



## Cylinder heads

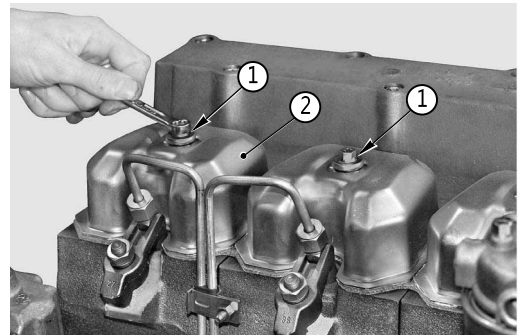
### Removing the cylinder heads

Remove screws (1) and remove valve covers (2).



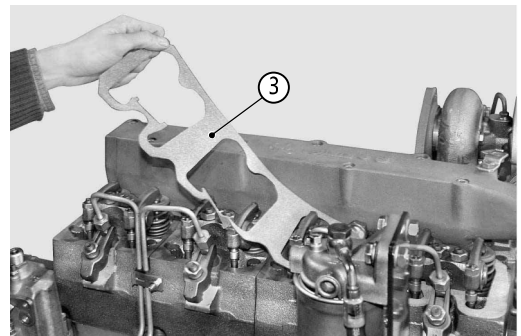
#### NOTE

Inspect the O-rings carefully.



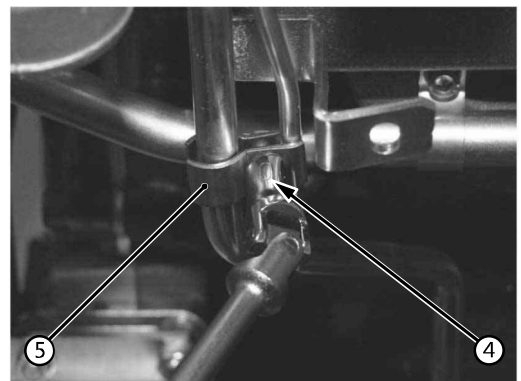
1.

Remove gasket (3) and discard.



2.

Undo bolt (4) and remove clamp (5).



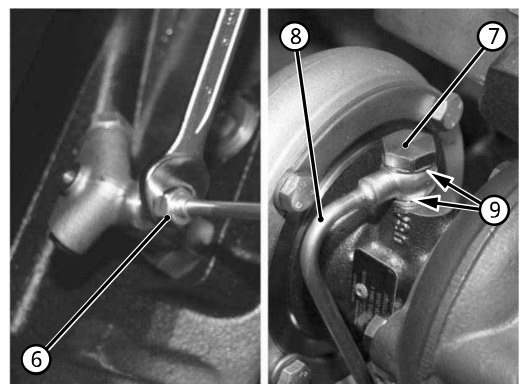
3.

Undo unions (6) and (7) and remove the turbocharger oil delivery pipe.



#### NOTE

Renew copper washers (9) on reassembly.

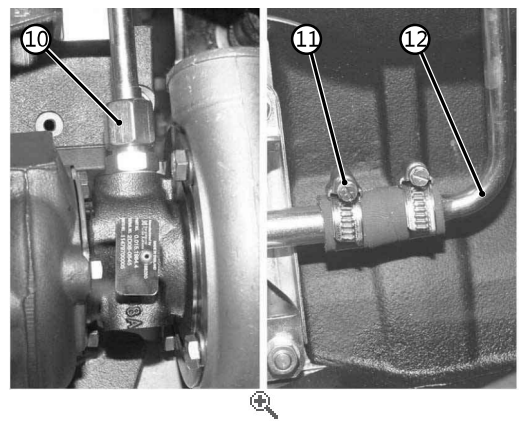


4.

Unscrew union (10).

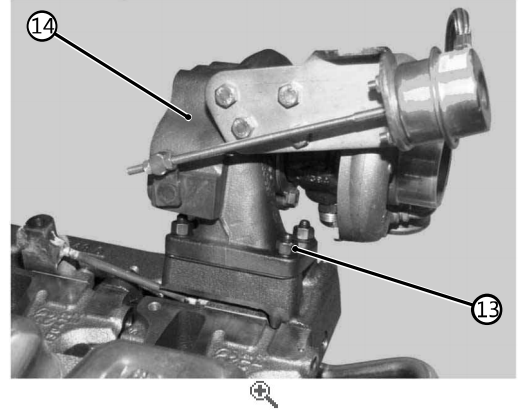
Slacken off strap (11).

