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3. Instructions for preventing environmental damage

Engine oil and filter cartridges and elements, fuel/fuel filters

- Take old oil to an old oil disposal point only.
- Ensure without fail that oil and Diesel fuel will not get into the sewerage system or the ground.

**Caution:**

Danger of contaminating potable water!

- Treat filter elements and cartridges as special waste.

Coolant

- Treat undiluted anticorrosion and/or antifreeze agents as special waste.
- The regulations of the relevant local authorities are to be observed for the disposal of spent coolants.

4. Instructions for handling used engine oil *

Prolonged or repeated contact of any kind of engine oil with the skin causes the skin to degrease, which may result in dryness, irritation or inflammation. Old engine oil also contains hazardous substances which in animal experiments have caused skin cancer. Handling old engine oil does not pose any health hazard if the basic safety and hygiene related regulations are observed.

Health and safety regulations:

- Avoid prolonged, excessive or repeated contact of old engine oil with the skin.
- Use a suitable skin protection agent or wear protective gloves.
- Clean the skin that has been in contact with engine oil.
 - Wash yourself thoroughly with soap and water. A nailbrush is an effective aid.
 - Special hand cleaning agents facilitate cleaning soiled hands.
 - Do not use petrol, Diesel fuel, gas oil, fluxes or solvents as cleaning agents.
- After washing apply moisturising handcream to your skin.
- Change oil-soaked clothes and shoes.
- Do not put any oil-soaked cloths into pockets.

Pay meticulous attention to the proper disposal of old engine oil.

– Old oil is a water hazard –

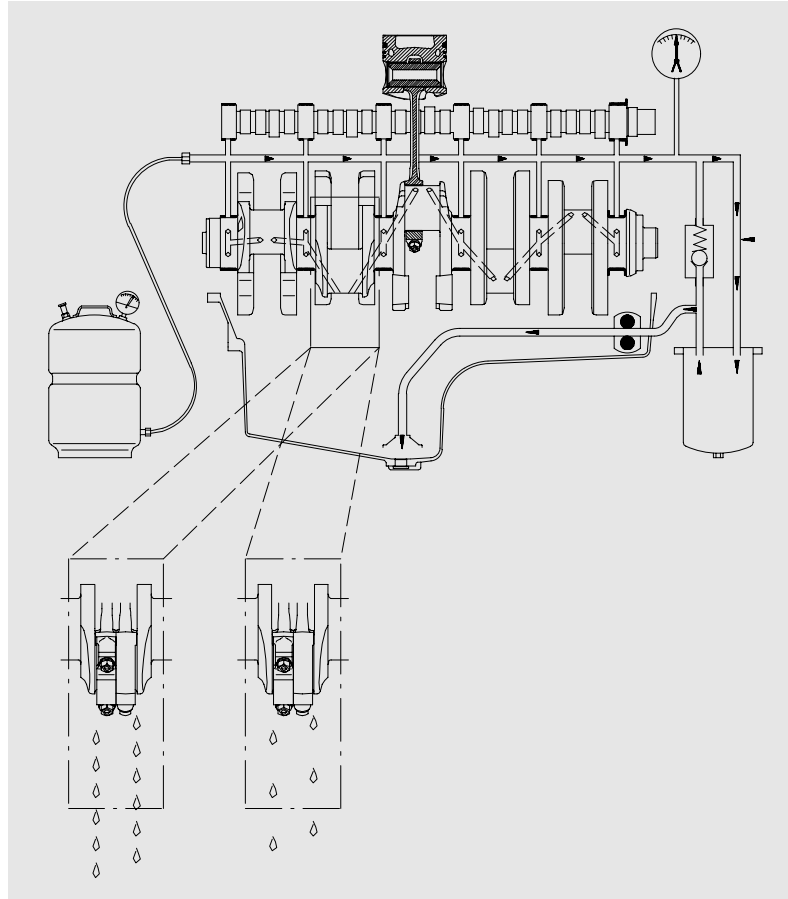
Therefore, do not pour any old oil into the ground, the drains or the sewerage system. Any violation of this rule is punishable.

Collect and dispose of old engine oil properly. For information concerning collection points, contact seller, supplier or the local authorities.

* Based on the "Information sheet for handling used engine oil"
(Notes on how to handle old engine oil).

Pressurising an engine affords the following advantages:

- All engine parts are lubricated before engine startup; a lubricating film can be built up inside the bearings as early as after the first few rotations of the crankshaft, thereby preventing damage to the bearing races.
- Any loss of oil, be it the result of excessively large bearing play or leaks from the crankcase or from crankcase bores which may not be plugged, can be detected immediately. For this purpose, mount the engine on an assembly dolly, remove the oil pan and install a suitable oil collector under the crankcase in such a way that the bearings are visible.



Performance of pressurisation:

At least 30% of the total oil quantity is forced from the pressurisation container into the engine oil circuit. The operating pressure serves as the yardstick for the pressure to be forced in and must not be exceeded. The pressurisation container is connected up to the engine oil circuit at the oil filter head (screw plug, arrowed).

