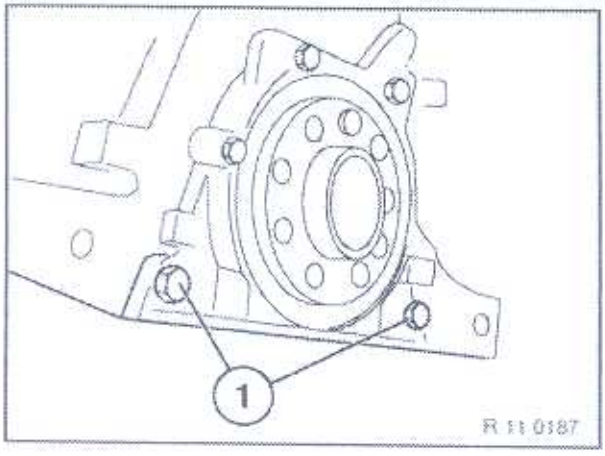


Fit special tool 11 2 213 to crankshaft.

Coat sealing lip of radial sealing ring with oil.

Slide on end cover.

Carefully pull off special tool 11 2 213.



Note:

Threads on screws (1) are coated with sealing compound - use new screws.

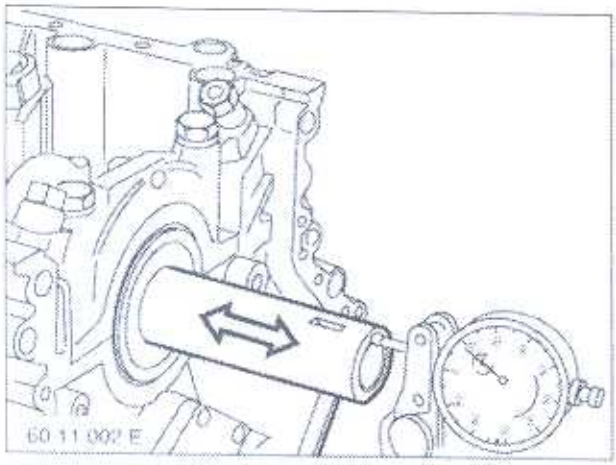
Tighten down end cover.

(engine removed)

Fitting timing case cover to underside,
refer to 11 14 110

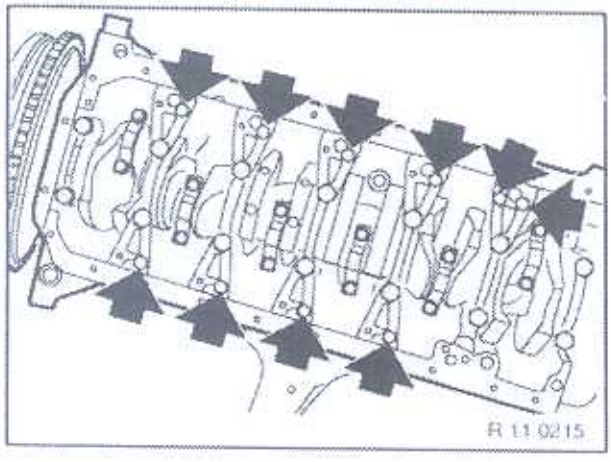
Removing all pistons,
refer to 11 25 530

Removing end cover from back: this operation is described in section on replacing radial seal in crankshaft,
refer to 11 14 151



If the permitted end float is exceeded, check crankshaft, pilot bearing shells and engine block and replace where necessary.

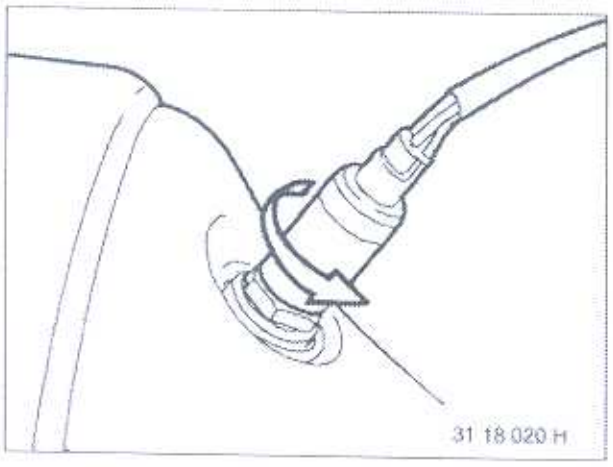
End float,
refer to Technical Data



On engines with aluminium engine block:

Unfasten screw connection on reinforcement plates.

(refer to Operation No. 13 00 002)



Disconnect connector for oxygen sensor.

Unclip Lambda oxygen sensor cable from bracket.

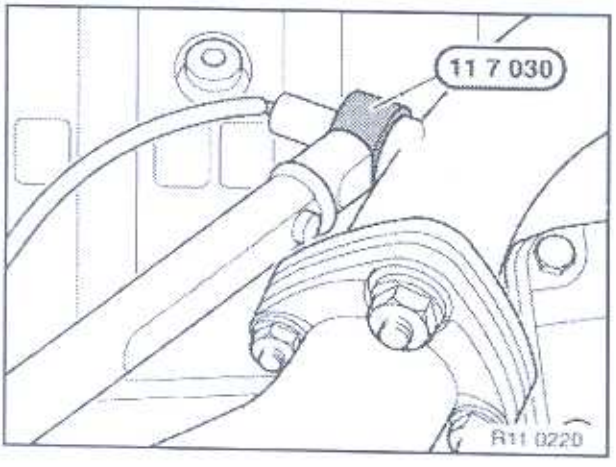
Unfasten oxygen sensor.

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 allow any lubricant to make contact with the oxygen sensor section protruding into the exhaust section.



Installation:

Tighten oxygen sensor with special tool 11 7 030.

Tightening torque,

refer to Technical Data 11 78 1AZ

Protect (mask) Lambda oxygen sensor when applying underseal.

Note cable routing of oxygen sensor.

11 62 140 Removing and installing, sealing or replacing both exhaust manifolds (M52/S52)

Unfasten exhaust pipe from manifold.

Disconnect connector for oxygen sensor.

Unclip oxygen sensor cable from bracket.

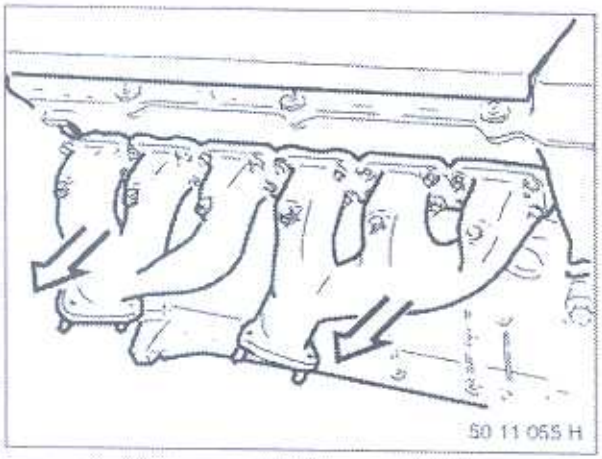
If necessary, remove non-return valve and pipe for secondary air induction.

Installation:

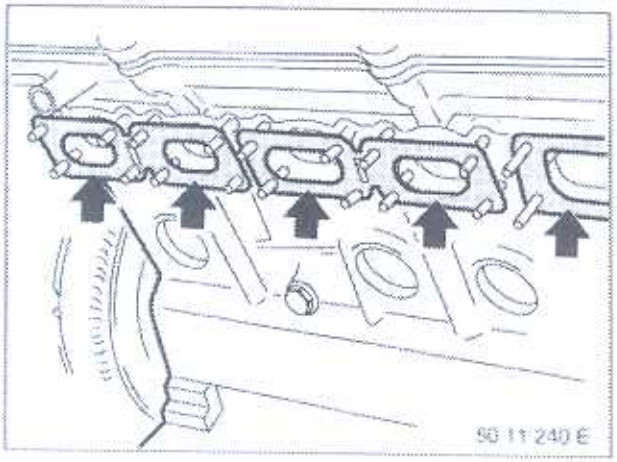
Replace seals.

Coat thread with copper paste -CRC-.

Replace nuts.



Unfasten nut on exhaust manifold.



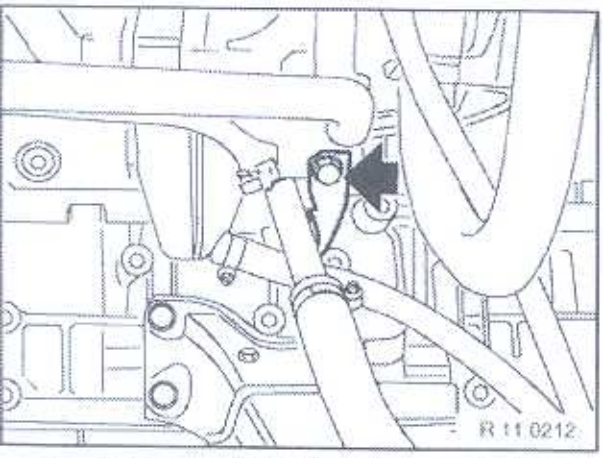
Installation:

Replace seals.

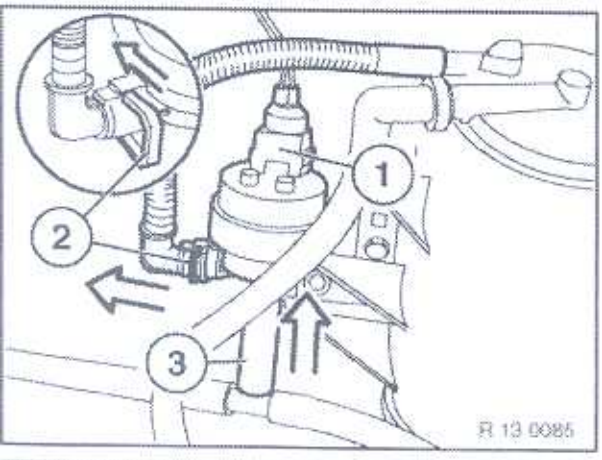
Coat thread with copper paste -CRC-.

Replace nuts.

Tightening torque,
refer to Technical Data 11 62 1AZ



Unfasten retaining bracket from coolant line.



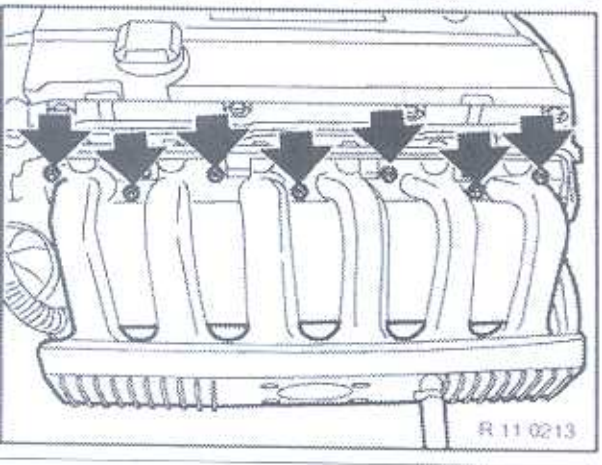
Unfasten following plug connections:

- Temperature sensor for intake air
- Idle speed control valve

Disconnect plug connections (1) on tank vent valve

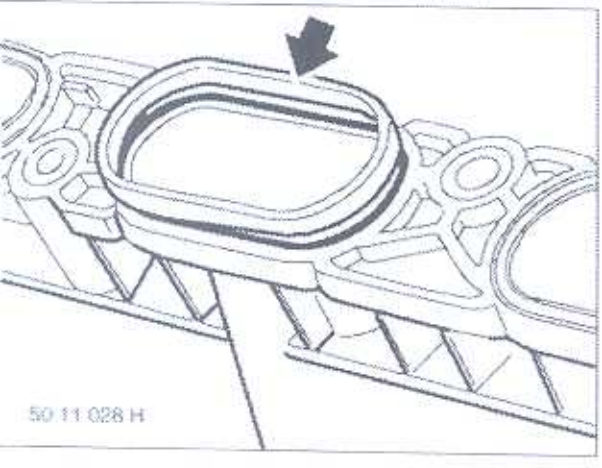
Pull tank vent valve upwards to remove from bracket.

Press down locking bracket (2), remove hose.



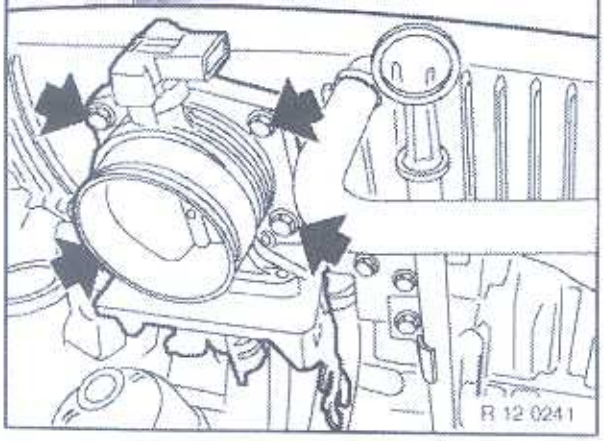
Unfasten intake air manifold.

Remove intake air manifold and tank vent valve.



Installation:

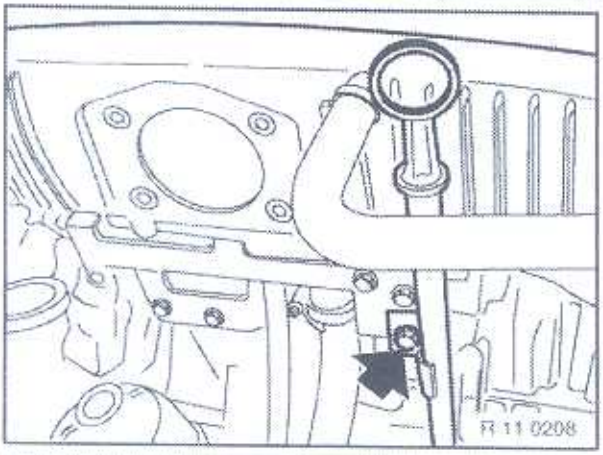
Check gaskets and replace if necessary.



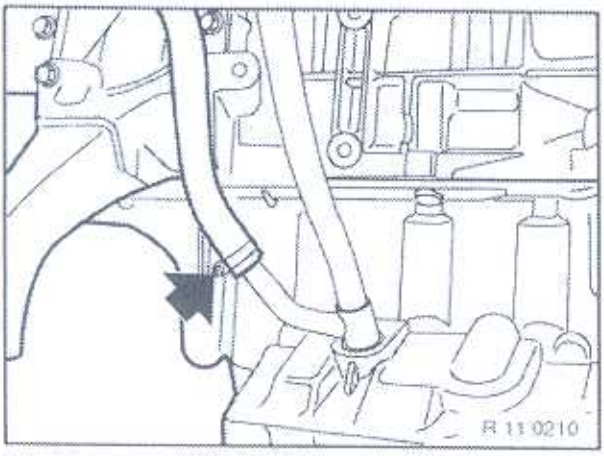
Remove throttle valve.

Note:

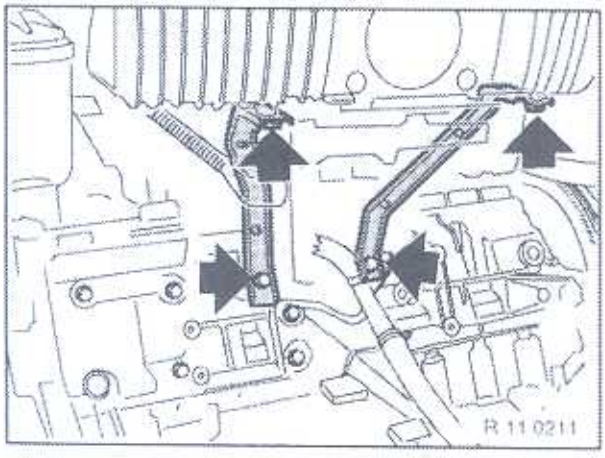
Bowden cables and throttle valve preheating unit remain connected.



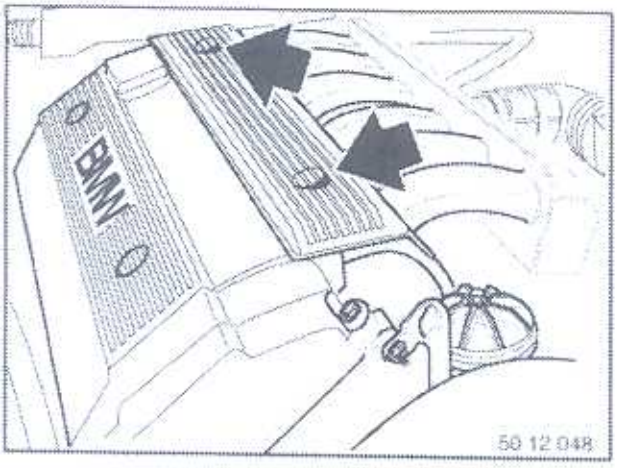
Unfasten guide tube from dipstick on manifold.



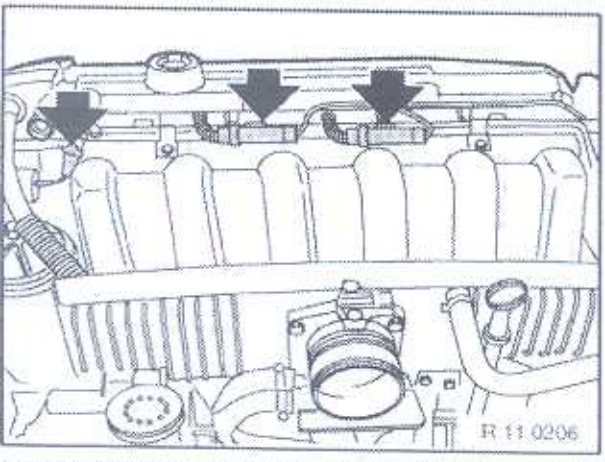
Remove oil return hose from cyclone oil separator.



Remove support from front and rear manifold.



Remove cover from injection valves.

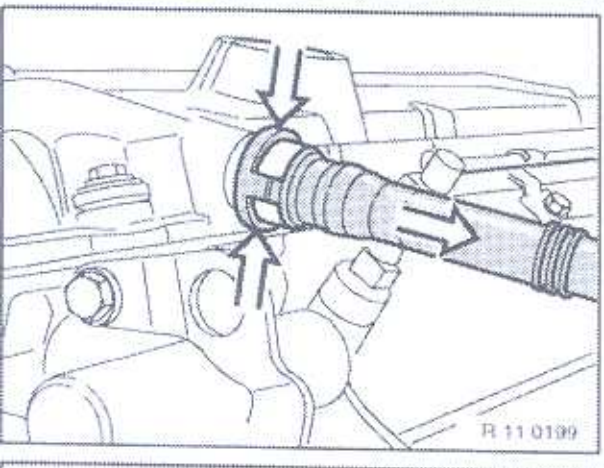


Unclip plug connections from oxygen sensors.

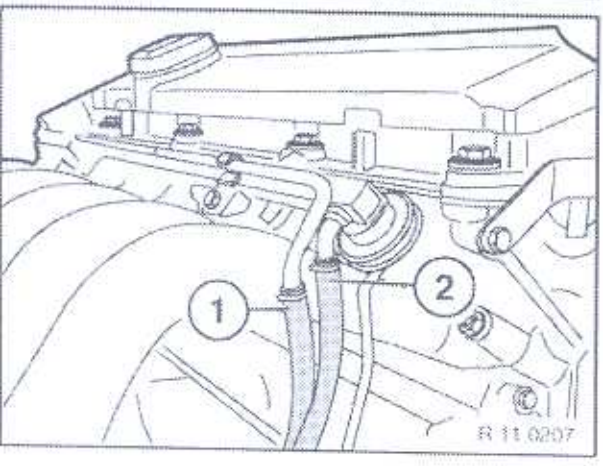
Unfasten plug connection from VANOS solenoid valve.

Lift connector strip off injection valves and place to one side.

Remove vacuum hose for brake force booster from intake air manifold.



Unclip connection for ventilation.



Caution!

Catch and dispose of fuel as it escapes.

(1) Removing fuel delivery line (from fuel filter).

(2) Removing fuel return line.

Follow instructions on removal and installation of fuel hoses,

refer to 13 53 540

Secure fuel hoses in bracket on intake air manifold.

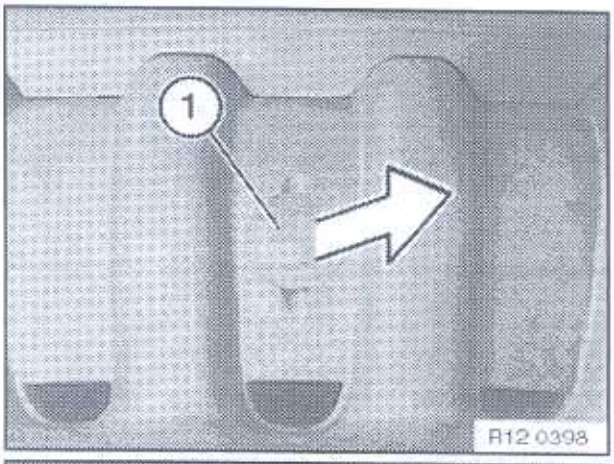
Note instructions on removing and disconnecting battery,
refer to General Information MG 12

Disconnect negative battery lead.

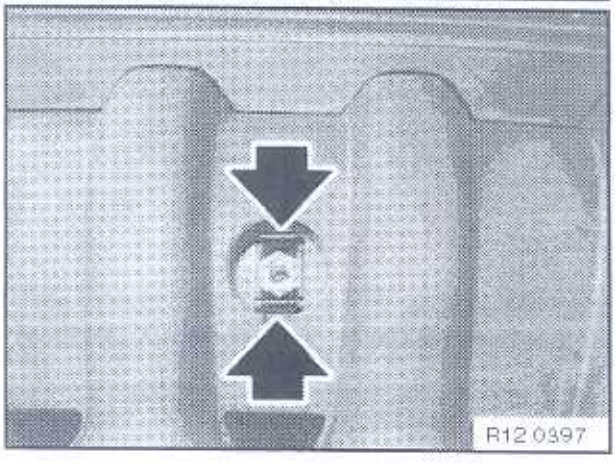
Removing intake air housing with mass air flow sensor,
refer to 13 71 000

Only E39

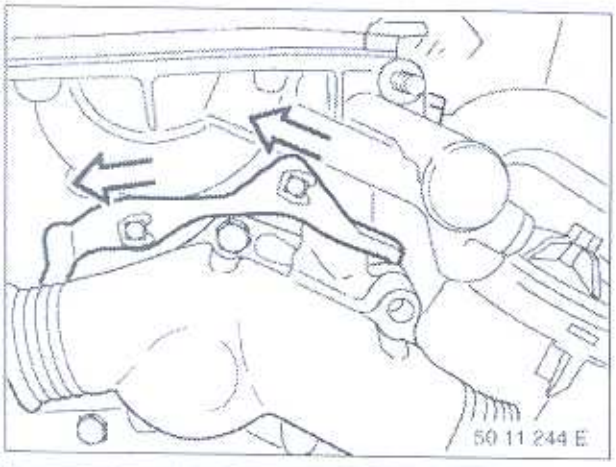
Remove cover on windshield and left air duct. This operation is described in section on removing complete wiper console,
refer to 61 61 270



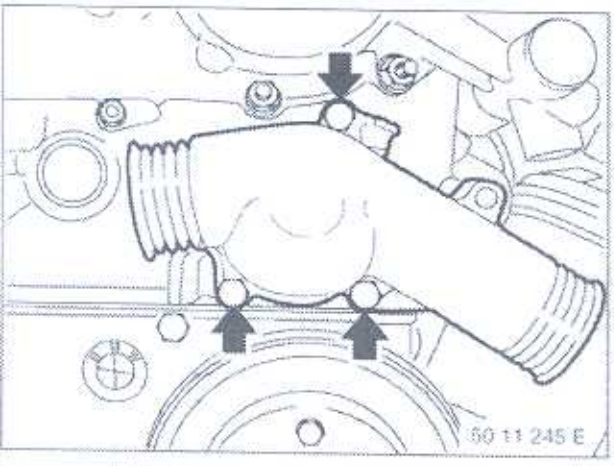
Lift off cover (1).



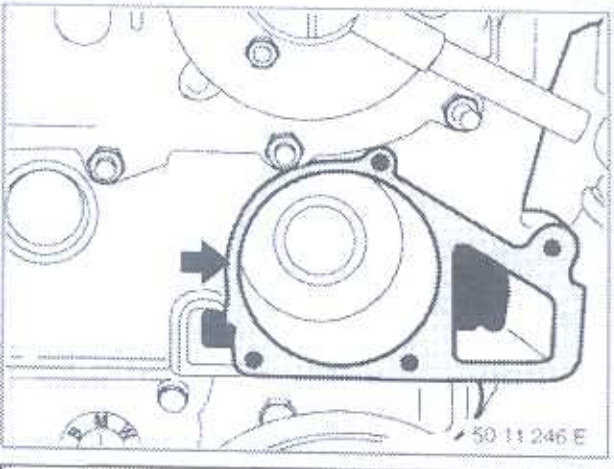
Unclip positive battery lead by pulling downwards.



Remove cable channel.



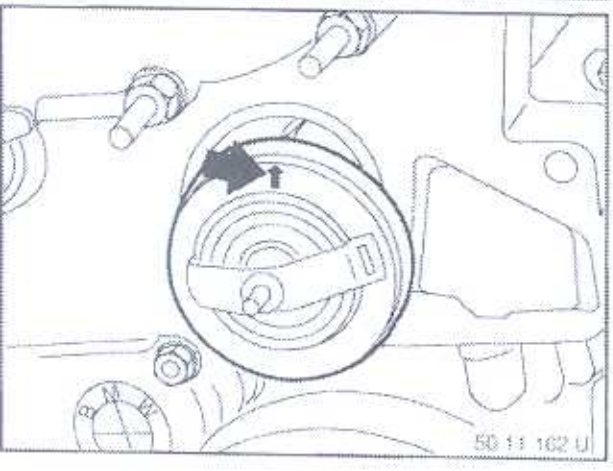
Unfasten thermostat housing.



Installation:

Keep sealing faces clean and free of oil.

Replace seal.



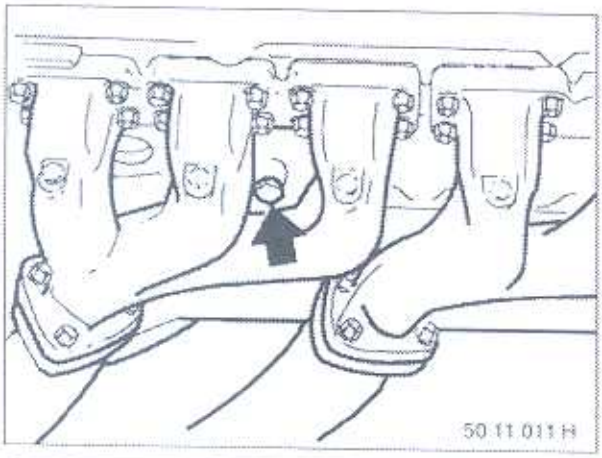
Installation:

Check installed direction.

Vent with arrow facing upwards

Replace seal.

Removing fan coupling with fan wheel and fan cowl,
refer to 11 52 020



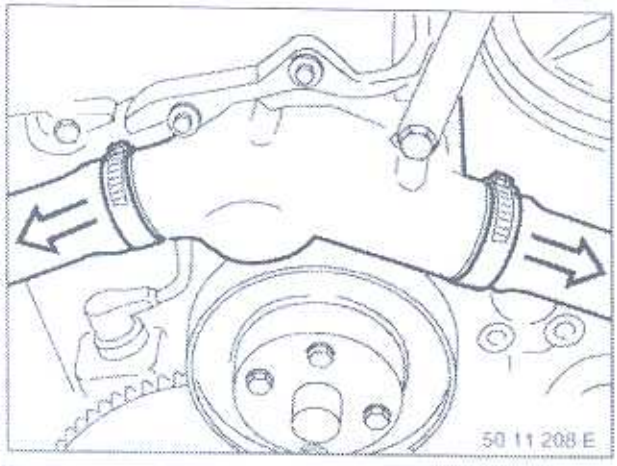
Drain and dispose of coolant.

Installation:

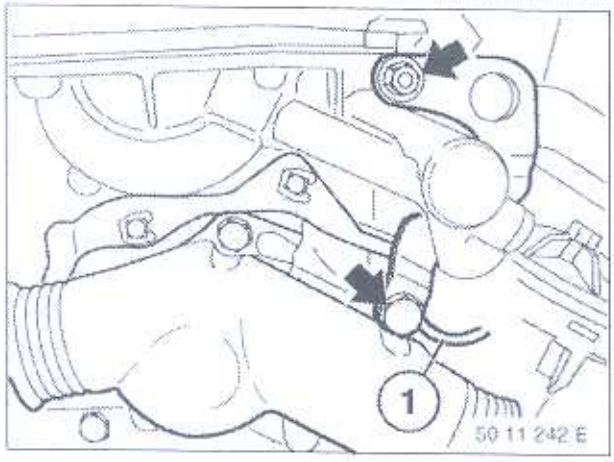
Replace seal.

Tightening torque,
refer to Technical Data 11 11 5AZ

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

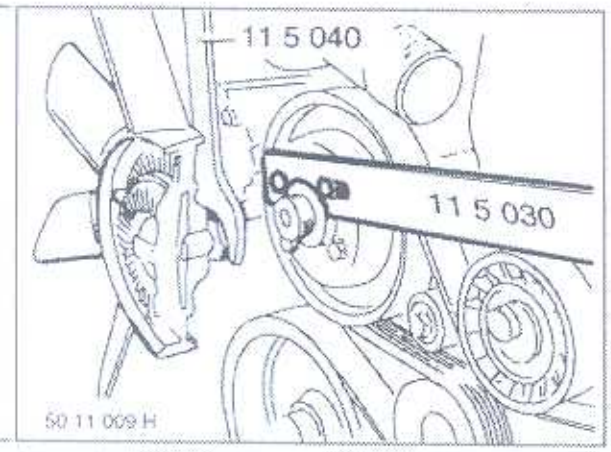


Unfasten water hoses.



Unscrew suspension eye.

If necessary, remove air guide for alternator.



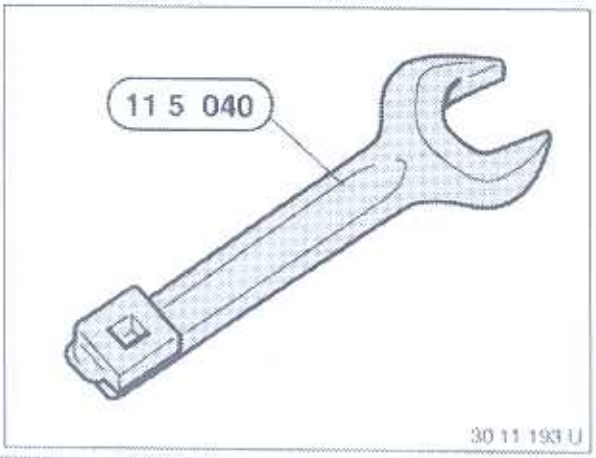
Caution!

Left-hand threads.

Using special tool 11 5 030, brace against pulley and unfasten cap nut from water pump using special tool 11 5 040.

If necessary, unfasten fan cowl.

Take the fan wheel with fan coupling off the water pump and remove.



Installation:

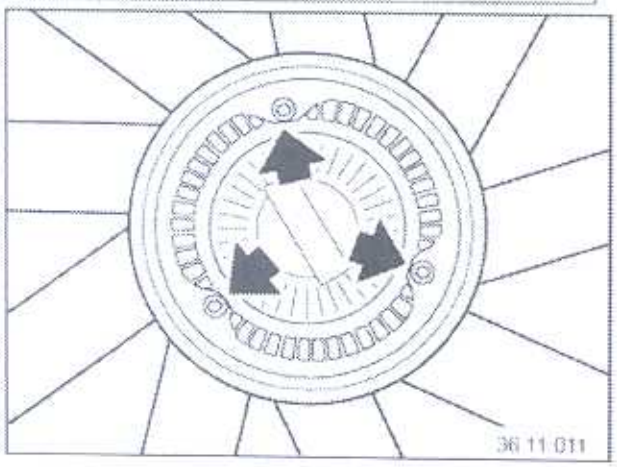
Tighten down fan wheel using special tool 11 5 040.

Tightening torque,

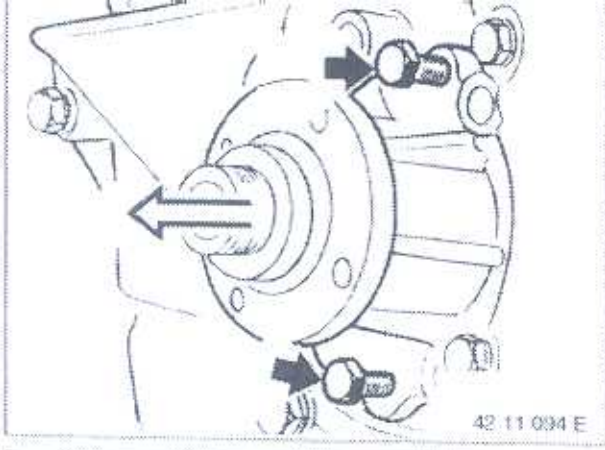
refer to Technical Data 11 52 1AZ

Note:

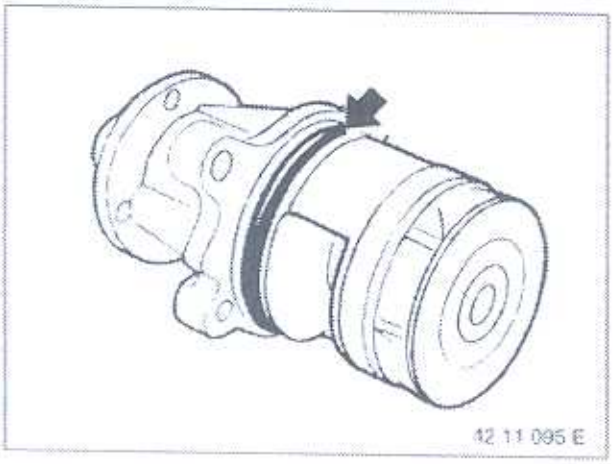
When using special tool 11 5 040, 30 Nm on the torque wrench scale are equivalent to a tightening torque of 40 Nm.



