

General

The 4th Generation engine series consists of water-cooled in-line diesel engines with three, four, six and seven cylinders. The turbocharged engines are equipped with wet, changeable cylinder liners.

All the engine types have a rigid and ribbed cylinder block. The crank mechanism is designed for supercharging. The cylinder liners are wet and supported at the middle. The cylinder head bolts are high tensile bolts.

Cylinder Block

The cylinder block is the main body of the engine, to which other engine parts are attached. Wet and replaceable cylinder liners are supported at the middle, which reduces vibrations and directs coolant circulation mainly to the upper part of the liners.

In 33-, 44-, 49-, 66- and 74-engines, the seal between the lower part of the cylinder liner and the cylinder block is achieved by three O-rings, which are fitted in grooves in the liner. In 84- and 98-engines, the O-rings are fitted in grooves in the cylinder block. The upper part is sealed by the cylinder head gasket.

The camshaft is located in the cylinder block. In 33-, 44- and 49-engines, the camshaft front bearing location is fitted with a separate bearing sleeve. The remaining bearing locations are machined directly in the cylinder block. The 66-, 74-, 84- and 98-engines have separate bearing sleeves in all camshaft bearing locations. The drilling for the camshaft rear end is covered with a plug.

There are spaces on both sides of the rear main bearing for guide bearing shims (the crankshaft thrust bearings).

Flywheel Housing

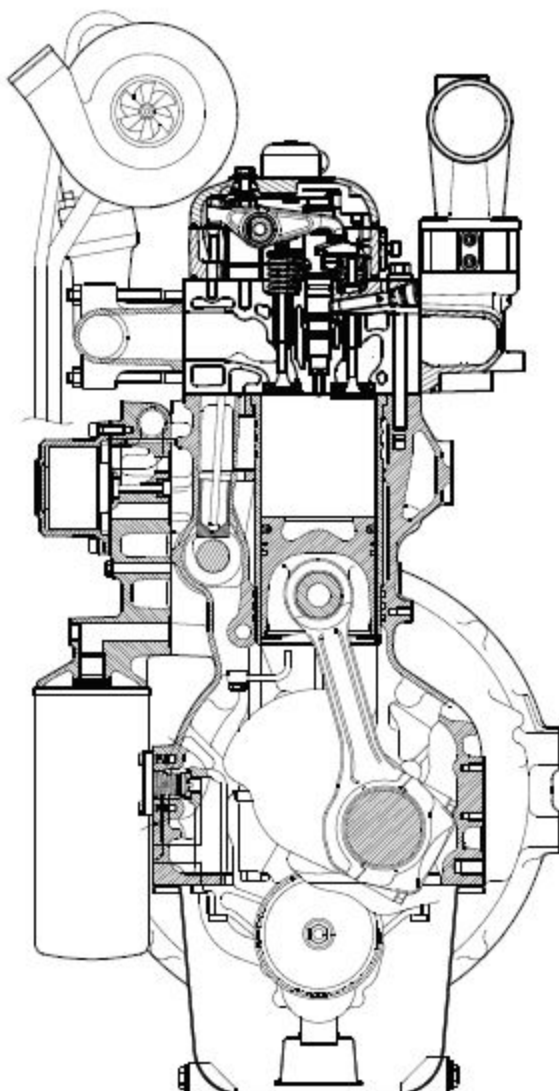
The flywheel housing is fitted at the rear end of the cylinder block. The seal for the crankshaft rear end is placed in a bore in the housing. The starter motor fixing point is fitted in the flywheel housing.

The lower face of the flywheel housing functions as a sealing surface for the oil sump gasket. This means that the lower face of the cylinder block must be level with the flywheel housing. When fitting the flywheel housing, its position is determined by tension pins.

The flywheel housing is delivered according to the requirements set by the engine model and different flywheel housings can be mounted on all engine types.

Valve Mechanism

The valve mechanism is operated by the camshaft which is located in the cylinder block. The drive is transferred with the help of tappets and push rods. The camshaft gear wheel is fitted with a nut and guided with a key. Each bearing is lubricated by the force feed lubrication system through drilled oilways in the cylinder block.



