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Inlet manifold	
Attachment bolts	60 Nm
Glow plug attachment nut	55 Nm
Air inlet hose clamps	12 Nm
Turbocharger	
Heat shield attachment bolts	30 Nm(1)
Turbine housing clamp plate attachment nut	15 Nm
Attachment nuts, exhaust manifold flange/turbocharger	60 Nm(2)
Elbow on turbocharger	40 Nm
Oil supply pipe banjo bolt	90 Nm

(1) Secure with Loctite 243
(2) Apply Copaslip to secure

Oil cooler

Attachment bolts connecting oil cooler to cylinder block	50 Nm
Coolant supply pipe union	90 Nm
Plug, adjustable banjo connection	90 Nm
Banjo bolt, adjustable banjo connection	90 Nm

Centrifugal oil filter

Central bolt	20 Nm
Oil discharge pipe union	50 Nm

Dip stick

Threaded coupling	60 Nm

(1) Secure with Loctite 243
(2) Secure with Loctite 572
(3) Secure with Loctite 2701

Oil sprayer

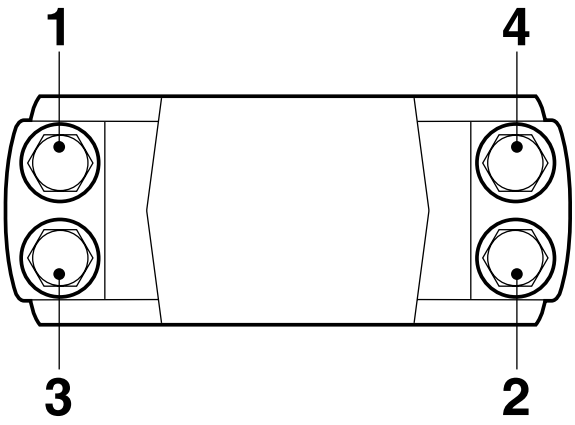
Banjo bolt M14 for oil sprayer with locking plate	30 Nm
M10 banjo bolt for oil sprayer	30 Nm

Main bearing caps

Main bearing cap attachment bolts	150 Nm + 120° angular displacement(1)

Big-end bearing caps

Attachment bolts, big-end bearing caps	
1st phase, sequence 1-2-3-4	35 Nm
2nd phase, sequence 4-3-2-1	45 Nm
3rd phase, sequence 1-2-3-4	60° angular displacement(2)



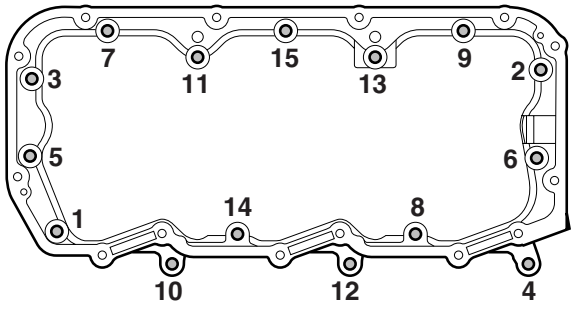
M200661

(1) Apply a drop of oil to thread and contact surface.

(2) Connecting rod bolts are to be used once and tightened as instructed.
When fitting the connecting rod in the engine, apply a drop of oil to the threads and contact surfaces of the connecting rod bolts.

0

Flywheel housing	
Attachment bolts	110 Nm(1)
Sealant to be used when fitting flywheel housing	Loctite 510
Flywheel	
Attachment bolts	
Without PTO	260 Nm + 90° angular displacement
With PTO	260 Nm + 150° angular displacement
Engine mountings on timing gear end	
Cylinder block bracket attachment bolts	92 Nm
Chassis engine bracket attachment bolts	73 Nm
Vibration damper engine bracket attachment bolts	225 Nm + 60° angular displacement
Engine mountings on flywheel end	
Flywheel housing engine bracket attachment bolts	260 Nm
Chassis engine bracket attachment bolts	73 Nm
Vibration damper engine bracket attachment bolts	225 Nm + 60° angular displacement
Engine hanger brackets	
Attachment bolts	110 Nm
Valve gear	
Valve cover attachment bolts	25 Nm
Rocker setting bolt lock nut	40 Nm
Bridge piece setting bolt lock nut	40 Nm
Lubricating oil strip/rocker seat attachment bolts	110 Nm
DEB set screw nut	25 Nm
Solenoid valve	20 Nm
Wiring harness attachment bolt	9 Nm
Valve sleeve attachment bolts	30 Nm
Tighten the valve sleeve bolts in the sequence shown.	



M200942

(1) Apply Loctite 243 to secure

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5. Run the drive train at operating temperature (drive for at least 15 minutes with a loaded vehicle).

Note:
When switched on, the air compressor and fan consume 10 to 15 kW engine power on average. During the test try to avoid that both consumers are or have been switched on.

6. Connect DAVIE and follow the instructions in DAVIE.

7. Fully depress the brake pedal during the acceleration test.

Result of first acceleration test
If the acceleration time is not achieved, first carry out the following work.

- Check the fuel system for the presence of air.
- Replace/clean the air filter element.
- Check the setting of the wastegate on the turbocharger (if present).
- Check the engine brake butterfly valve for smooth operation.
- Check the inlet air cooler exterior for dirt deposits.
- Clean the water separator (if fitted).
- Clean the fuel coarse filter.
- Check whether the hand pump on the fuel coarse filter is tightened.
- Replace the fuel fine filter.
- Check the suction pipe of the tank for clogging by large pieces of foreign matter.

4. LUBRICATING OIL SYSTEM XF ENGINE

4.1 FAULT-FINDING TABLE

FAULT: ENGINE OIL PRESSURE TOO LOW	
Possible cause	**Remedy**
Engine oil level too low.	Top up engine oil to maximum level.
External oil leakage.	Visually check engine for leakage. Repair if necessary.
Defective oil-pressure switch.	Check the switch. Replace if necessary.
Oil fails to meet the required specifications.	Renew the engine oil and the oil filter.
Oil temperature is too high.	Check the oil cooler.
Oil mixed with coolant or fuel.	Renew the engine oil and the oil filter.
Oil feed-through pipe or oil suction pipe loose or broken.	Check the oil pipes. Repair if necessary.
Oil-pressure control valve fails to operate.	Check the oil pressure control valve.
Inadequate functioning of oil pump.	Check the oil pump.
Run-out main or connecting-rod bearings.	Check the main or connecting-rod bearings.
Loose oil nozzle of piston cooler.	Check the oil nozzle. Replace if necessary.
Defective internal oil pressure pipes or sealing.	Check the oil pressure pipes and seals.
Contamination between oil-pressure control valve and seat.	Check/clean the oil pressure control valve.
Contaminated oil filter.	Renew the oil filter.