Unfasten screws and detach fan from fan coupling.



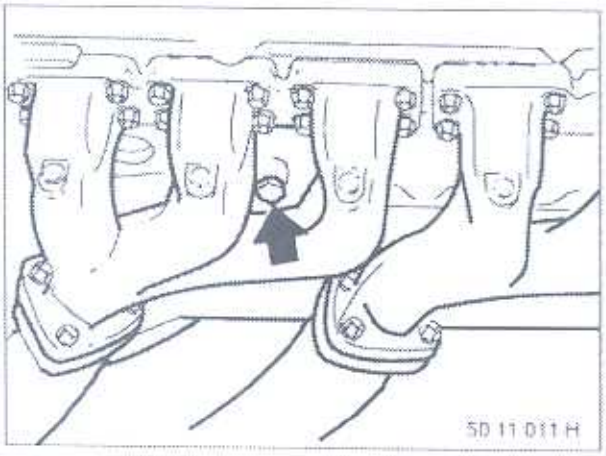
Tighten two screws (M 6) into thread of water pump and water pump out of timing case.



Installation:

Replace O-ring and coat with coolant as anti-friction agent.

Removing alternator drive belt,
refer to 11 28 010



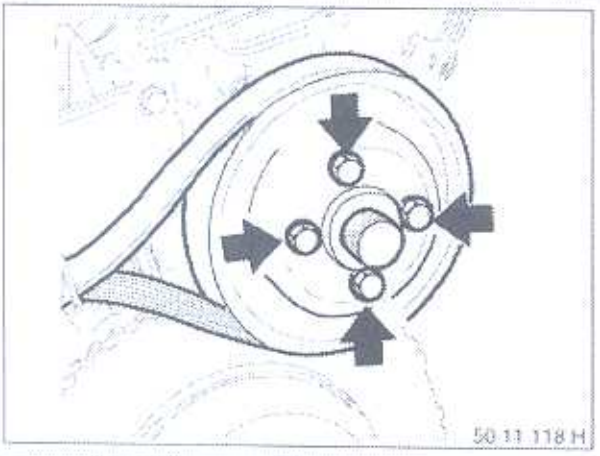
Drain and dispose of coolant.

Installation:

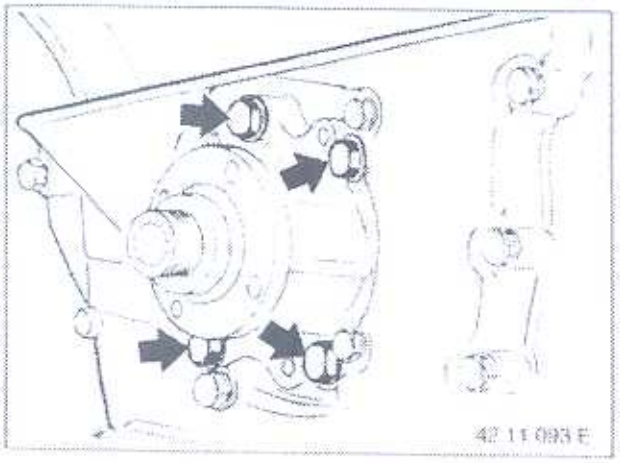
Replace seal.

Tightening torque,
refer to Technical Data 11 11 5AZ

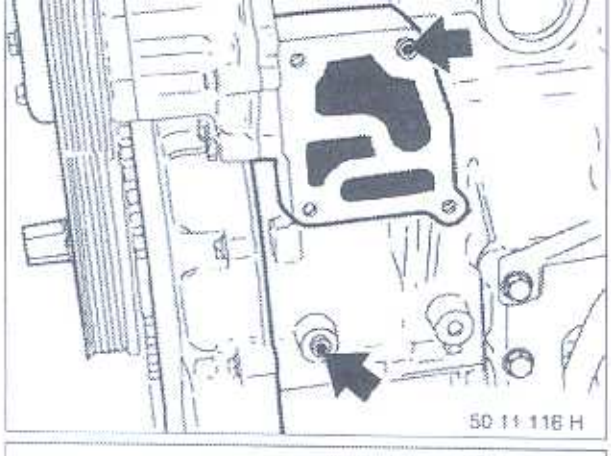
Bleeding cooling system and checking for water leaks,
refer to 17 00 039



Release belt pulley.

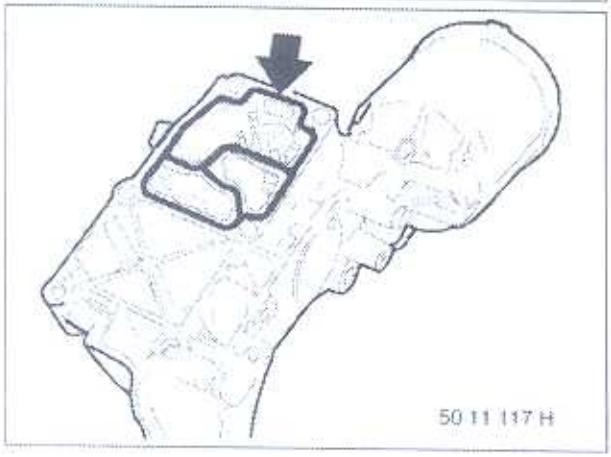


Release water pump.



Installation:

Check dowel sleeves.



Installation:

Replace seal.

Top up engine oil.

11 42 020

Removing and installing, sealing or replacing complete full-flow oil filter (M52/S52)

Removing intake air manifold,
refer to 11 61 050

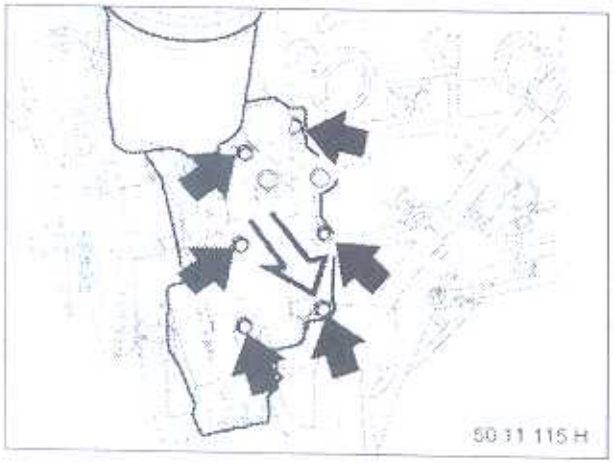
Unfasten oil filter cover to allow oil to flow out of main flow oil filter housing and back into oil pan.

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

Removing alternator,
refer to 12 31 020

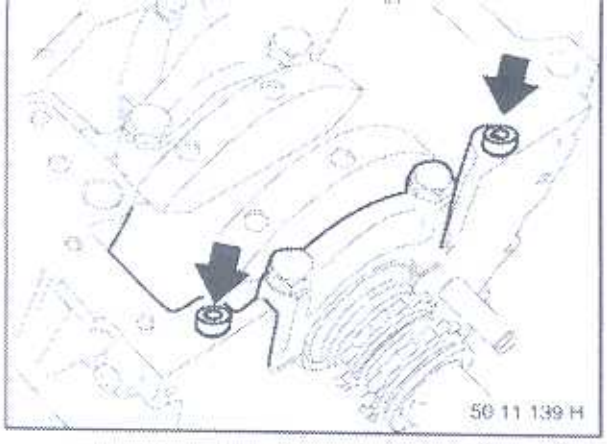
Unfasten vane pump for power steering unit and tie up to one side (lines remain connected).

If necessary, remove alternator drive belt,
refer to 11 28 020



Remove connector for oil pressure switch.

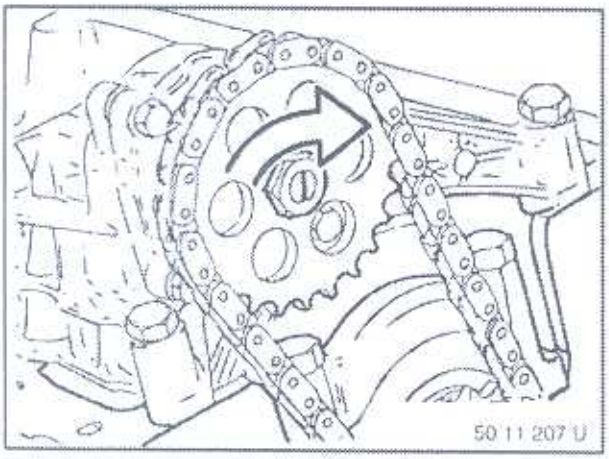
Unfasten screws and remove complete full-flow oil filter.



Installation:

Check dowel sleeves.

Removing oil pan,
refer to 11 13 000



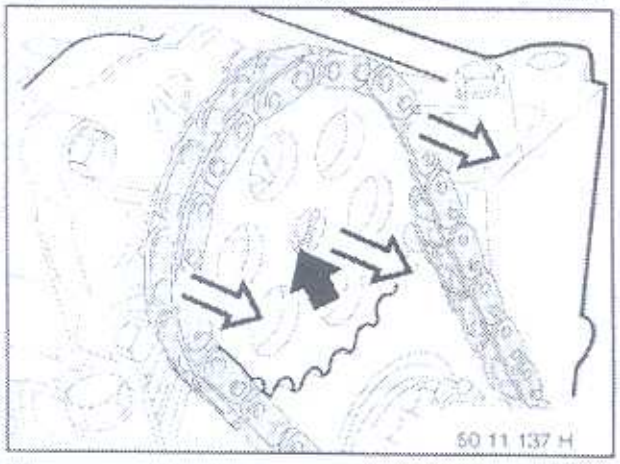
Caution!

Left-hand threads.

Unfasten nut.

Installation:

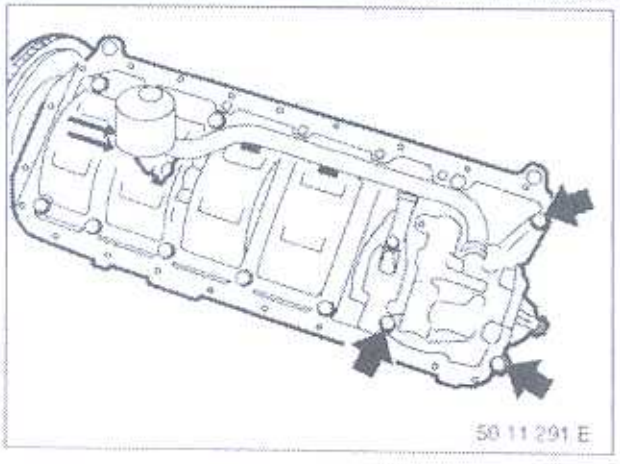
Tightening torque,
refer to Technical Data 11 41 4AZ



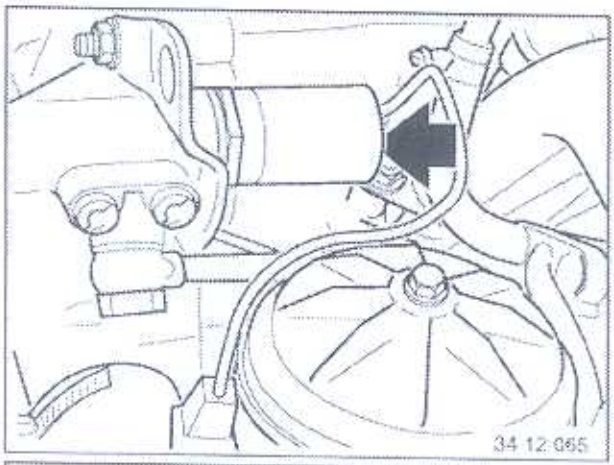
Remove sprocket with chain.

Installation:

Note spline teeth.



Unfasten oil pump and suction pipe support.



Switch off ignition.

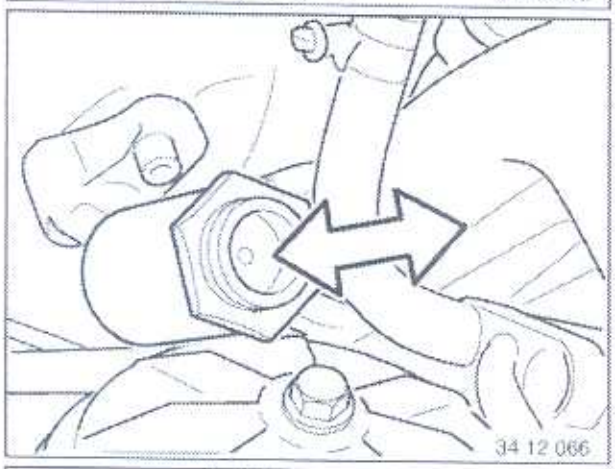
Remove plug connection from VANOS adjustment unit.

Removing VANOS solenoid valve.

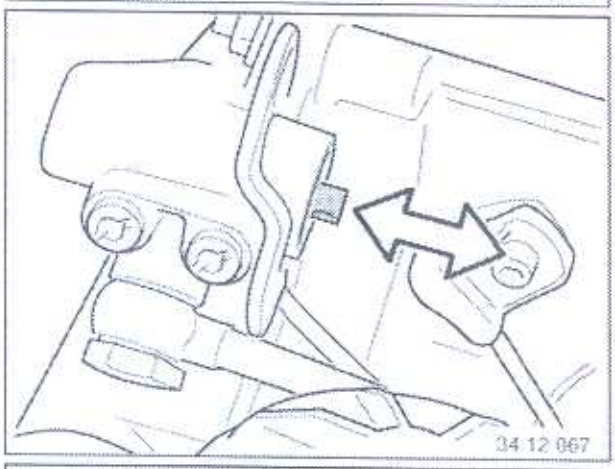
Installation:

Replace seal.

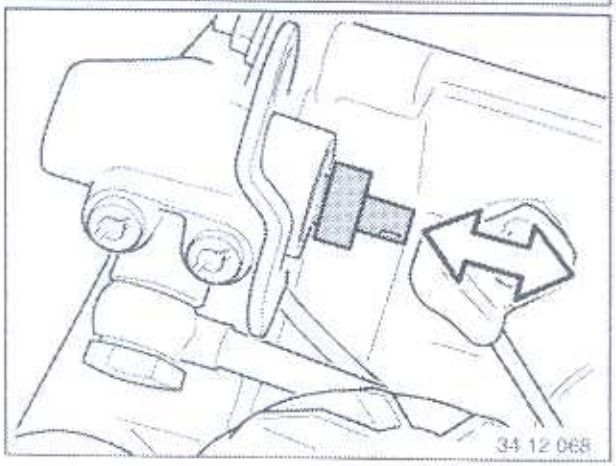
Tightening torque,
refer to Technical Data 11 36 1AZ



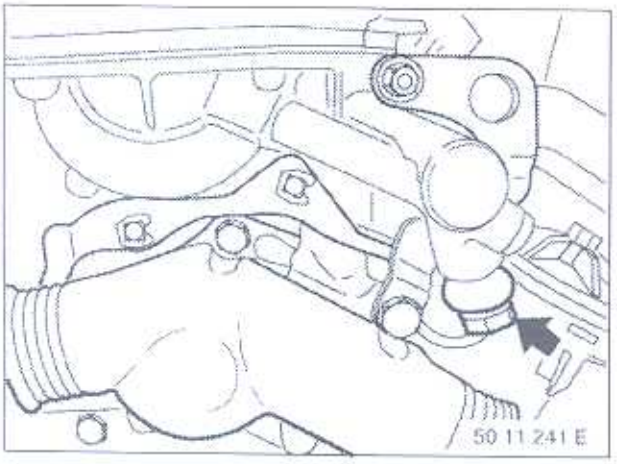
Move valve tappet back and forth: tappet must move freely.



Move plunger of hydraulic piston back and forth. Must be possible to move hydraulic piston easily.



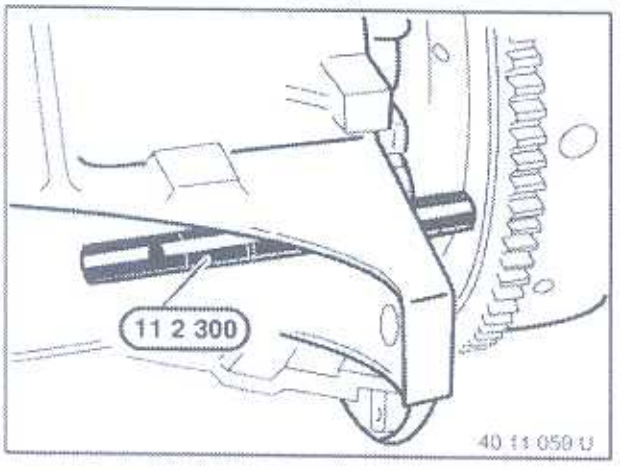
If hydraulic pistons prove difficult to move, the complete VANOS adjustment unit must be replaced.



Fit oil pressure line with new seals.

Tightening torque,
refer to Technical Data 11 36 2AZ

Install solenoid-valve plug-in connection.



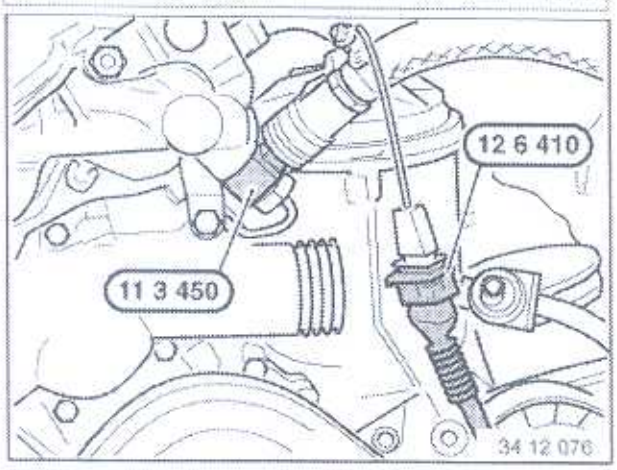
Remove special tool 11 2 300 (setting mandrel).

Assemble engine.

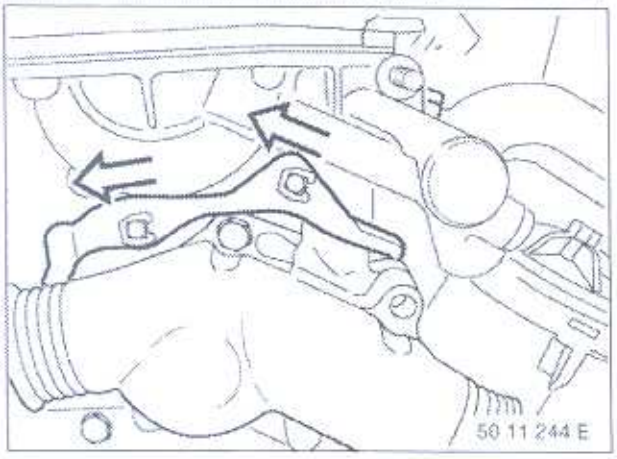
50 11 500 U

Caution!

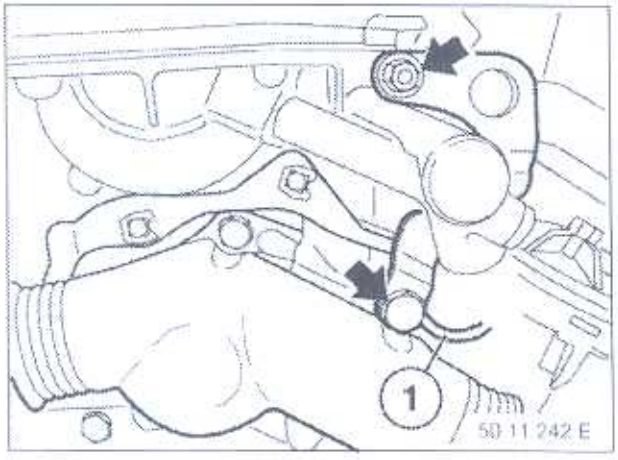
If the adjustment travel is less than 8.5 mm, the VANOS adjustment unit must be removed and readjusted.



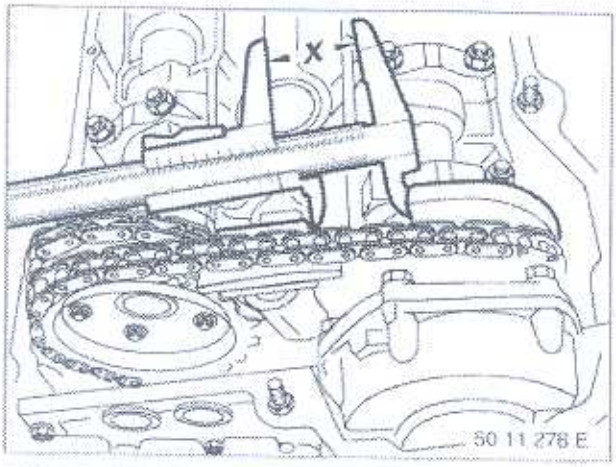
Remove special tools 11 3 450 and 12 6 410.



Fit cable duct.

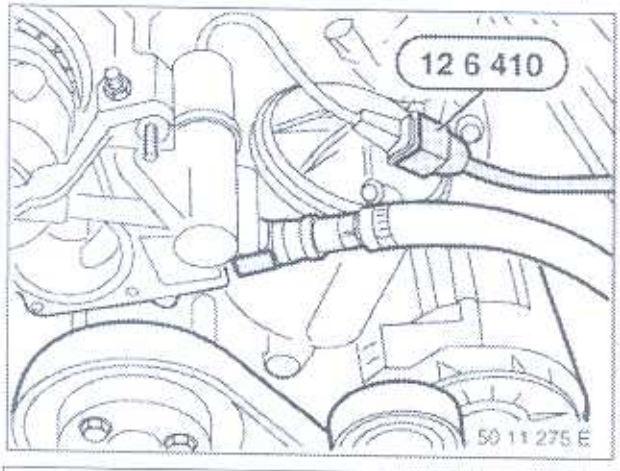


Fit suspension lug.



Measure gap (x) between secondary tensioner and edge of sensor gear.

Note down distance 1.



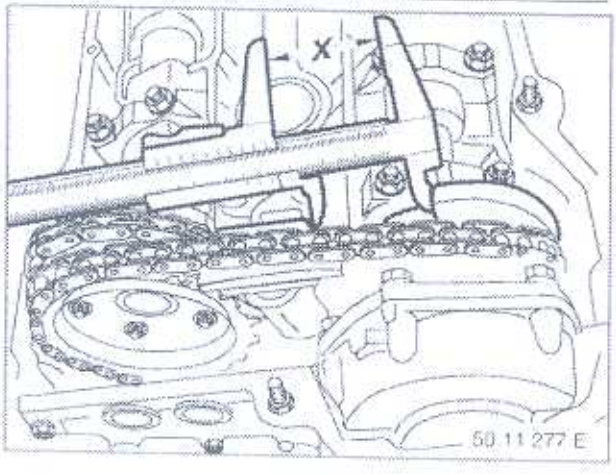
Connect special tool 12 6 410 to plug connection for VANOS solenoid valve.

Connect positive clip to battery connection point.

To adjust camshaft, connect negative terminal to vehicle earth.

Caution!

Reversing terminals on special tool will destroy installed diode on VANOS solenoid valve. Solenoid valve remains serviceable but current spikes can give rise to faults in vehicle circuit.

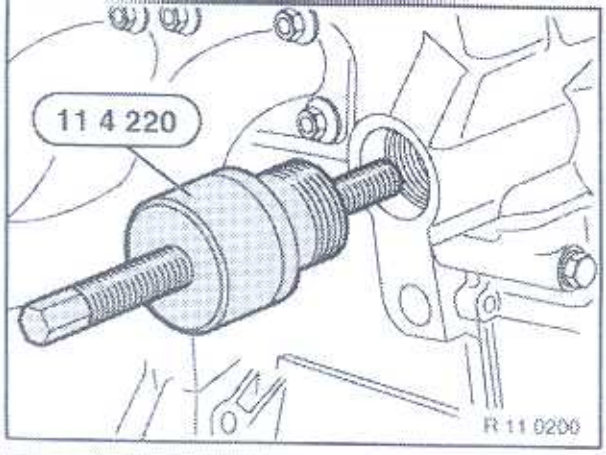


Measure gap (x) between secondary tensioner and edge of sensor gear.

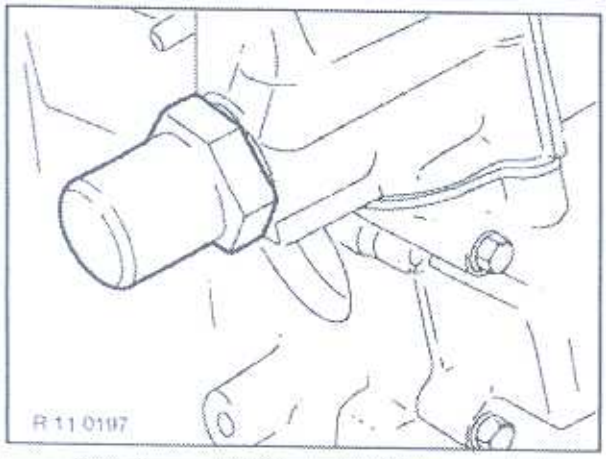
Note down distance 2.

Determine control travel:

Distance 2 - distance 1 = length of stroke.



Relieve tension on special tool 11 4 220 and remove.



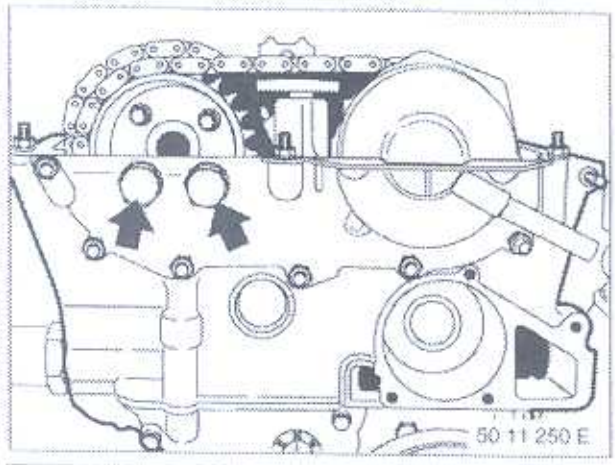
Install cylinder for chain tensioning piston:

M52

refer to 11 31 090

S52

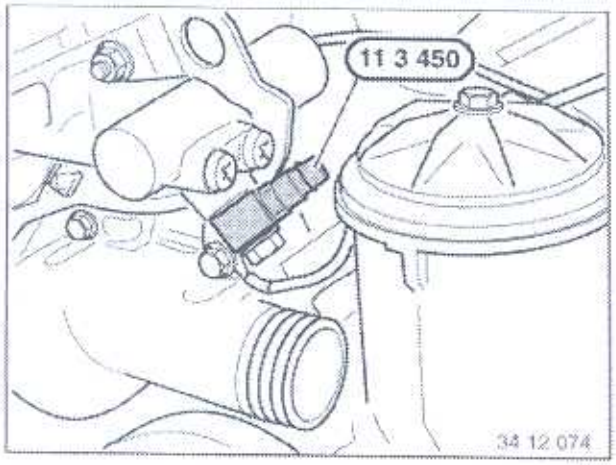
refer to 11 31 091



Install plugs with new sealing rings.

Tightening torque,

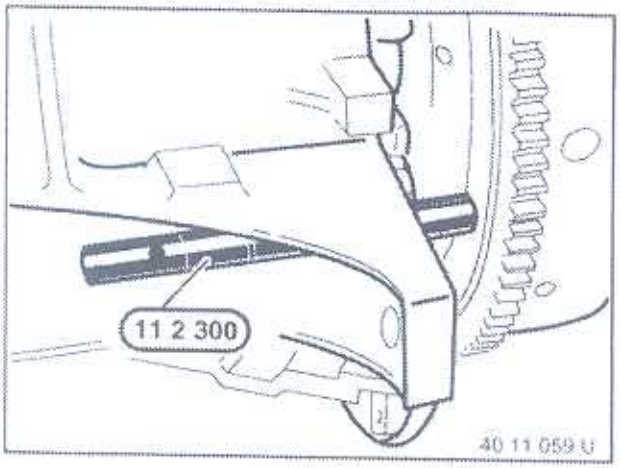
refer to Technical Data 11 36 3AZ



Check function of VANOS adjustment unit.

Fit special tool 11 3 450 with banjo bolt on oil pressure line.

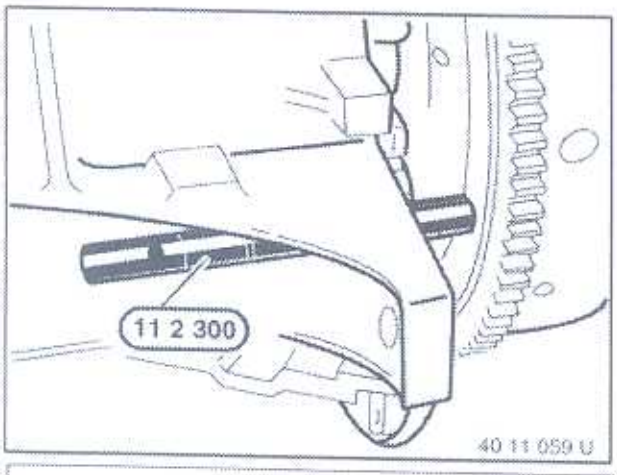
Connect up compressed air (2 ... 8 bar).



Remove special tool 11 2 300.

Note:

If work was carried out on the camshafts previously, rotate engine twice engine-wise, then check camshaft setting.

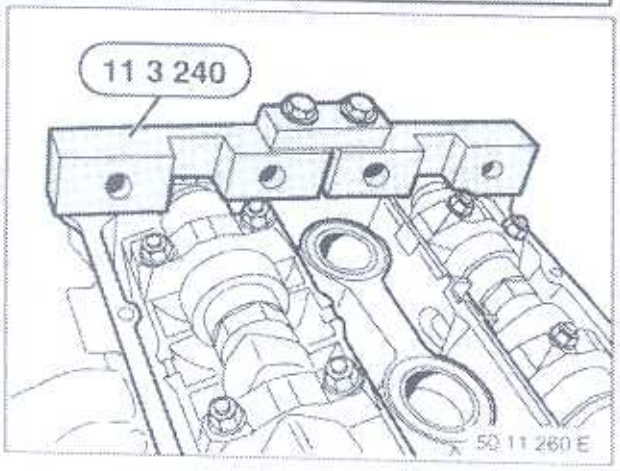


Secure crankshaft with special tool 11 2 300 in TDC position of 1st cylinder.

Caution!

Do not turn the engine back.

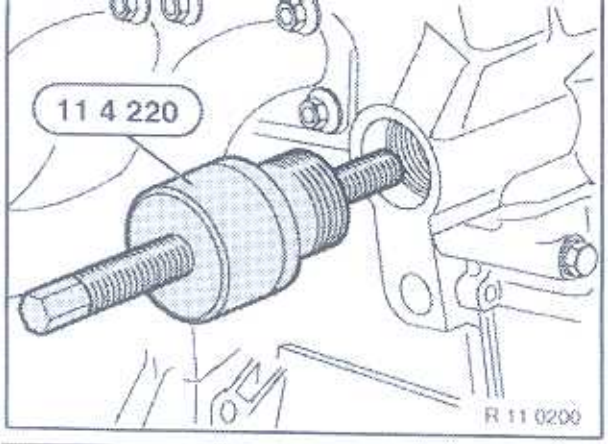
Remove special tool 11 2 300 before switching on the engine.



Apply special tool 11 3 240 on camshafts.

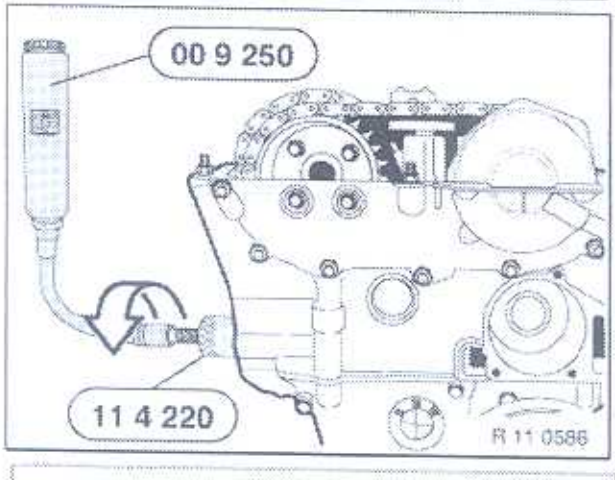
The camshaft setting is OK if special tool 11 3 240 locates flush against the cylinder head.

Remove special tool 11 3 240.

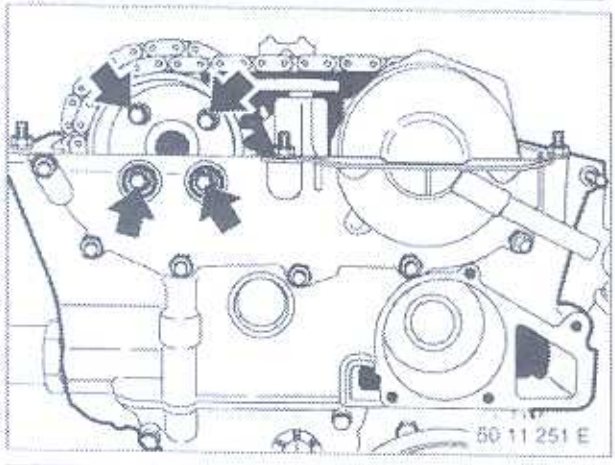


Install special tool 11 4 220.