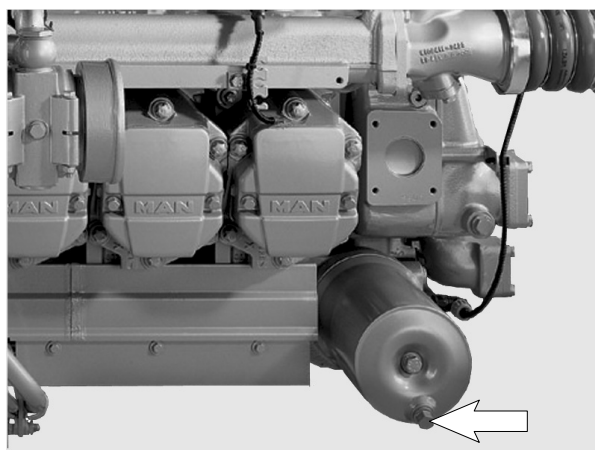


Fig. 5

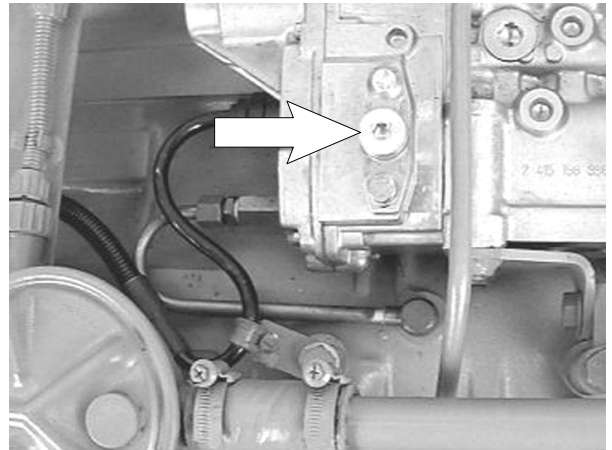
Remove screw plug ① on governor housing.
If fitted, take out blocking pin ②.



Caution:

If the injection pump is blocked the camshaft must on no account be loaded or turned because parts of the blocking pin may break off and fall into the governor.
Non-compliance with this may result in severe damage to the injection pump.

If the pointer is exactly in the centre of the inspection hole, the pump plunger for cylinder no. 1 is at start of delivery. However, it is possible to determine exactly whether or not the pump is at start of delivery only by means of the following special tools:



5

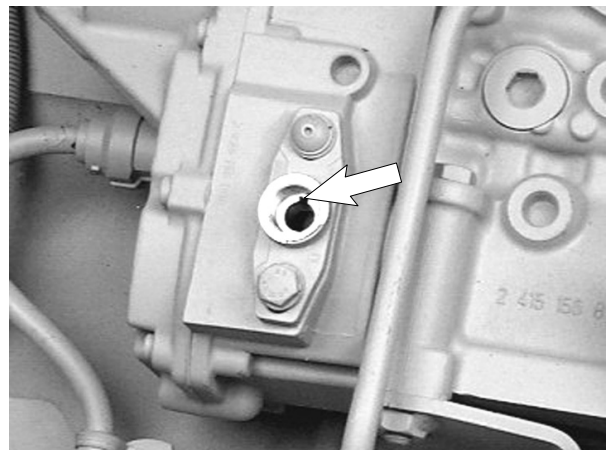
1. Light signal transmitter

Fig. 6

Push light signal transmitter into socket in governor housing. Ensure that the lug fits in the groove. Tighten the knurled nut by hand.

Turn engine by hand so that piston in cylinder no. 1 in the compression stroke comes close to the start of delivery.

Lamp (A) comes on shortly before start of delivery is reached.



6

Fig. 7

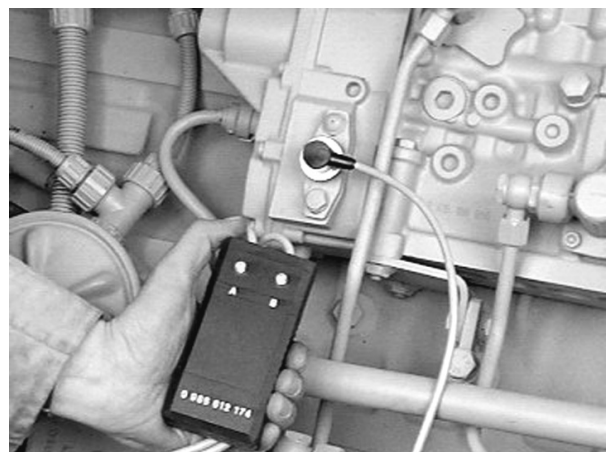
Slowly turn the engine further until lamp (B) comes on too. The injection pump is now at start of delivery.



Note:

If only lamp (B) comes on during this test, the engine has been turned past the start of delivery. In this case turn the engine back and repeat the procedure.

If only lamp (B) comes on during this test, the engine has been turned past the start of delivery. In this case turn the engine back and repeat the procedure.



7

Check tightness of nozzle holder base, pressure pipe and leak-oil line



Caution:

After the injection nozzles have been installed, always check to ensure that the nozzle holder seat, pressure pipe and leak-off oil lines do not leak.

Fig. 18

- ① Adapter for connecting up the compressed air hand pump (to make yourself)
- ② Compressed air hand pump with pressure gauge, special tool, see item. 25, page LEERER MERKER.

18

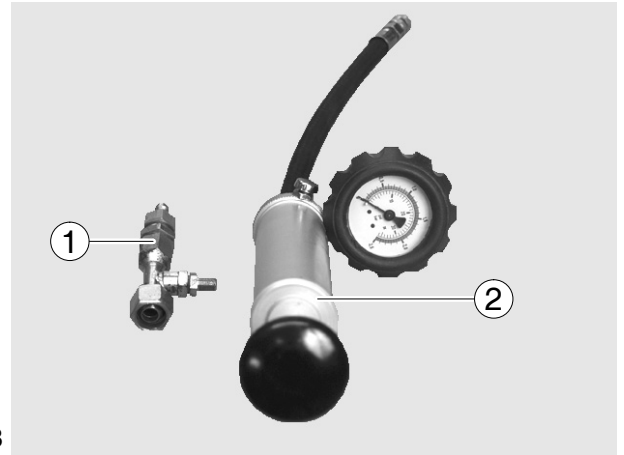


Fig. 19

Make adapter item ①, fig. 19 from standard parts

- ① T-connector for connecting up a pressure gauge with internal thread M8x1, is not necessary if the compressed air hand pump with pressure gauge item ②, fig. 18 is used and it must be closed
- ② Union nut M16x1,5
- ③ Connector M14x1,5
- ④ Adapter GE 8-PLR 1/4"
- ⑤ Connector fitting for compressed air hand pump (ewo, part-number 320.031)