4. VALVE MECHANISM

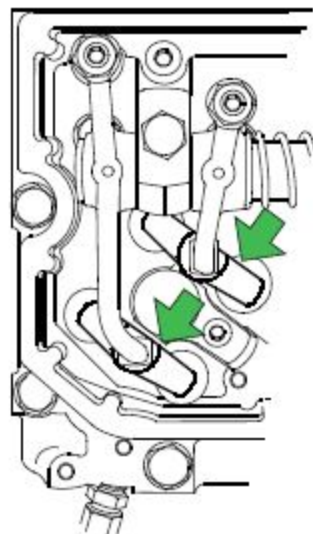
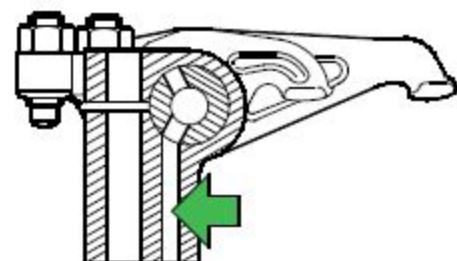
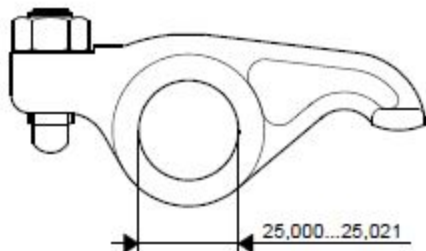
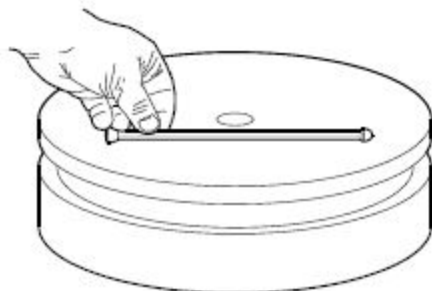
4.1. Reconditioning Valve Mechanism

1. Check the valve tappets, especially the contact surface against the camshaft. Worn or damaged tappets should be discarded.
2. Check the straightness of the push rods by rolling them on a surface table. Also check the spherical surfaces at the ends. Notice the length difference between the push rods in different engine types:

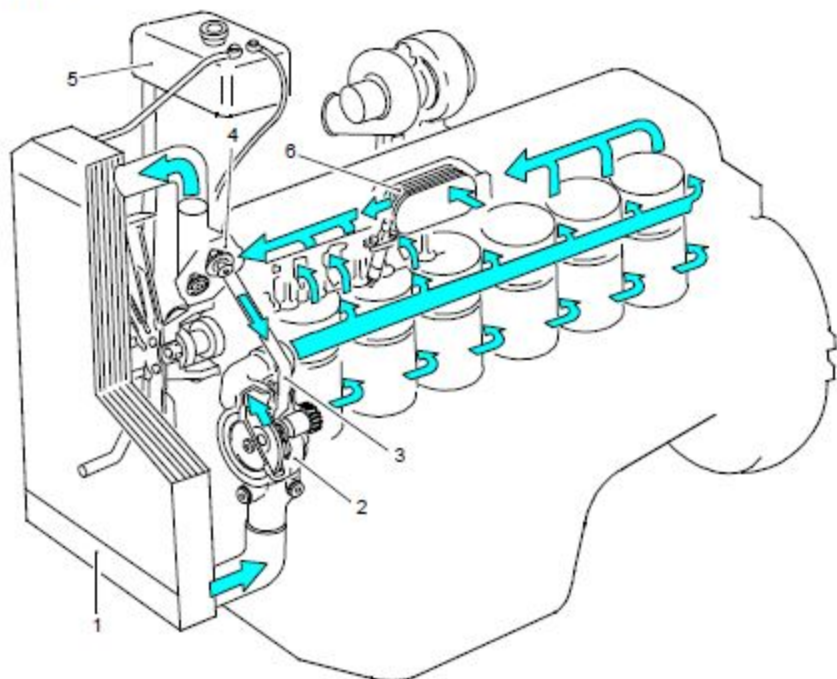
Engine	Total Length of Push Rod, mm	Order Number of Push Rod
33/44/49/66/74	245...246.3	8370 70119
84/98	286...287.3	8370 69014

3. Dismantle and clean the rocker arm mechanism. Check the shaft for wear and check that the oilways are clean.
4. Check the diameter of the rocker arm bore, 25.000...25.021 mm. Change the worn or damaged rocker arm. Where necessary, grind the rocker arm valve contact surface to the correct shape. Do not grind more than necessary, as the hardened layer is thin.
5. Fit the plug to the other end of the rocker arm shaft. Lubricate the shaft and fit various parts in the correct order. Note the correct position of the shaft and the bearing brackets. Fit the other end plug and tighten plugs to 25 Nm.