Fit adjusting screw to tensioning rail.



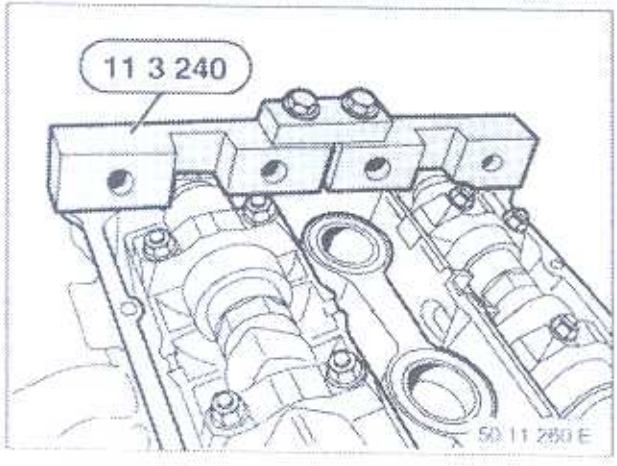
Tighten tensioning rail with special tool 11 4 220 by rotating the adjusting screw with special tool 00 9 250 or preload with standard torque wrench to 1.3 Nm.



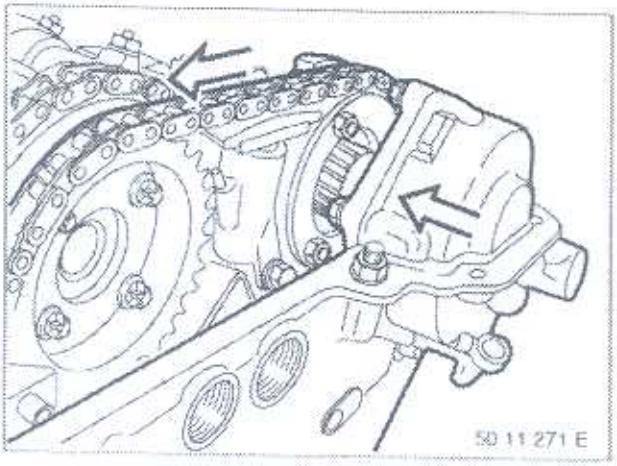
Tighten sprocket on exhaust camshaft in two passes.

Tightening torque,

refer to Technical Data 11 31 3AZ



Remove special tool 11 3 240.

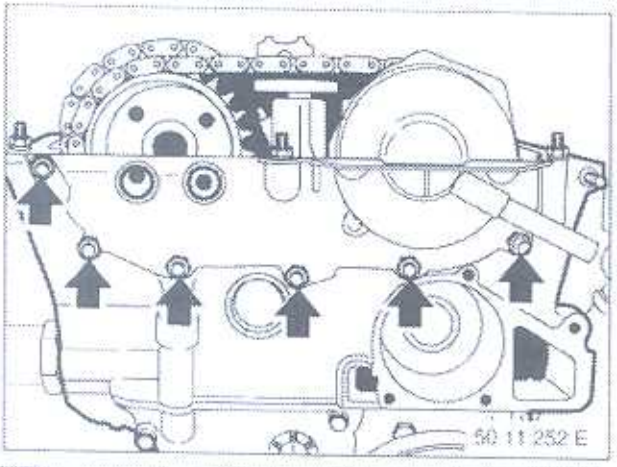


Version without plate spring

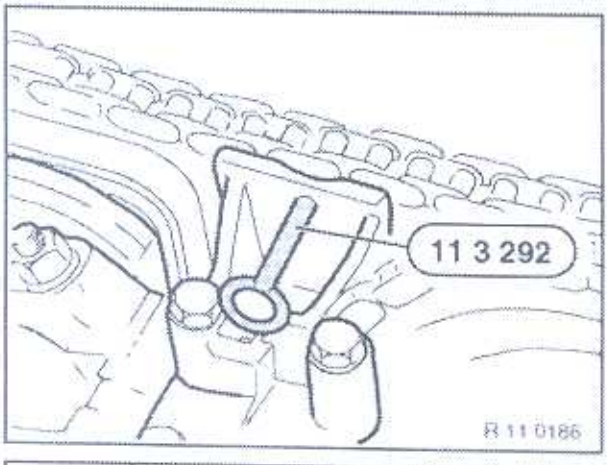
Slide VANOS adjustment unit towards cylinder head.

Guiding the helical bevel splined shaft into the helical bevel splined sprocket turns the sprockets with mounted chain counter-clockwise.

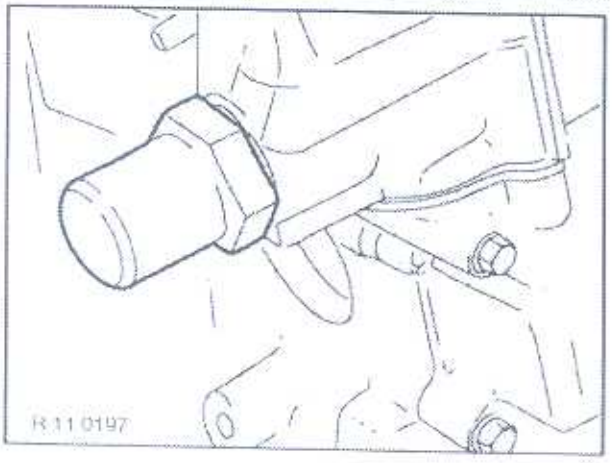
Guide the chain with sprockets in counter-clockwise direction by hand.



Tighten down VANOS adjustment unit.



Remove special tool 11 3 292.



Caution!

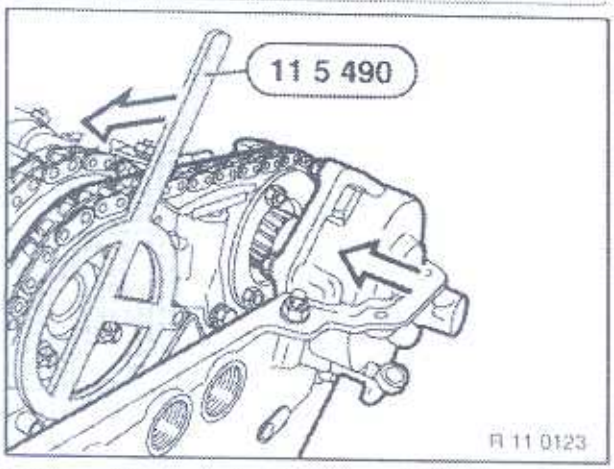
Strong spring force.

Unfasten cylinder for chain tensioning piston.

50 11 500 U

Caution!

Always ensure that the FIRST suitable tooth engages.



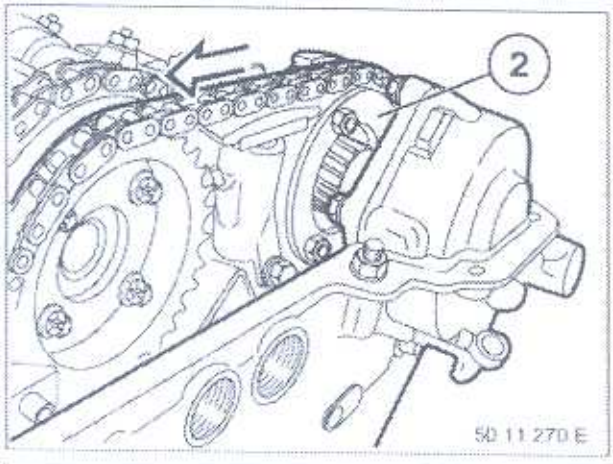
R 11 0123

Version with plate spring

Slide VANOS adjustment unit towards cylinder head.

Guiding the helical bevel splined shaft into the helical bevel splined sprocket turns the sprockets with mounted chain counter-clockwise.

Rotate chain and gears with special tool 11 5 490 counter-clockwise.



50 11 270 E

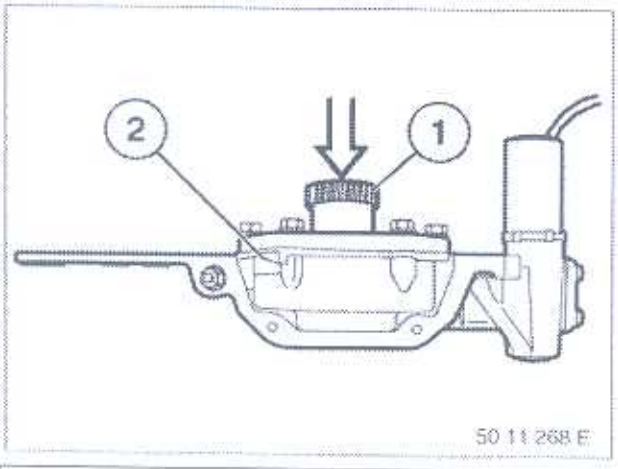
Version without plate spring

Rotate chain and gears by hand counter-clockwise until spline shaft locates in internal spline of sprocket (2).

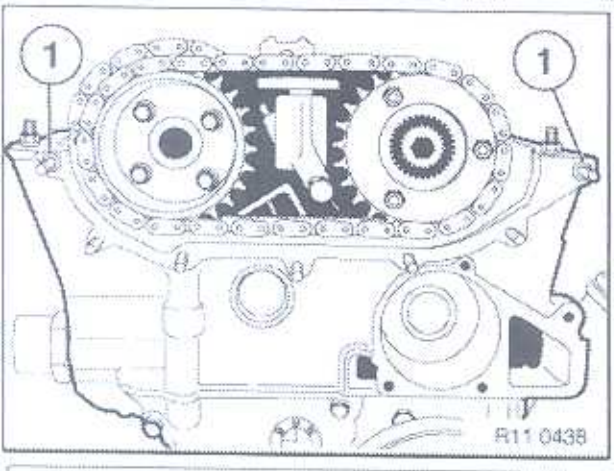
50 11 500 U

Caution!

Always ensure that the FIRST suitable tooth engages.



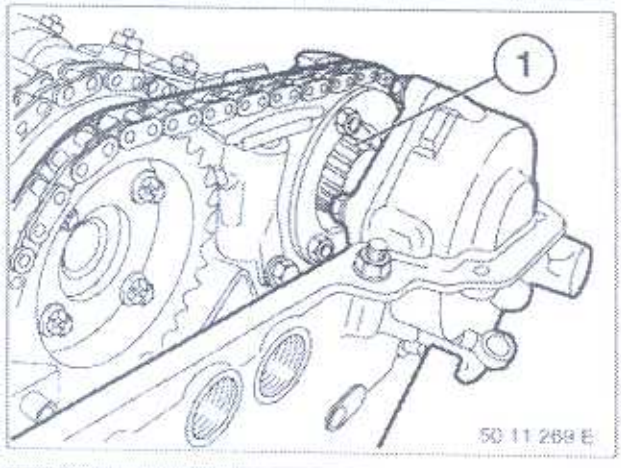
Press back spline shaft on adjustment unit (1) as far as detent in housing (2).



Note dowel sleeves (1).

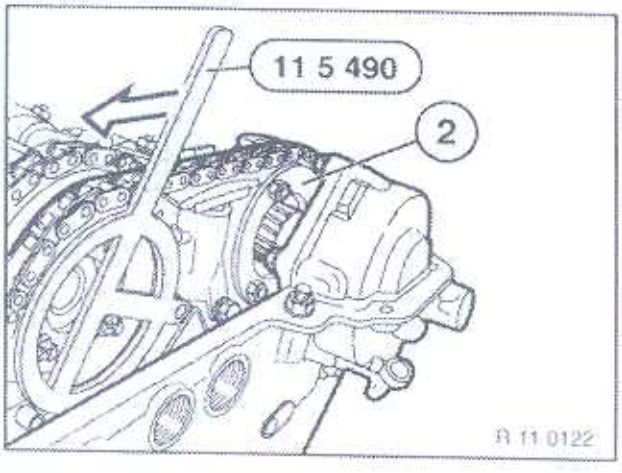
Seal contact edges along joint between cylinder head and VANOS adjustment unit with Drei Bond 1209 sealing compound (refer to BMW Parts Service).

Replace seal.



Fit VANOS adjustment unit.

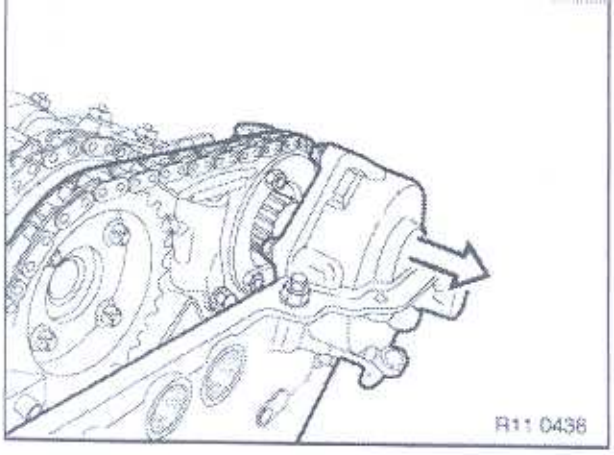
Rotate spline shaft (1) until internal spline engages.



Version with plate spring

Fit special tool 11 5 490 to exhaust camshaft.

Rotate chain and gears with special tool 11 5 490 counter-clockwise until spline shaft engages in internal spline of sprocket (2).



Version without plate spring

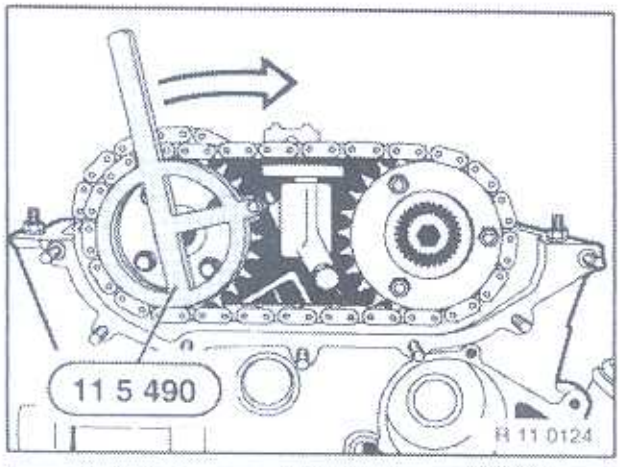
Note:

On the version without plate spring, the VANOS adjustment unit can be removed without special tool.

Removing VANOS adjustment unit.

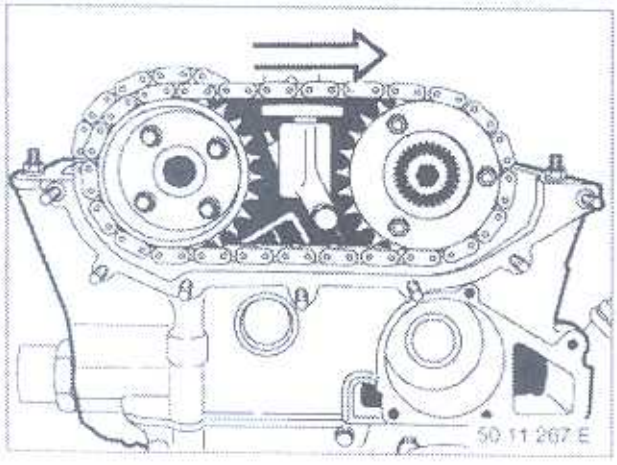
Installation:

Installation of VANOS adjustment unit is described separately from removal. Assembly sequence differs between removal and installation.



Version with plate spring

Rotate sprockets and secondary chain clockwise with special tool 11 5 490 until detent position is reached.

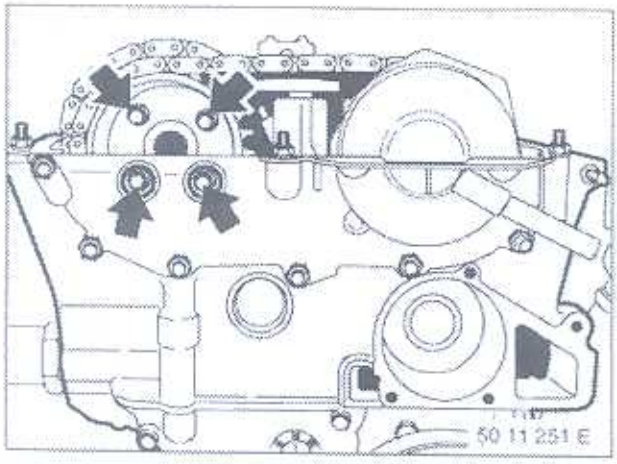


Version without plate spring

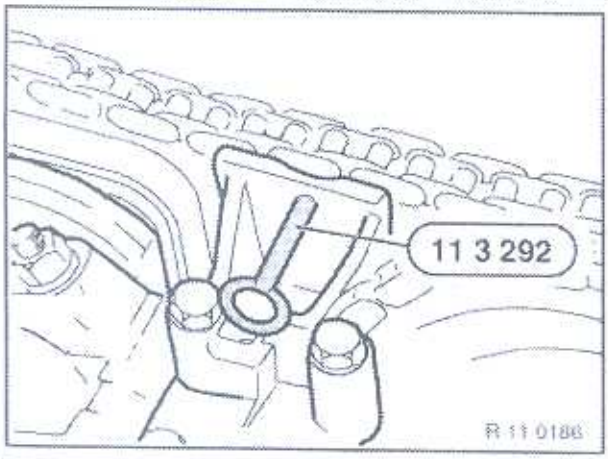
Note:

On version without plate spring, special tool is not required.

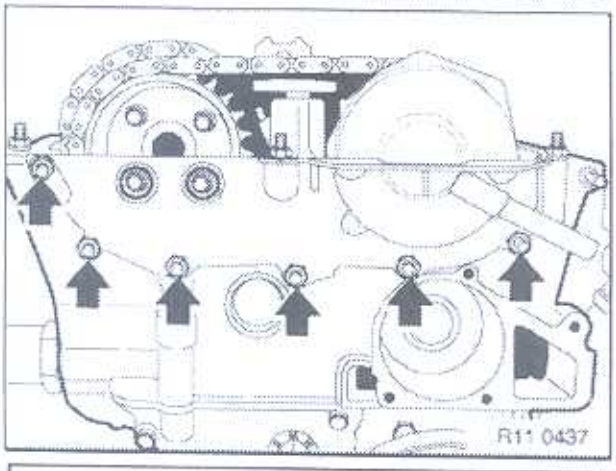
Turn sprockets with mounted secondary chain clockwise as far as stop.



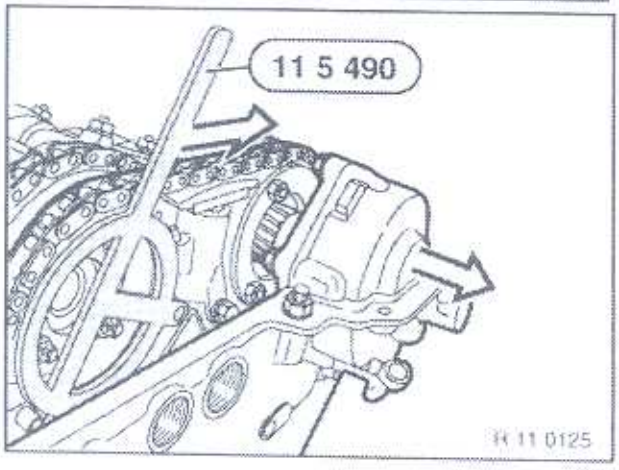
Unfasten sprocket screws on exhaust camshaft.



Press down top of seconday chain tensioner and lock with special tool 11 3 292.



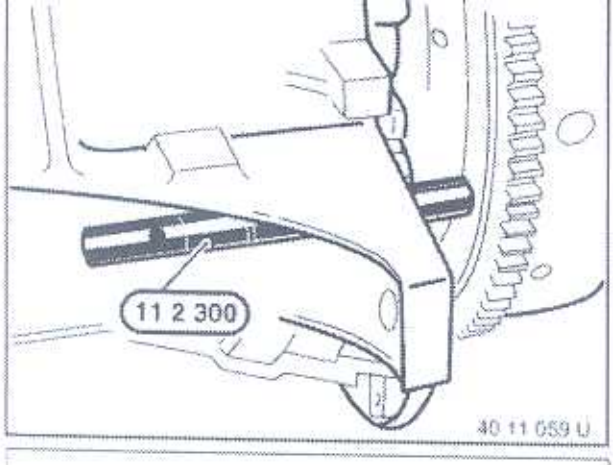
Unscrew nuts.



Version with plate spring

Fit special tool 11 5 490 to exhaust camshaft gear.

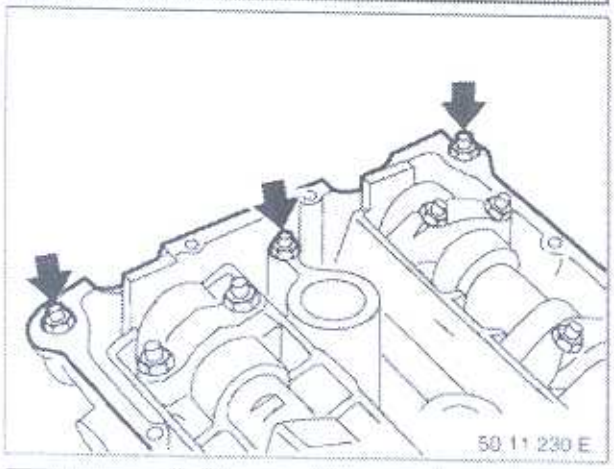
Using special tool 11 5 490, rotate sprockets and secondary chain clockwise, at the same time removing the VANOS adjustment unit.



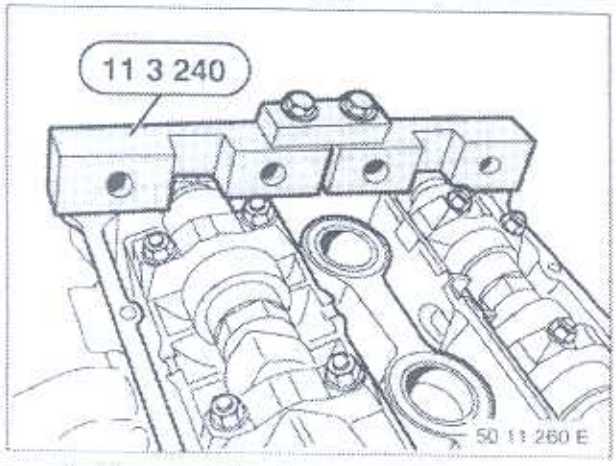
Secure crankshaft in TDC position with special tool 11 2 300.

Caution!

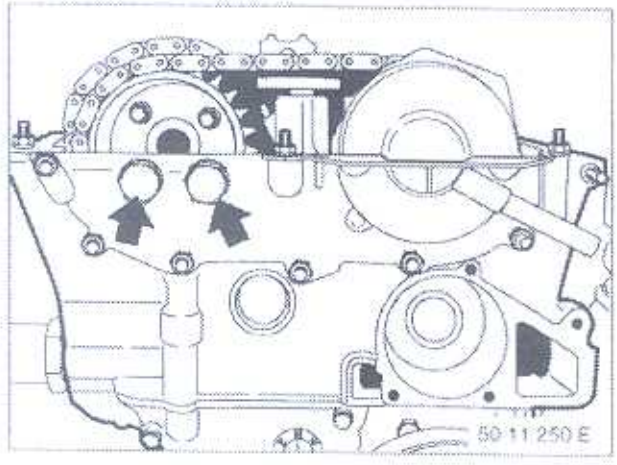
Remove special tool 11 2 300 before starting engine.



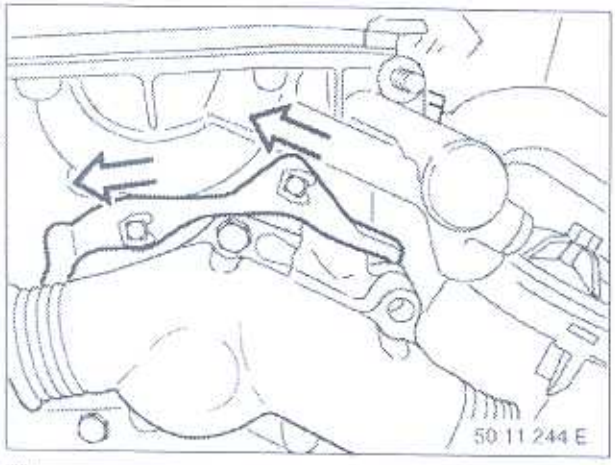
Unscrew studs.



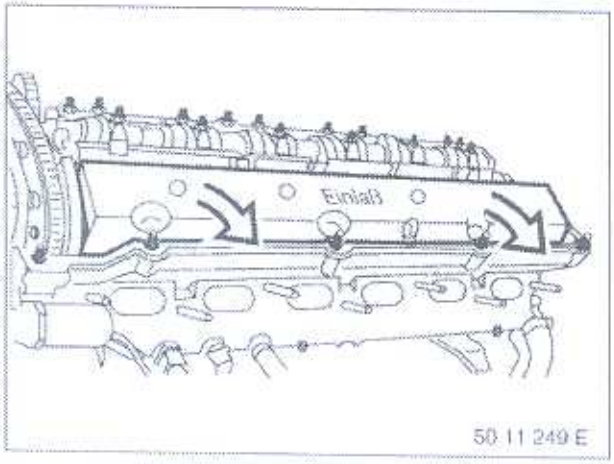
Locate camshafts with special tool 11 3 240.



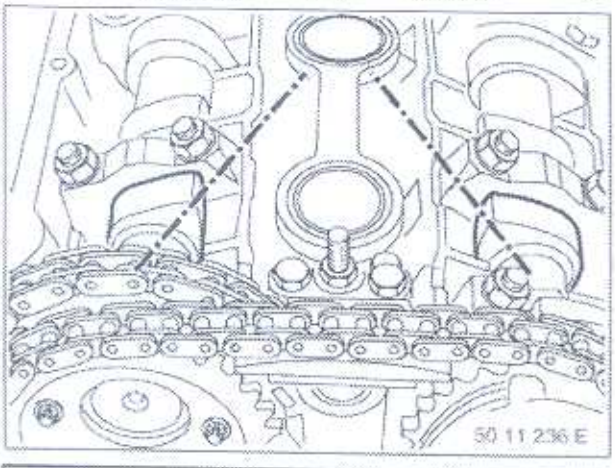
Unfasten screw plugs.



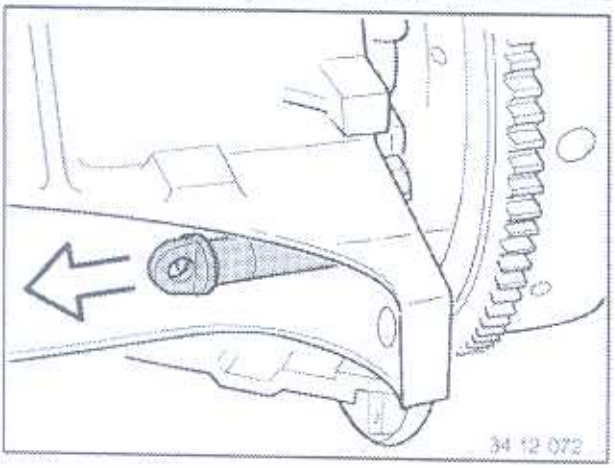
Remove cable channel.



Pull off plastic cover for intake camshaft.



Rotate engine engine-wise until cam tips on intake and exhaust camshafts on 1st cylinder face one another.



Pull dust guard out of the special tool bore.

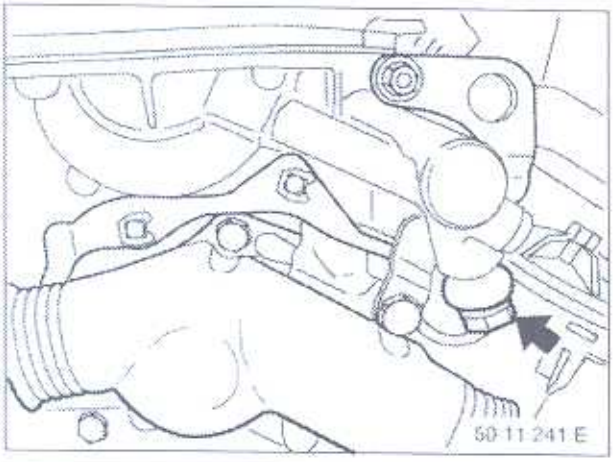
Removing fan wheel with fan coupling,
refer to 11 52 020

Removing cylinder head cover,
refer to 11 12 000

Removing spark plugs,
refer to 12 12 011

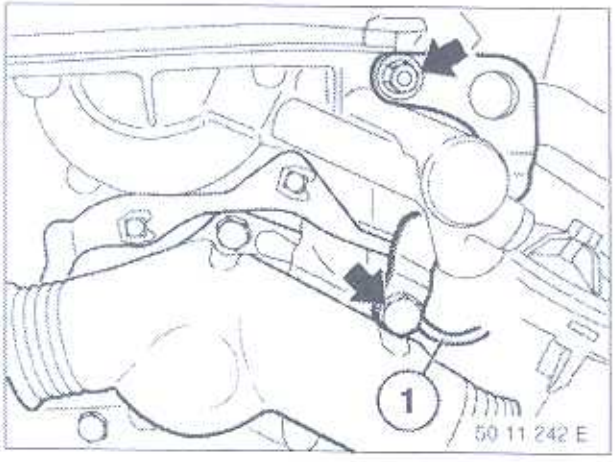
Removal:

Removal of VANOS adjustment unit is described separately from installation. Assembly sequence for removal and installation is different.

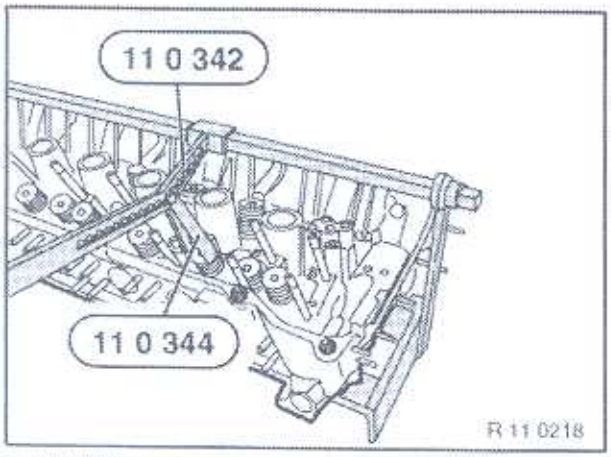


Unscrew oil pressure pipe.

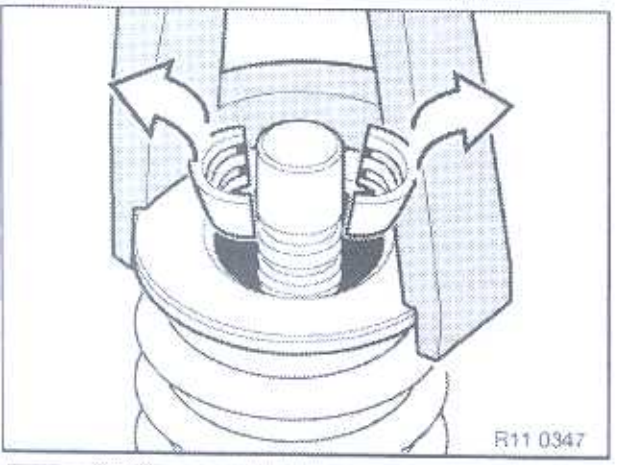
Disconnect solenoid-valve plug-in connection.



Unscrew suspension eye.

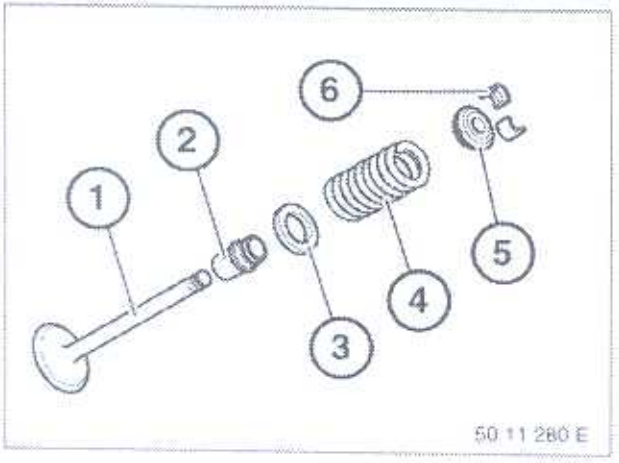


Align special tool 11 0 344 in direction of valve shaft and select appropriate groove in special tool 11 0 342.



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

Remove valve spring and plate spring.



