



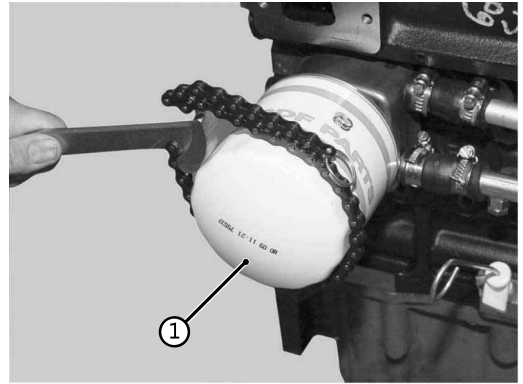
Heat exchanger removal

Unscrew oil filter (1) and remove it.



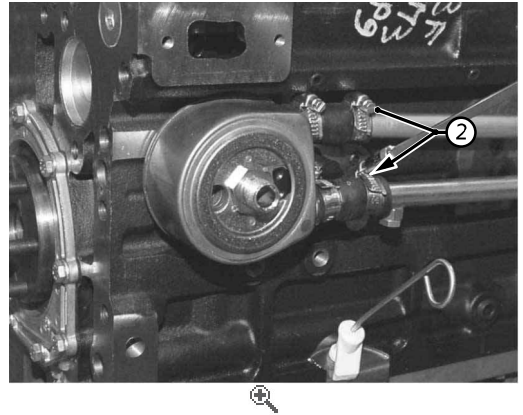
NOTE

When installing, lubricate the gasket with engine oil.



1.

Loosen coolant pipe clamps (2).



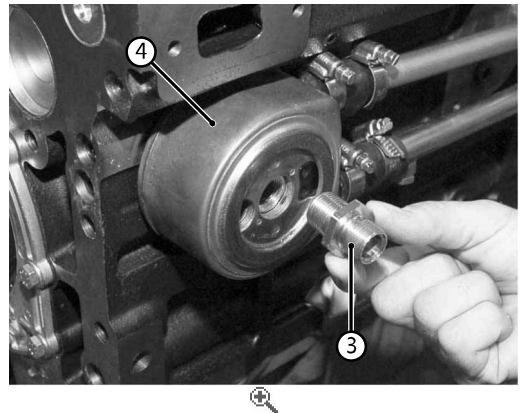
2.

Unscrew union (3) and remove heat exchanger (4).



NOTE

When installing, lubricate the gasket with engine oil.



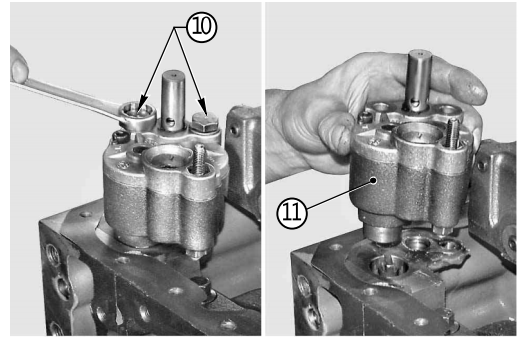
3.



Lubrication pump

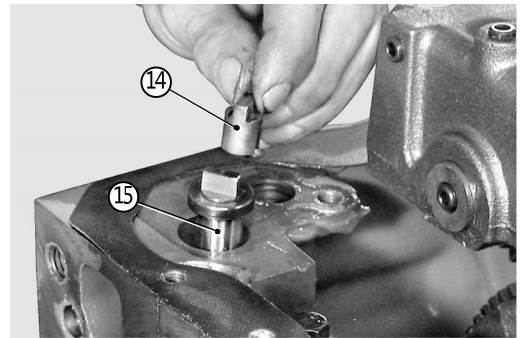
Removal

Remove screws (10) and pump (11).



1.

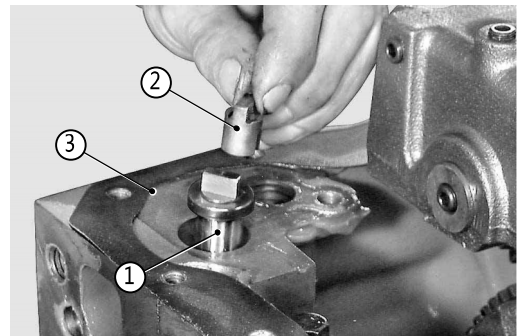
Remove drive coupling (14) and shaft (15).