6. Fit the connecting parts onto the valves in position as shown in the picture.



Cooling system



Cooling system (84-engine)

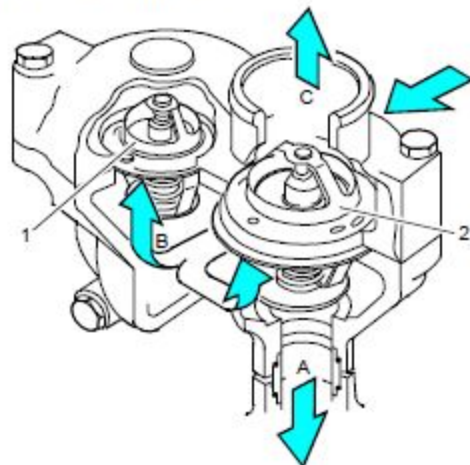
1. Radiator
2. Coolant pump
3. By-pass pipe
4. Thermostats
5. Expansion tank
6. Oil cooler

The coolant pump is attached to the front face of the cylinder block and the thermostat housing is mounted above it.

On 84-engines, the gear driven coolant pump is attached to the front face of the timing gear housing. The thermostat housing is mounted on front end of the cylinder head.

The system has the internal liquid circulation via the by-pass pipe. The circulation is regulated by the 2-way thermostat. This arrangement ensures a steady warming-up of the engine under all conditions.

In some 66- and 74-engines and 84-engines there are two separate thermostats where one of them is steering the by-pass of coolant liquid. The thermostats differ in types and opening temperatures. When the coolant temperature is below the thermostat opening temperature the coolant (A) circulates through the by-pass hole into the coolant pump. The smaller, single-acting thermostat (1) opens first (at 79°C) letting one part of the coolant (B) into the radiator. Following the load increase, also the other thermostat (2) opens (at 83°C). This is a double-acting type which closes the by-pass hole when it opens and directs the coolant (C) into the radiator. These engine models do not have any separate winter-type thermostats.



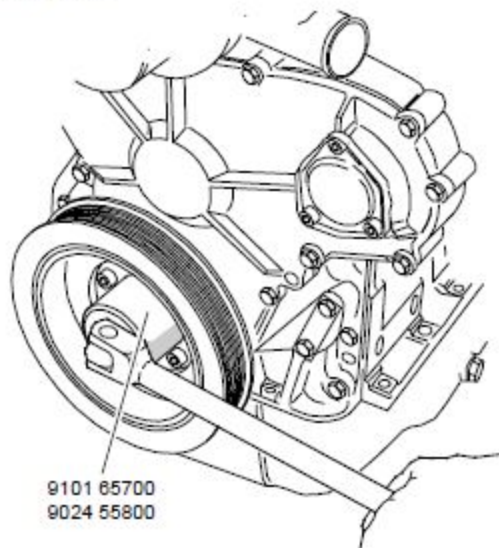
9. TIMING GEAR ASSEMBLY

33-, 44-, 66- and 74-engines

A. Removing timing gear casing

As the timing gear casing bottom face forms a part of the mating face for the oil sump gasket, the casing cannot be removed without first removing the oil sump.

1. Drain the engine oil and remove the oil sump.
2. Remove the radiator, fan, alternator, belt tensioning and belt (if not removed earlier). If the engine is equipped with an air compressor or air conditioner, it has to be removed.



3. Loosen the crankshaft nut (special tool 9101 65700 for 33-, 44- and 66-engines or tool 9024 55800 for 74-engines). Remove the hub (with belt pulley).

Note! On 66-engines the belt pulley must be removed before unscrewing the nut. If the 66-engine is equipped with a viscose damper, the front end nut is opened with tool 9024 55800.

4. Remove the drive unit and hydraulic pump (if installed).
5. Remove the timing gear casing cover and the oil deflector ring at the front end of the crankshaft.
6. Remove the injection pump. See instruction 13 C.

Note! If the timing gear casing is not to be changed, the injection pump can remain in place. In which case disconnect all leads and pipes from the pump.