19

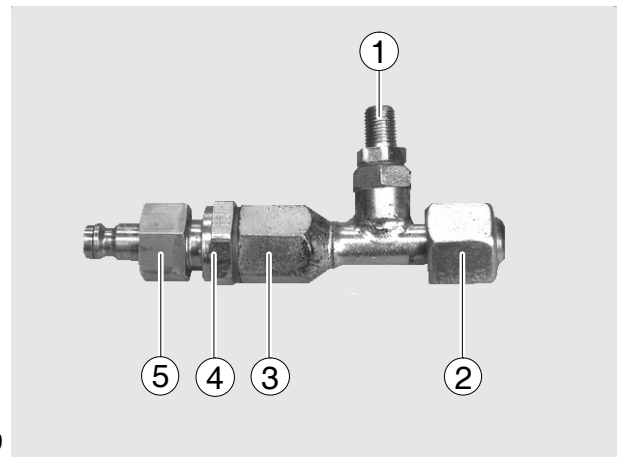
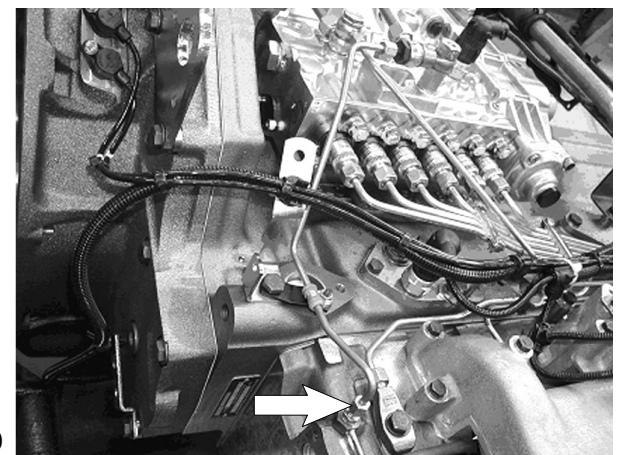


Fig. 20

Proceed as follows:

- Loosen injection lines on the connector fitting or on the injection pump
- Close fuel feed, e.g. on fuel pre-cleaner with taper plug VKA10
- Connect compressed air hand pump to fuel return (arrow) with screw connector
- Pump approx. 2 bar pressure to fuel system

20



Caution:

The pressure must not drop for a period of 3 minutes.

- Tighten up the injection lines again with the specified torque, see page 34.
- Reconnect leakage fuel return line

Instaling coolant pump

Fig. 3

Renew O-ring.

Fit coolant pump with new seal.

Tighten the securing bolts with the prescribed torque.

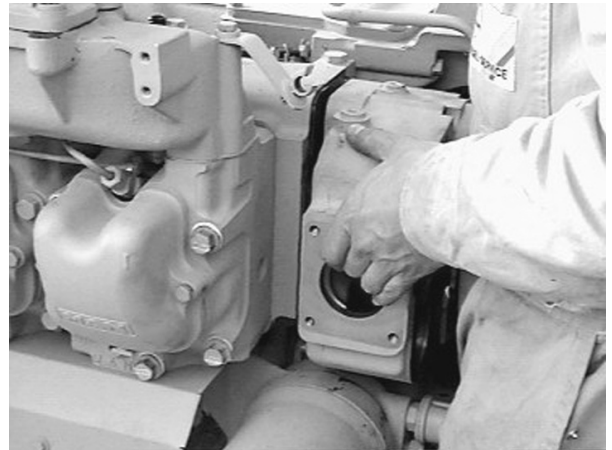


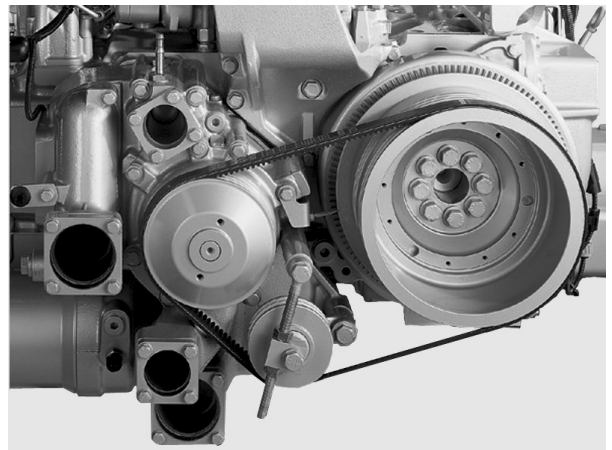
Fig. 4

Refit V-belt pulley and coolant neck.

Insert thermostat insert, see page 43.

Fit and tension the V-belt see Page 134.

Fill coolant, see page 42



Note:

Exchange or repair coolant pump only if it has been found to be leaky.

The design of the coolant pump mechanical cassette seal permits small amounts of coolant to pass through it. This coolant passing through results in a trace of drained coolant below the drain bore. The coolant pump need not be exchanged or repaired because of this trace of permeating coolant.

For this reason, before replacing or repairing a coolant pump, ascertain

- whether the cooling circuit shows visible and recurring signs of coolant loss; if yes
- whether the coolant loss is caused by spillage from the expansion tank (e.g. too full) or by other leakages from hoses, radiator etc.

Coolant pumps must be exchanged only if water drips visibly while the engine is in operation or after the engine has been switched off.

Replacing coolant pump during repair work only in event of identified leakage

The design of the coolant pump mechanical cassette seal permits small amounts of coolant to pass through it.

This coolant passing through results in a trace of drained coolant below the drain bore.

This trace of drained coolant does not mean that the coolant pump has to be replaced.

For this reason before exchanging or repairing a coolant pump ascertain

- whether the cooling circuit shows visible and recurring signs of coolant loss; if yes
- whether the coolant loss is caused by spillage from the expansion tank (e.g. too full) or by other leakages from hoses, radiator etc.