5.2 FAULT-FINDING TABLE FOR VEHICLE FUNCTIONS

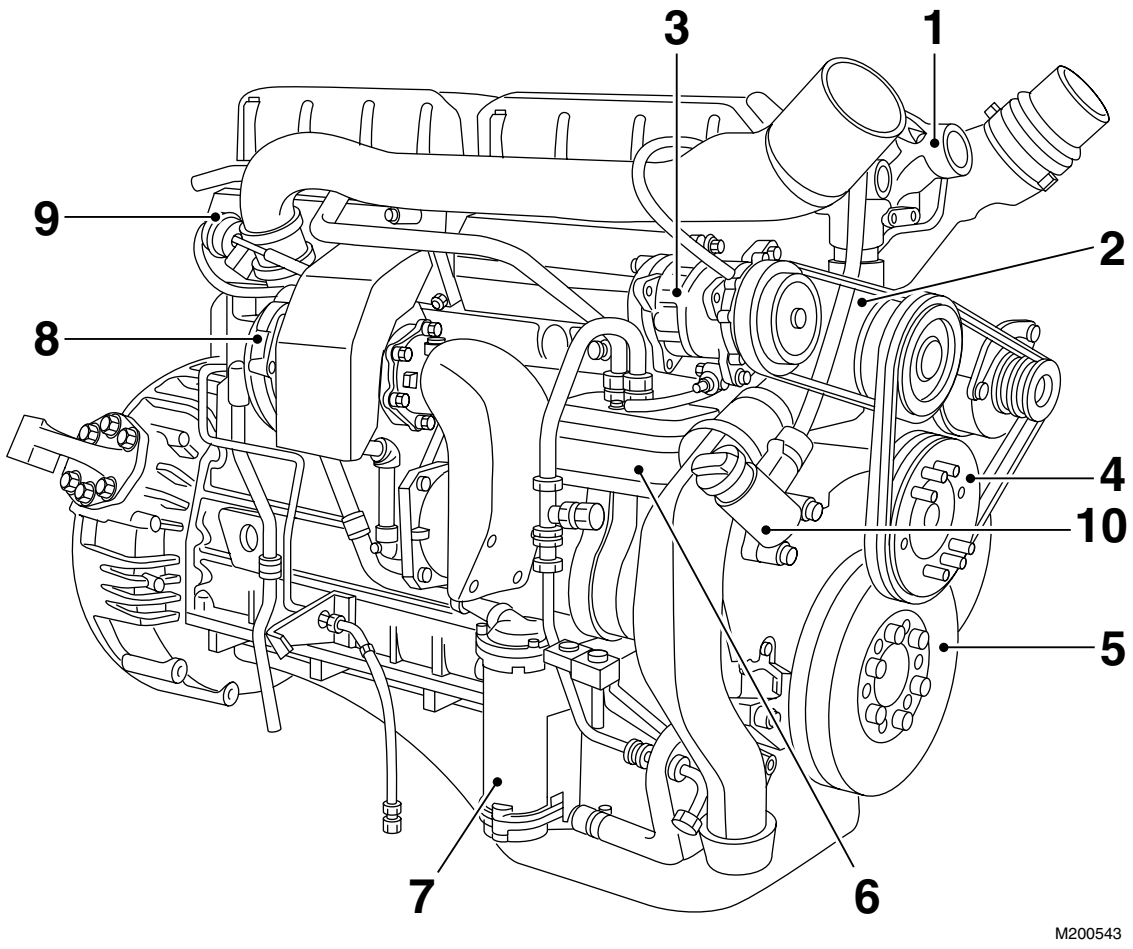
FAULT: VEHICLE SPEED CONTROL IS NOT FUNCTIONING	
Possible cause	**Remedy**
Fault in electrical components/wiring of: - wiring harness - combination switch - speed signal - proximity switch	Check the electrical system.
There is/are switch-off condition(s) for vehicle speed control.	Check for presence of switch-off condition(s).

FAULT: ENGINE SPEED CONTROL IS NOT FUNCTIONING	
Possible cause	**Remedy**
There is/are switch-off condition(s) for engine speed control.	Check for presence of switch-off condition(s).
Fault in electrical components/wiring of: - wiring harness - combination switch - speed signal	Check the electrical system.

FAULT: DEFECTIVE PRE-GLOWING AND AFTER-GLOWING FUNCTIONS	
Possible cause	**Remedy**
Fault in electrical components/wiring of: - wiring harness - preglowing control light - glow filaments - glow-filament relay	Check the electrical system.
There is/are switch-off condition(s) for the pre-glowing and after-glowing functions.	Check for presence of switch-off condition(s).

2. GENERAL

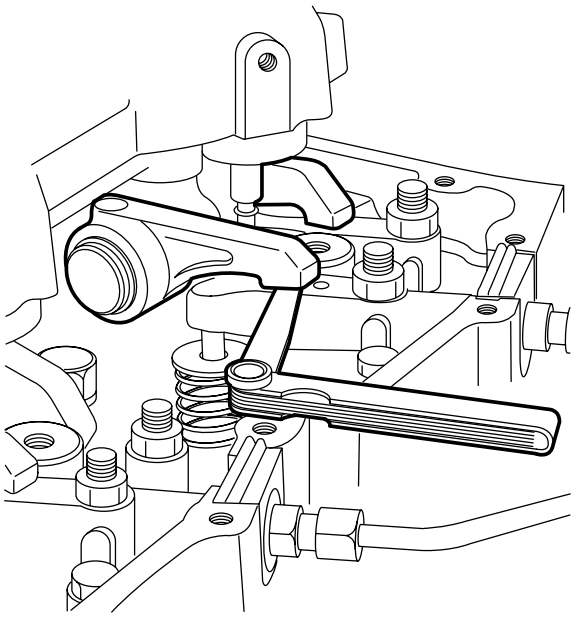
2.1 LOCATION OF COMPONENTS



Legend
1. Thermostat housing
2. Water pump
3. Air-conditioning compressor
4. Fan drive
5. Vibration damper
6. Air compressor
7. Oil cooler
8. Turbocharger
9. Wastegate diaphragm
10. Oil-filling pipe

5. By cranking the crankshaft always $^1/_3$ stroke, using the special tool (DAF no. 1310477), the valves can be adjusted according to the injection sequence 1-5-3-6-2-4.

Cylinder with valves in overlap position	Adjust valves of cylinder
1	6
5	2
3	4
6	1
2	5
4	3


M200540

6. If the engine has been fitted with a DEB, the DEB clearance must be checked following the valve-clearance adjustment.

7. Fit the valve covers, see chapter “Removal and installation”.

4. REMOVAL AND INSTALLATION

4.1 REMOVAL AND INSTALLATION, ENGINE

Suspend the engine carefully from the hoist, using approved lifting gear.

Various fluids will be released when pipes are removed. Collect these fluids. Take care of your personal protection and any fire hazards.