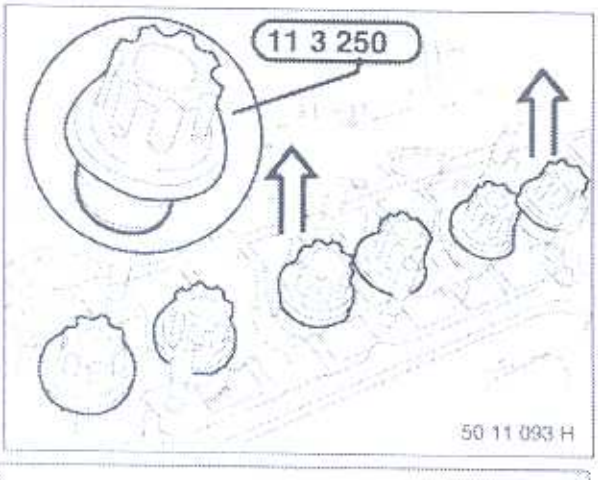
Installation sequence:

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

(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

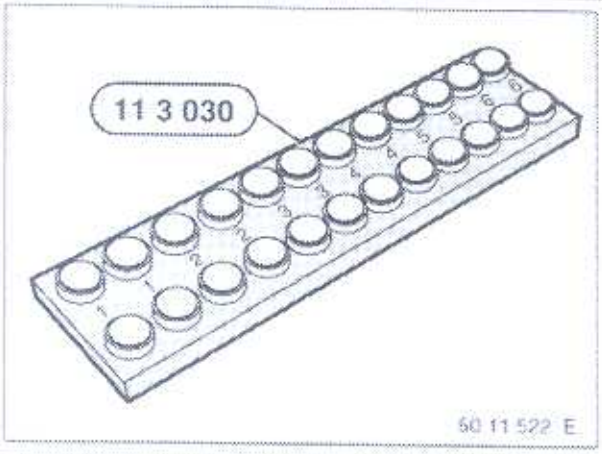


Secure bucket tappets with special tool 11 3 250.

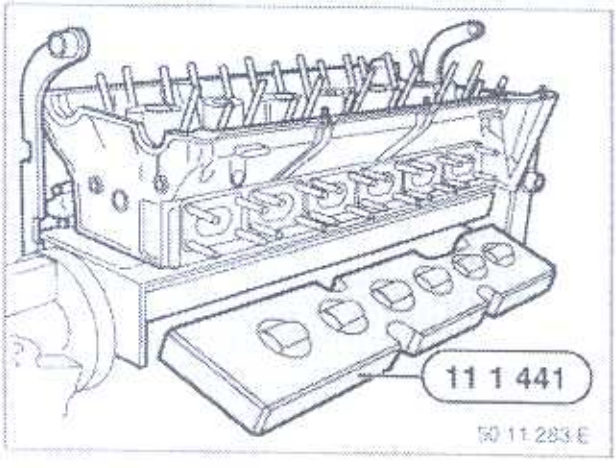
Lift out bearing strip with bucket tappet.

Installation:

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



Fit bucket tappets arranged by cylinder and in correct sequence on special tool 11 3 030.

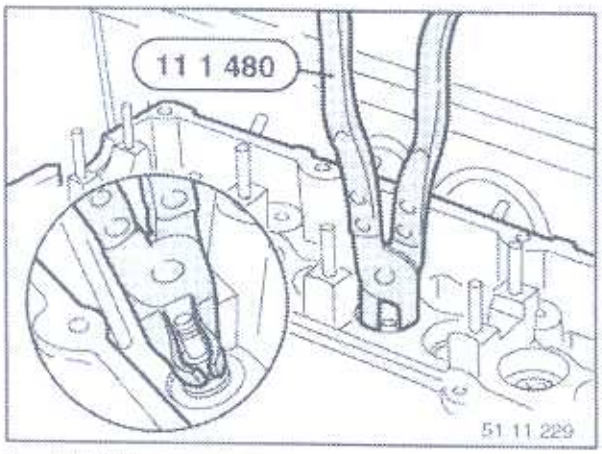


Install special tool 11 1 441 from below in special tool 11 1 065 and locate with special tool 11 1 045.

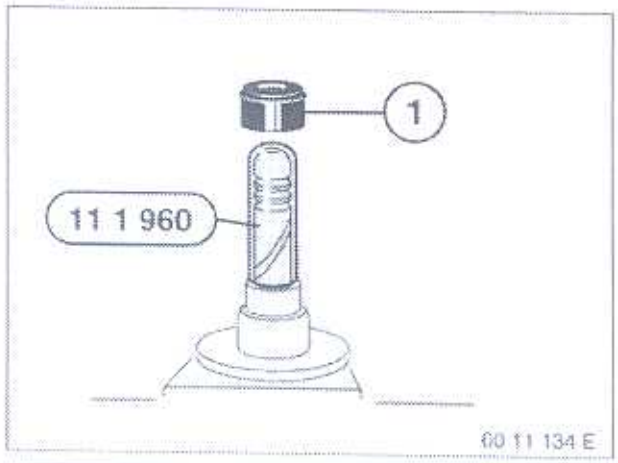
(cylinder head removed)

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

Remove all valve springs,
refer to 11 34 715

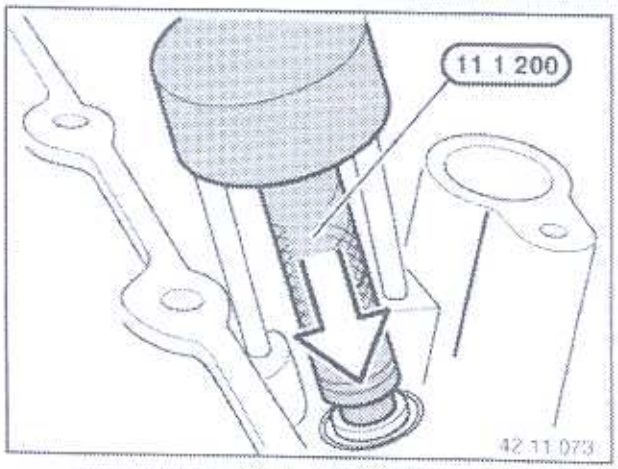


Remove valve stem seal with special tool 11 1 480.



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 valve stem seal firmly home by hand with special tool 11 1 200.

(cylinder head removed)

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

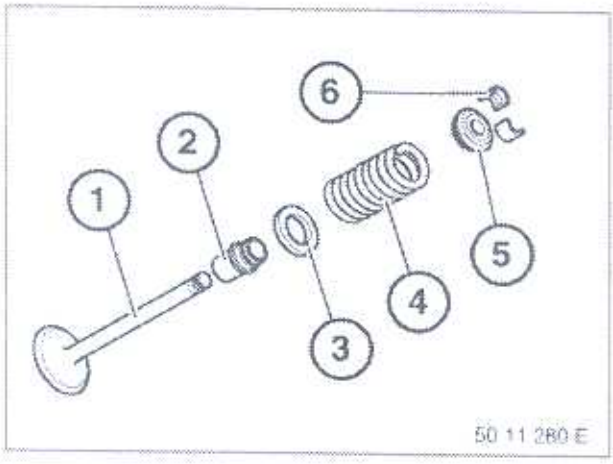
Replacing valve stem seals,
refer to 11 34 560

Remove valves from cylinder head.

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

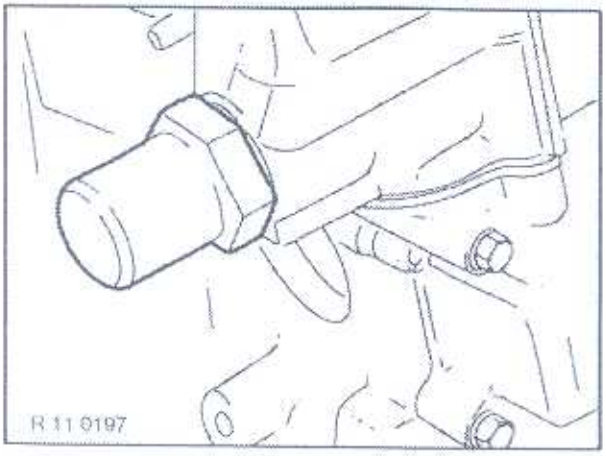
If necessary, ream the valve guide,
refer to 11 12 600

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



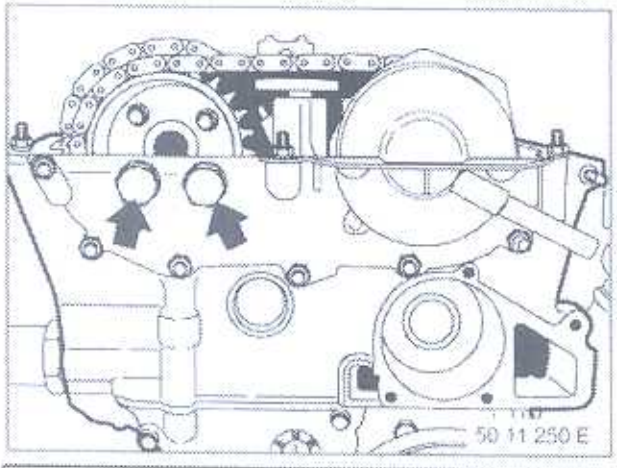
Install cylinder for chain tensioning piston:

M52

refer to 11 31 090

S52

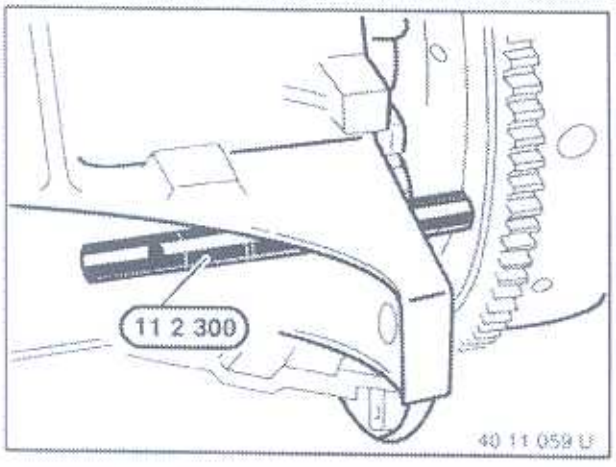
refer to 11 31 091



Install plugs with new sealing rings.

Tightening torque,

refer to Technical Data 11 36 3AZ



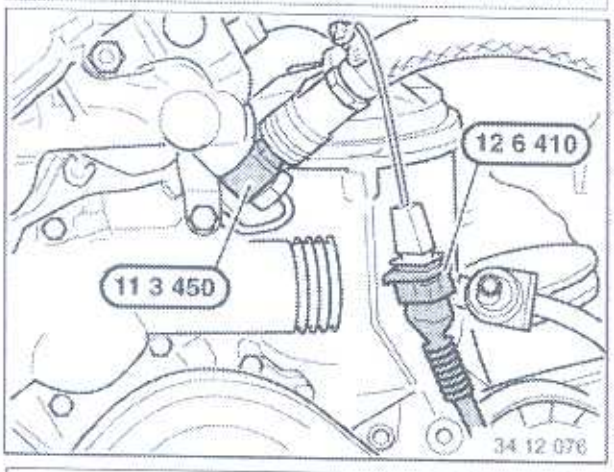
Remove special tool 11 2 300 (plug mandrel).

Assemble engine.

50 11 500 U

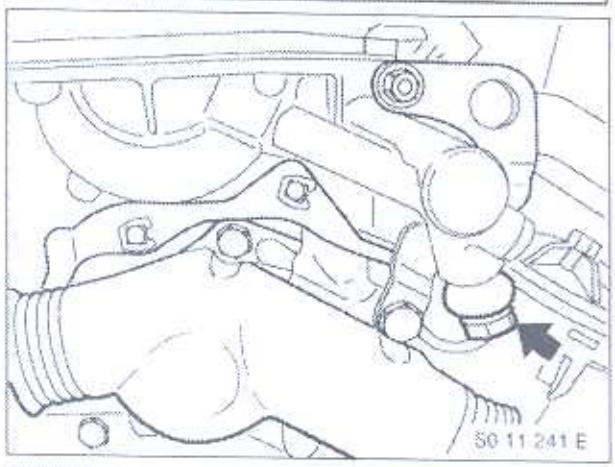
Caution!

If adjustment travel is less than 8.5 mm, the VANOS adjustment unit must be removed and reset,
refer to 11 36 010



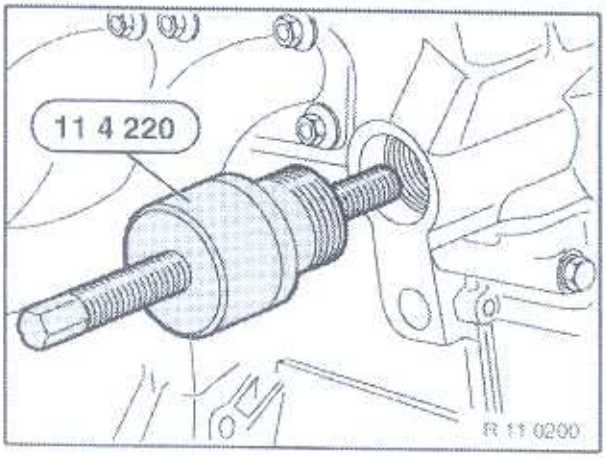
34 12 076

Remove compressed air connection.
Remove special tools 11 3 450 and 12 6 410.



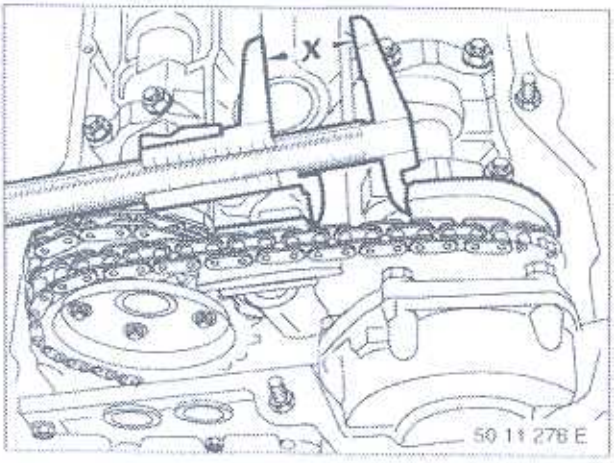
50 11 241 E

Fit oil pressure line with new seals.
Tightening torque,
refer to Technical Data 11 36 2AZ
Install solenoid-valve plug-in connection.



R 11 0200

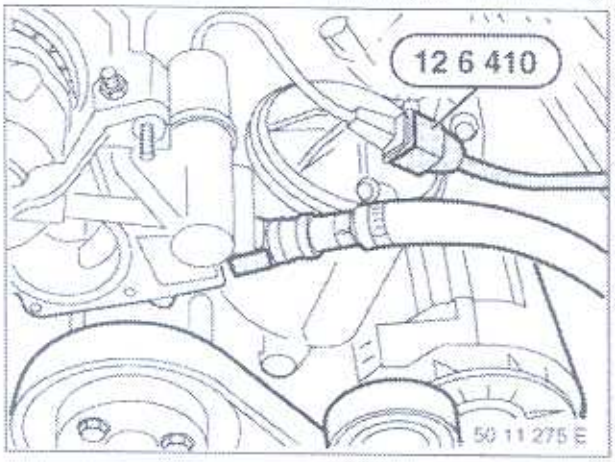
Relieve tension on special tool 11 4 220 and remove.



Check adjustment travel of VANOS adjustment unit:

Measure gap (x) between secondary tensioner and edge of sensor gear.

Note down distance 1.



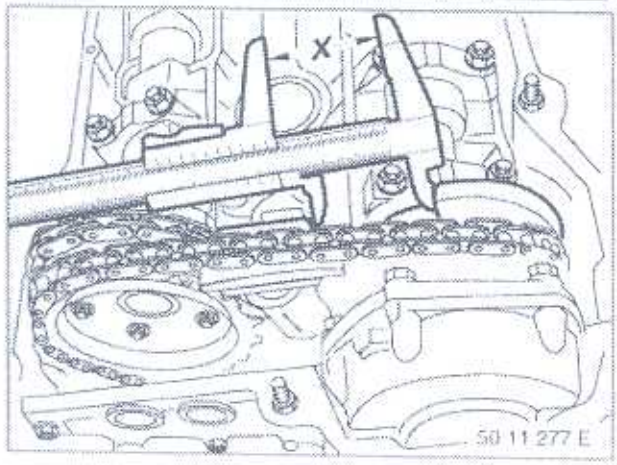
Connect special tool 12 6 410 to plug connection for VANOS solenoid valve.

Connect positive clip to battery connection point.

To adjust camshaft, connect negative terminal to vehicle earth.

Caution!

If terminals on special tool are accidentally inverted, this destroys the diode installed on the VANOS solenoid valve. Solenoid valve remains serviceable but current spikes can give rise to faults in vehicle circuit.

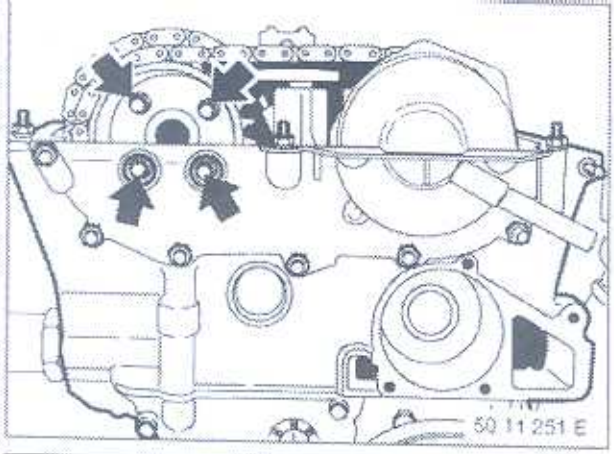


Measure gap (x) between secondary tensioner and edge of sensor gear.

Note down distance 2.

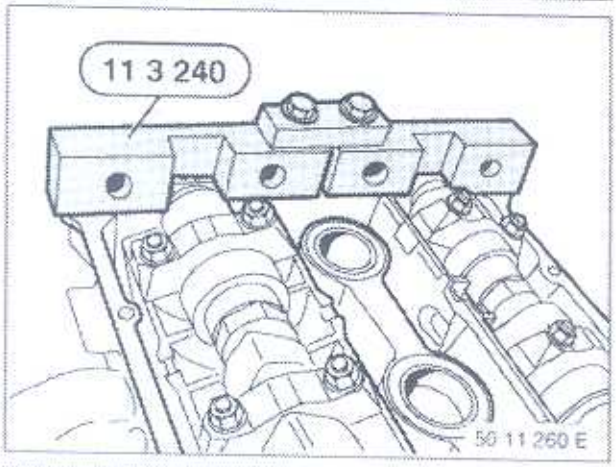
Determine control travel:

Distance 2 - distance 1 = length of stroke.

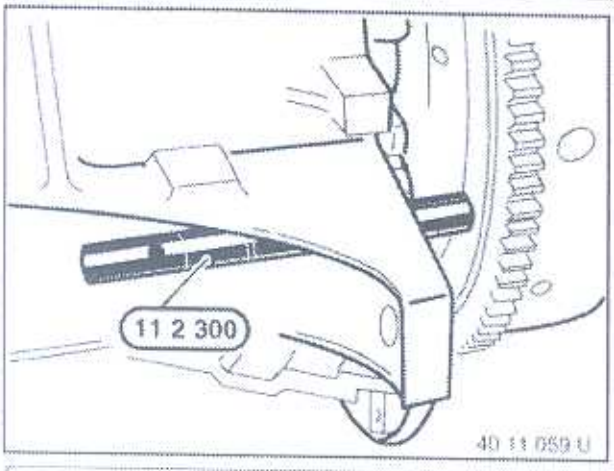


Tighten sprocket on exhaust camshaft in two passes.

Tightening torque,
refer to Technical Data 11 31 3AZ



Remove special tool 11 3 240.



Remove special tool 11 2 300.

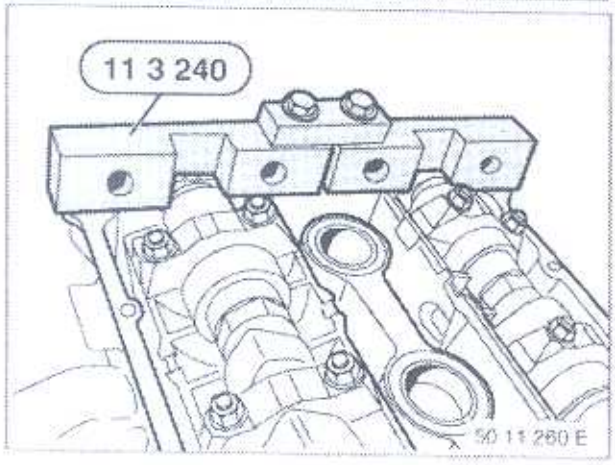
Rotate engine twice, then check camshaft adjustment.

Secure crankshaft with special tool 11 2 300 in TDC position of 1st cylinder.

Caution!

Do not turn the engine back.

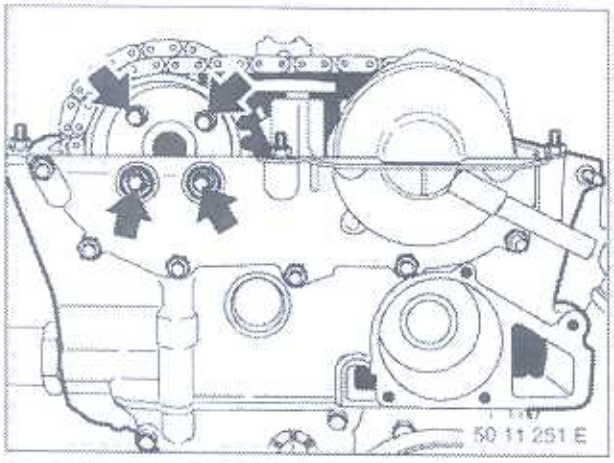
Remove special tool 11 2 300 before switching on the engine.



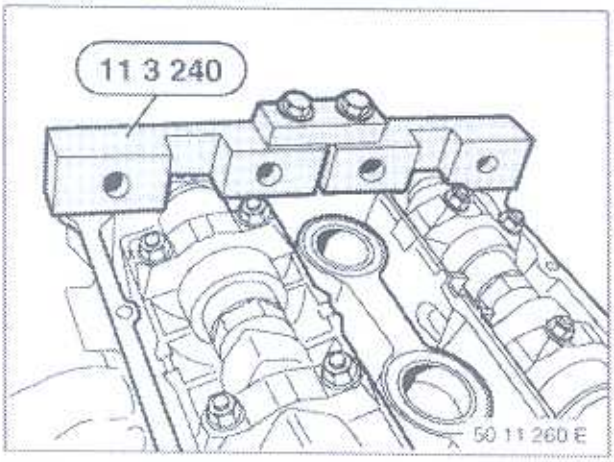
Apply special tool 11 3 240 on camshafts.

The camshaft setting is OK if special tool 11 3 240 locates flush against the cylinder head.

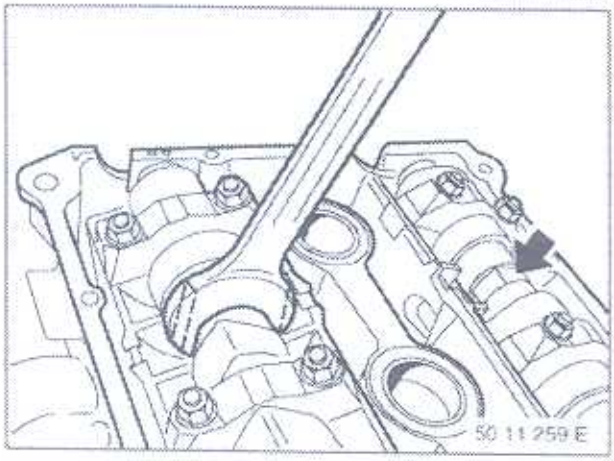
Remove special tool 11 3 240.



Unfasten sprocket screws on exhaust camshaft.



Remove special tool 11 3 240 from camshaft.

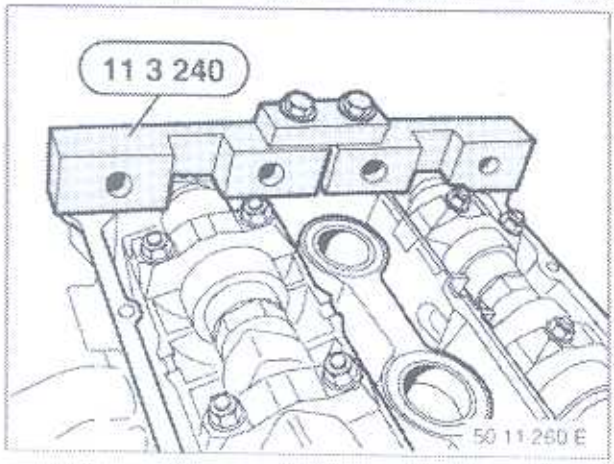


Align camshaft with open-end wrench.

Caution!

Do not damage the cylinder head.

Machine open-end wrench accordingly if necessary.



Fit special tool 11 3 240 to camshafts on cylinder 6.

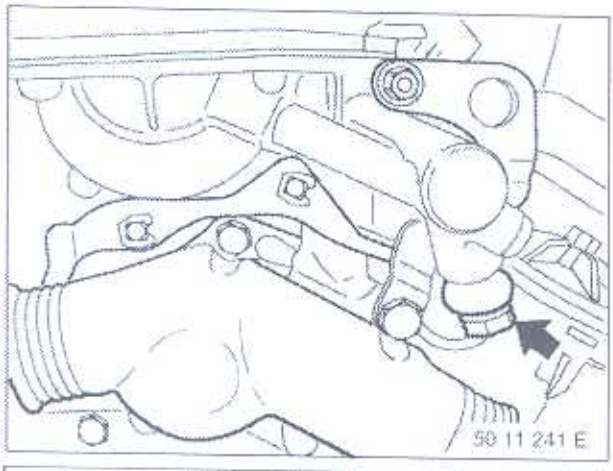
Note:

Camshaft setting is OK if special tool 11 3 240 can lie flush on the cylinder head.

(refer to Operation No. 11 31 005)

Before performing the adjustment work, check timing of camshaft,

refer to 11 31 005



Unscrew oil pressure pipe.

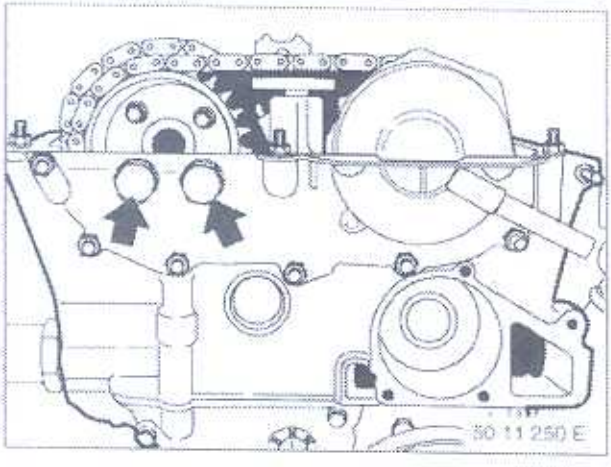
Disconnect solenoid-valve plug-in connection.

Fit special tool 11 3 450 with banjo bolt on oil pressure line.

Connect up compressed air (2 ... 8 bar).

Note:

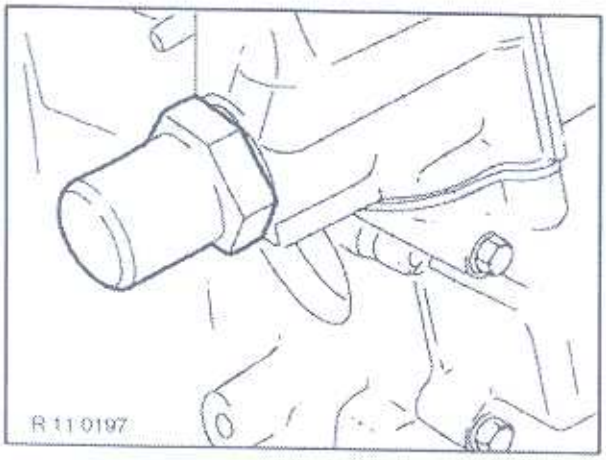
This ensures that spline shaft on VANOS adjustment unit remains in basic setting and camshaft position is not altered by VANOS adjustment unit.



Unfasten screw plugs.

(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 31 001



Caution!

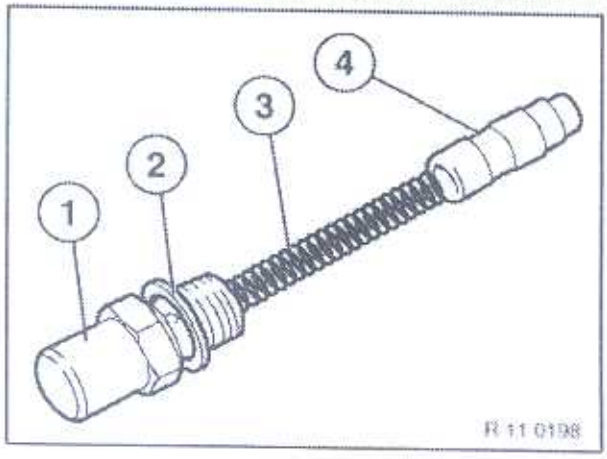
Strong spring force.

Unfasten cylinder for chain tensioning piston.

Installation:

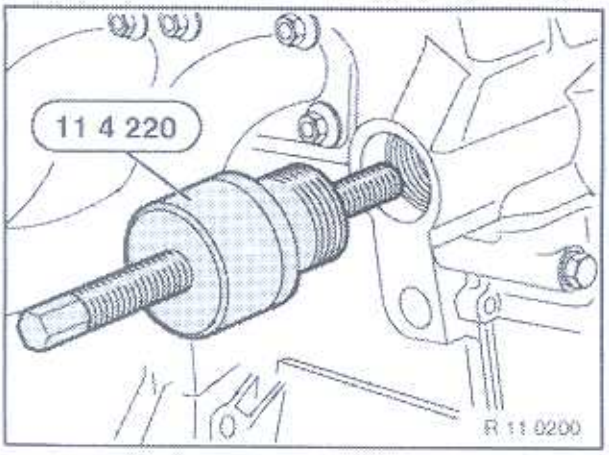
Replace sealing ring.

Tightening torque,
refer to Technical Data 11 31 8AZ

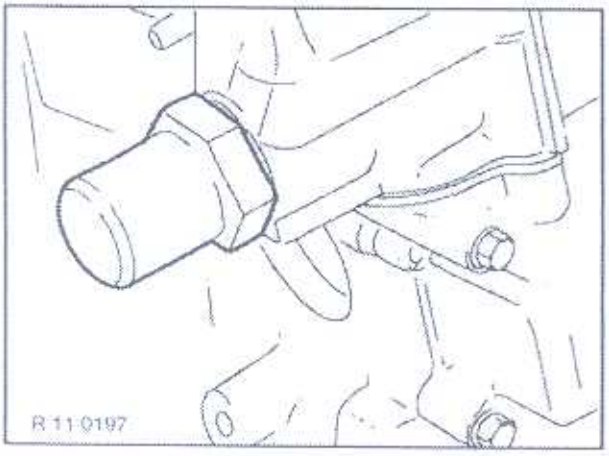


Arrangement of Components:

1 Cylinder for chain tensioning piston
2 Sealing ring
3 Spring
4 Piston



Relieve tension on special tool 11 4 220 and remove.



Install cylinder for chain tensioning piston:

M52

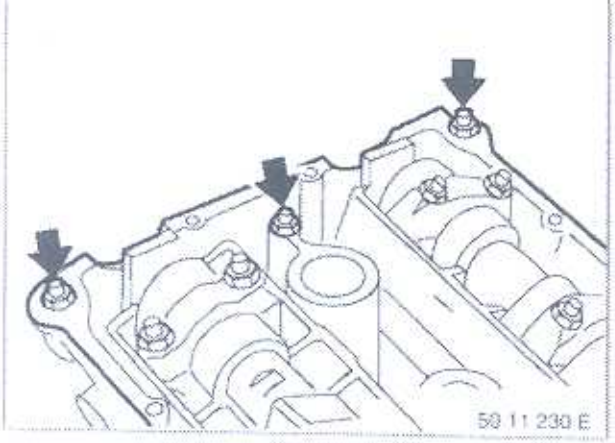
refer to 11 31 090

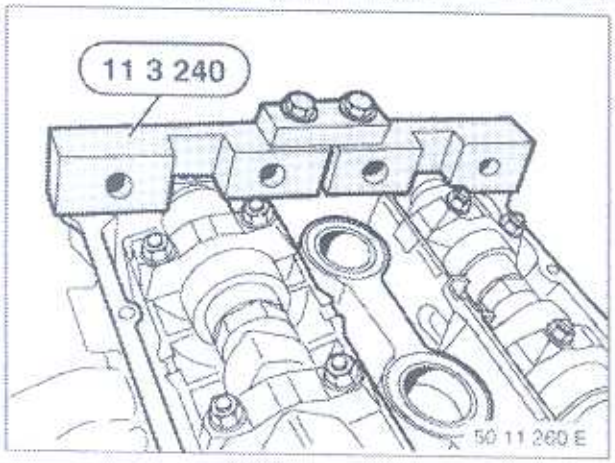
S52

refer to 11 31 091

Assemble engine.

Unscrew studs.





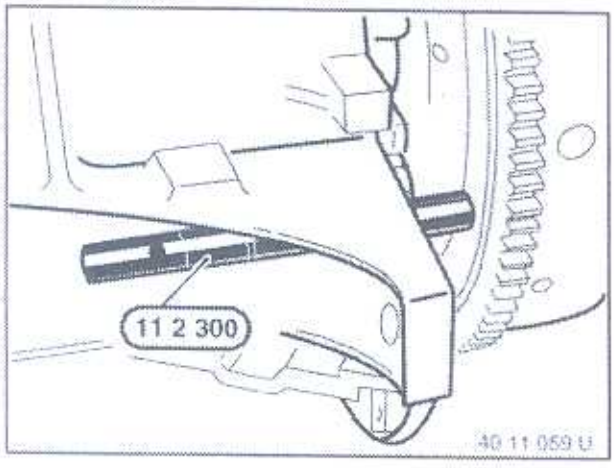
Fit special tool 11 3 240 on 6th cylinder to camshaft and check the camshaft setting.

The camshaft setting is OK if special tool 11 3 240 locates flush against the cylinder head.

Remove special tool 11 3 240.