Coolant pumps may only then be replaced if dripping water can clearly be seen while the engine is running or after it has been turned off.

Installation note for mechanical seal

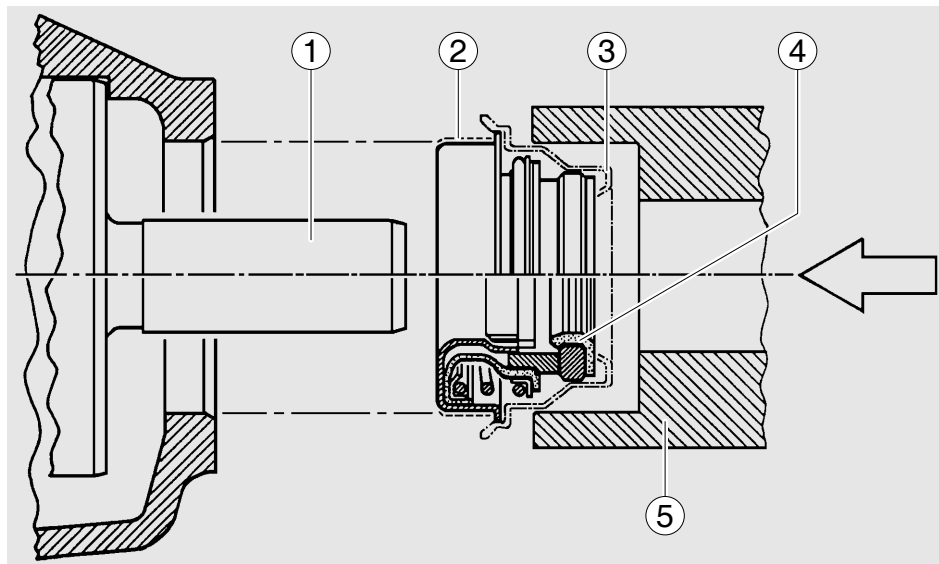
Fit the mechanical seal “wet”, i.e. when fitting, coat holding sleeve ④ and coolant pump shaft ① with a mixture of 50% water and 50% cleaning spirit or 40% to 50% antifreeze as per MAN 324 and water.

Other antiseize agents must not be used.

Because the seal on collar ② is coated with sealing paint, no sealing paint needs to be applied if the locating bore in the coolant pump housing is in perfect condition.

If the bore shows even the slightest scoring or other minor damage, a sealing bead of Dirko-Transparent, Part No. , must be applied to collar ②.

Fit the seal with a plastic transportation cap onto shaft ① and use installation tool ⑤ to press it in until the tool contacts the housing. Remove the plastic cap.



Note:

Tests have shown that most cases of damage to the coolant pump can be attributed to the use of unsuitable coolants.

Only the anticorrosion and antifreeze agents expressly approved by MAN Nutzfahrzeuge AG as per MAN norm 324 (see brochure Fuels, Lubricants, Coolants for and MAN Diesel Engines”) guarantee faultless operation

Removing oil spray nozzle

- Drain engine oil
- Removing the oil pan, see page 65

Fig. 1

Unscrew the oil spray nozzle valve (arrowed) and remove with the oil spray nozzle.

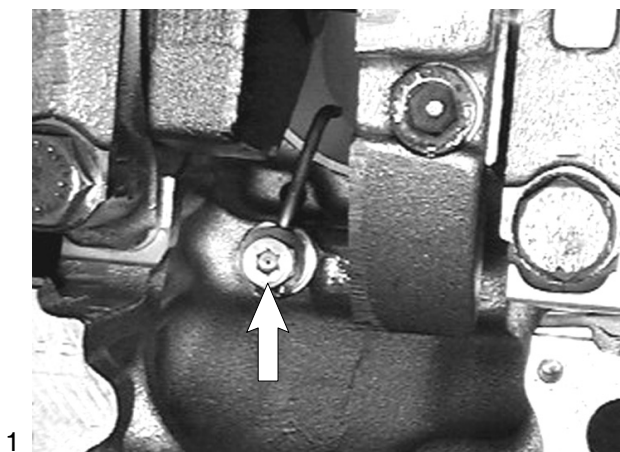


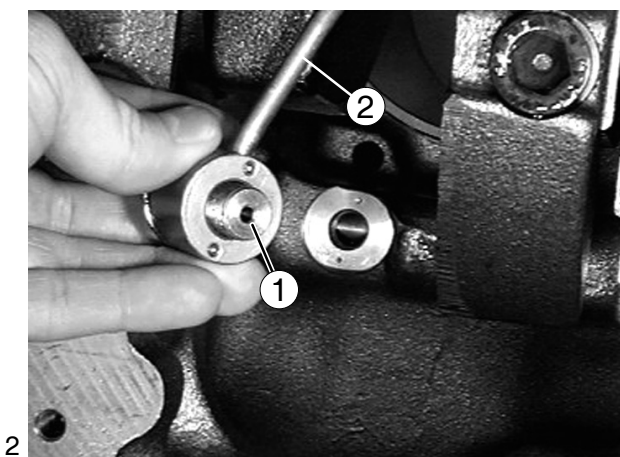
Fig. 2

- ① Oil spray nozzle valve
- ② Oil spray nozzle



Note:

The oil spray nozzles are provided with balls. When the oil spray nozzle valve is tightened at the factory, the balls are pressed into the crankcase where they make impressions which are used as marker points for installing the nozzle in the event of repairs.