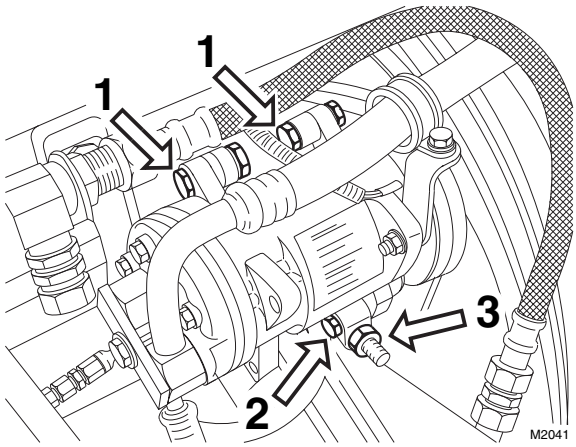
Note:
Because of the large number of vehicle specifications, it is not feasible to exactly specify the engine removal and installation procedures for every vehicle.
This description only includes the main points requiring attention.

- Disconnect the earth lead from the battery pole.
- Avoid opening of fluid systems as much as possible. If possible, remove and put aside the engine components.
- When removing the engine, ensure that no parts or dirt fall into the engine, radiator or other components. Therefore, plug all openings.
- Electrical wiring harnesses are easily damaged. If damaged, they may cause faults. Make sure these wiring harnesses are stress-free and have been installed away from moving parts.
- Tighten all fixing bolts to the correct tightening torque.
- Do not allow the engine to rest on the oil sump. Because the oil sump is made of sheet material, it will be severely damaged by the engine's own weight.

20. Install the heat shields of the exhaust manifold and tighten the fixing bolts to the specified tightening torque, see main group “Technical data”.
21. Install the air-conditioning bracket, if present.
22. Adjust the V-belt tension of the air-conditioning compressor, see chapter “Checking and adjusting”.
23. Install the reaction rod between the engine and the radiator.
24. Install the compressor pipe from the air inlet pipe to the compressor.
25. Install the inlet pipe between the turbocharger and the intercooler.
26. Install the inlet air hoses between the engine and the intercooler and tighten the fixing bolts to the specified tightening torque, see main group “Technical data”.
27. Connect the electric wiring.
28. Reconnect the earth lead to the battery.
29. Fill the cooling system.

Removal, compressor and air-conditioning V-belt

1. Slacken the upper attachment bolt (1) on the compressor.
2. Slacken the lower fixing bolt (2) on the compressor.
3. Slacken the fixing bolt from the threaded spindle which is attached to the cooling-water pump.
4. Turn the lock nuts (3) on the threaded spindle so that the alternator can be tilted towards the engine block and the V-belt can be removed from the pulley.



Installation, compressor and air-conditioning V-belt

1. Inspect the pulleys for damage, rust and grease deposits.
2. Install the compressor and air-conditioning V-belt and adjust the V-belt tension, see the chapter “Checking and adjusting”.

4.21 REMOVAL AND INSTALLATION, TIMING-GEAR COVER SEALING RING

Removing the timing-gear cover sealing ring

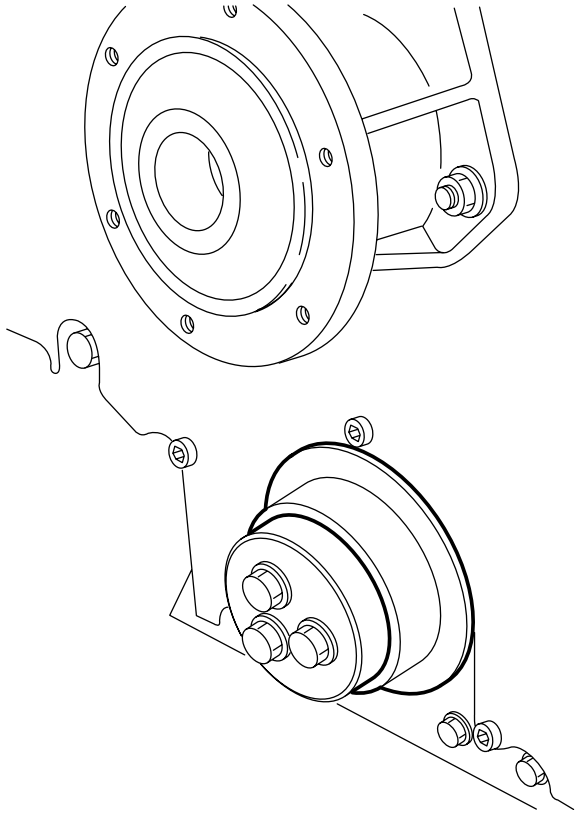
1. Remove the vibration damper hub.
2. Remove the timing-gear cover sealing ring by drilling two small holes into the sealing ring and pull, using the special tools (DAF no. 0484899 and DAF no. 0694928) to pull the sealing ring from the timing-gear cover.

Installing the timing-gear cover sealing ring

1. Clean and check the sealing ring recess in the timing-gear cover. Even minimal damage can lead to a leak.

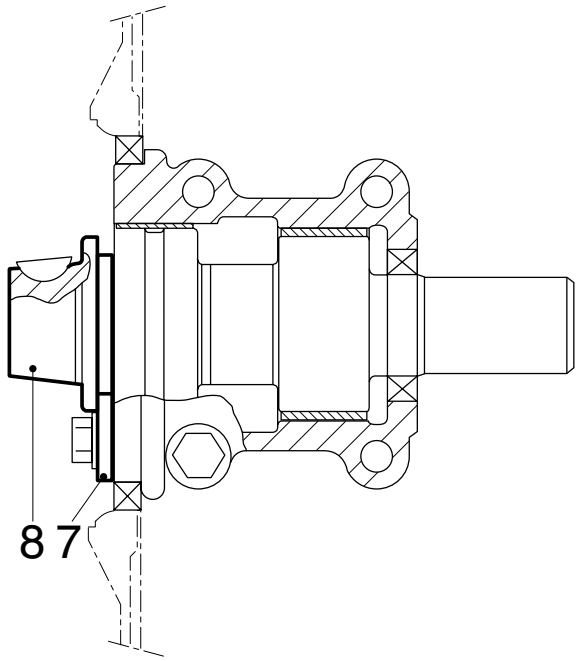
   Note:
   If a filler ring was fitted in the oil sealing ring recess, re-install this filler ring.

2. Use the special tool (DAF no. 1310424) to fit a **dry** new sealing ring and install the thrust piece in the recess of the timing-gear cover.
3. Remove the special tool.
4. Install the vibration damper hub.