Disconnect and remove turbocharger return pipe (12).



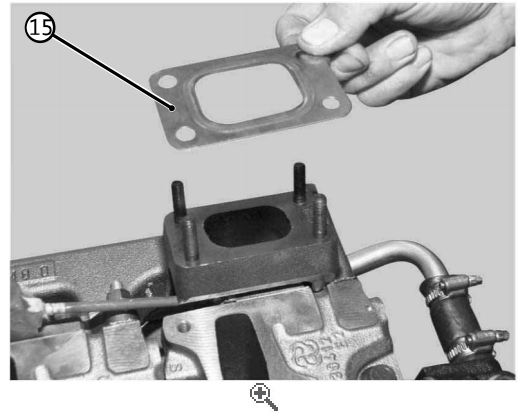
5.

Undo the four nuts (13) and remove turbocharger (14).



6.

Remove gasket (15).



7.

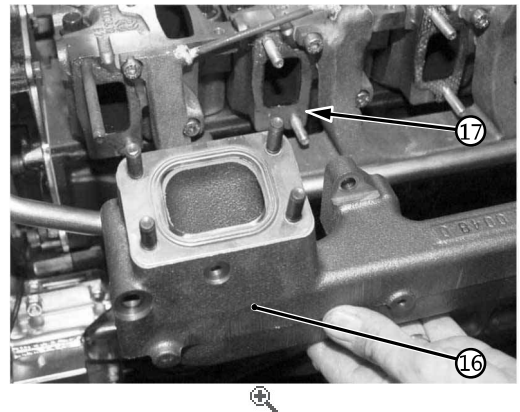
Undo the locknuts and remove exhaust manifold (16).

Remove seals (17).



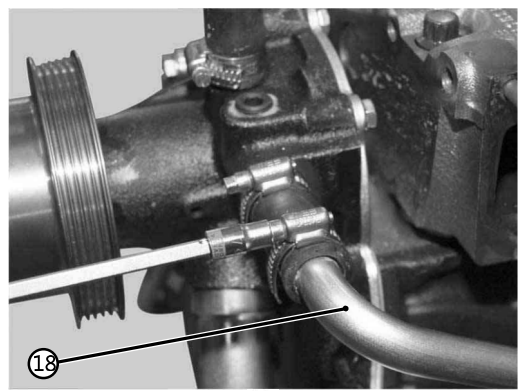
**NOTE**

Renew gaskets (17) on reassembly.



8.

Loosen the clamp and disconnect pipe (18) from the water pump.



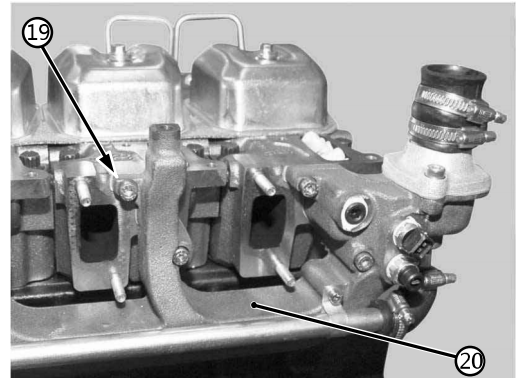
9.

Undo fixing screws (19) and remove manifold (20) from the cooling circuit, complete with thermostatic valve.



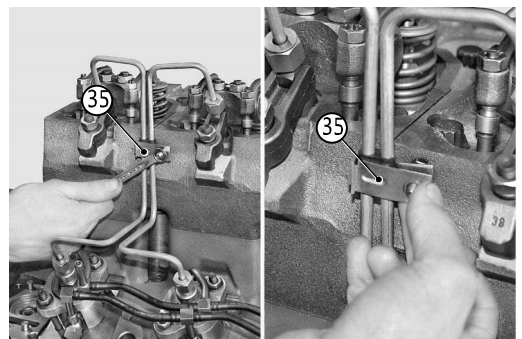
**NOTE**

Renew the gaskets on reassembly.