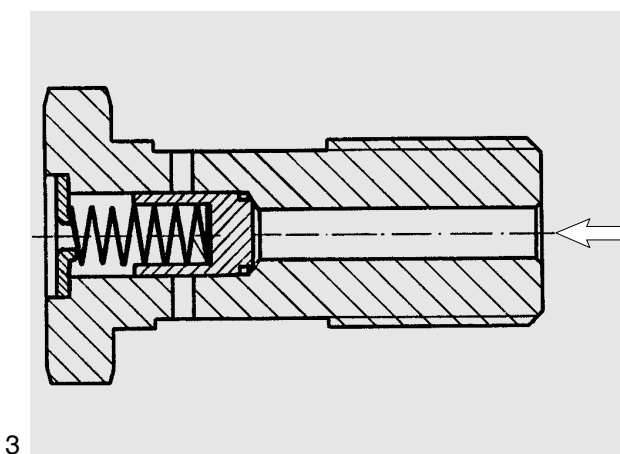


Checking oil spray nozzle valve

Fig. 3

Use a piece of wire to check whether the valve piston is easy to move.

Opening pressure, see "Service Data".



Installing the oil injection nozzle

Fig. 4

Screw in the oil spray nozzle together with its valve.

The balls of the oil spray nozzle must be located in the impressions designated for this purpose in the crankcase. This ensures that the nozzle is secured in the correct installation position.

Turn the engine. The crankshaft drive or pistons must not collide with the oil injection nozzle.

Tighten the securing bolts with the prescribed torque.



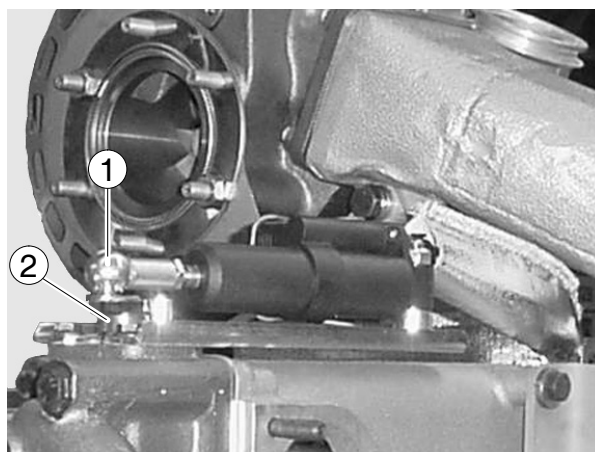
Pneumatic cylinder

Fig. 1



Caution:

If the pneumatic cylinder is changed set the ball head ① so that it is hooked up with approx. 4 mm pre-load with the shut-off flap ② closed.



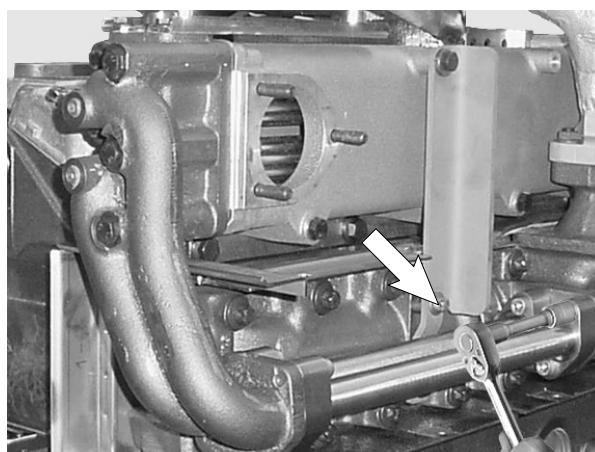
Removing EGR module

- Removing the turbocharger, see page 79
- Remove exhaust manifold, see page 80
- Drain off coolant, see page 42
- Detach air line from pneumatic cylinder

Fig. 2

Remove pipes and brace (arrow) and coolant elbow for exhaust-gas recirculation (EGR).

1



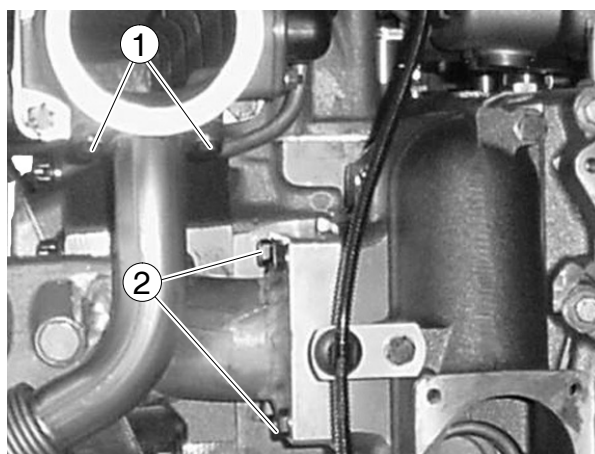
2

Fig. 3

Remove mounting bolts for exhaust-gas recirculation line ① and coolant elbow ②.

Take off exhaust-gas recirculation elbow and coolant elbow.

3

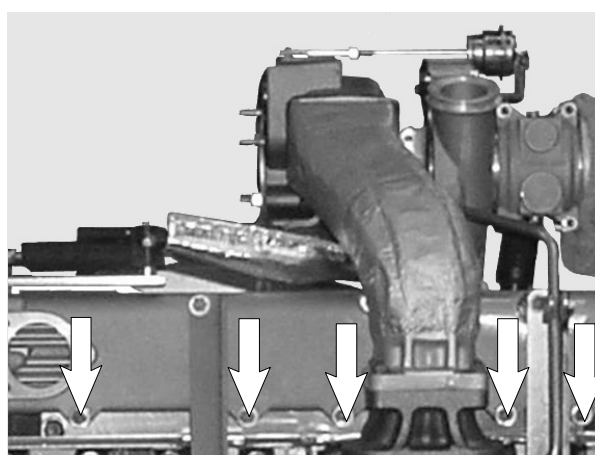


3

Fig. 4

Remove mounting bolts for EGR module and take off EGR module.