2.

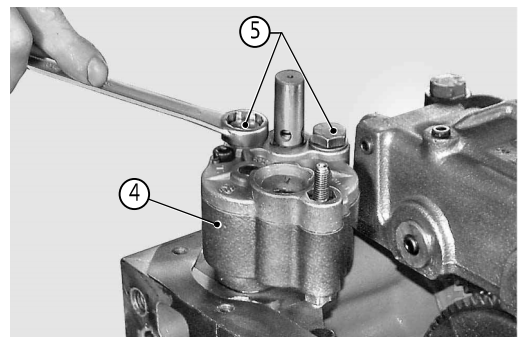
Assembly

Lubricate pump drive shaft (1) and drive coupling (2) and fit into block (3).



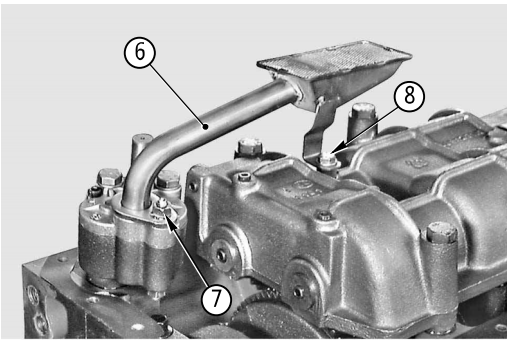
1.

Fit pump (4) and secure with screws (5).



2.

Fit suction rose (6) and secure with nut (7) and screw (8).



3.



Lubrication pump disassembly

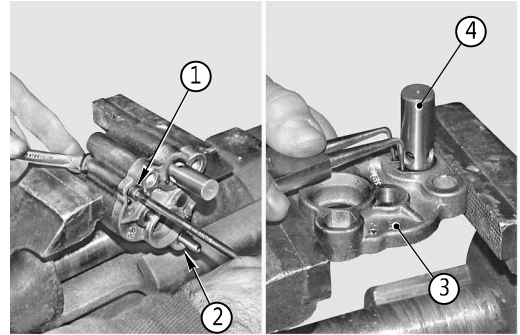
NOTE



1. Dismantle the pump only for a visual inspection; renew the entire unit in the presence of anomalous wear. Disassembly of the pressure limiting valve must be carried out when, on checking the pump delivery pressure, the values specified in "Checks and technical data" cannot be reached.

Loosen and remove screw (1) and nut (2).

Remove pump cover (3) and remove pressure limiting valve (4).



2.

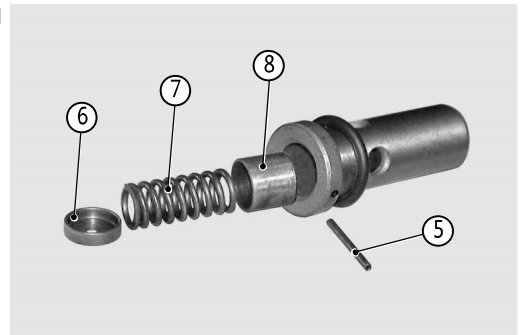
Drive out spring pin (5) and remove the valve assembly, withdrawing end cap (6), spring (7) and piston (8).

Clean carefully and refit the valve checking that piston (8) slides freely.



NOTE

Valve calibration: 4.9...5.9 bar (71.07...85.57 psi)



3.

Check wear of gears (9) and the pump body to decide whether or not to replace the entire assembly.

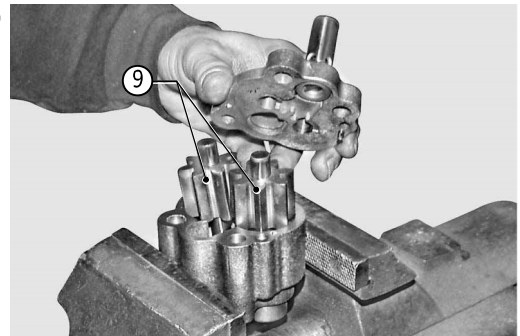


NOTE

On refitting, lubricate the gears and drive gear shaft liberally.