M200771

Installing the fuel pump drive housing

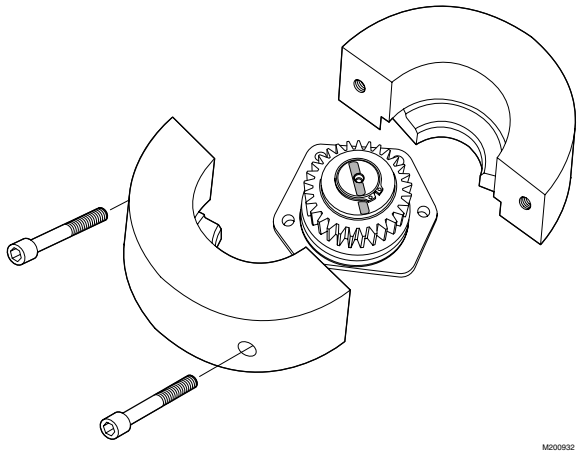
1. Install the fuel-pump drive housing with a new O-ring for lubrication. Tighten the fixing bolts to the specified torque. See main group “Technical data”.
2. Install the drive shaft (8) in the fuel-pump drive housing.
3. Install the axial retainer plate (7) and tighten the fixing bolts to the specified tightening torque, see main group “Technical data”.
4. Install a dry new timing-gear case sealing ring (3) using special tool (DAF no. 1329318).
5. Install the fuel pump drive gear wheel.
6. Set the injection timing.

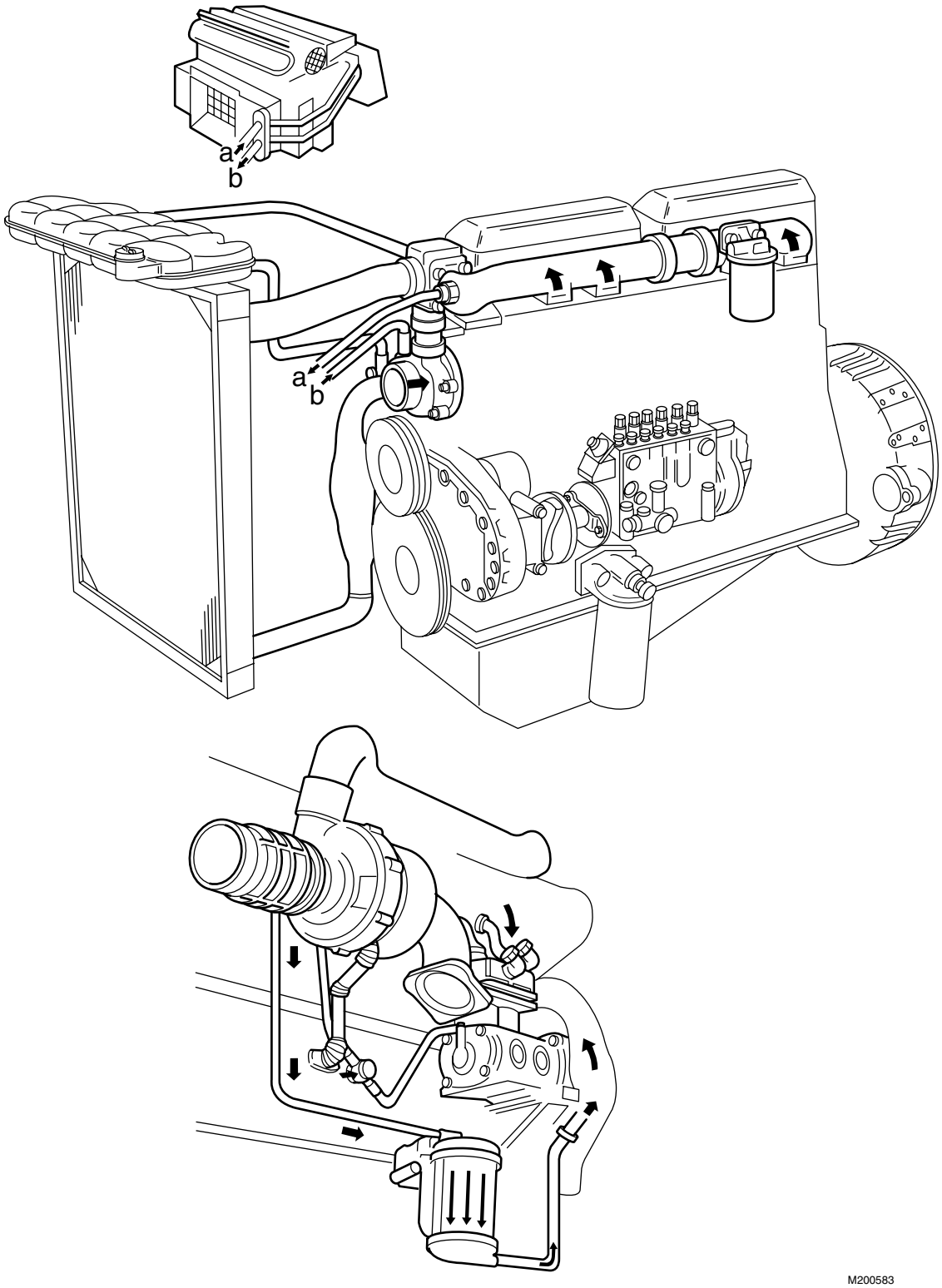


M200581

Inspect
Fit the special tool (DAF no. 1329445) under the gear wheel (12) and press the shaft with a force of 100 kN. If the shaft is pressed from the gear wheel, the shaft and/or the gear wheel is/are rejected.

15. Apply a little engine oil in the bearing housing (11) and check the shaft (1) for even rotation.




a
b
a
b
M200583

4.3 CHECKING THE VISCOUS FAN CLUTCH

Do not run the engine in an enclosed or unventilated area.

Make sure exhaust fumes are properly extracted.

Maintain a safe distance from rotating and/or moving components.

Testing with a cold engine
During this test, the slip in the viscous fan clutch is measured, when the clutch is not operational. This test must be carried out with a “cold” engine (coolant temperature approximately 50°C).

1. Check the coolant level, and as necessary top up with coolant.
2. Start the engine and run it at idling speed for at least 5 minutes.
3. Then use a digital revolution counter to measure the fan speed at a number of engine speeds (from idling to maximum engine speed).
   During this test procedure, the speed of the fan should be approx. 600 to 1100 rpm.

Testing with a warm engine
This test checks whether the contact operates at an operating temperature of 85 - 95°C.

1. Check the coolant level, and as necessary top up with coolant. Be careful when topping up the coolant, if the engine is warm.
2. Remove the front engine encapsulation.