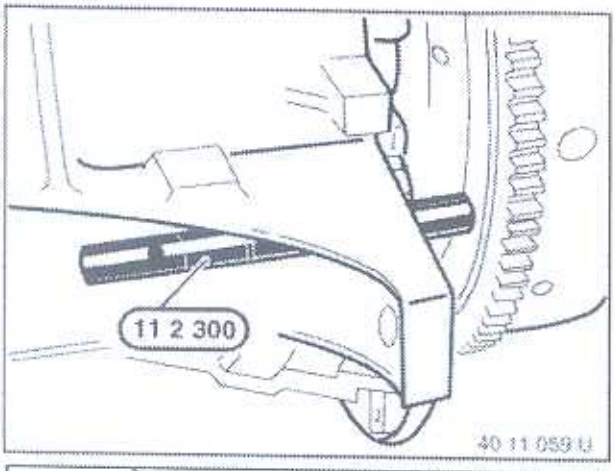
If necessary, check adjustment travel of VANOS adjustment unit and adjust timing of camshaft,

refer to 11 31 505



Remove special tool 11 2 300.

Install dust guard from inspection bore.

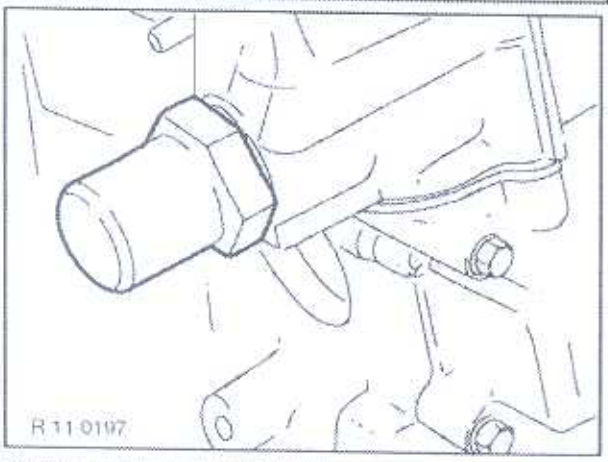


Secure crankshaft with special tool 11 2 300 in TDC firing position of 1st cylinder.

Caution!

Do not turn the engine back.

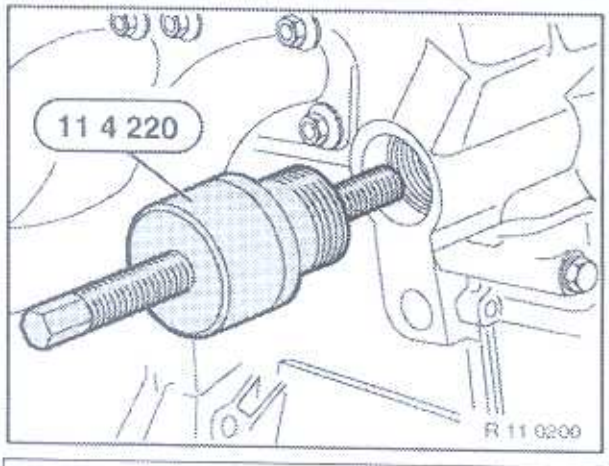
Remove special tool 11 2 300 before starting engine.



Caution!

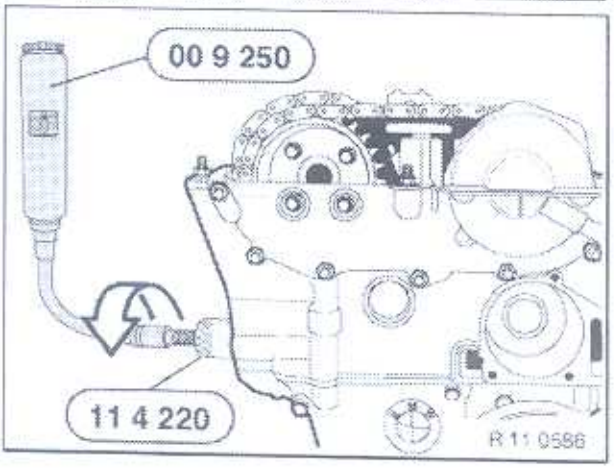
Strong spring force.

Unfasten cylinder for chain tensioning piston.



Install special tool 11 4 220.

Fit adjusting screw to tensioning rail.

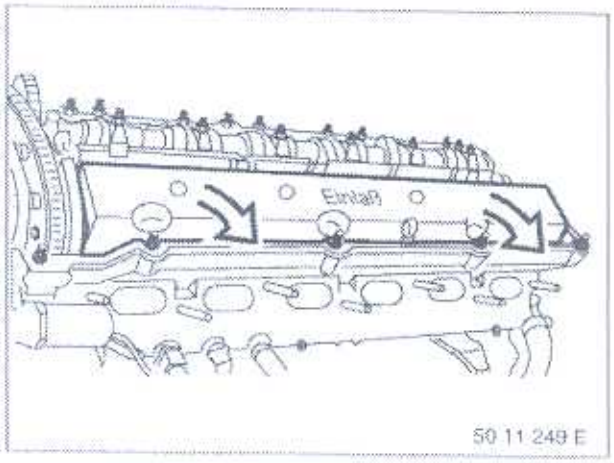


Tighten tensioning rail with special tool 11 4 220 by rotating the adjusting screw with special tool 00 9 250 or preload with standard torque wrench to 1.3 Nm.

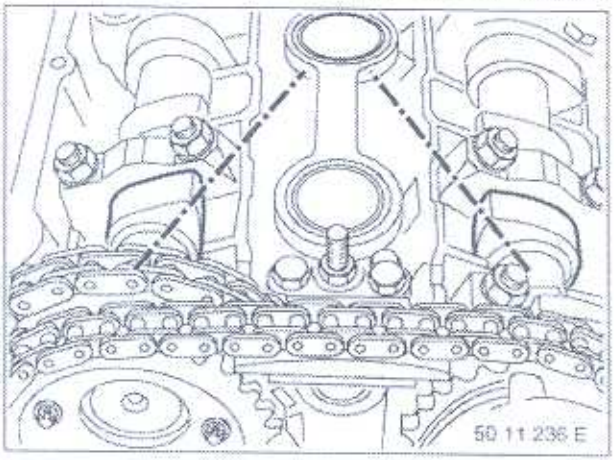
Removing fan wheel with fan coupling,
refer to 11 52 020

Removing cylinder head cover,
refer to 11 12 000

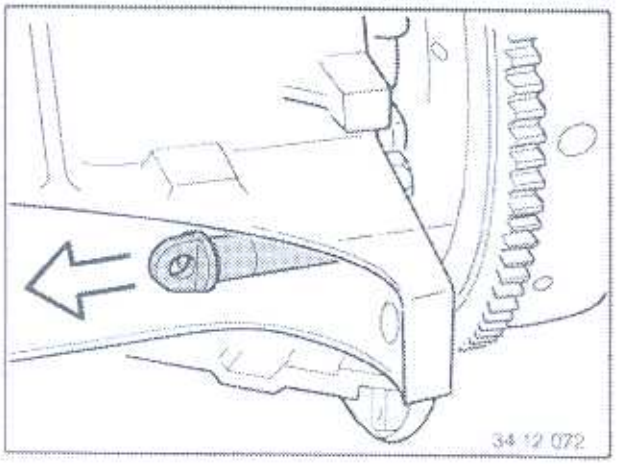
Removing spark plugs,
refer to 12 12 011



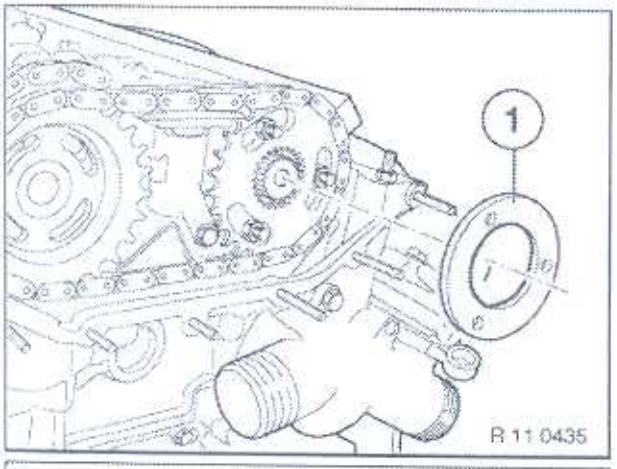
Pull off plastic cover for intake camshaft.



Rotate engine engine-wise until cam tips on intake and exhaust camshafts on 1st cylinder face one another.

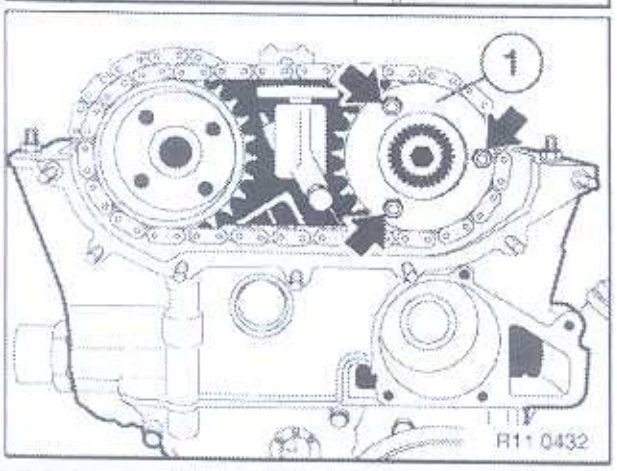


Pull dust guard out of the special tool bore.



Version without plate spring

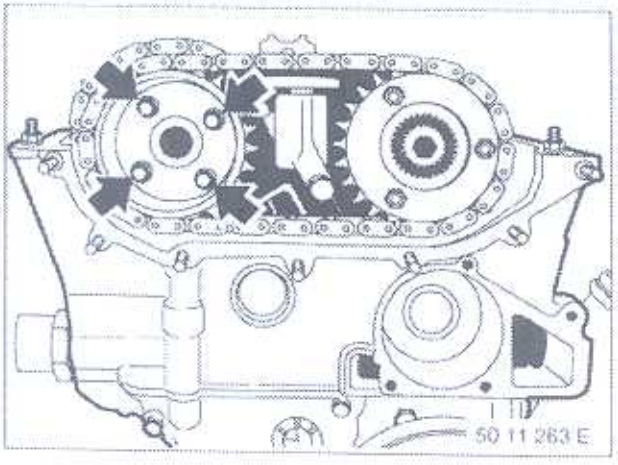
Fit thrust washer (1) to the intake camshaft.



Version without plate spring

Tighten down thrust washer (1) with nuts.

Tightening torque,
refer to Technical Data 11 31 3AZ

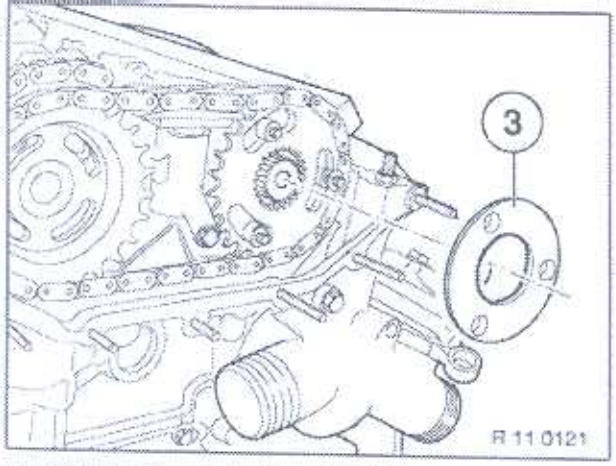


Fit washer and screws to the exhaust camshaft.

Fit screws with zero backlash: sprocket remains able to move.

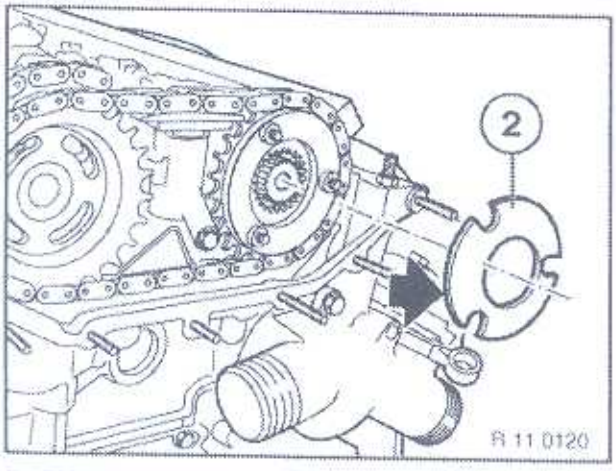
Installing VANOS-adjustment unit,
refer to 11 36 010

Assemble engine.



Version with plate spring

Fit approx. 2 mm thickness of thrust washer (3).



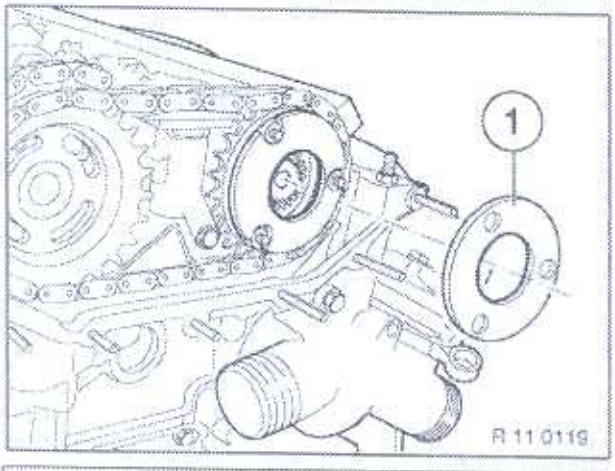
Version with plate spring

Note:

Note installation direction of plate spring.

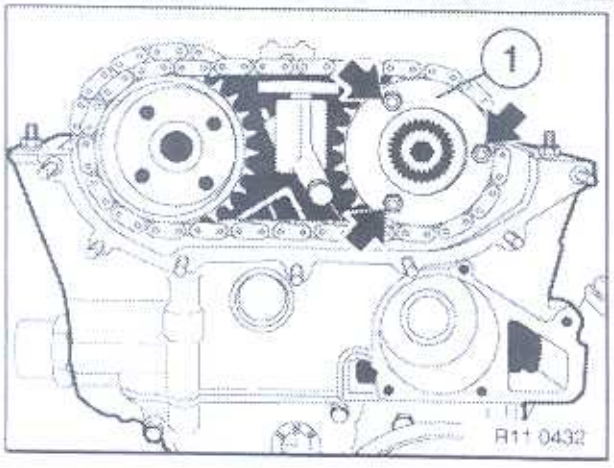
Install large support diameter facing towards camshaft.

Install plate spring (2).



Version with plate spring

Fit approx. 4 mm thickness of thrust washer (1) to the intake camshaft.

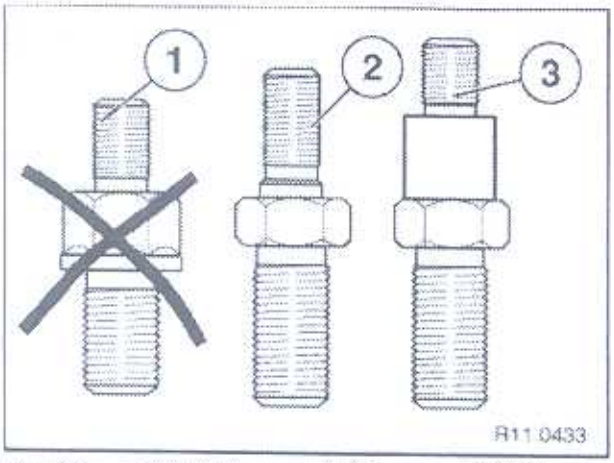


Version with plate spring

Install nuts and tighten down.

Tightening torque,

refer to Technical Data 11 31 3AZ



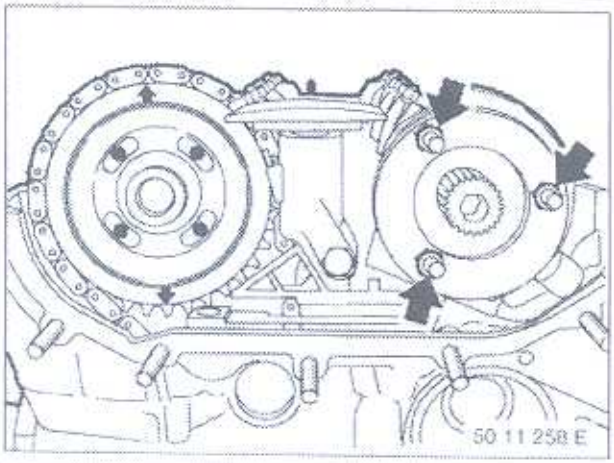
Caution!

There is a danger of mixing up:

(1) Studs for cylinder-head covers.

(2) Studs for thrust washers and sprockets (version without plate spring).

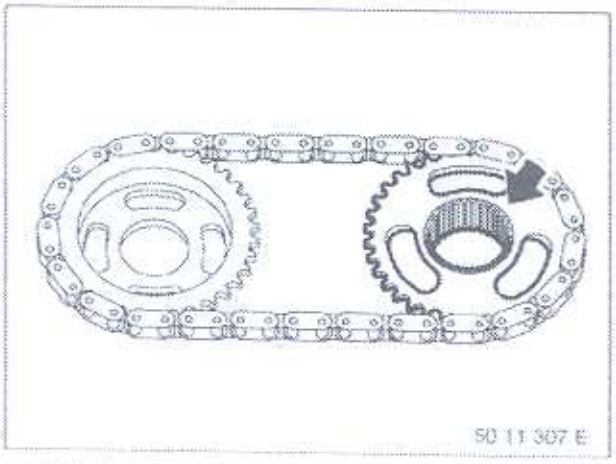
(3) Studs for thrust washers and sprockets (version with plate spring).



Fit thrust washer and tighten down with dowels.

Tightening torque,

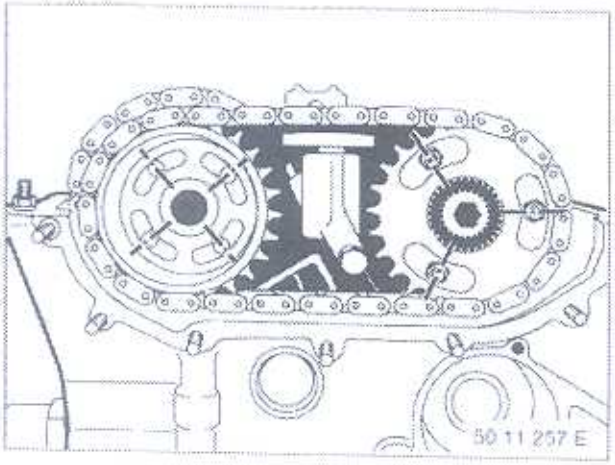
refer to Technical Data 11 31 3AZ



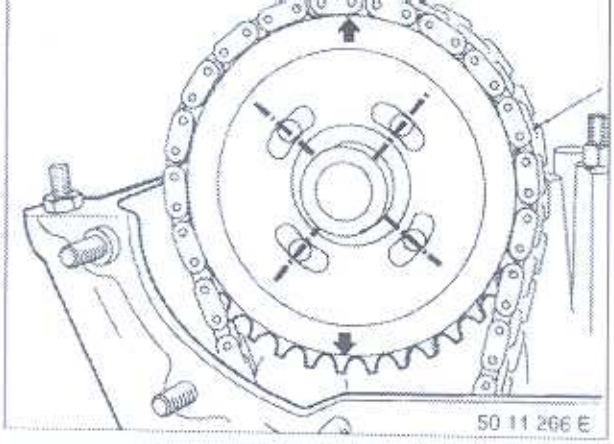
Caution!

Correctly install sprocket for intake camshaft.

Flat side facing VANOS housing, collar facing camshaft.

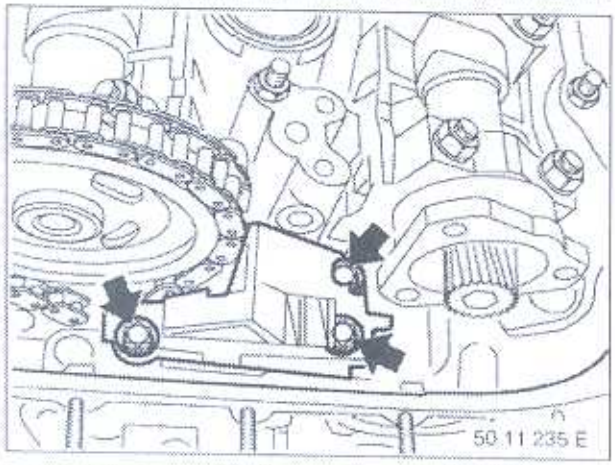


Mount both sprockets together with chain. Slots centered.

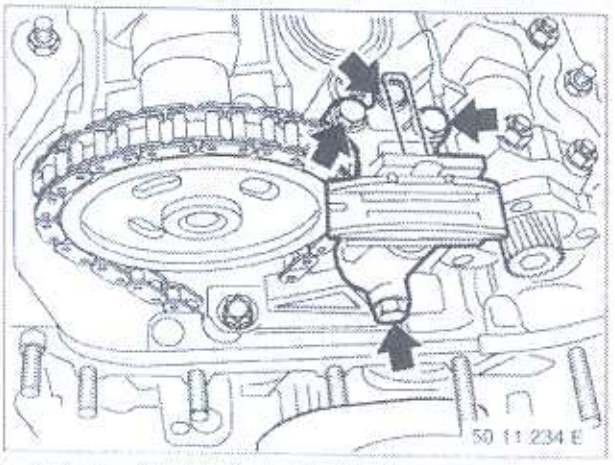


Note:

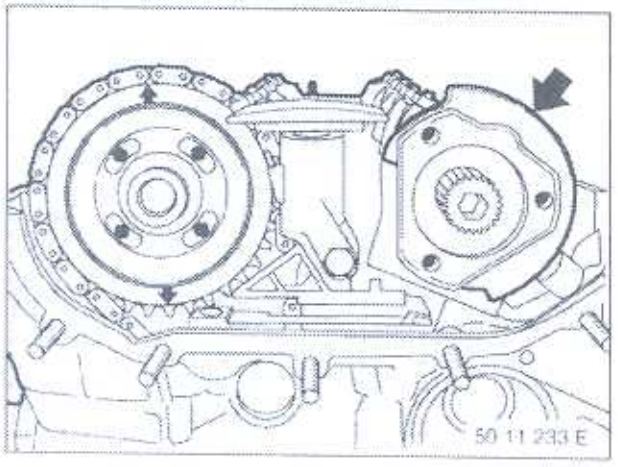
Long sprocket slots are now centered on threaded bores.



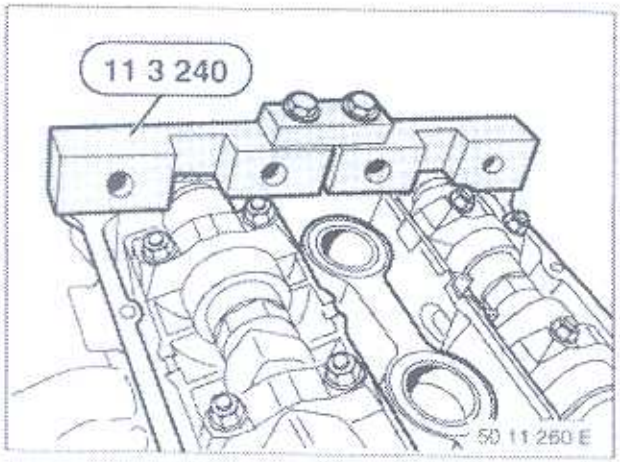
Install chain guide.



Install secondary chain tensioner.



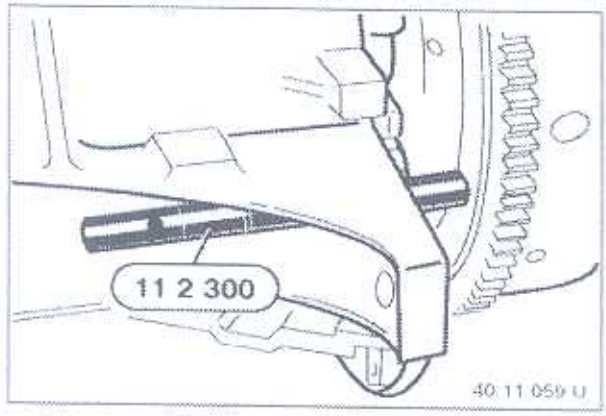
Fit sensor gear to the intake camshaft.



Fit special tool 11 3 240 to camshafts on cylinder 6.

Note:

Camshaft adjustment is correct if special tool 11 3 240 bears on the cylinder head without gaps.

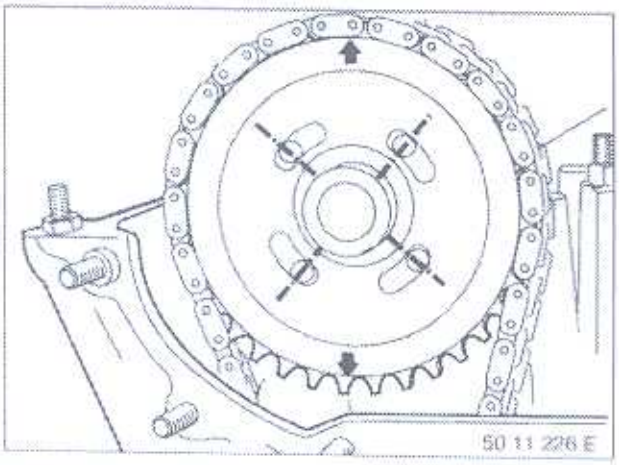


Rotate engine from the 30 ° before TDC position engine-wise up to TDC position.

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

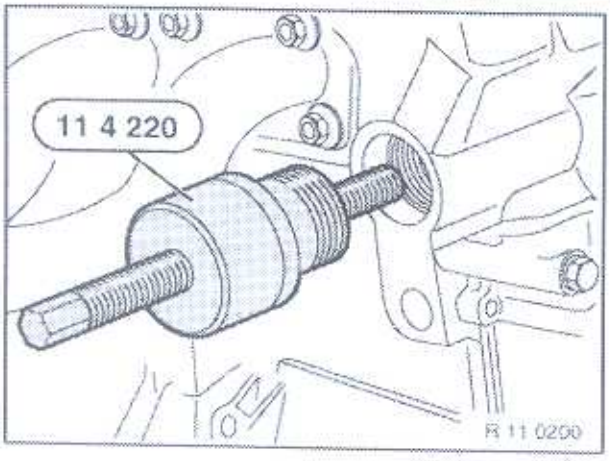
Caution!

Remove special tool 11 2 300 (plug mandrel) before switching on the engine.



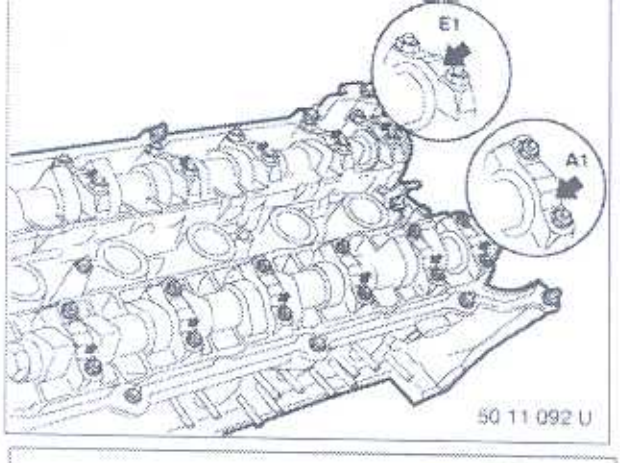
Fit primary timing chain to sprocket.

Fit sprocket to exhaust camshaft with threaded bores on left side aligned down the deep bores.



Install special tool 11 4 220 in chain tensioning sleeve.

Screw in the adjusting screw to touch the tensioning rail, but do not yet tighten it.



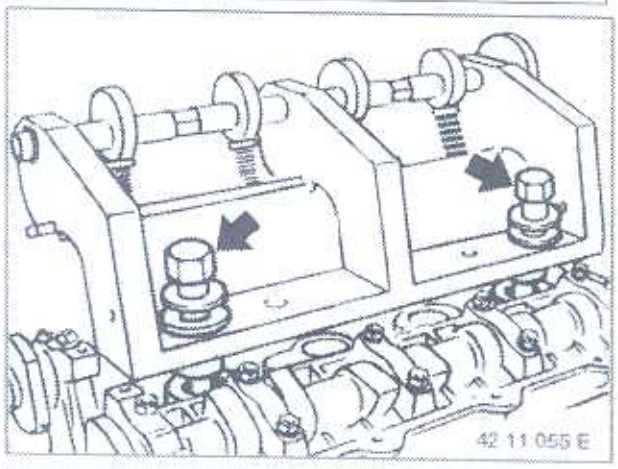
Fit bearing cover.

Note:

The bearing covers are legibly identified from the exhaust end:

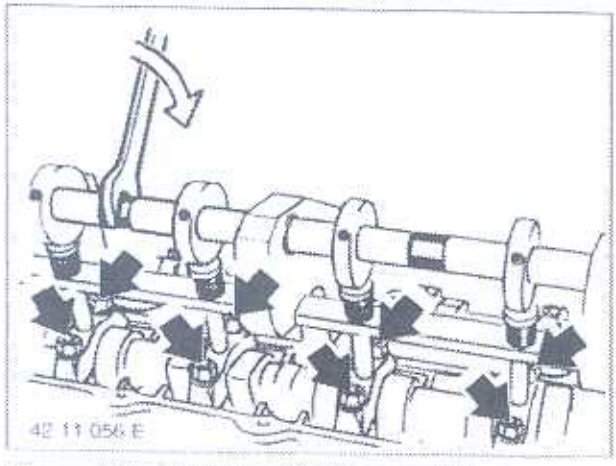
A1 ... A7 for the exhaust end

E1 ... E7 for the intake end



Fit special tool 11 3 260 to cylinder head and screw into spark plug threads of cylinders 1 and 4.

Tightening torque,
refer to Technical Data 12 12 1AZ

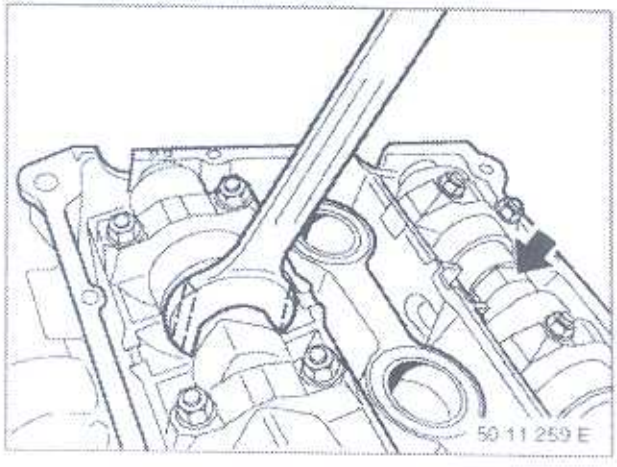


Turn the eccentric shaft to pre-tension the bearing caps.

Tighten down bearing cover.

Tightening torque,
refer to Technical Data 11 31 1AZ

Remove special tool 11 3 260.



Align camshaft with open-end wrench.

Caution!

Do not damage the cylinder head.

Machine open-end wrench accordingly if necessary.

Installation

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

Caution!

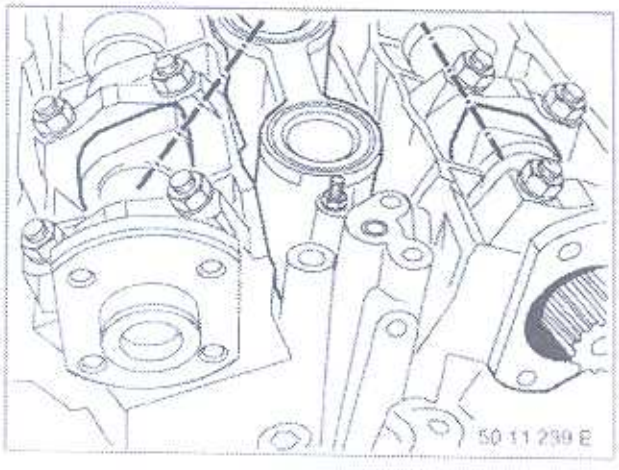
The bucket tappets expand when not subjected to load by the camshaft and therefore require some time before they can be pushed back down. During a rapid assembly sequence, the "closed" valves may still be open and be in contact with the piston.

Observe the following waiting times after installing the camshafts and turning the engine back to the TDC position:

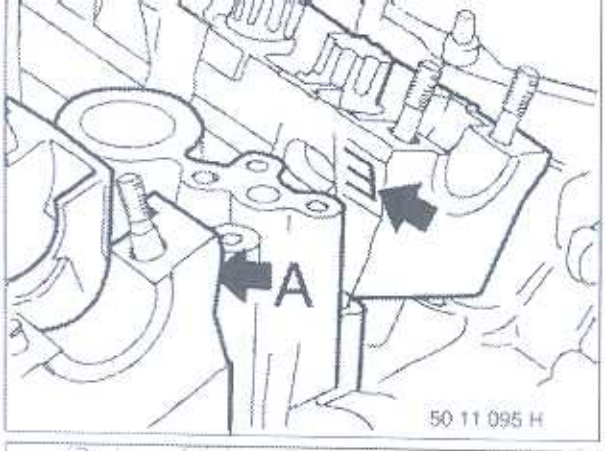
Room temperature (20 °C) 4 mins

10 °C ... 20 °C 11 min

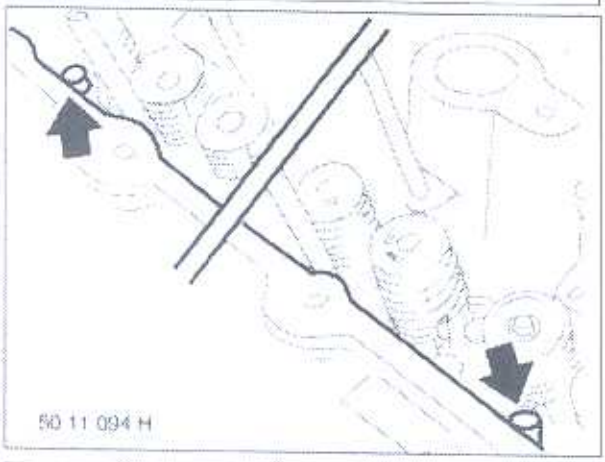
0 °C ... 10 °C 30 min



Install camshafts with tips on intake and exhaust valves pointing towards 1st cylinder.