Gears: gearbox oil

Screws: 20.4 Nm (15 lb.ft.)



4.

Minimum flow rate	700 rpm			2400 rpm		
	litres	bar	psi	litres	bar	psi
	11	0.5...1.5	7-22	38	3.5...4.5	51-65



Lubrication pump disassembly

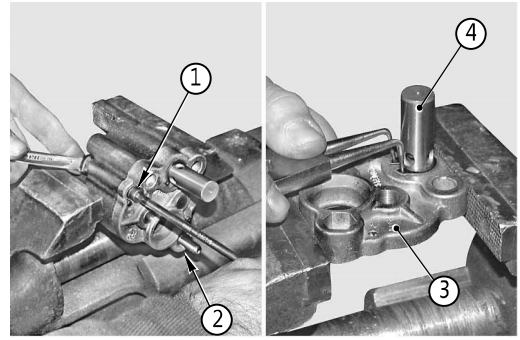
NOTE



Dismantle the pump only for a visual inspection; renew the entire unit in the presence of anomalous wear. Disassembly of the pressure limiting valve must be carried out when, on checking the pump delivery pressure, the values specified in "Checks and technical data" cannot be reached.

Loosen and remove screw (1) and nut (2).

Remove pump cover (3) and remove pressure limiting valve (4).



1.

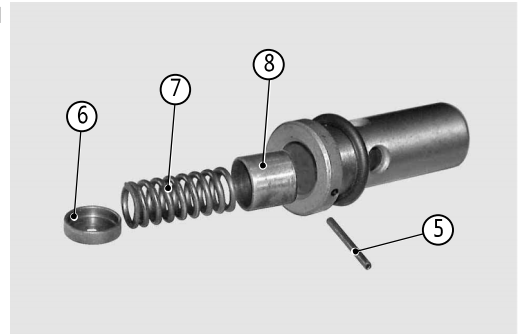
Drive out spring pin (5) and remove the valve assembly, withdrawing end cap (6), spring (7) and piston (8).

Clean carefully and refit the valve checking that piston (8) slides freely.



NOTE

Valve calibration: 4.9...5.9 bar (71.07...85.57 psi)



2.

Check wear of gears (9) and the pump body to decide whether or not to replace the entire assembly.

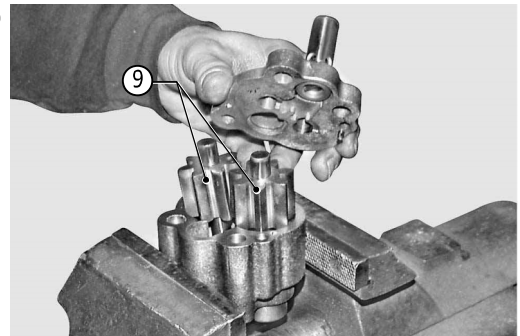


NOTE

On refitting, lubricate the gears and drive gear shaft liberally.

Gears: gearbox oil

Screws: 20,4 Nm (15 lb.ft.)



Minimum flow rate	700 rpm			2400 rpm		
	litres	bar	psi	litres	bar	psi
	16	0.5...1.5	7-22	48	3.5...4.5	51-65

3.



Oil sump

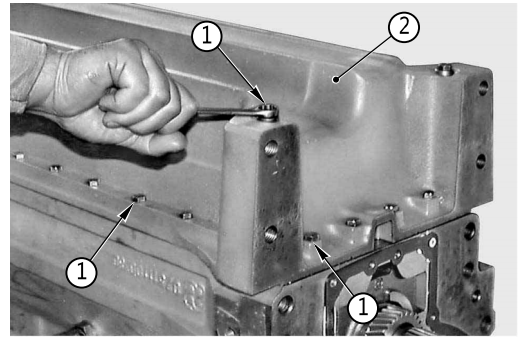
Removal

Unscrew and remove screws (1) securing oil sump (2).



NOTE

Make a note of the positions of the washers and spacers.



1.

Attach oil sump (2) to a hoist and remove it.