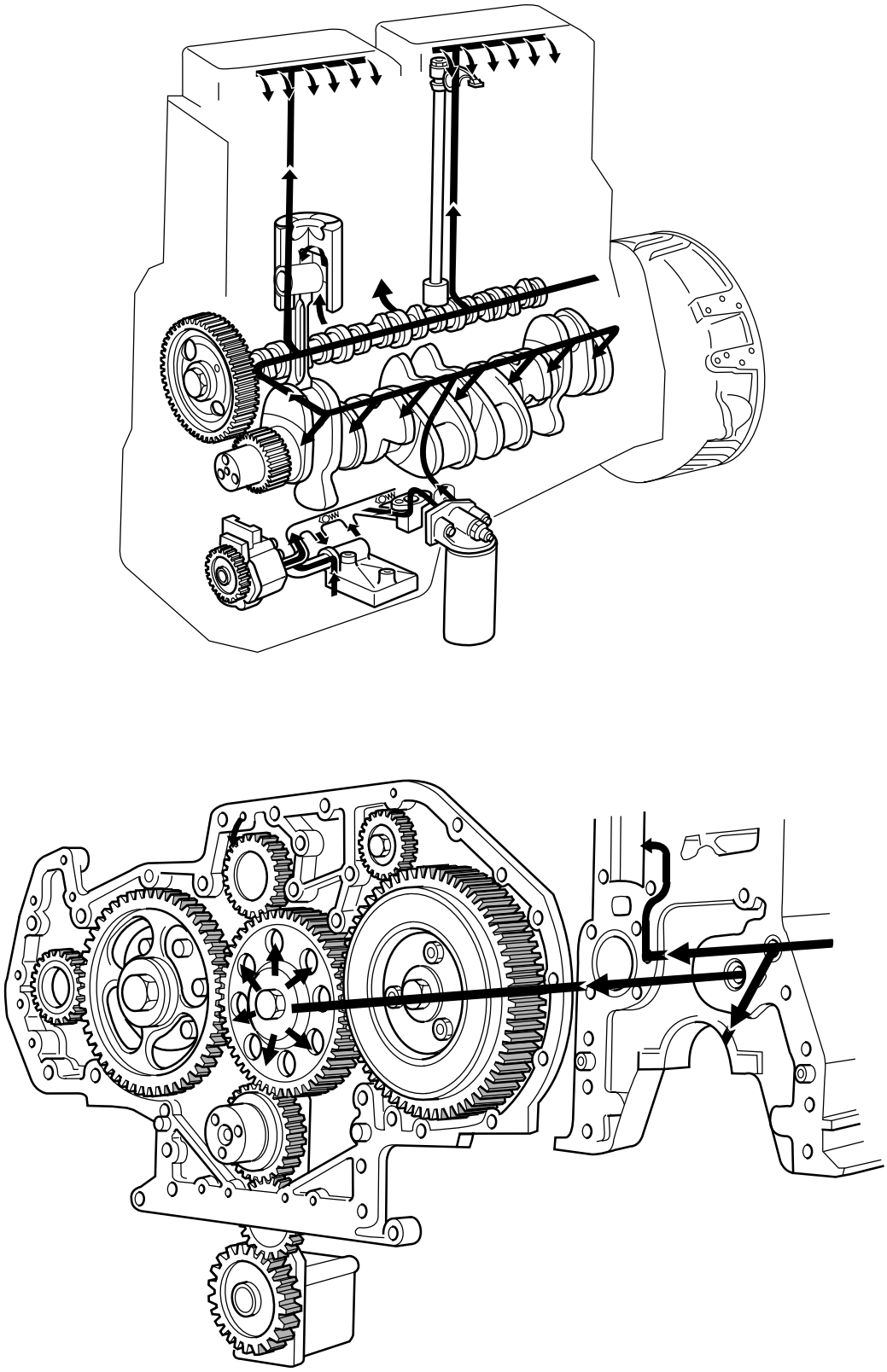
15. Remove the right-hand connector pipe from the inlet pipe to the intercooler.
16. Remove the air-conditioning compressor unit and move it, together with the hoses, to the front of the intercooler.
17. Remove the fixing bolts from the intercooler.
18. Move the intercooler a little to the right to remove the fixing bolt of the oil filler pipe.
19. Remove the oil filler pipe.
20. Remove the reaction rod from the radiator to the engine lifting eye.
21. Remove the fixing nuts from the radiator brackets. Remove the entire radiator, intercooler, and wind tunnel from the chassis.
22. Remove the intercooler from the radiator.

Installing the radiator

1. Install the entire radiator, intercooler, and wind tunnel in the chassis. Tighten the fixing nuts to the specified tightening torque, see main group “Technical data”.
2. Slide the oil filler pipe onto the radiator and install the fixing bolt.
3. Place the intercooler in its position and hand-tighten with two fixing bolts.
4. Install the reaction rod from the radiator to the engine lifting eye.
5. Install the air-conditioning compressor and its pipes over the radiator.
6. Install the air-conditioning compressor unit on the engine bracket.

2. GENERAL

2.1 LUBRICATING OIL SYSTEM DESCRIPTION



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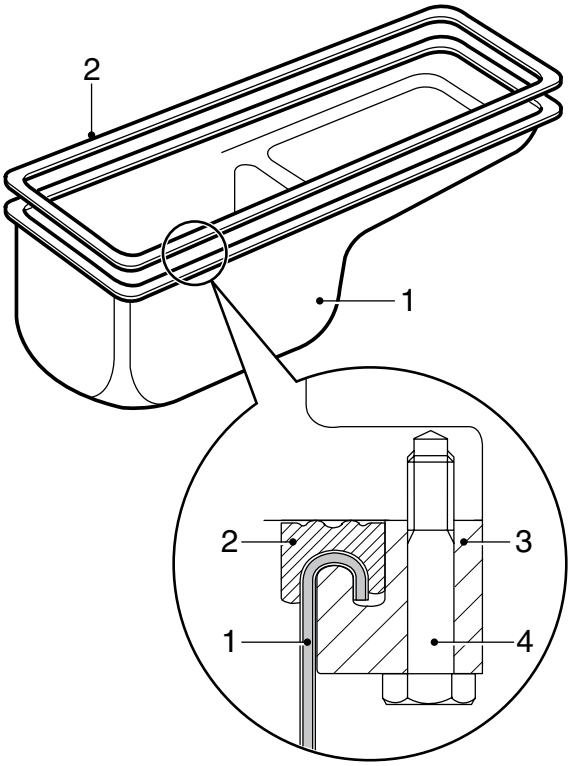
4.3 REMOVAL AND INSTALLATION, OIL SUMP

Removal, oil sump

1. Remove the soundproofing under the engine.
2. Drain the engine oil, see chapter “Draining and filling”.
3. Support the oil sump (1).
4. Remove the attachment bolts (4) and locking brackets (3) all around.
5. Remove the oil sump together with the sealing rubber (2).

Installation, oil sump

1. Clean the sealing surfaces of the oil sump and the engine block.
2. Check the oil sump sealing rubber (2). Damaged sealing rubbers (2) must be replaced.
3. First install the sealing rubber on the front and rear sides of the oil sump. As a next step, the sealing rubber may be fitted to the long sides of the oil sump.
4. Fit the oil sump (1) with the sealing rubber (2) in a straight position.
5. Install the attachment bolts (4) and locking brackets (3). Tighten the fixing bolts crosswise to the specified tightening torque, see main group “Technical data”.
6. Fill the engine with the specified quantity of lubricating oil.
7. Run the engine for a short time, and check whether the oil sump is correctly sealed. Check the oil level.
8. Install the soundproofing under the engine.



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4

1. SAFETY INSTRUCTIONS

Do not run the engine in an enclosed or unventilated area.
Make sure exhaust fumes are properly extracted.