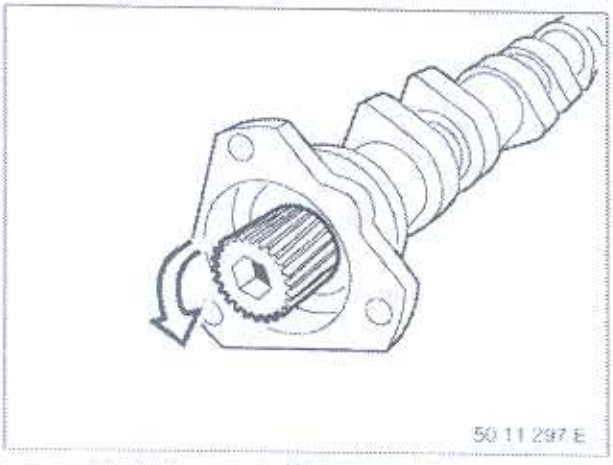


The bearing strips are marked with "A" for exhaust side and "E" for intake side.



Note centering dowels on retaining pins at bearing points 2 and 7.

Install bearing strips.



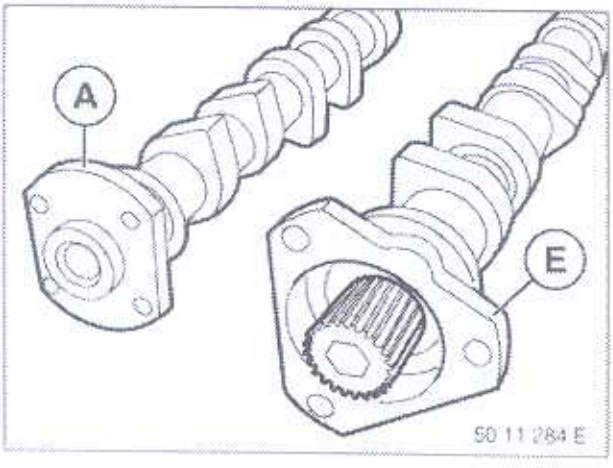
If necessary, replace splined shaft in intake camshaft.

Clamp camshaft with protective vice jaws.

Remove splined shaft.

Installation:

Tightening torque,
refer to Technical Data 11 31 5AZ

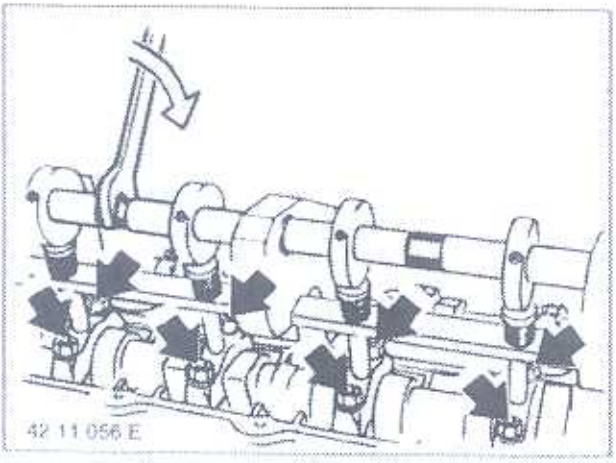


Note:

Differentiating features of camshafts on sprocket flanges:

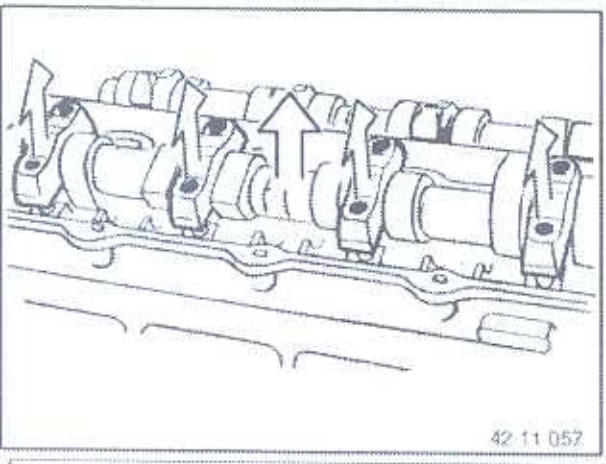
A = Exhaust camshaft

E = Intake camshaft



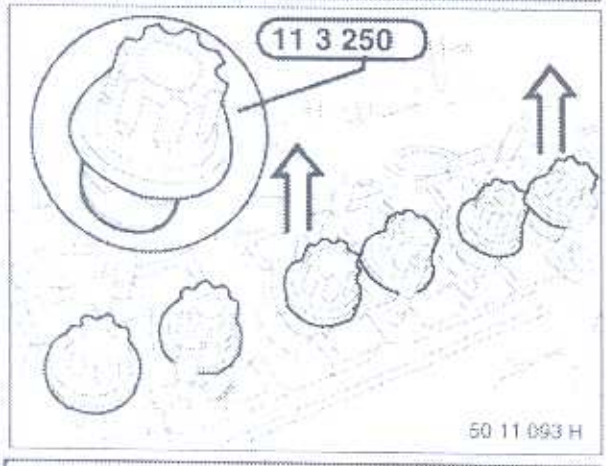
Turn the eccentric shaft to pre-tension the bearing caps.

Unfasten nuts on bearing cover.



Remove tension from the eccentric shaft and remove special tool 11 3 260.

Remove bearing cover and place to one side in orderly fashion. Remove camshaft.



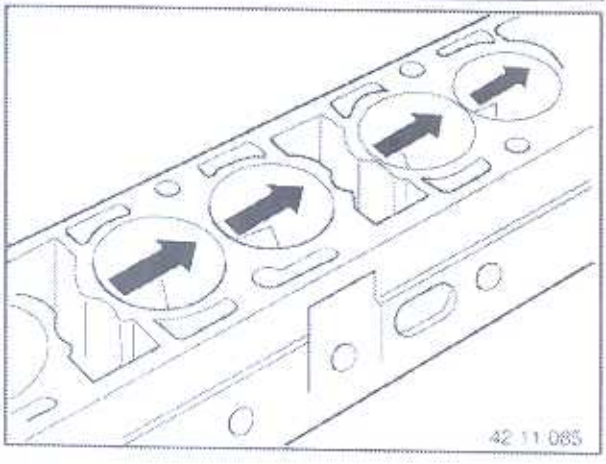
If necessary, remove complete bearing strip with bucket tappets.

Brace bucket tappets with special tool 11 3 250.

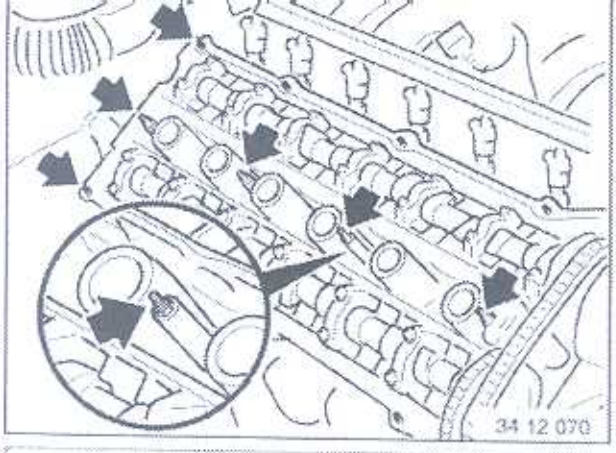
Lift out complete bearing strip with bucket tappet.

Note:

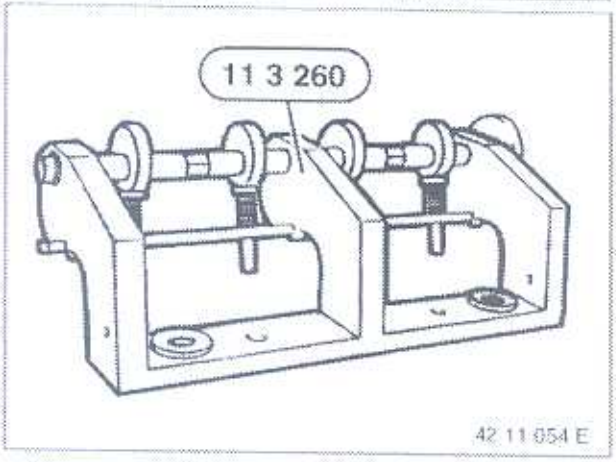
Worn bucket tappets may only be reused in the same tappet bore.



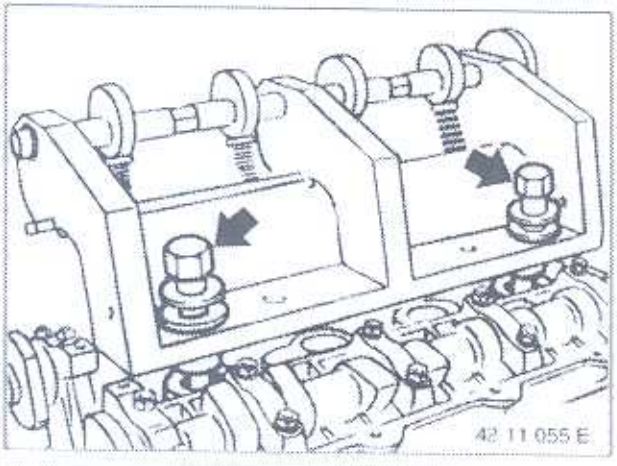
Check bearing points on bucket tappets for signs of wear (scoring).



Unscrew studs.



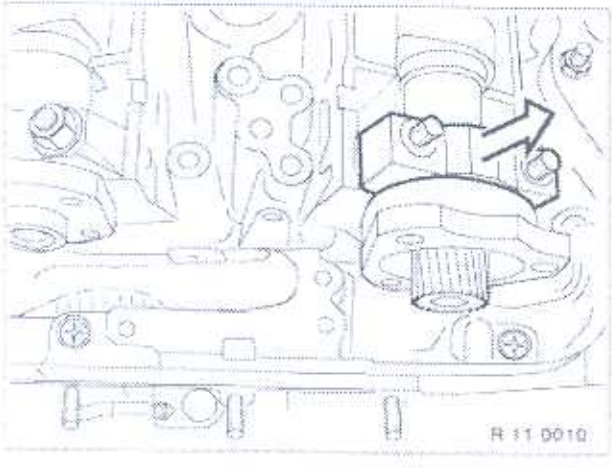
Prepare special tool 11 3 260.



Fit special tool 11 3 260 to cylinder head and screw into spark plug threads in cylinders 1 and 4.

Tightening torque,

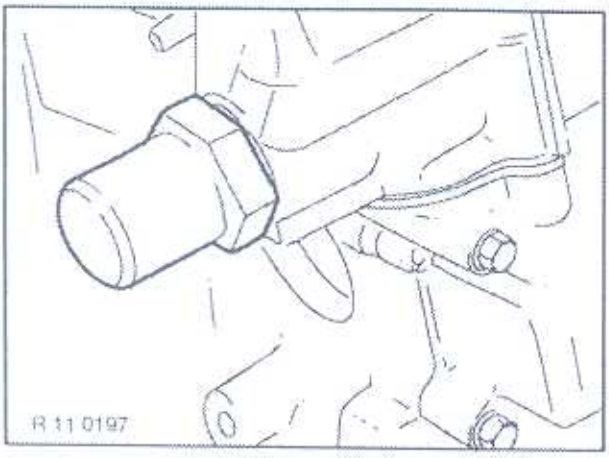
refer to Technical Data 12 12 1AZ



Caution!

Bearing cover 1 on intake camshaft is centered on hollow dowels.

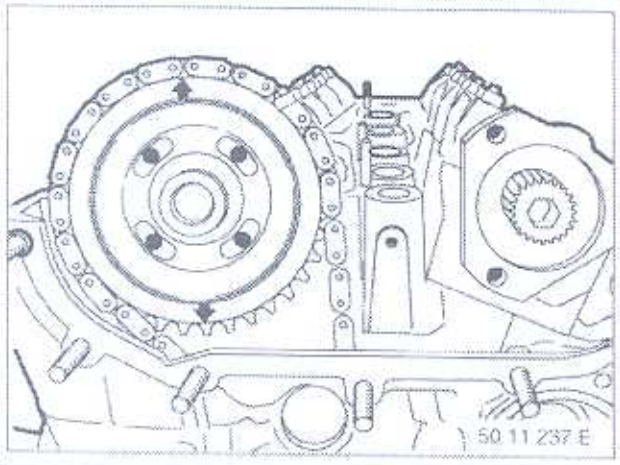
To prevent the intake camshaft from tilting in the bearing strip, remove bearing cover 1.



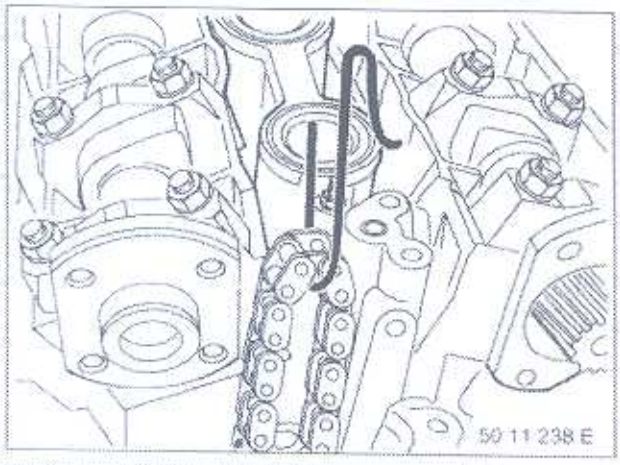
Caution!

Strong spring force.

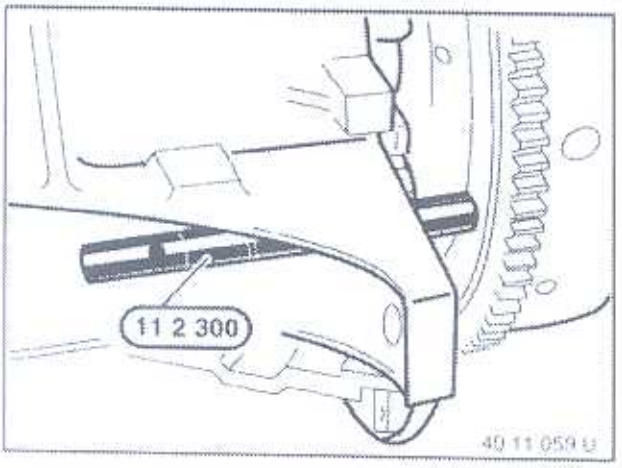
Unfasten cylinder for chain tensioning piston.



Lift off sprocket with chain.



Protect timing chain to prevent it from falling.

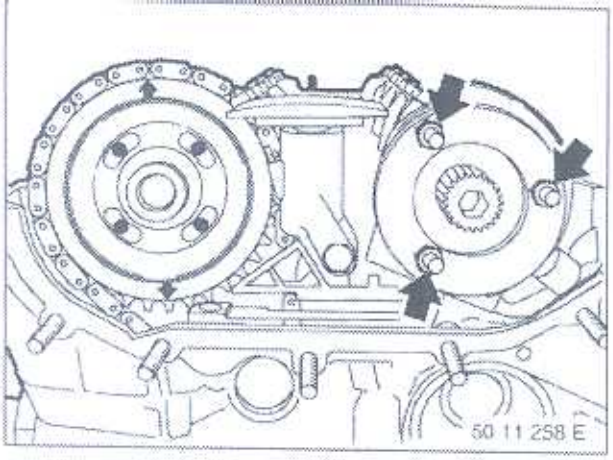


Caution!

To prevent damaging valves when fitting the camshafts, no pistons should be in TDC position.

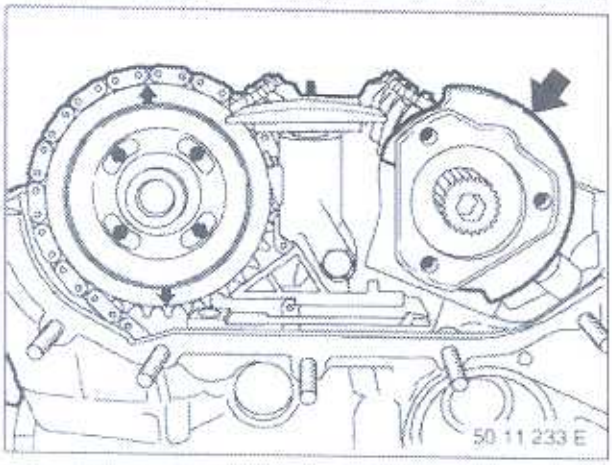
Pull out special tool 11 2 300.

Rotate engine counter-enginewise approx. 30 ° using the central screw.

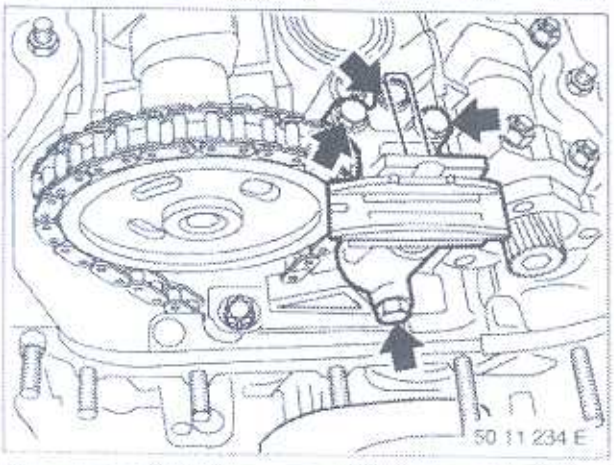


Unscrew thrust washer bolts.

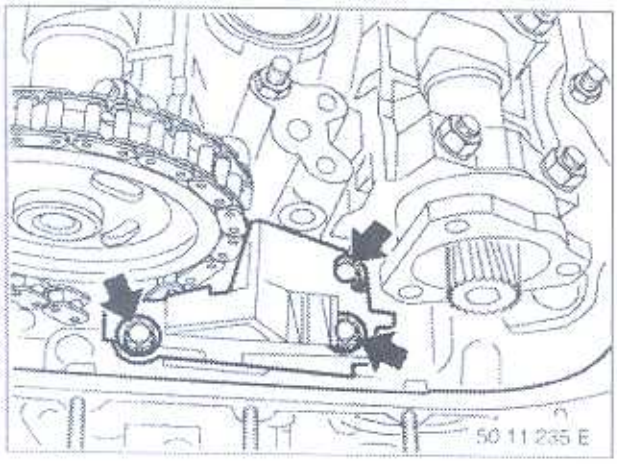
Remove thrust washer.



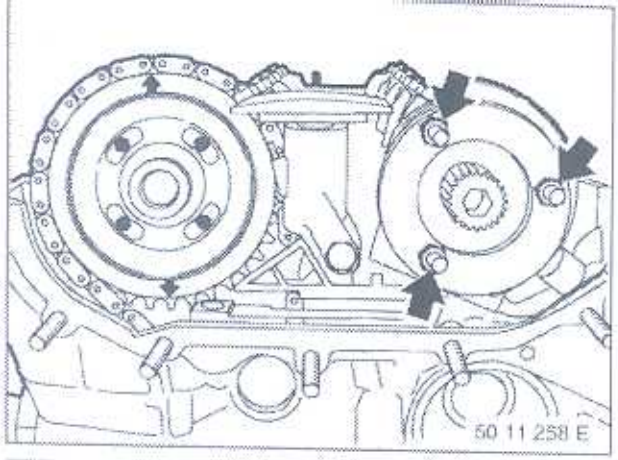
Remove sensor gear.



Unscrew secondary chain tensioner.

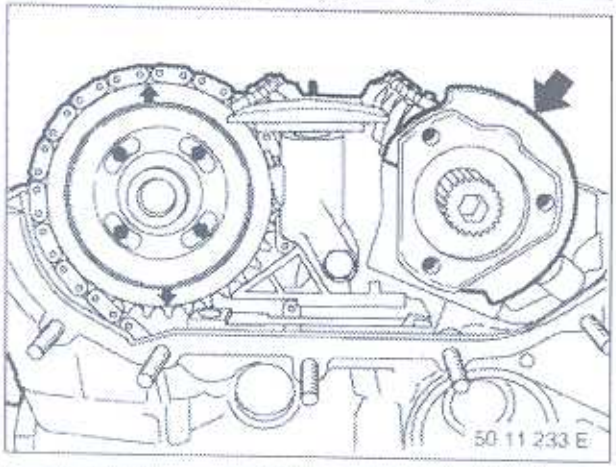


Unscrew chain guide.

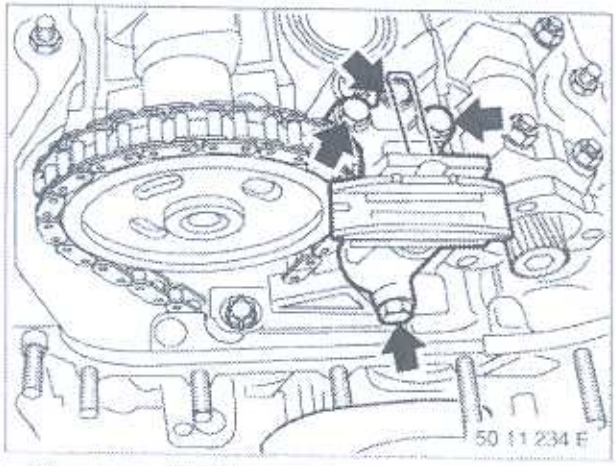


Unscrew thrust washer bolts.

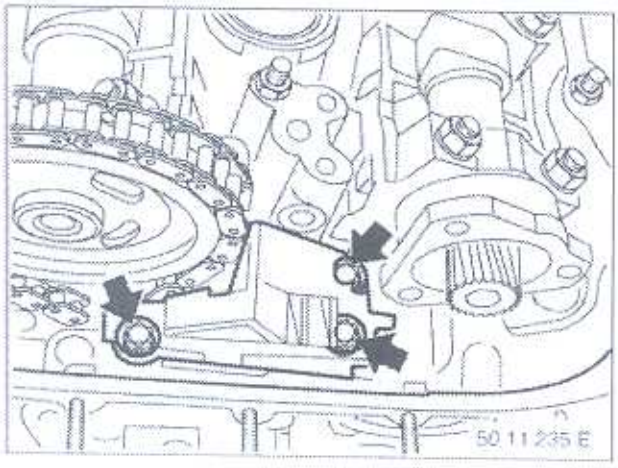
Remove thrust washer.



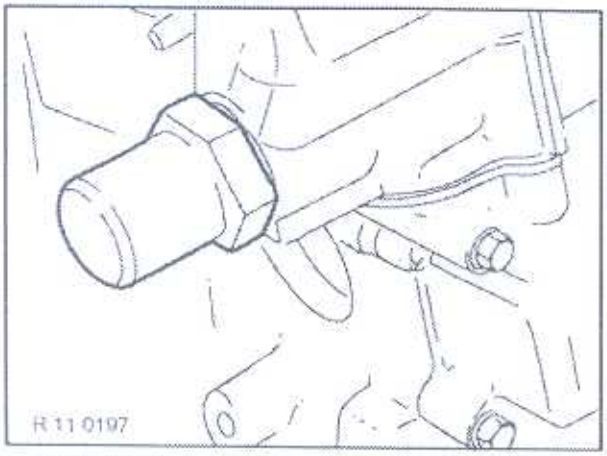
Remove sensor gear.



Unscrew secondary chain tensioner.



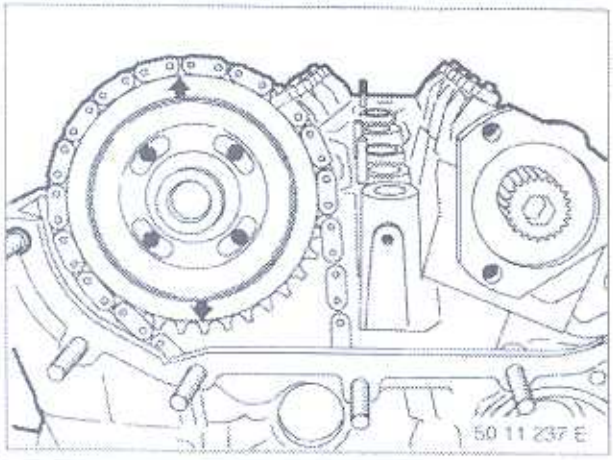
Unscrew chain guide.



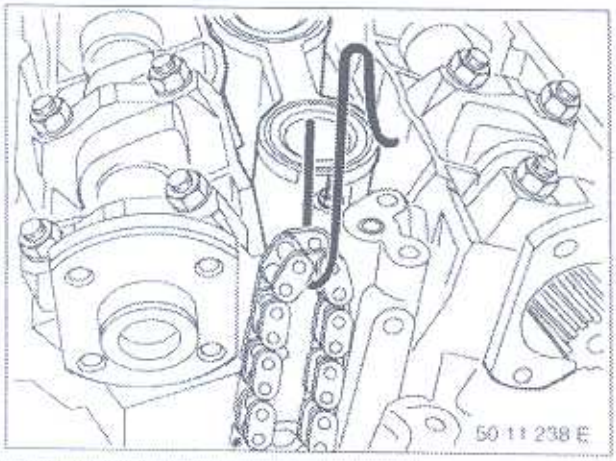
Caution!

Strong spring force.

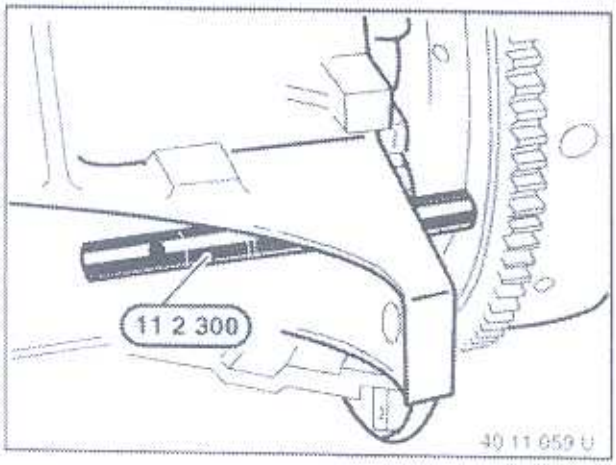
Unfasten cylinder for chain tensioning piston.



Lift off sprocket with chain.



Protect timing chain to prevent it from falling.

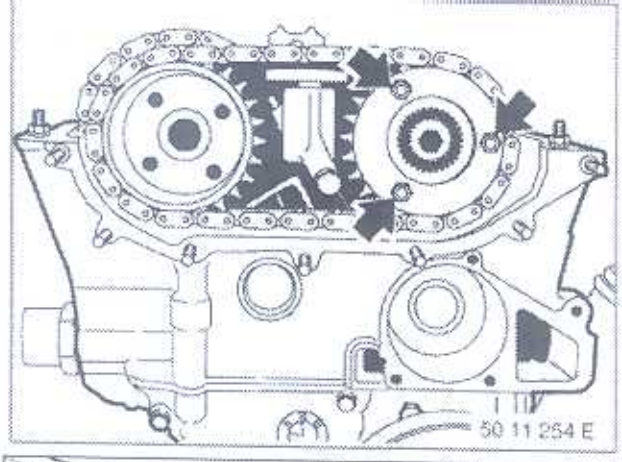


Caution!

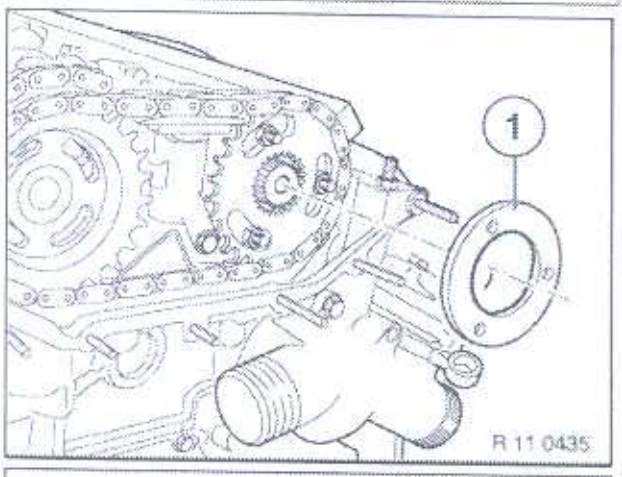
To prevent damaging valves when fitting the camshafts, no pistons should be in TDC position.

Pull out special tool 11 2 300.

Rotate engine counter-enginewise approx. 30 ° using the central screw.

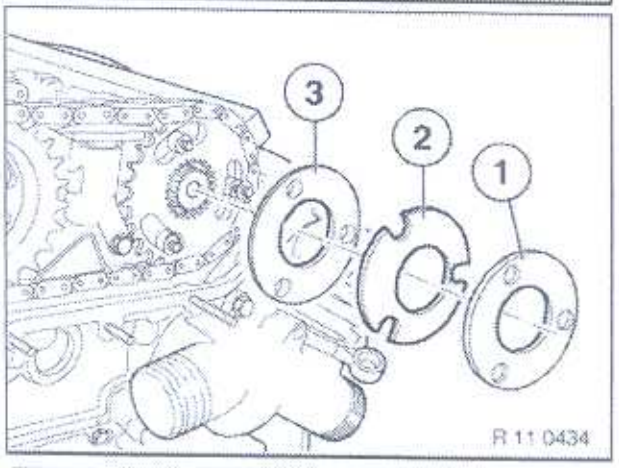


Unfasten nuts from intake camshaft.



Version without plate spring

Remove thrust washer (1).



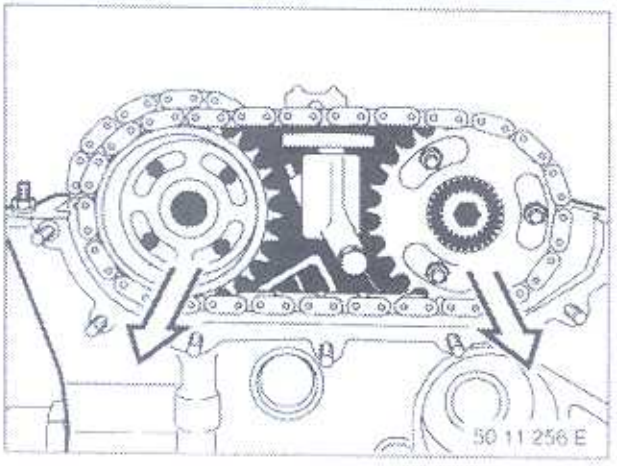
Version with plate spring

(1) Thrust washer approx. 4 mm thick

(2) Plate spring

(3) Thrust washer approx. 2 mm thick

Remove thrust washers and plate spring.



Remove sprockets together with chain.

(intake or exhaust side as applicable)

The intake and exhaust camshafts can be changed in the vehicle.

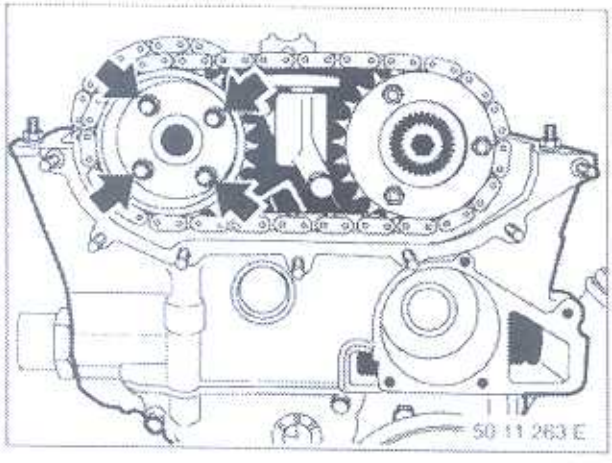
Caution!

Incorrect removal/installation without help of fixture could damage or break the camshaft. Valves could also be bent through contact with the piston crowns. Always note installation instructions and use specified special tools, procedures and sequences.

Removal

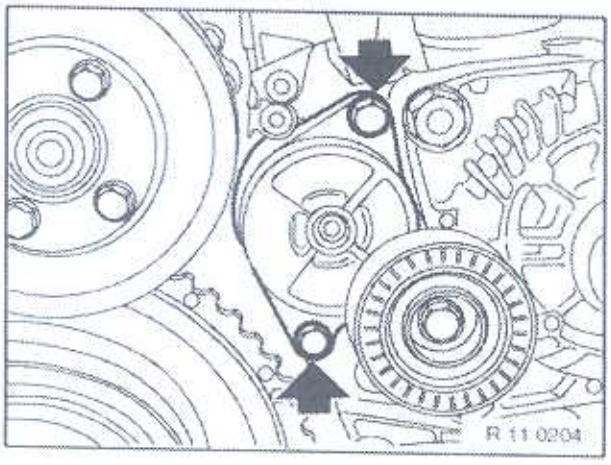
Removal of camshaft is described separately from installation. Assembly sequence for removal and installation is different.