4



Disassembling rocker arm mechanism

- Remove cylinder head, see Page 90

Fig. 1

Clamp mounting plate ② (special tool LEERER MERKER, item. 24) in a vice and bolt the rocker arm bearing housing onto the mounting plate.
The exhaust valve rocker arm shaft has a tapped hole.
Screw adapter and impact puller ① into this tapped hole.

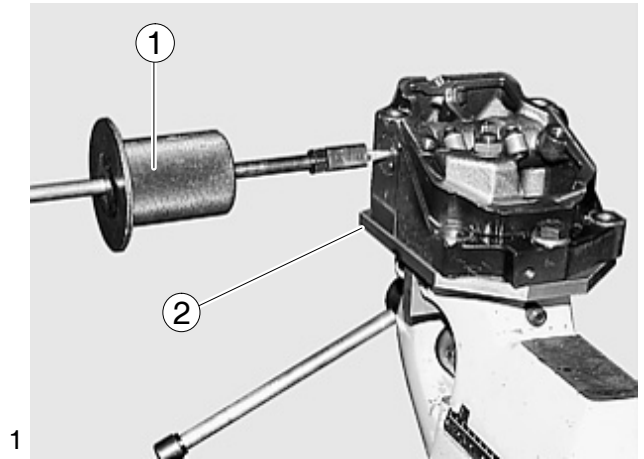


Fig. 2

Pull out the exhaust valve rocker arm shaft and remove the rocker arm.

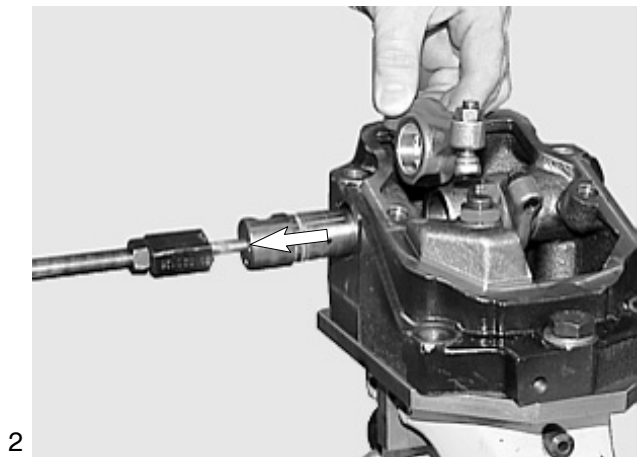


Fig. 3

Drive out the intake valve rocker arm shaft with a suitable plastic mandrel.

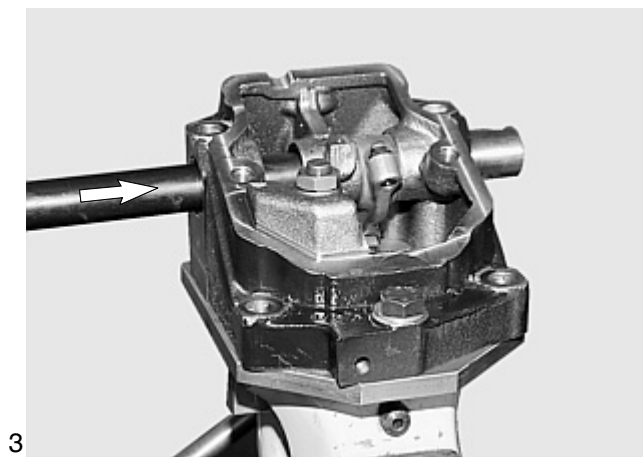


Fig. 4

Remove the rocker arm shaft and rocker arm.



- Removing and attaching cylinder head, see page 90
- Remove and install valves, see page 99

Fig. 1

Special tool for removing and installing the valve guides and valve seats(see page 169, Pos. 26.5):

- ① Press-in plates for valve seat inserts
- ② Spacer ring for ①
- ③ Extraction and press-in punch for valve guides and valve seats
- ④ Press-in sleeve for valve guides

1

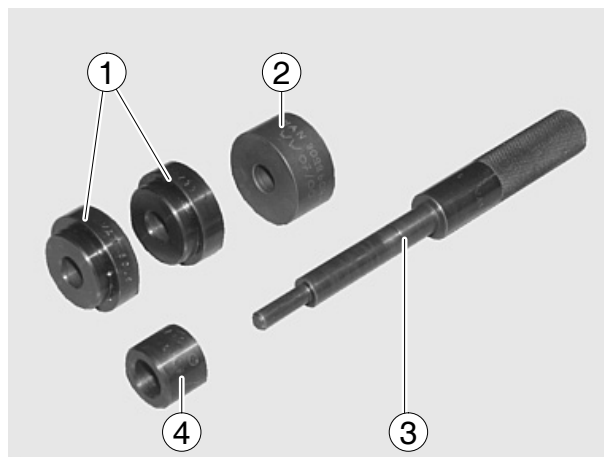


Fig. 2

Press out the valve guide from the combustion chamber side with press-in punch ③.

2

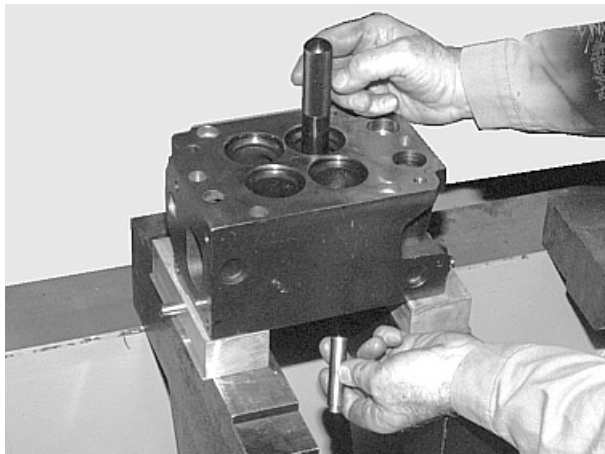


Fig. 3

Lubricate the new valve guide and press in with the press-in punch and press-in sleeve from the rocker arm side.