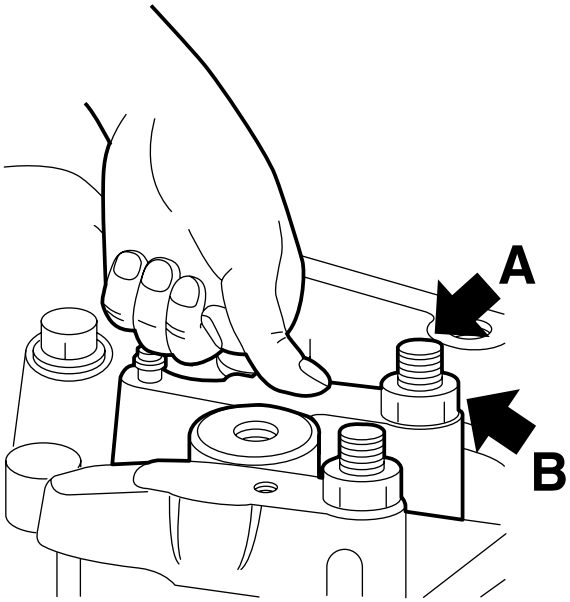
Maintain a safe distance from rotating and/or moving components.

Various sorts of oil and other lubricants used on the vehicle may constitute a health hazard. This also applies to engine coolant, windscreen washer fluid, refrigerant in air-conditioning systems, battery acid and diesel fuel.
So avoid inhaling and direct contact.

Exhaust gases contain carbon monoxide. Carbon monoxide is a deadly, colourless and odourless gas, which, when inhaled, deprives the body of oxygen, leading to asphyxiation. Serious carbon monoxide poisoning may result in brain damage or death.

It is recommended to always disconnect the battery's earth connection during repair or maintenance activities for which the power supply is not required.

4. Remove the bridge from the valves and place it in a vice.
5. Slacken lock nut (B).
6. Reposition the bridge in the engine over the valves.
7. Firmly press on the bridge centre (above the guiding pin) with your thumb.
8. Hand-tighten adjusting screw (A) until the bridge starts to move (adjusting screw (A) now touches the valve).
9. Turn adjusting screw (A) through another 90° and carefully remove the bridge from the valves.
10. Place the bridge in a vice and tighten lock nut (B) to the specified torque without turning adjusting screw (A), see main group “Technical data”.
11. Reposition the bridge over the valves.
12. Install the rocker bracket.
13. Install the DEB or the lubricating-oil strip (depending on model). Install the lubricating-oil strip in such a way that the mark “cyl. 1/4” is located on cylinder 1 or cylinder 4 respectively.
14. Adjust the valve clearance and, if fitted, the DEB clearance.
15. Fit the valve covers, see chapter “Removal and installation”.



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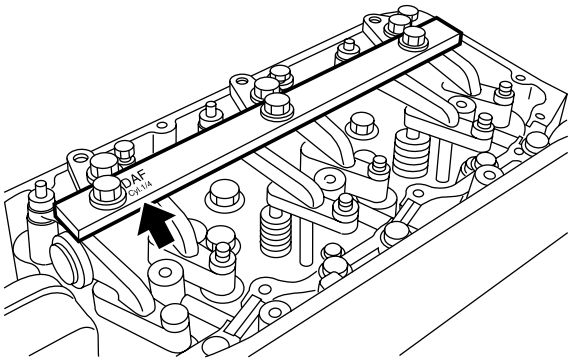
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4. REMOVAL AND INSTALLATION

4.1 REMOVAL AND INSTALLATION, ENGINE

Suspend the engine carefully from the hoist, using approved lifting gear.
Various fluids will be released when pipes are removed. Collect these fluids. Take care of your personal protection and any fire hazards.

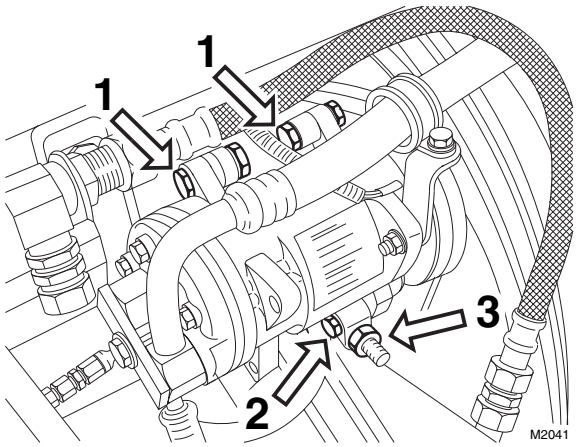
Note:
Because of the large number of vehicle specifications, it is not feasible to exactly specify the engine removal and installation procedures for every vehicle.
This description only includes the main points requiring attention.

- Disconnect the earth lead from the battery pole.
- Avoid opening of fluid systems as much as possible. If possible, remove and put aside the engine components.
- When removing the engine, ensure that no parts or dirt fall into the engine, radiator or other components. Therefore, plug all openings.
- Electrical wiring harnesses are easily damaged. If damaged, they may cause faults. Make sure these wiring harnesses are stress-free and have been installed away from moving parts.
- Tighten all fixing bolts to the correct tightening torque.
- Do not allow the engine to rest on the oil sump. Because the oil sump is made of sheet material, it will be severely damaged by the engine's own weight.

11. Install the injectors.
12. Install the valve mechanism.
13. Install the coolant pipe and the thermostat housing with new gaskets.
14. Install the water hoses between the radiator and the thermostat housing.
15. Fit the injection lines.
16. Fit the thermostat housing to the coolant pipe.
17. Install the fuel leak-off pipe between the fuel filter and the inlet manifold.
18. Install the coolant filter, if present, on the coolant pipe.
19. Install the hoses of the auxiliary heating, if present.
20. Install the heat shields of the exhaust manifold and tighten the fixing bolts to the specified tightening torque, see main group “Technical data”.
21. Install the air-conditioning bracket, if present.
22. Adjust the V-belt tension of the air-conditioning compressor, see chapter “Checking and adjusting”.
23. Install the reaction rod between the engine and the radiator.
24. Install the compressor pipe from the air inlet pipe to the compressor.
25. Install the inlet pipe between the intercooler and the turbocharger.
26. Install the air inlet hoses between the engine and the intercooler.
27. Connect the electric wiring.
28. Reconnect the earth lead to the battery.
29. Fill the cooling system.

Removal, compressor and air-conditioning V-belt

1. Slacken the upper fixing bolt (1) on the compressor.
2. Slacken the lower fixing bolt (2) on the compressor.
3. Slacken the fixing bolt from the threaded spindle which is attached to the cooling-water pump.
4. Turn the lock nuts (3) on the threaded spindle so that the alternator can be tilted towards the engine block and the V-belt can be removed from the pulley.



Installation, compressor and air-conditioning V-belt

1. Inspect the pulleys for damage, rust and grease deposits.
2. Install the compressor and air-conditioning V-belt and adjust the V-belt tension, see the chapter “Checking and adjusting”.