Removing VANOS adjustment unit,
refer to 11 36 010

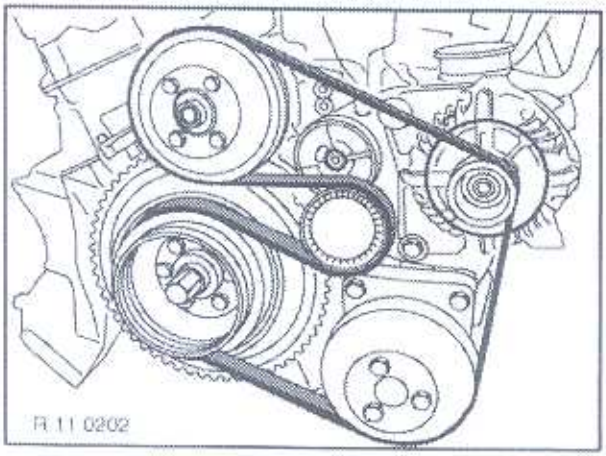


Remove the loosened screws from the exhaust sprocket wheel.

Removing alternator drive belt,
refer to 11 28 010



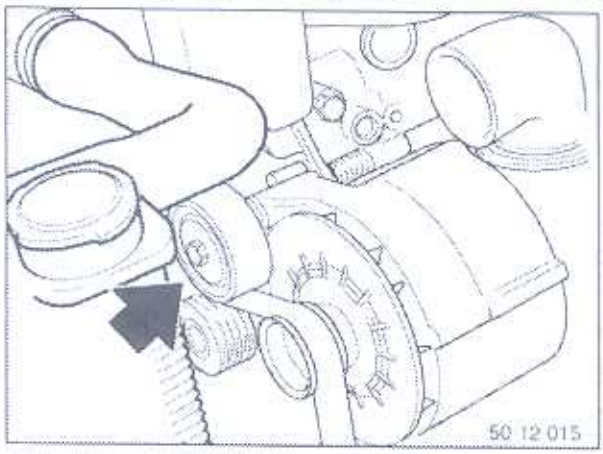
Unfasten screws on tensioner for alternator drive belt.



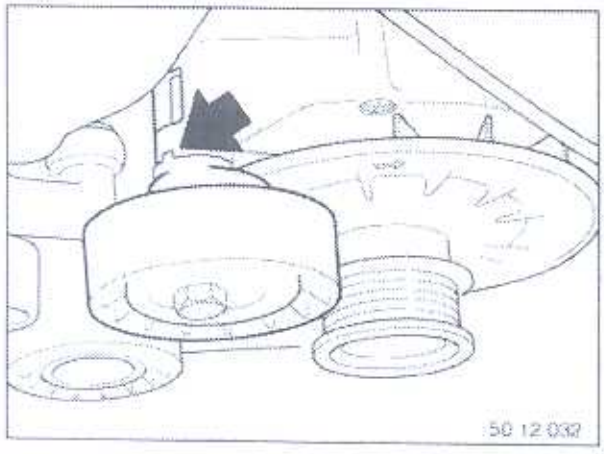
Layout of drive belt.

Installation:

When fitting drive belt, ensure it is correctly located on the pulleys.



Version with auxiliary tensioning roller.



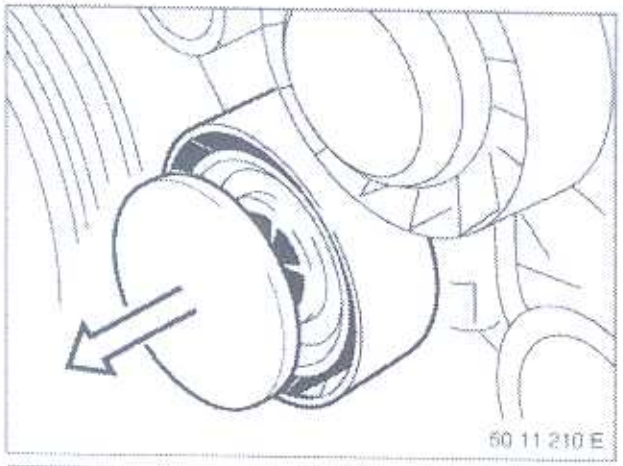
Installation:

The locking device on the auxiliary tensioning roller must engage in the groove of the alternator.

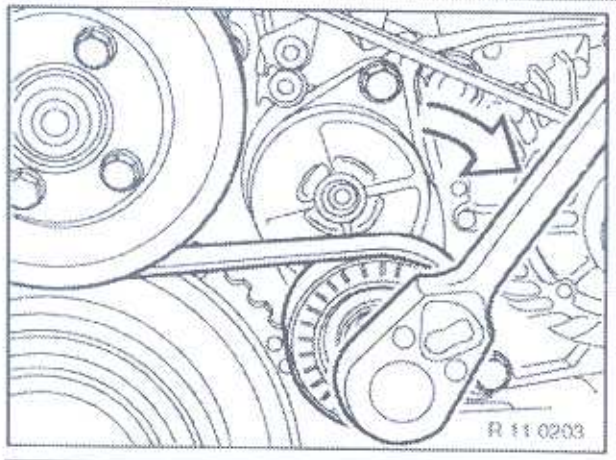
Note:

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



Remove cap from tensioning roller.



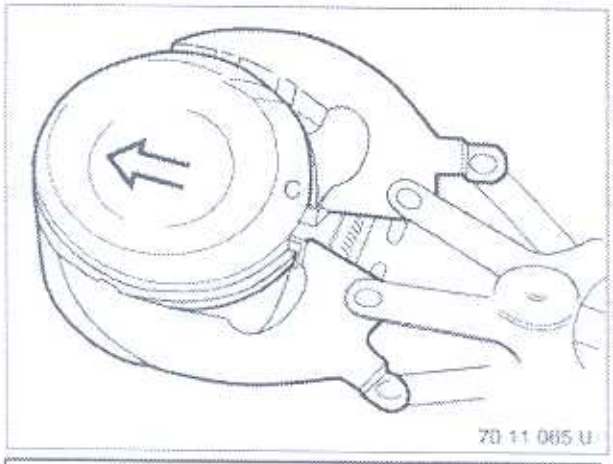
Relieve tension on belt drive.
Remove drive belt.

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.

(piston removed)



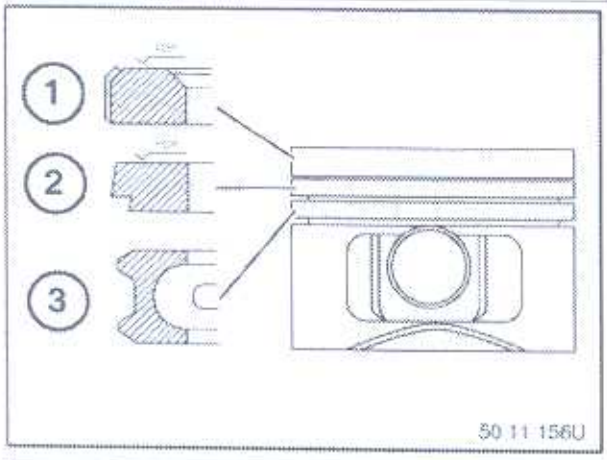
Remove piston rings with a piston-ring compressing pliers.

Note:

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

Put aside piston rings in correct sequence and installation position.

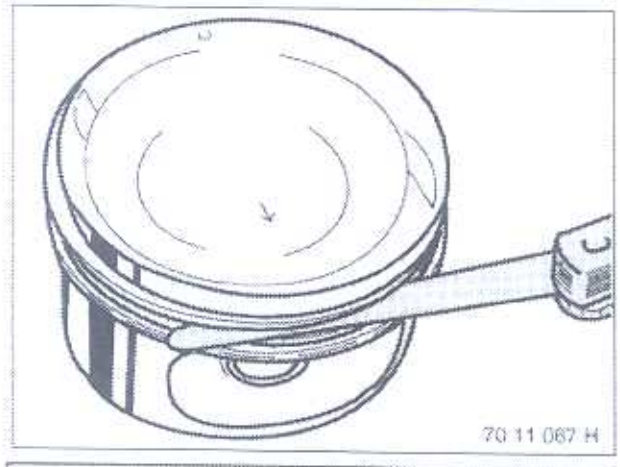
New pistons may only be installed together with new piston rings.



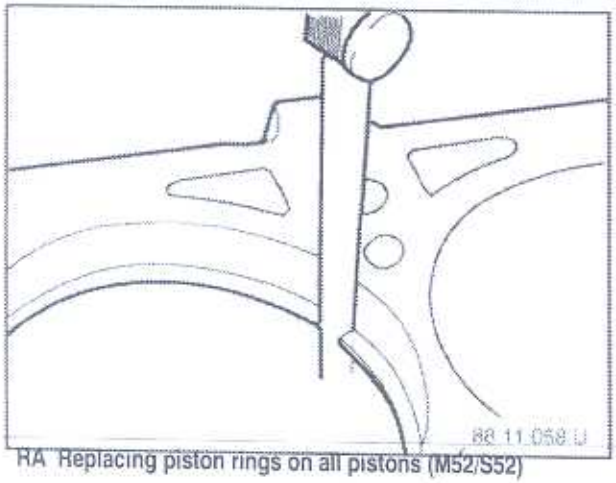
Installation:

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

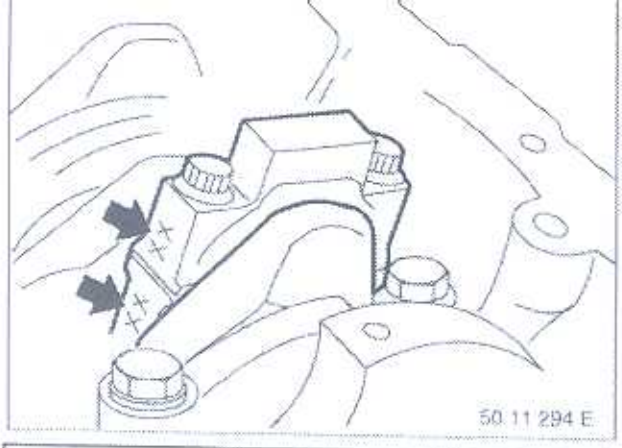
1. Plain compression ring
2. Stepped taper-face ring "TOP"
3. Slotted oil ring with hose spring clip



Measuring end float,
refer to Technical Data



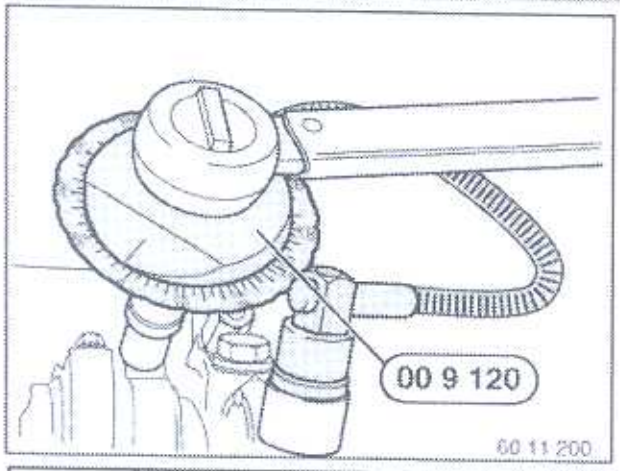
Measuring contact clearance,
refer to Technical Data



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

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

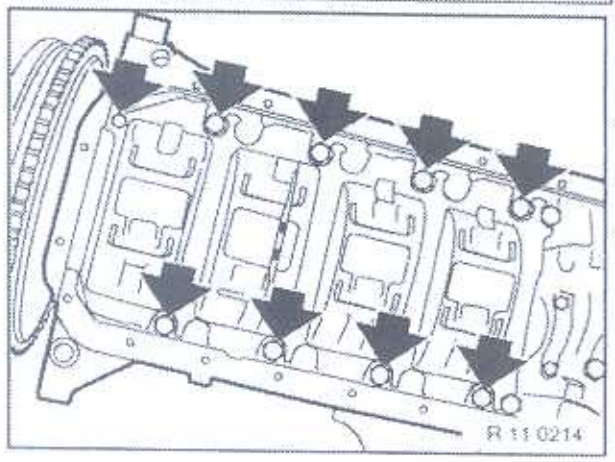
Install new conrod bolts.



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

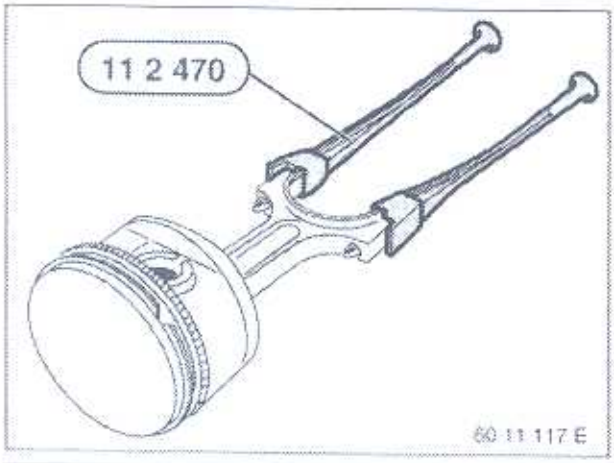
Tightening torque,

refer to Technical Data 11 24 1AZ

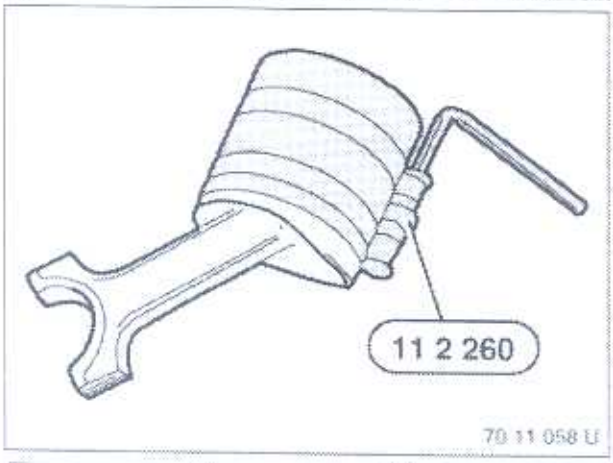


Fit oil scraper.

Assemble engine.



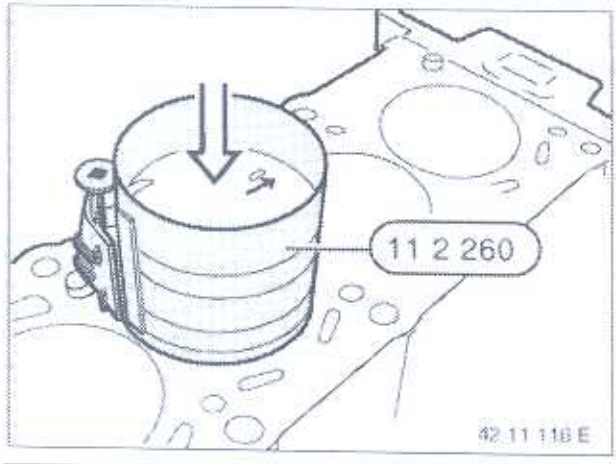
Insert special tool 11 2 470 in conrod.



Lightly coat pistons and piston rings with oil.

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

Press together piston rings with special tool 11 2 260.



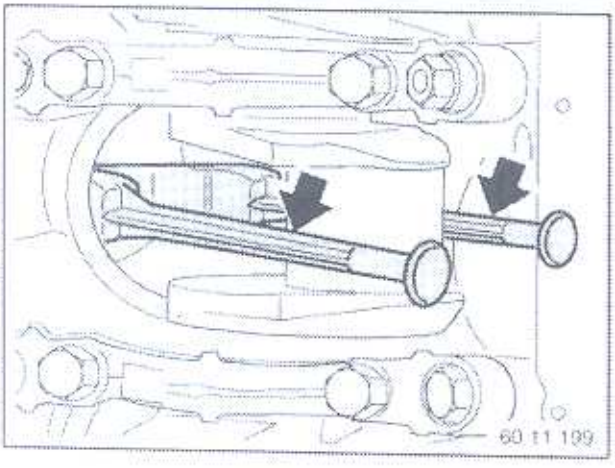
Install pistons with arrows pointing towards camshaft drive.

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

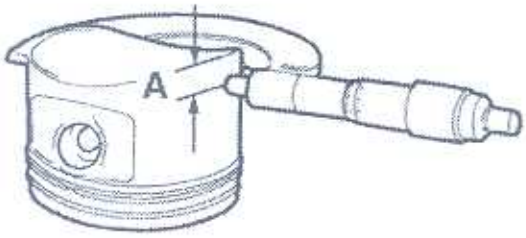
Caution!

Danger of piston ring failure.

Press in piston only with finger force (do not knock in!).



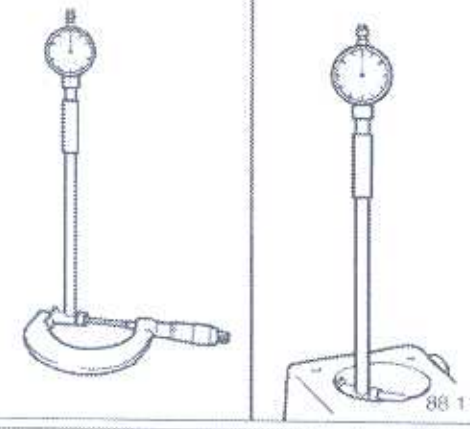
Attach crankpin to connecting rod.



88 11 051 U

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



88 11 052 U

Set internal caliper on micrometer to zero on the piston diameter measured. Measure cylinder bore at bottom, middle and top diagonally.

Piston installation clearance,
refer to Technical Data

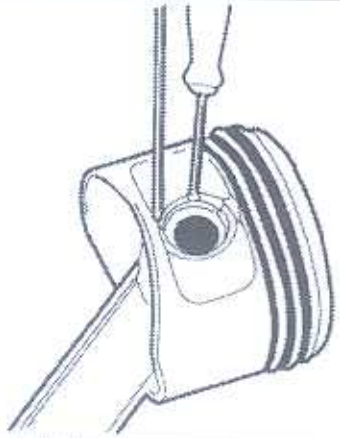
Max. permissible total wear clearance,
refer to Technical Data

42 11 117 U

Caution!

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 both the visible pair numbers on the installation direction arrow on the piston point to the right.

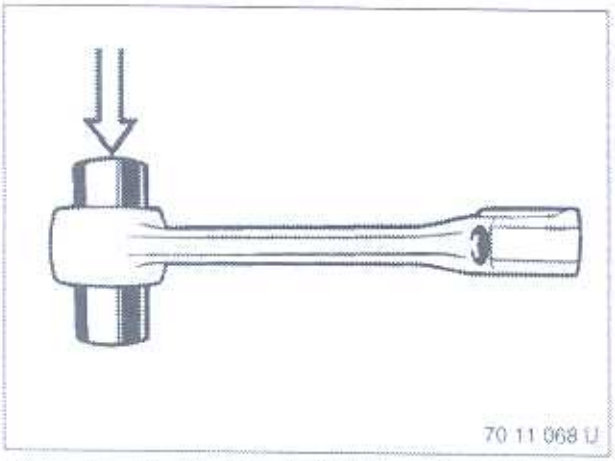


70 11 063 U

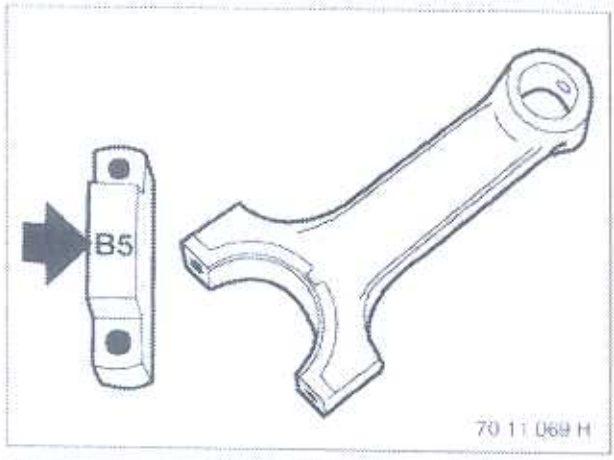
Fit the retaining ring with its aperture opposite the recess.

Installation:

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



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

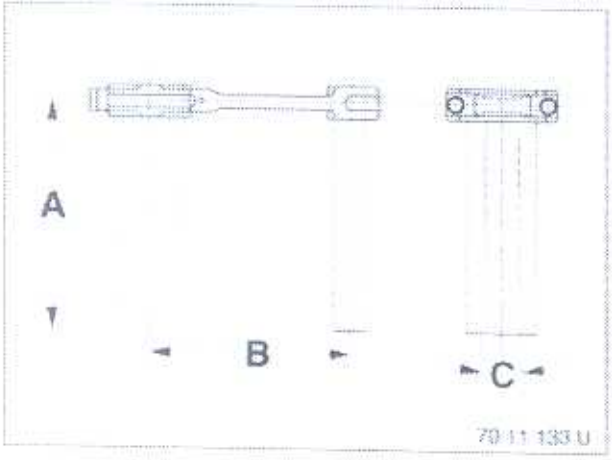


If necessary, replace connecting rods.

Note:

Inside any one engine, all connecting rods must share the same weight class.

The BMW Parts Service only supplies connecting rods in complete sets.



If necessary, check that conrods are parallel, i.e. ensure they are not twisted.

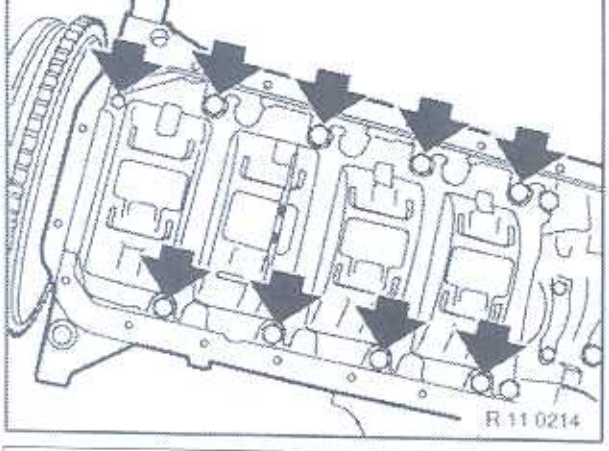
A= Inspection gap

B= Permitted parallelity deviation at distance A

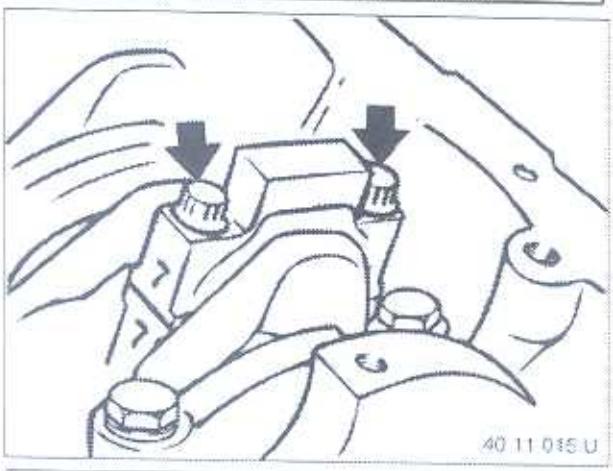
C= Permitted distortion on each side

Dimension A, B and C,
refer to Technical Data

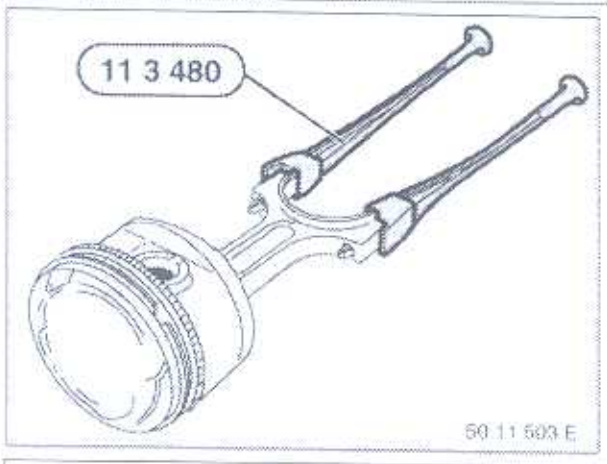
Replacing conrod bearing shells,
refer to 11 24 571



Remove oil lever.

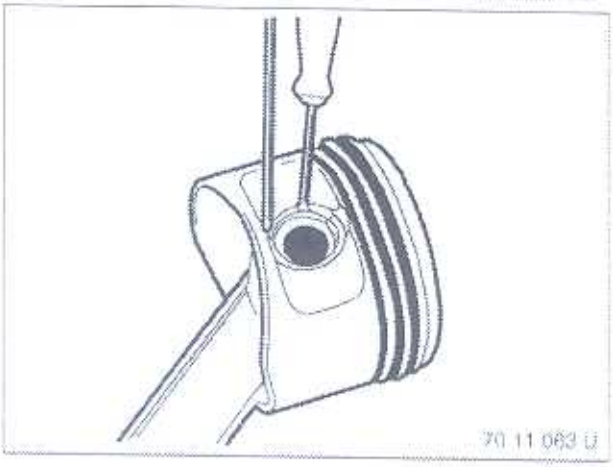


Unscrew conrod bearing cover.



Insert special tool 11 3 480 in connecting rod.

Remove conrod with piston from cylinder head side.



Lift out retaining ring and press out piston pin.

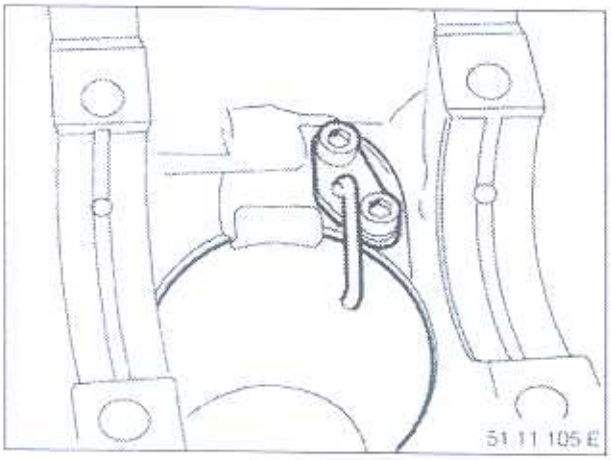
Caution!

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

(engine removed)

Removing cylinder head,
refer to 11 12 500

Removing oil pump,
refer to 11 41 000



Note:

The S52 and the M52 B25/B28 have spray nozzles between bearing seats for piston cooling.

This illustration shows crankshaft removed.

Installation:

Screw threads are coated with screw retaining compound.

Replace screws.

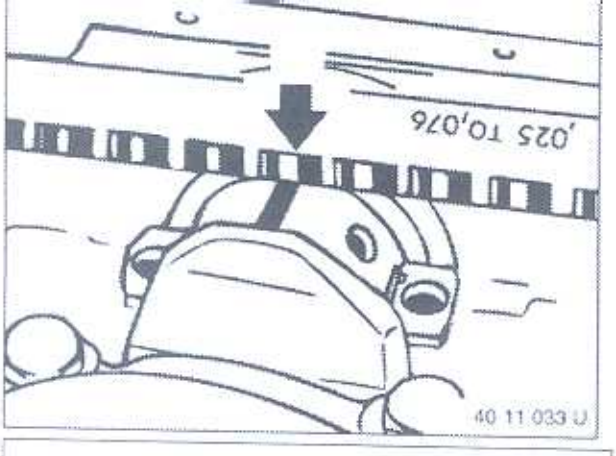
Removal:

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

Caution!

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

Connecting rods and bearing covers are designated with the same pair number: do not mix them.

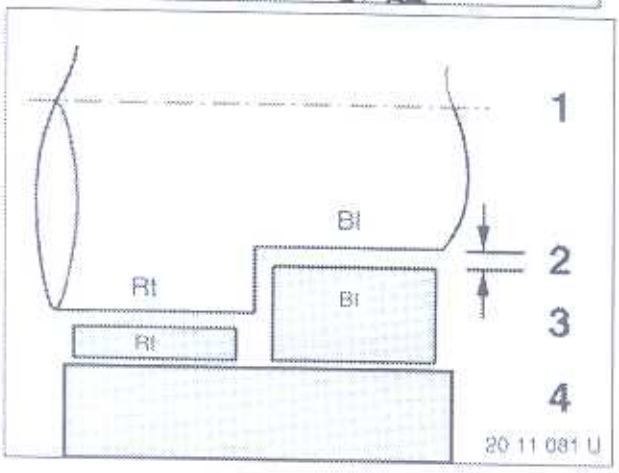


Remove bearing cover and read off bearing clearance across width of pinched plastic thread with the help of the measuring scale.

Conrod bearing clearance,

refer to Technical Data

Remove plastic thread.



Summary:

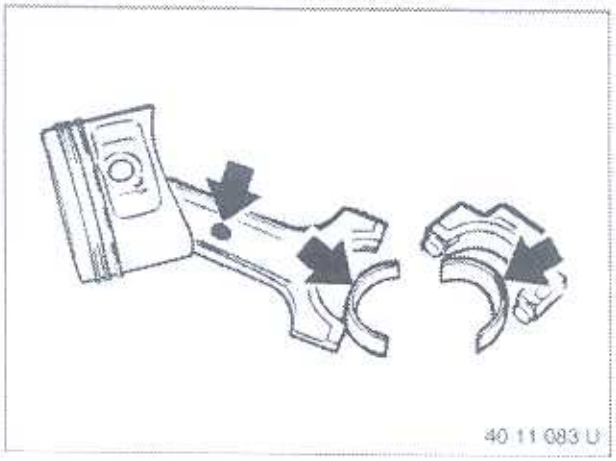
Color code/shaft diameter/bearing strength

Rt = red

Bl = blue

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

(piston removed)



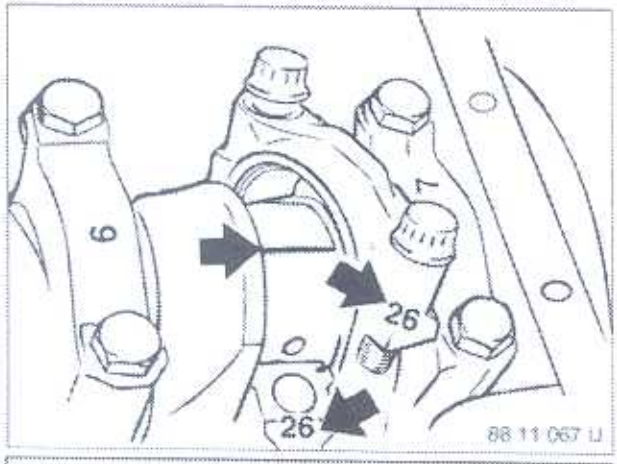
Install new conrod bearing shells.

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

Caution!

Note grinding stage of crankshaft,
refer to Technical Data

Installing pistons,
refer to 11 25 530

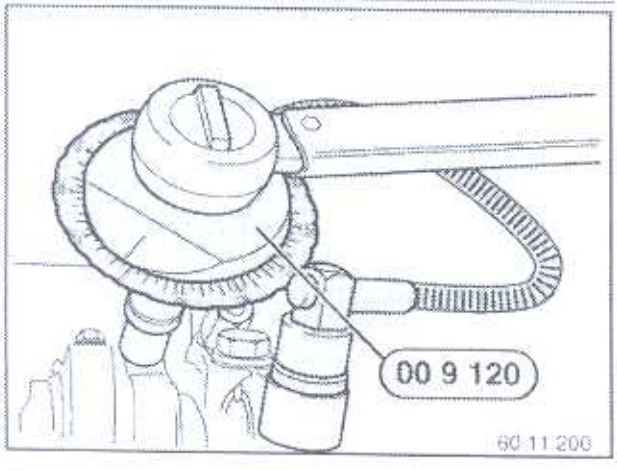


Check conrod bearing clearance.

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.



Caution!

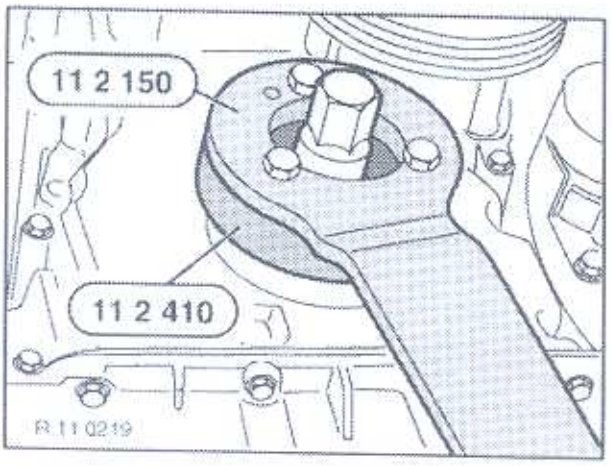
Do not turn the connecting rods or crankshaft.

Use the old conrod bolts to check conrod clearance.

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

Tightening torque,
refer to Technical Data 11 24 1AZ

Removing vibration damper,
refer to 11 23 010



Secure special tool 11 2 150 to special tool 11 2 410 (spacer disc) on hub.

Caution!

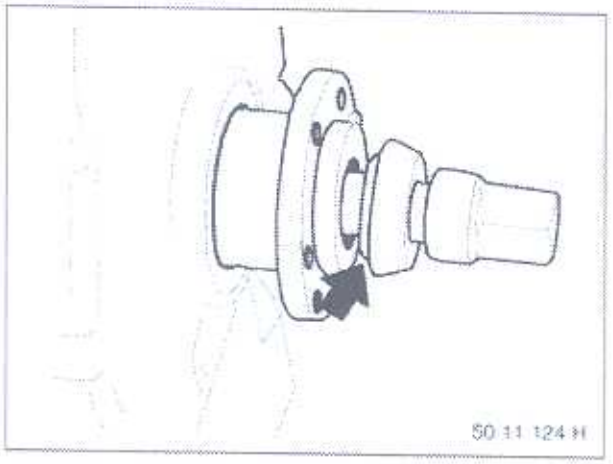
Remember to fit dowel pin.

Protect engine bracket from damage.

Insert wood between engine support and special tool 11 2 150.

Unfasten central screw, remove washer with hub.

Replace crankshaft radial sealing ring,
refer to 11 14 151



Installation:

Position hub in such a way that groove and woodruff key are aligned.

Shoulder of washer faces hub.