Press-in depth (see "Service Data").

3

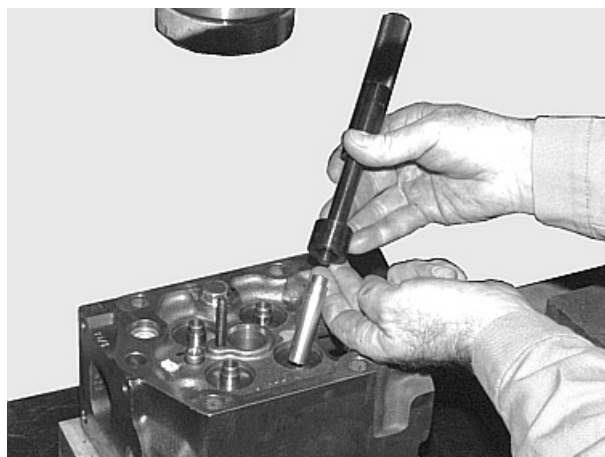


Fig. 4

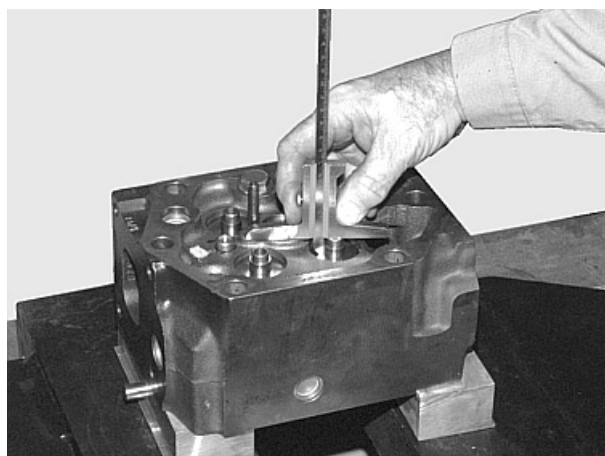
The press-in depth of the valve guides is determined by the press-in sleeve.



Note:

When the valve guides have been replaced, the valve seats must also be re-conditioned (refer to technical data and manufacturer's instructions of the valve seat turning equipment available in the machine shops).

4



Removing the camshaft

- Draining off coolant, see page 42
- Removing the oil pan, see page 65
- Removing the starter motor, see page 132
- Removing the flywheel and timing case, see page 113
- Remove cylinder head, see Page 90
- Remove vibration damper, see page 69

Fig. 1

Remove end cover (arrow) from air compressor wheel.

Take off air compressor wheel..

1

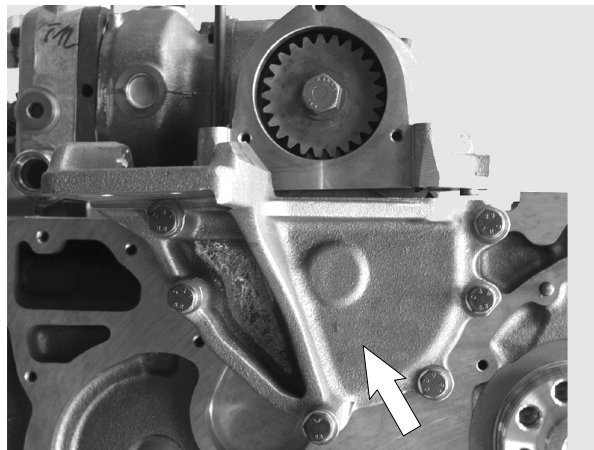


Fig. 2

Withdraw the camshaft. Take care not to damage the camshaft bearings. Check the camshaft for wear and damage.

In the case of damage to the camshaft or drive toothed wheel, the entire unit (camshaft – gear wheel) must be replaced.

2

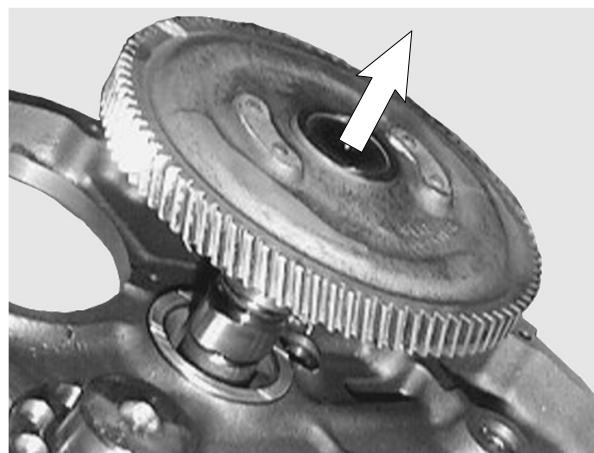
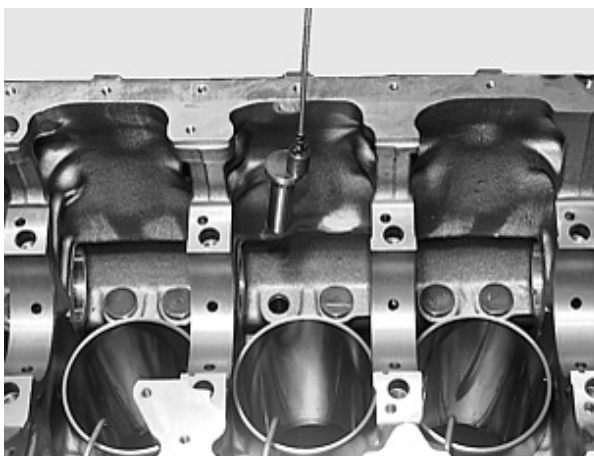


Fig. 3

Pull out the valve tappets with a magnet, check for wear and replace if necessary.

Valve tappets can only be removed when the camshaft has been removed.

3



Removing cylinder liners



Note:

Observe oversizes for cylinder liner outside diameters and collar heights (see "Service Data").