5

4.21 REMOVAL AND INSTALLATION, TIMING-GEAR COVER SEALING RING

Removing the timing-gear cover sealing ring

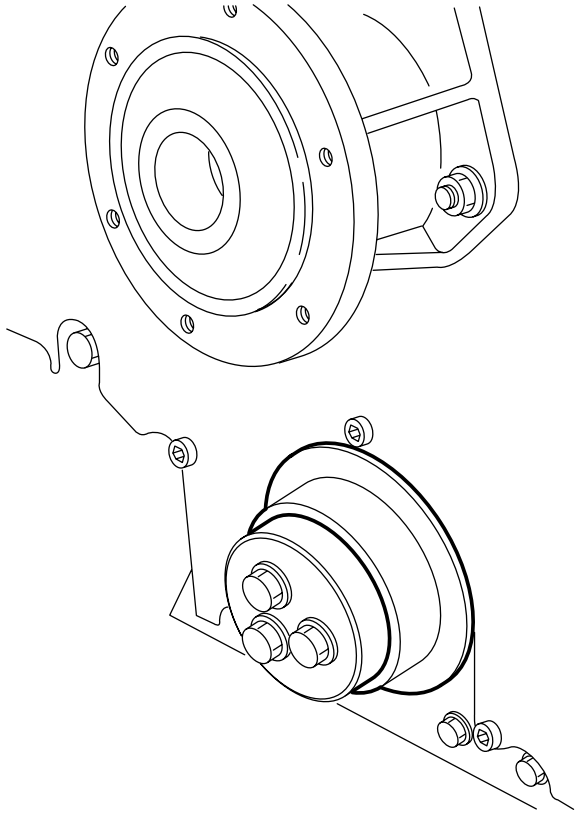
1. Remove the vibration damper hub.
2. Remove the timing-gear cover sealing ring by drilling two holes in the sealing ring and using special tools (DAF no. 0484899 and DAF no. 0694928) to pull the sealing ring from the timing-gear cover.

Installing the timing-gear cover sealing ring

1. Clean and check the sealing ring recess in the timing-gear cover. Even minimal damage can lead to a leak.

   Note:
   If a filler ring was fitted in the oil sealing ring recess, re-install this filler ring.

2. Use the special tool (DAF no. 1310424) to fit a **dry** new sealing ring and install the thrust piece in the recess of the timing-gear cover.
3. Remove the special tool.
4. Install the vibration damper hub.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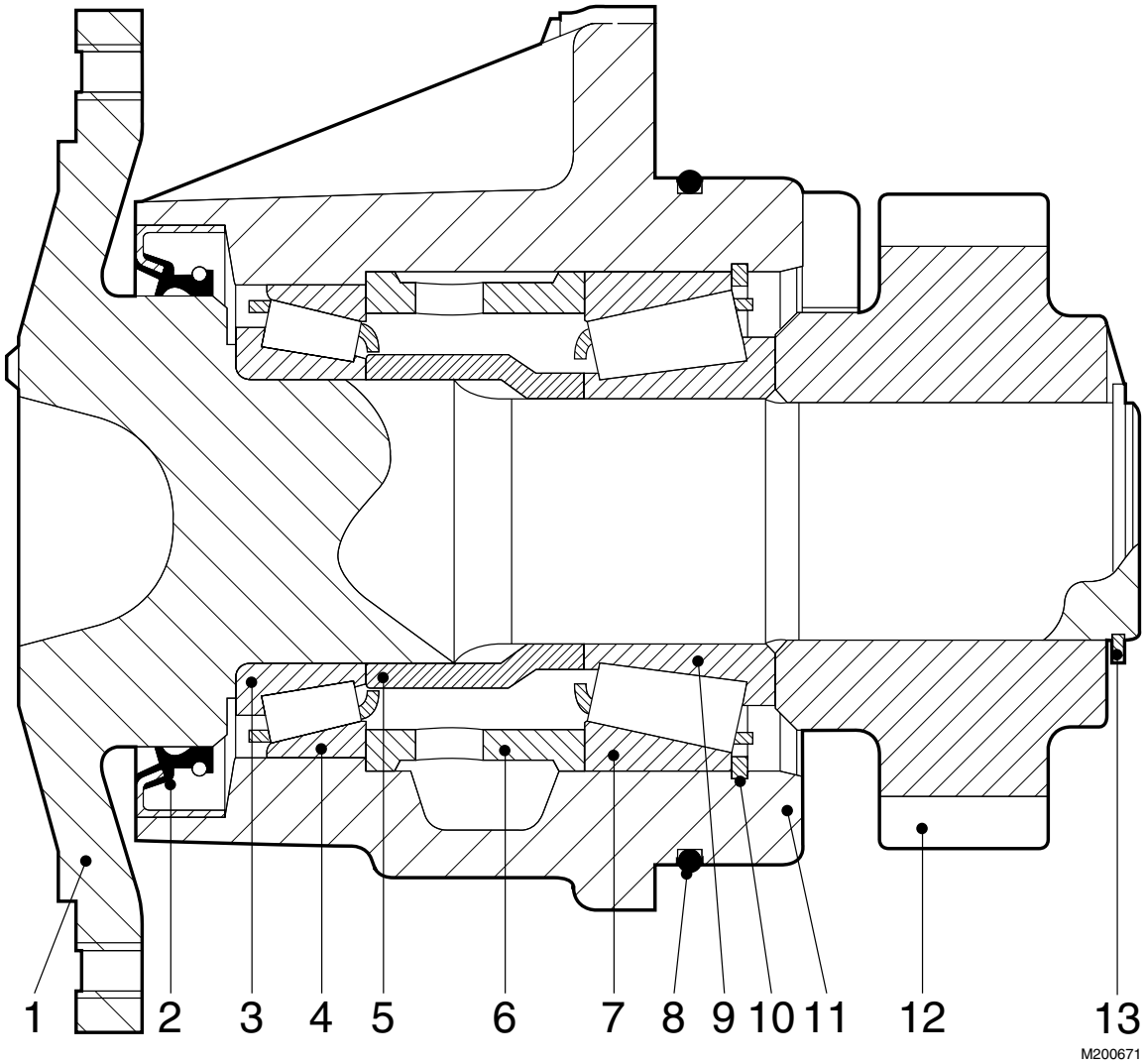
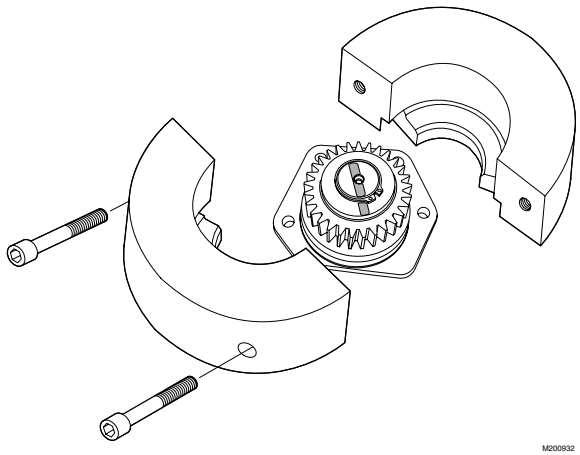


2. Fit the special tool (DAF no.1329445) under the gear wheel (12) and press the shaft out of the gear wheel (12).
3. Support the bearing housing (11) and press the shaft until the bearing (9) is released from the shaft.
4. Remove the shaft from the bearing housing (11) and remove the spacer sleeve (5).
5. Remove the bearing (3) from the shaft.
6. Remove the oil sealing ring (2) from the bearing housing (11).
7. Remove the circlip (10) from the bearing housing (11).
8. Support the bearing housing (11) and press the bearing rings (4) and (7), with intermediate ring (6), jointly out of the bearing housing (11).