7. Unscrew the idler gear bolts (17 and 22 mm). Remove the flange, gear wheel and bearing journal.

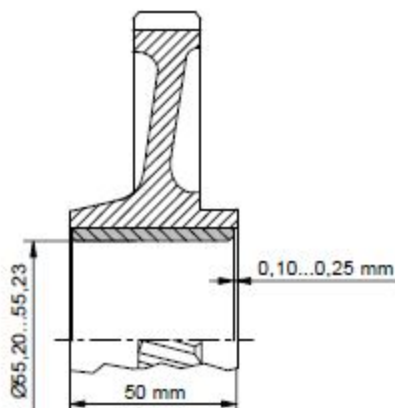
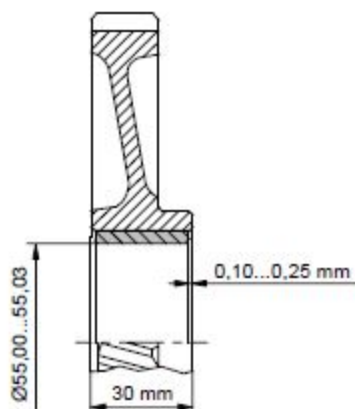
8. Extract the camshaft.

Note! If the cylinder head and valve mechanism have not been removed, the tappets must be prevented from falling down, see instruction 4 B.

9. Remove the timing gear casing. Ensure that all sealing surfaces are not damaged.

10. Remove the crankshaft front sealing ring from the front casing and clean all the parts that have been removed.

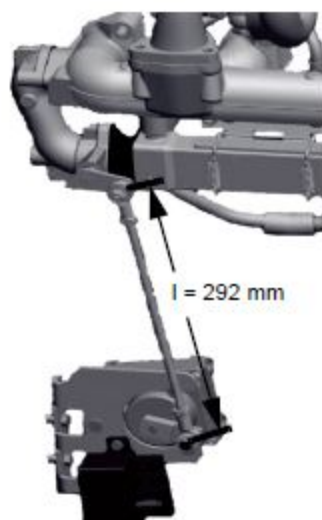
B. Reconditioning idler gear



If the idler gear bushing is changed, press in a new bushing so that its rear edge is 0,1...0,25 mm inside the gear wheel rear edge.

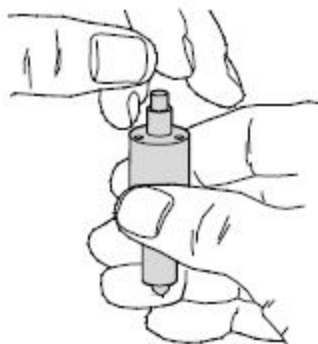
12.5.3. Link rod

The length of the link rod must be adjusted very carefully in case it has been damaged or after changing the actuator. The correct length is 292 mm when the actuator is in static state.



C. Reconditioning injectors

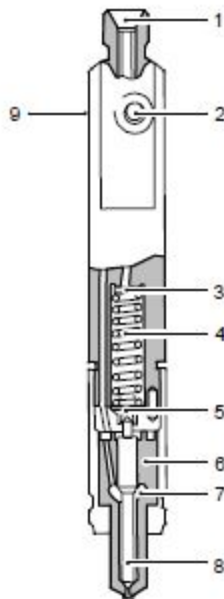
1. Secure the injector in a suitable way.
2. Unscrew the nozzle cap nut. Remove the nozzle and the parts inside the holder.
3. Clean the nozzle in cleaning fluid both inside and outside.
4. Clean the nozzle holes with a suitable needle.
5. Test the movement of the nozzle valve as follows:



Rinse the parts thoroughly in fuel or testing fluid. Pull the valve out of the nozzle body to 1/3rd of its length. If the fit is correct, the valve should be able to slide down in the nozzle body under its own weight. Turn the valve slightly and repeat the test. Should the nozzle valve bind slightly, it should be changed.

Injector

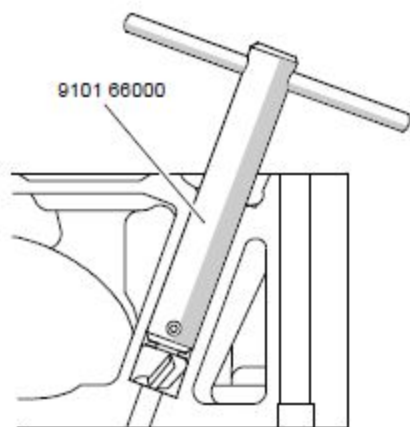
1. Fuel inlet
2. Leak-off pipe connection
3. Adjusting shim
4. Pressure spring
5. Pressure pin
6. Nozzle body
7. Pressure chamber
8. Injector needle
9. Number code