- Remove cylinder head, see Page 90
- Remove piston, see Page 120

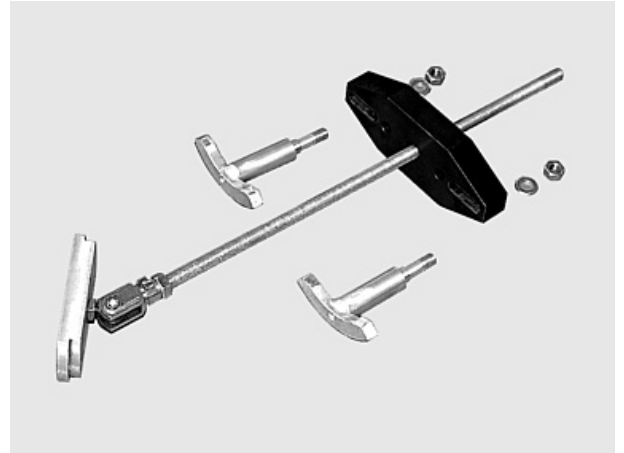


Fig. 1

Observe oversizes for cylinder liner outer diameters and collar heights (see Service Data)

1

Fig. 2

Mark cylinder liner position relative to engine so that it can be reinstalled in the same position if re-used.

Insert cylinder liner extractor device into cylinder liner, taking care not to damage the oil spray nozzle

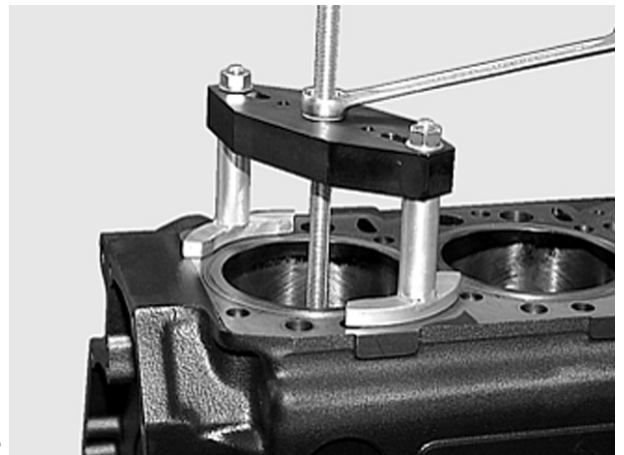


2

Fig. 3

Fit the support on the extractor spindle and screw on the nut.

Hold extractor spindle in place and extract cylinder liner by turning nut.



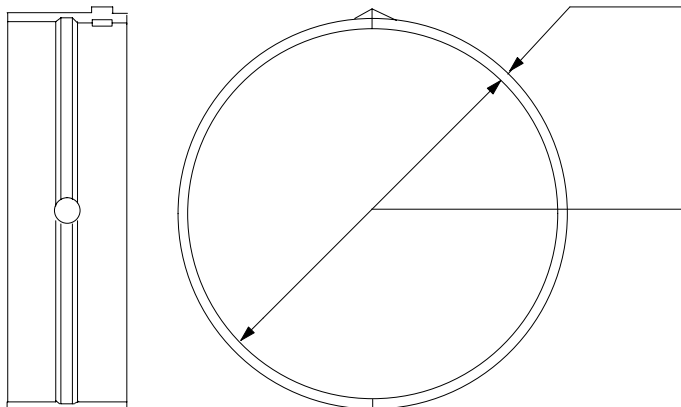
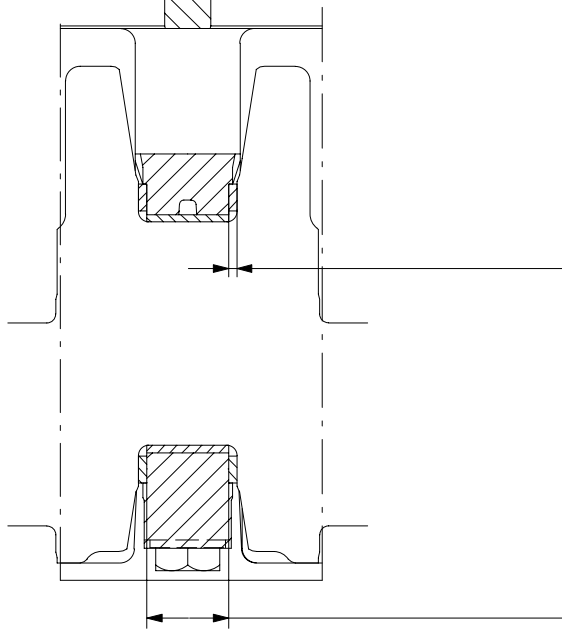
3

Fig. 4

Take off extractor device and take out cylinder liner.



4

Service Data	Dimensions Limiting values	
Main bearing 	Data for wall thickness and bearing inner diameter also apply to the alignment bearing standard size: 3,455–3,467 mm undersize –0,25: 3,580–3,592 mm undersize –0,50: 3,705–3,717 mm undersize –0,75: 3,830–3,842 mm undersize –1,00: 3,955–3,967 mm Bearing bore in installed condition: standard size: 104,066–104,112 mm undersize –0,25: 103,816–103,862 mm undersize –0,50: 103,566–103,612 mm undersize –0,75: 103,316–103,362 mm undersize –1,00: 103,066–103,112 mm Spread: 0,3 – 1,2 mm Marking: top / bottom standard size: 0005 / 0006 undersize –0,25: 0011 / 0012 undersize –0,50: 0013 / 0014 undersize –0,75: 0015 / 0016 undersize –1,00: 0017/ 0018	
	max. axial clearance of crankshaft: 0,200–0,401 mm: Width of thrust washer: standard: 3,350–3,400 mm oversize1: 3,600–3,650 mm oversize2: 3,850–3,900 mm 38,961–39,000 mm	