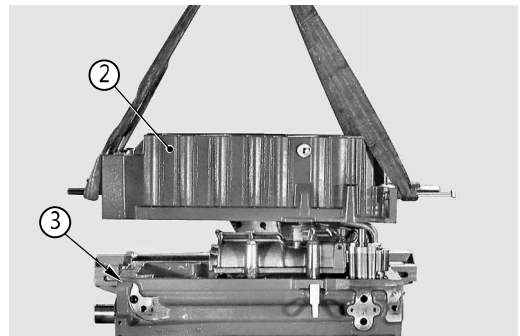
NOTE

To remove the oil sump tap gently and evenly with a rubber mallet.



NOTE

Renew gasket (3) on reassembly.



2.

Installation

Coat the sump mating surfaces in correspondence with the front and rear main bearings oil seals with sealant.

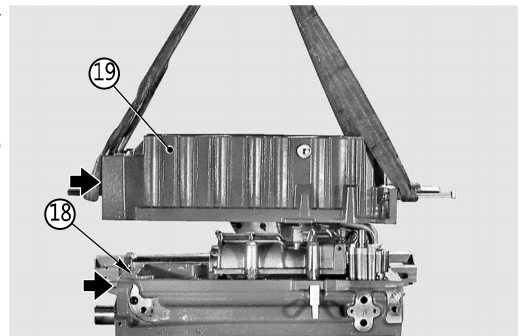
Seal area: Silastic 738

Position gasket (18), install sump (19) so that the rear face of sump (19) is aligned with the rear face of the engine block as shown by the arrows; fix the sump with the screws.



NOTE

Fit the washers and spacers under the screws as noted on disassembly.



Screws: 30...35 Nm (22.1...24.8 lb.ft.)

1.



INJECTION PUMPS, GOVERNOR AND FUEL SUPPLY

1. Remove the fuel filter.



NOTE

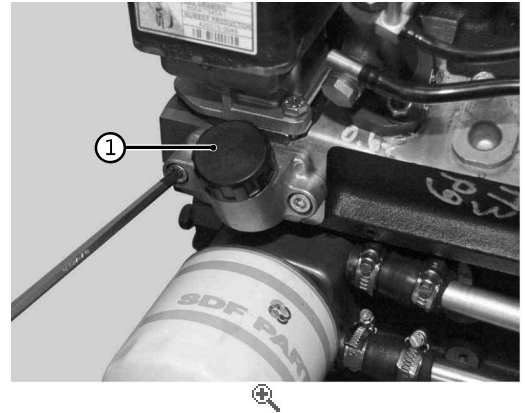
Plug the pipes to prevent the ingress of dirt.

Remove oil filler cap (1).



NOTE

Inspect the O-ring carefully; if in the least doubt about its condition, fit a new seal.



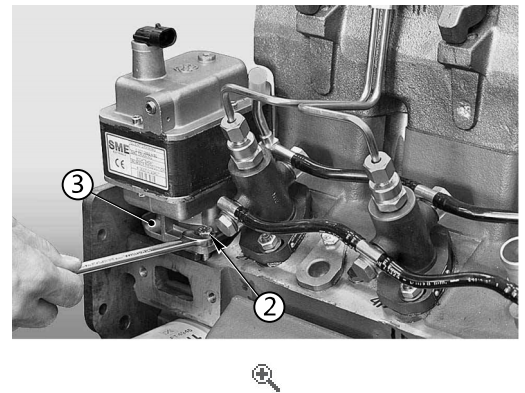
2.

Remove screws (2) securing governor drive unit (3).



NOTE

On 3/4-cylinder versions, this unit also drives the oil pump.



3.

4. Only if necessary

See para. Installation of electronic governor support

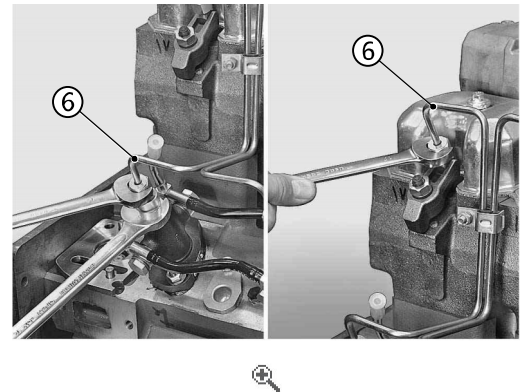
Remove fuel delivery pipes (6) to the injectors.