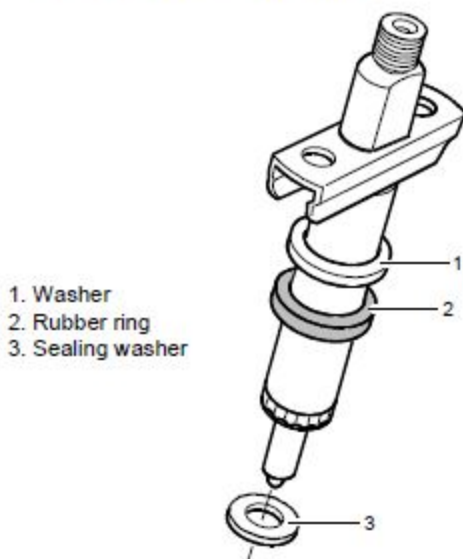
6. Before assembling, all parts should be carefully cleaned in clean fuel or testing fluid.

7. Put the same thickness of shim back as were fitted earlier. Note possible adjustment of the opening pressure. Assemble the rest of the injector. Note the position of the spring guide and the valve stop spacer.

8. Tighten the nozzle cap nut by hand and then to 60 Nm.

D. Fitting injector in engine

1. Clean the injector sealing surface in the cylinder head. If necessary use a reamer 9101 66000.



1. Washer
2. Rubber ring
3. Sealing washer

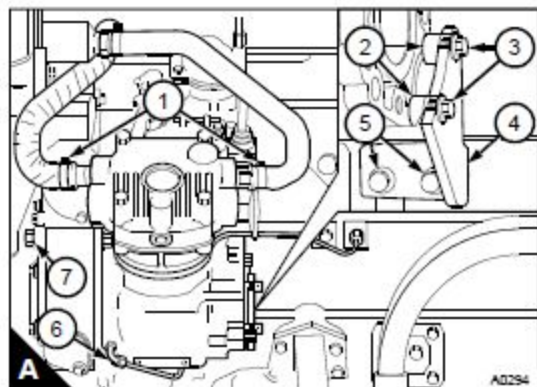
2. Fit the injector in the cylinder head using a new sealing washer.

Bendix Compressor**To remove****Operation 15-1**

- 1 Drain the engine cooling system.
- 2 Release the air pressure in the air system. Disconnect the air pipes and the coolant pipes (A1) to and from the cylinder head of the compressor.
- 3 Remove the lubricating oil pipe (A6) which is fitted between the compressor and the engine cylinder block.
- 4 If necessary, remove the steering pump from the rear of the compressor.
- 5 Loosen the two setscrews (A3) of the support bracket (A4) at the rear end of the compressor. Remove the two fasteners (A5) which fasten the support bracket to the cylinder block or filter head and remove the bracket.
Note: Spacers (A2) are used between the bracket of the 1W150R compressor and the compressor body.

Remove the nut from the stud at the bottom of the compressor flange. Remove the nut (A7) from the stud at the front of the timing case and remove the compressor from the engine.

If it is necessary to remove the idler gear of the compressor, see [Operation 6-8](#).



To fit

Operation 15-2

- 1 Set the piston of number 1 cylinder to TDC, see [Operation 8-1](#) or [Operation 8-2](#).
- 2 Fit a new "O" ring (A5) in its recess in the drive housing. Lubricate the "O" ring with clean engine lubricating oil.
- 3 Rotate the crankshaft of the compressor until the mark (B1) or (C1) on the rear face of the crankshaft aligns with the 6A line (six cylinder engines) or the 4A line (four cylinder engines) on the label on the rear face of the compressor.
- 4 Push the shortest thread of the stud (A4) through the hole at the top of the compressor flange and fit the nut fully onto the thread. Engage the stud in the hole (A1) in the timing case. Slide the compressor onto the stud (A3) for the bottom of the flange.
- 5 Slide the compressor forward until the teeth of the drive gear are against the teeth of the idler gear (A2). Slowly rotate the crankshaft of the compressor clockwise (from the rear) until the drive gear and the idler gear are in mesh.
- 6 Carefully push the compressor forward until the spigot on the compressor is fully fitted in the timing case. In this position, the mark on the rear of the crankshaft should align with the dark area on the timing label marked 6 (six cylinder engines) or 4 (four cylinder engines).
- 7 If the alignment is not correct, pull the compressor out of engagement and move the crankshaft of the compressor in the relevant direction to mesh with the next gear tooth. Carefully push the compressor assembly into position. Check that the mark on the rear of the crankshaft is in the correct position. Fit the nuts to the stud (A4) which passes through the timing case (A1) and to the stud at the bottom of the flange. Tighten the two nuts to 75 Nm (55 lbf ft) 7,6 kgf m.

Continued