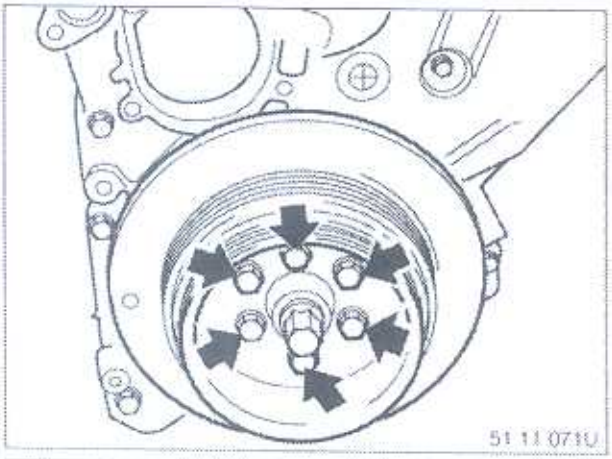
Replace central screw.

Tightening torque,
refer to Technical Data 11 23 2AZ

Unscrew and remove splash guard.

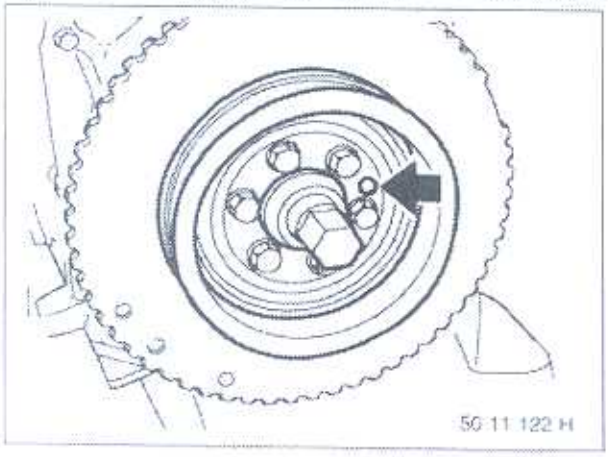
Removing fan wheel with fan coupling,
refer to 11 52 020

Removing alternator drive belt,
refer to 11 28 010



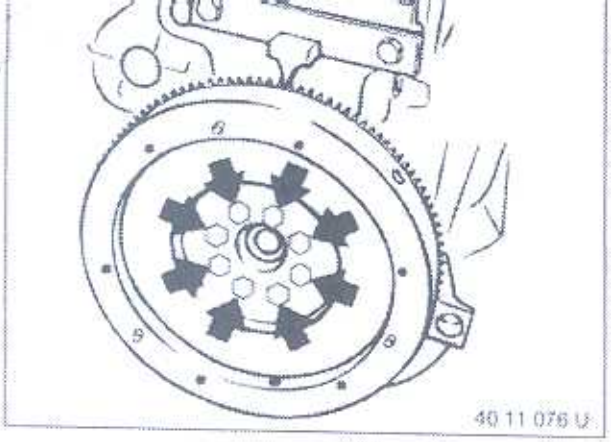
Unscrew vibration damper bolts and take off vibration damper.

Tightening torque,
refer to Technical Data 11 23 3AZ



Installation:

Align locating bore in vibration damper with dowel.

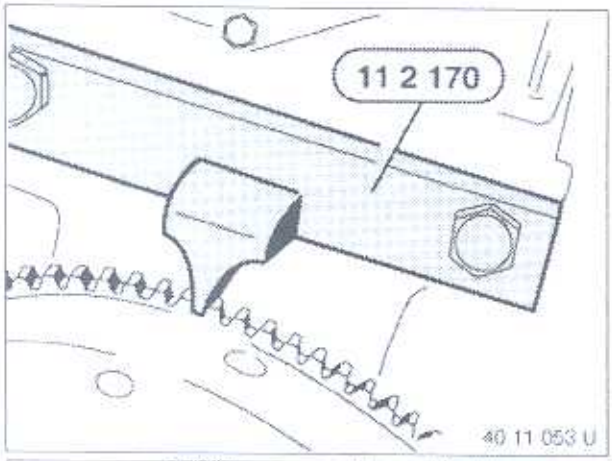


Installation:

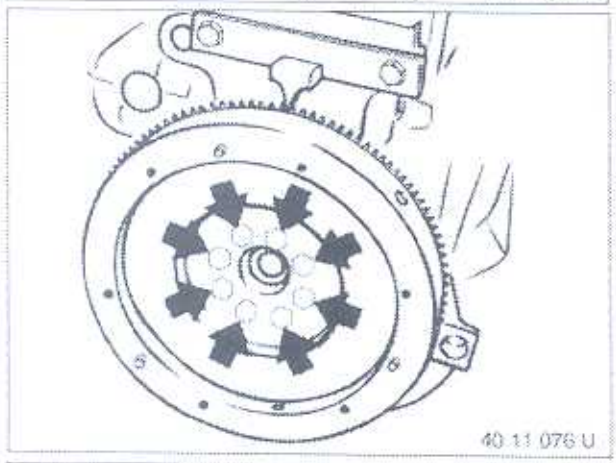
Clean thread and install new micro-encapsulated screws.

Tightening torque,
refer to Technical Data 11 22 1AZ

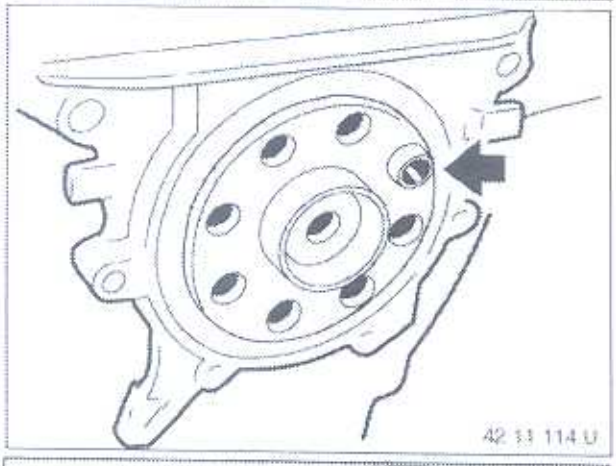
(clutch removed)



Arrest flywheel with special tool 11 2 170.

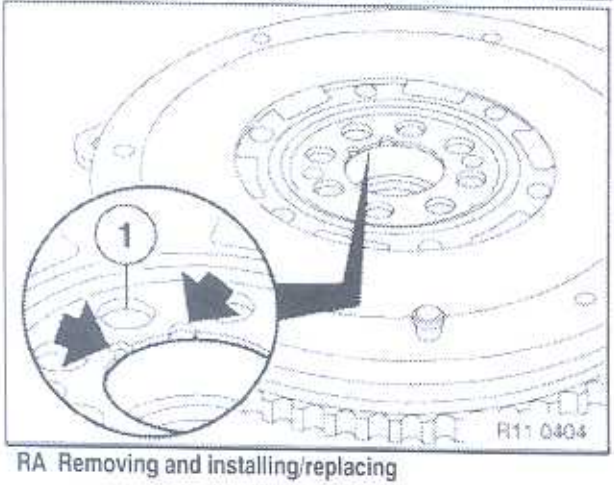


Unfasten screws and remove flywheel.



Installation:

Remember to fit hollow bush.

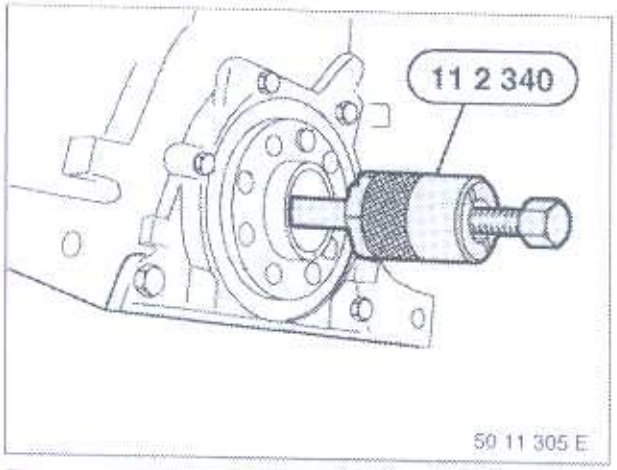


Installation:

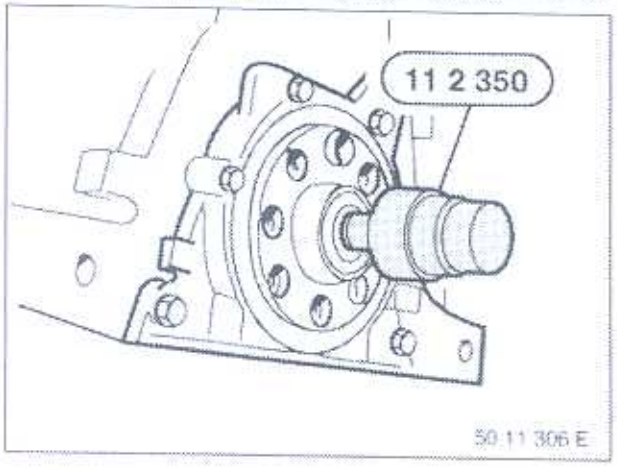
The position of the dowel sleeve (1) in the dual-mass flywheel is marked with two notches beside the respective screw bore.

11 21 571 **Replacing grooved ball bearing in crankshaft (M52/S52)**

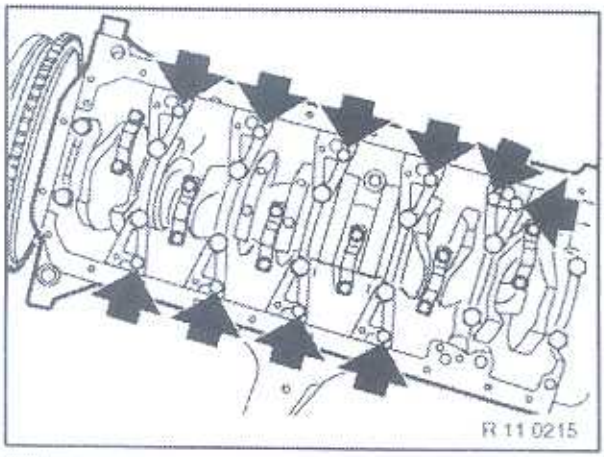
(clutch removed)



Remove guide bearing with special tool 11 2 340.



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



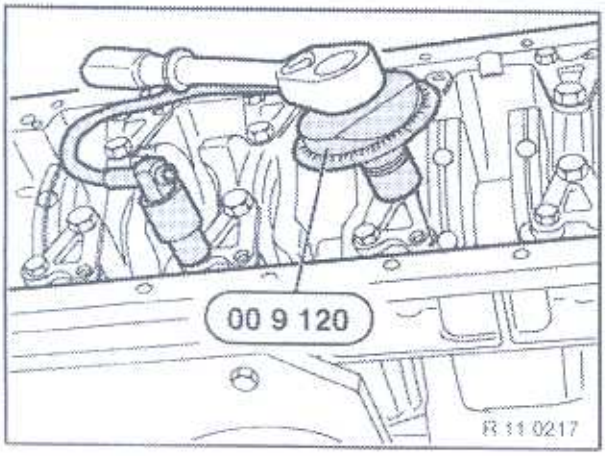
On engines with aluminium engine block:

Installation:

Install reinforcement plates and fit screws with zero backlash.

Install main bearing shells and abut firmly.

Tighten down screw connection on reinforcement plates.

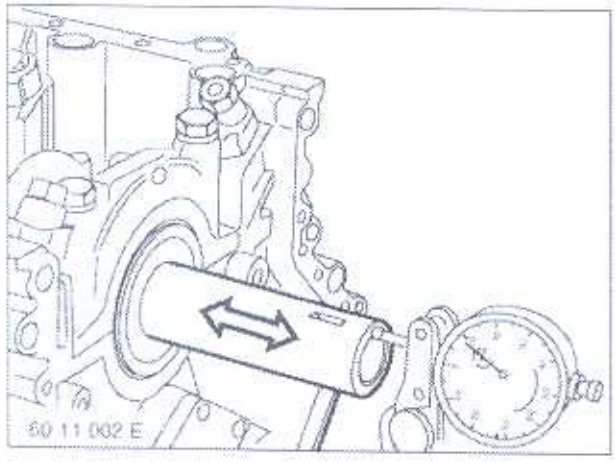


Tightening specifications for main bearing:

1. Tighten all screws on main bearing cover with jointing torque.
2. Unfasten screws on main bearing cover 6.
3. Strike back and front of crankshaft with plastic hammer to center thrust bearing (do not damage crankshaft).
4. Tighten screws of main bearing cover 6 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.

   Tightening torque,

   refer to Technical Data 11 11 1AZ

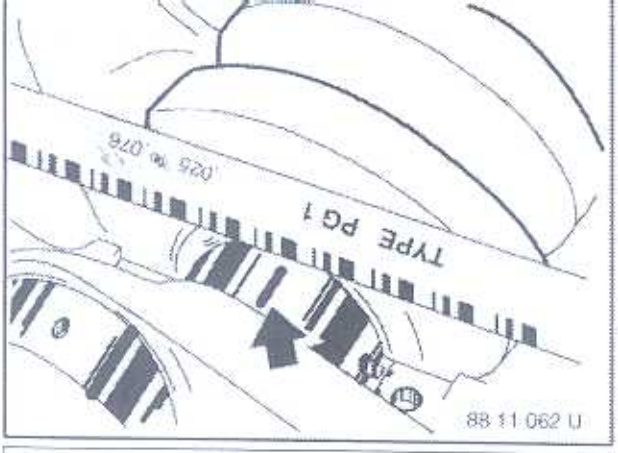


Check end float.

If the permitted end float is exceeded, check crankshaft, pilot bearing shells and engine block and replace where necessary.

End float,

refer to Technical Data

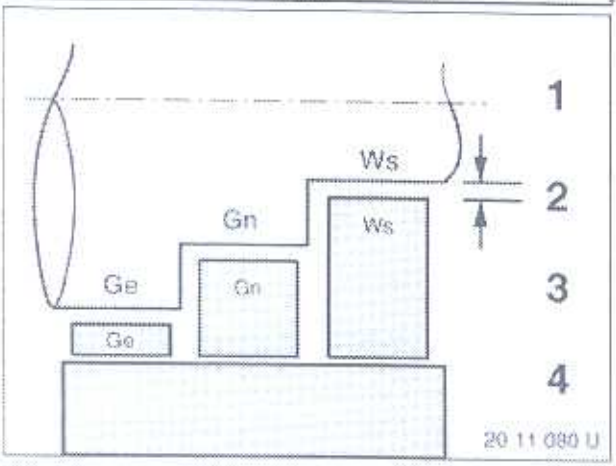


Remove main bearing cover and read off bearing clearance on width of squashed plastic thread using the measuring scale.

Face runout on crankshaft bearing,

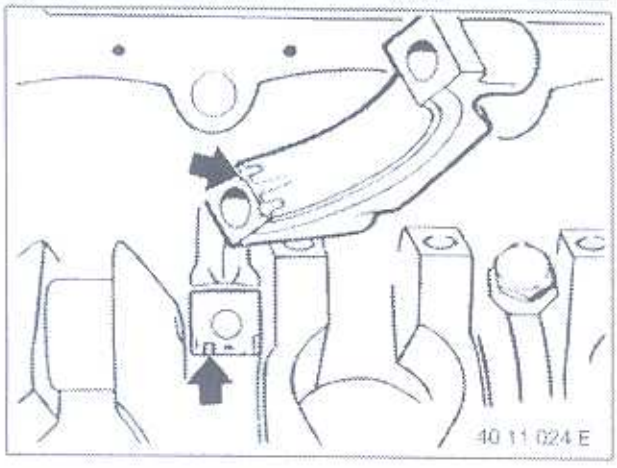
refer to Technical Data

If necessary, fit new bearing shells with a different color code to correct bearing clearance.



Color code for shaft diameter/bearing size:

1. Crankshaft
   - Ge = yellow
   - Gn = green
   - Ws = white
2. Bearing clearance
3. Bearing shells: yellow, green or white
4. Bearing cover



Note:

Remove plastic thread.

Coat main bearing shells and crankshaft with engine oil.

Install main bearing cover with grooves in main bearing shell mount on one side.

Align main bearing cap flush with side of bearing seat.

Installation:

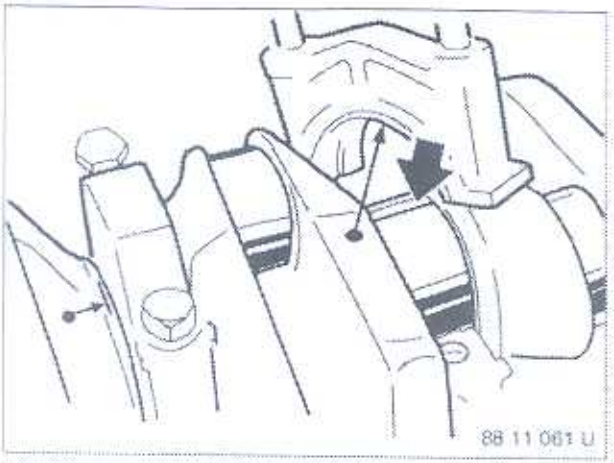
Always replace the screws on the main bearing cover with new ones.

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

Note:

On engines with aluminium engine block, do not wash off screw coating.

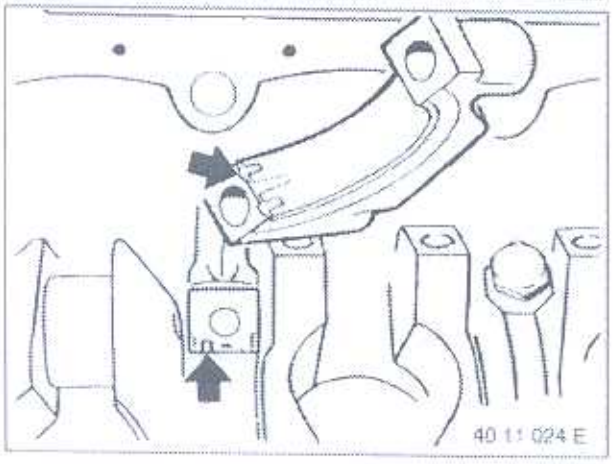
On engines with cast-iron engine block, wash and oil screws.



Check clearance on main crankshaft bearing.

Install crankshaft and place special tool 00 2 590 (Plastigage Type PG1) on the oil-free crankshaft.

Do not twist crankshaft.



Install main bearing cover with grooves in main bearing shell mount on one side.

Align main bearing cap flush with side of bearing seat.

Installation:

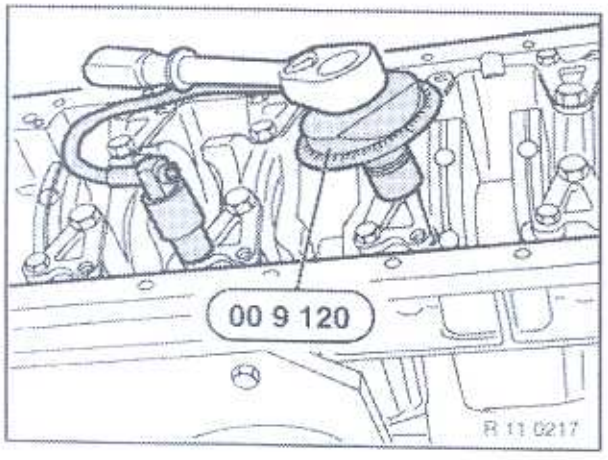
To check main bearing clearance, use the old main bearing screws.

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

Note:

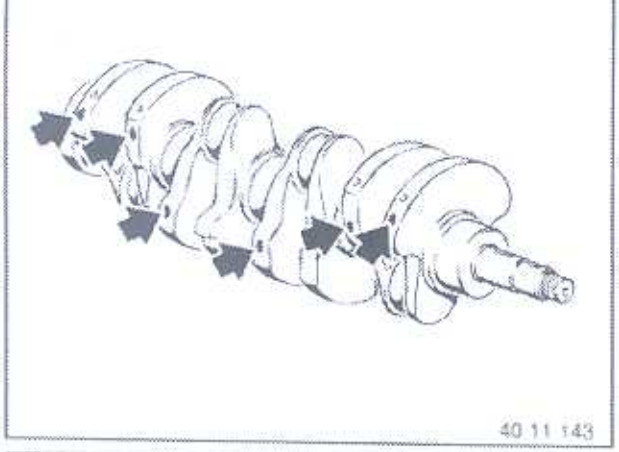
On engines with aluminium engine block, do not wash off screw coating.

On engines with cast iron engine block, wash and oil screws.



1. Tighten down main bearing screws with jointing torque.
2. Tighten down main bearing screws using special tool 00 9 120 and torsion angle.

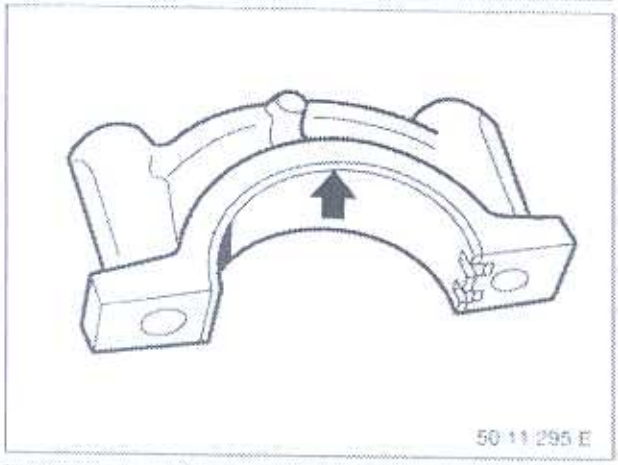
Tightening torque,
refer to Technical Data 11 11 1AZ



Install crankshaft.

Note:

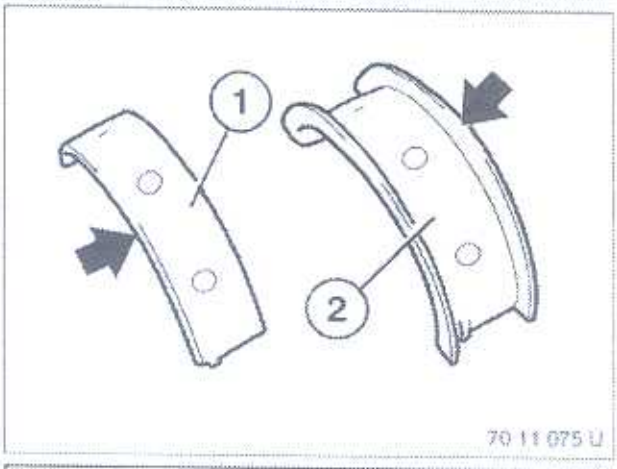
The crankshaft is marked with yellow, green or white paint according to the tolerance of the main journal.



Installation:

The bearing shell classification for the bearing cover is marked on the crankshaft in yellow, green or white paint.

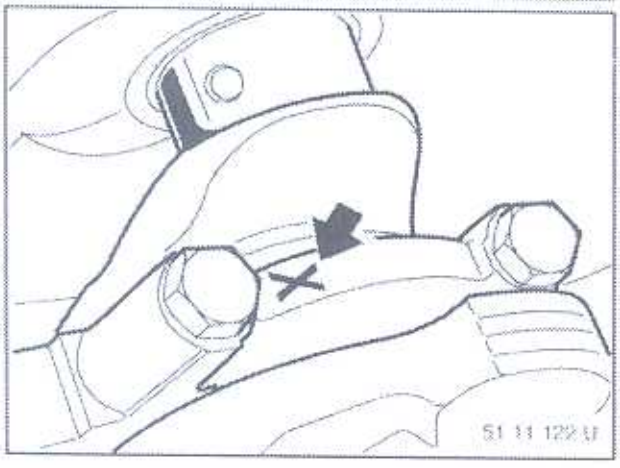
Place main bearing shells with same color code as that of crankshaft in main bearing caps.



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

1. Bearing shell
2. Guide bearing

Note grinding stage of main bearing spigot, refer to Technical Data

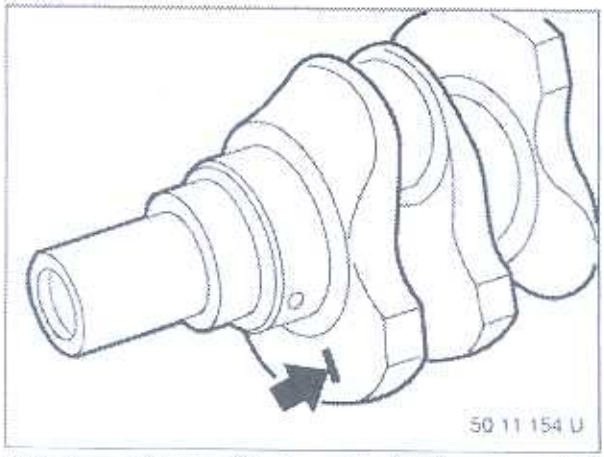


Note:

The bearing covers 1 ... 5 are designated on the exhaust end.

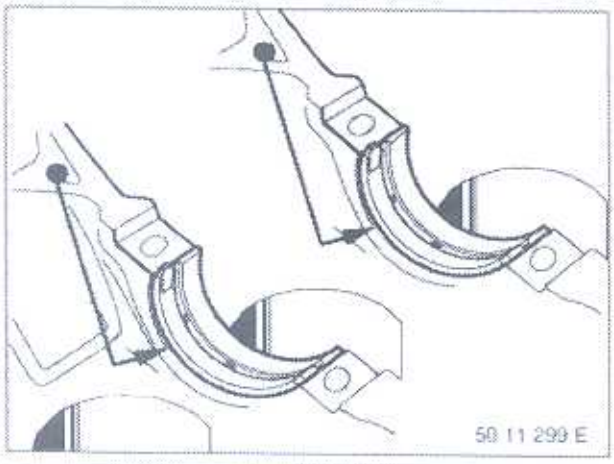
Bearing covers 6 and 7 are not designated.

Bearing cover 6 is a thrust bearing.



Caution!

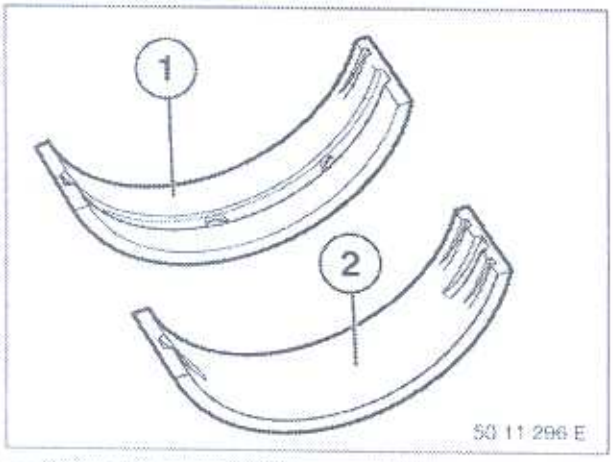
Note grinding stage of crankshaft, refer to Technical Data



Installation:

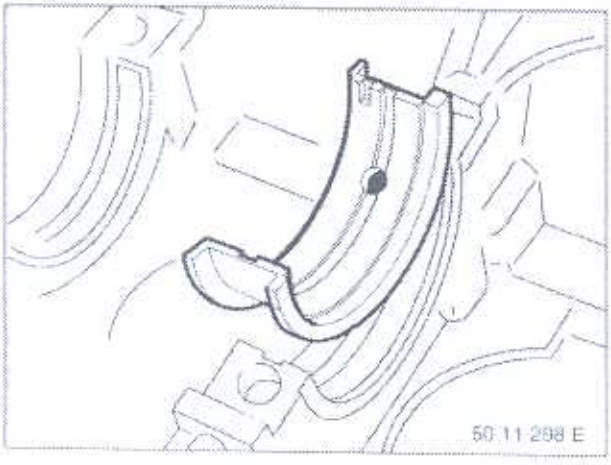
When replacing the bearing shells (including on replacement crankshaft), classification for bearing shell arrangement in engine block is waived.

Only install yellow bearing shells in the engine block.



Note:

1. Install bearing shells with continuous lubricant groove and one retaining lug in engine block.
2. Fit bearing shells without continuous lubricant groove and two retaining lugs in bearing cover.

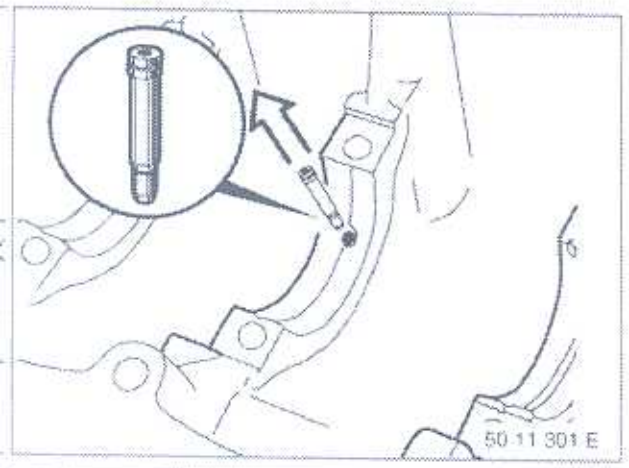


Note:

The axial guide on the crankshaft is fitted to bearing point 6.

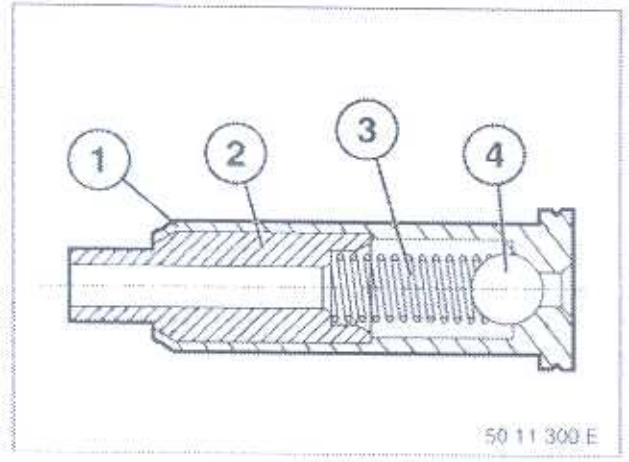
Insert pilot bearing shell in the engine block.

(engine dismantled)



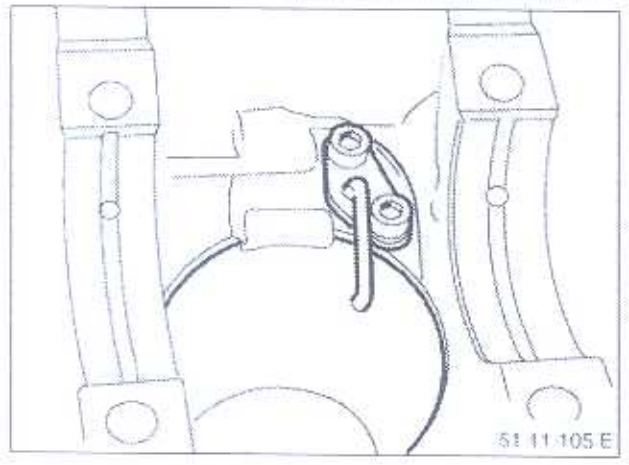
Note:

The M52 B20 has spray nozzles in the bore of bearing seats 2 to 7 to cool the pistons.



Design of injection nozzles:

(1) Nozzle housing
(2) Nozzle
(3) Spring
(4) Ball



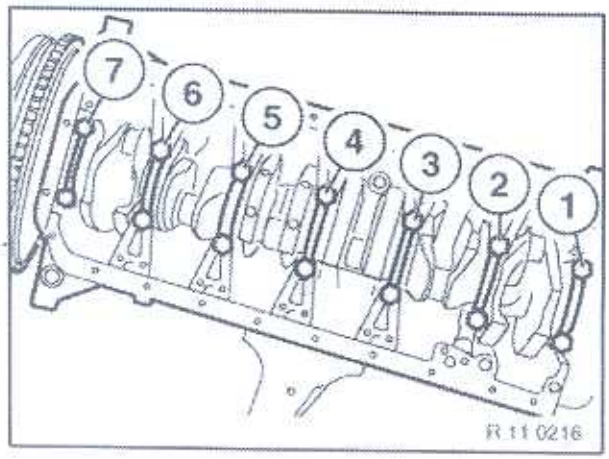
Note:

The S52 and the M52 B25/B28 have spray nozzles between bearing seats for piston cooling.

Installation:

Screw threads are coated with screw retaining compound.

Replace screws.



Unfasten screw connection on main bearing.

Remove main bearing cover (1 ... 7).

Lever out crankshaft.

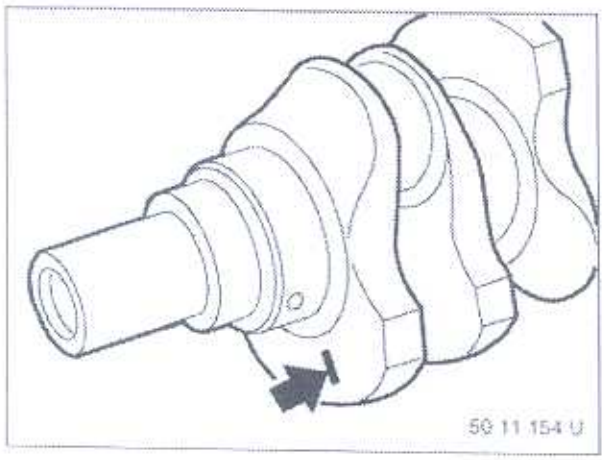
If necessary, unfasten increment wheel.

Installation:

Replace screws.

Install screws and tighten down in two passes.

Tightening torque,
refer to Technical Data 11 21 1AZ



Caution!

Note grinding stage of crankshaft,
refer to Technical Data

Replacing main crankshaft bearing shells,
refer to 11 21 531

Replacing conrod bearing shells,
refer to 11 24 571

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