(For details, see "REMOVING HEADS").



DANGER

Plug the pump unions immediately after having removed the fuel delivery pipes.



5.

Undo unions (7) and remove fuel supply pipe (8) to the injection pumps.



NOTE

Renew the bronze seals of the unions on reassembly. Use original parts only.



NOTE

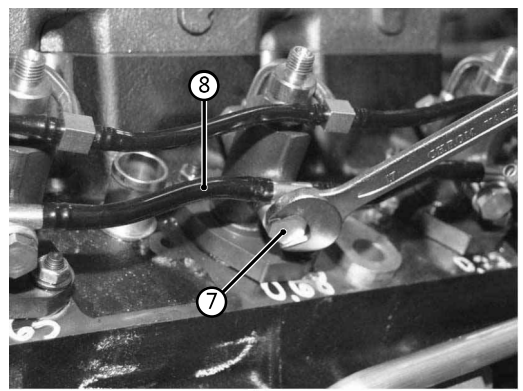
Carefully inspect the threads of the unions; if damaged, renew

the union using original parts only.

DANGER



Plug the pump ports with unions (7) immediately to prevent the ingress of contaminants.



6.

Remove unions (9) and fuel return pipe (10).



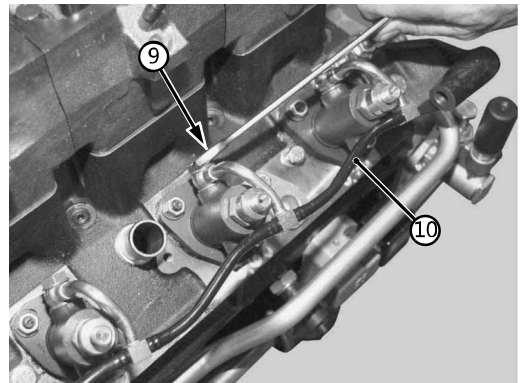
NOTE

Renew the seals of the unions on reassembly. Use original parts only.



NOTE

Carefully inspect the threads of the unions; if damaged, renew the union using original parts only.



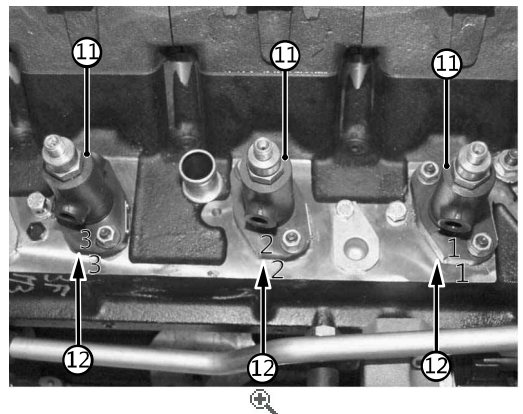
7.

Record the positions of injection pumps (11) and relative shims (12) to avoid confusion during re-assembly.



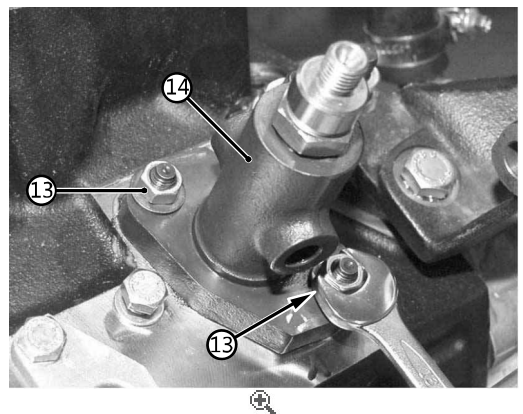
DANGER

Plug the pump ports with unions (9) immediately to prevent the ingress of contaminants.



8.

Gradually loosen and remove locknuts (13) and flange (14) of the injectors.



9.

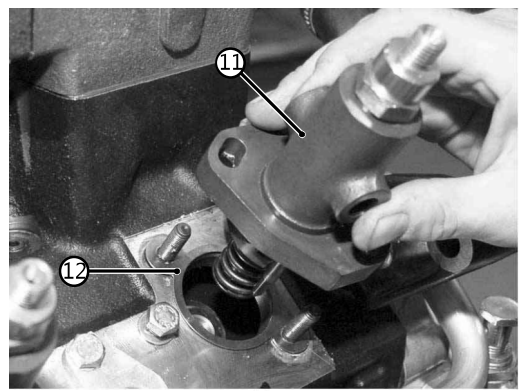
Manually move the control rod to around the mid-point of its stroke, remove the nuts and washers and remove injection pumps (11) and shim pack (12).