CONTENTS

3. DESCRIPTION OF COMPONENTS

3.1 DESCRIPTION OF COOLING SYSTEM PRESSURE CAP

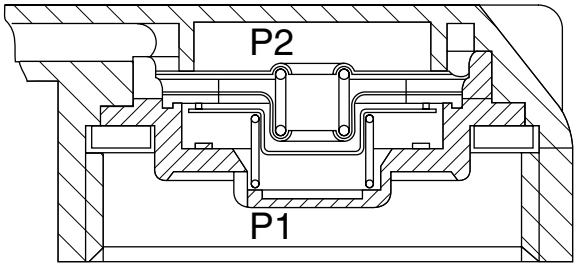
The pressure cap on the header tank is attached to the header tank via a screw thread. To fill the cooling system, remove this pressure cap or the filler cap at the front of the header tank.

The pressure cap has two valves. Normally, both valves are closed.

Overpressure in the cooling system
If the pressure (P1) in the cooling system rises to 0.7 bar, however, the overpressure valve opens.

The overpressure in the cooling system makes it possible to allow a higher temperature in the cooling system, without the coolant boiling.

Underpressure in the cooling system
If the pressure (P1) in the cooling system drops to approximately 0.1 bar below the outside air pressure (P2), the underpressure valve opens.



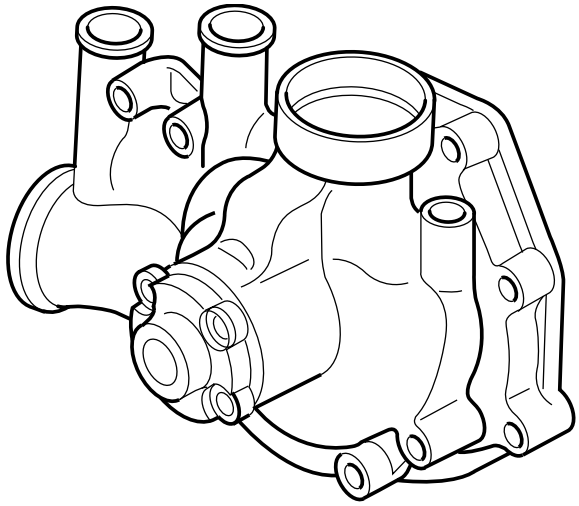
M200445

5. REMOVAL AND INSTALLATION

5.1 REMOVAL AND INSTALLATION, WATER PUMP

Removal, water pump

1. Remove the front engine encapsulation.
2. Drain the coolant, see chapter “Draining and filling”.
3. Remove the reaction rod between the engine and the radiator.
4. Remove the bolts from the guide ring brackets, and remove the guide ring.
5. Remove the fixing nuts of the viscous fan clutch on the fan pulley and place the viscous fan clutch and the fan as far forward as possible in the wind tunnel.
6. Remove the water pump, alternator and air-conditioning compressor V-belts.
7. Remove the fixing bolts from the thermostat housing on the water pipe and remove the thermostat housing with the connection piece.
8. Remove all water pipes connected to the water pump.
9. Remove the pipe from the water pump to the coolant filter.
10. Remove the fixing bolts holding the spindles of the alternator and air-conditioning compressor.
11. Remove the fixing bolts from the water pump.
12. Remove the water pump.



M200596

6. DRAINING AND FILLING

6.1 DRAINING AND FILLING/BLEEDING, COOLING SYSTEM

In order to avoid damaging the engine block, do not top up the warm engine with cold coolant.

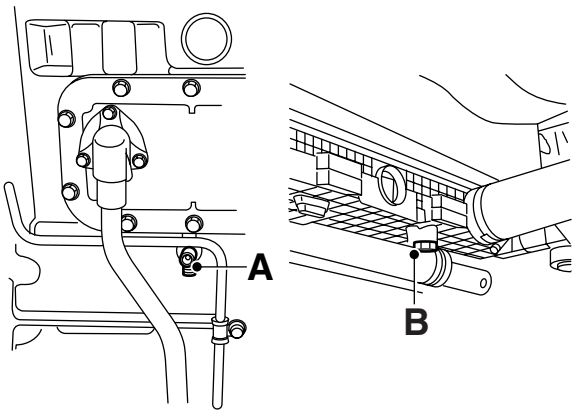
Coolant is a toxic substance and must be handled with care. Protect the skin and eyes.

Coolant is harmful to the environment; after use, it should be processed as industrial chemical waste.

When the coolant is hot, there is an overpressure in the cooling system. When removing the filler cap, allow the overpressure to escape, by first loosening the filler cap, one turn.

Draining the cooling system

1. Turn the heater control knob to the "warmest" temperature setting. As a result, the heater cock will be fully opened.
2. Remove the cooling system filler cap.
3. Collect the coolant. To do so, place suitable containers beneath the drain points.
4. Drain the cooling system at the engine block via drain tap (A) and the radiator via drain plug (B).
5. Flush out the cooling system.
6. Close drain tap (A) and install drain plug (B).



M200556

3. INSPECTION AND ADJUSTMENT

3.1 INSPECTION, LUBRICATING OIL CONSUMPTION

Note:
A lubricating oil consumption test is only useful after the engine has been run in (approx. 20,000 km).

1. First carefully check the engine for any lubricating oil leaks. Clean the engine before starting the test.
2. Run the engine to operating temperature.
3. Place the vehicle on a horizontal surface.
4. Remove the lubricating oil drain plug and drain the lubricating oil for 15 minutes. Collect the lubricating oil in a clean container.
5. Measure the exact amount of lubricating oil drained.
6. Refill the oil sump with the drained lubricating oil. Top up the lubricating oil amount to the specified quantity of lubricating oil.
7. Before starting the test, write down the exact amount of lubricating oil (**A**) in the oil sump. Write down the mileage (**C**) of the vehicle.
8. Drive between 500 and 1000 km under similar conditions as those in which the vehicle is normally used.
9. Immediately after the test run, place the vehicle on a level surface and write down its mileage (**D**).
10. Remove the lubricating oil drain plug and drain the lubricating oil for 15 minutes. Collect the lubricating oil in a clean container.