NOTE

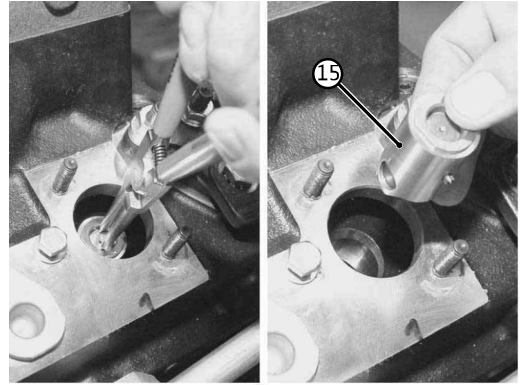
Note that if the shims or the pumps are mixed up and not

refitted in their original positions, then it will be necessary to carry out the timing procedure on all the pumps.



10.

Remove the roller tappets (15).



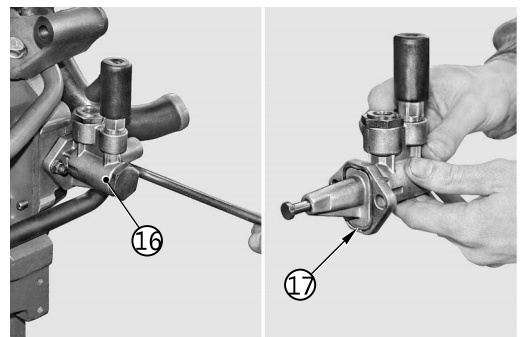
11.

Remove the nuts and remove fuel pump (16).



NOTE

Carefully check the condition of gasket (17).



12.



Injection pump timing

DANGER



The operations are described for cylinder N° 1, but they must be carried out for all cylinders. These operations must be carried out each time a new camshaft is fitted and whenever the valve timing is adjusted, whenever a new pump control rod or cam follower roller is fitted.

Remove the governor, if not previously removed.

Lubricate the exterior and insert in the crankcase all the roller tappets (1) responsible for operating the injection pumps.



NOTE

Lubricate the rollers with engine oil



NOTE

Check that pins (2) are located in their seats and rollers (1) are in contact with the cams.

1.

2. Bring piston N° 1 to TDC and turn the crankshaft until the piston performs a stroke corresponding to the static advance position shown in the table.



NOTE

The required position can be obtained by surpassing the precise dimension point turning the crankshaft counter-clockwise and then reaching the exact value with a clockwise rotation in order to recover backlash.

3.

Piston stroke mm (in.)	Static advance angle
1,39 (0.0547)	11°
1,65 (0.065)	12°

Measure the distance between the injection pumps mating surface on the engine block and the relative tappet.

Measure with tool (P/N 0.015.2474.4)

The instrument shows difference "X" (in 1/10 mm) between the nominal dimension fixed at 46.60 mm (check gauge drwng. 0.015.2477.0) and the effective distance between pump mating surface and tappet.

Dimension "X" will be a whole number (round to the closest whole number value) and must always be > 0.



NOTE

Make a note of dimension X.

Repeat these measurements for all cylinders.

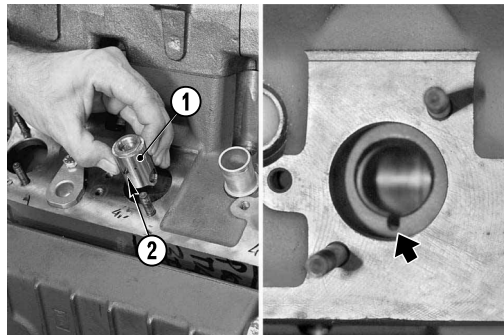
4.

5. Fit the injection pump control rod:

See para. Injection pumps control rod

Form the shim pack of thickness "X" (5) to be installed.

Apply a thin layer of sealant between shims (5), pump (6) and engine block (7) and install the parts on engine block (7).



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