10.

Remove anti-vibration clamps (35).



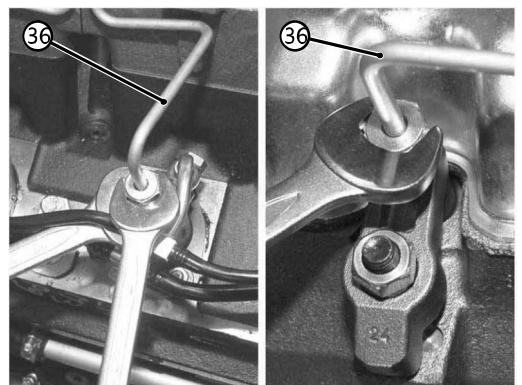
11.

Remove fuel delivery pipes (36) to the injectors.



**NOTE**

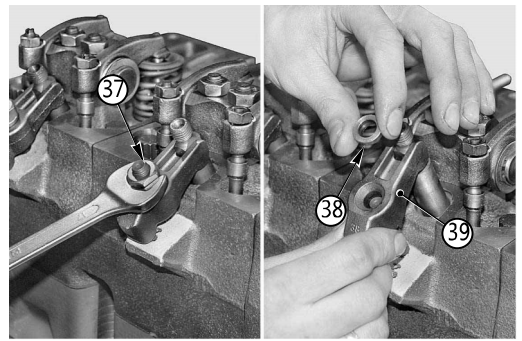
Holding the pump union loosen the pipe union.



12.

Remove nuts (37) and conical washers (38).

Remove injector retaining bracket (39).



13.

Extract out injectors (40) and O-rings (41).



**NOTE**

Renew the O-rings on reassembly.



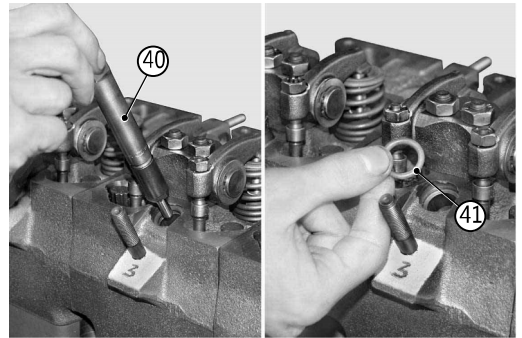
**NOTE**

Note which way round the injectors are installed.



**DANGER**

Plug the delivery bore and injector nozzle to prevent the ingress of contaminants.



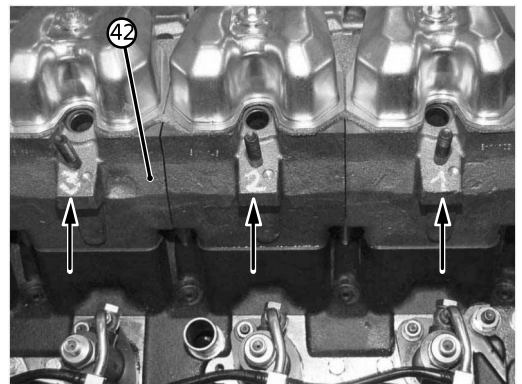
14.

Mark the cylinder heads (42) with respect to the engine block.



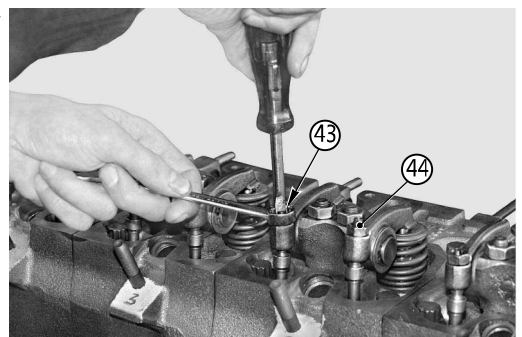
**NOTE**

Start numbering from cylinder 1 (side opposite flywheel).



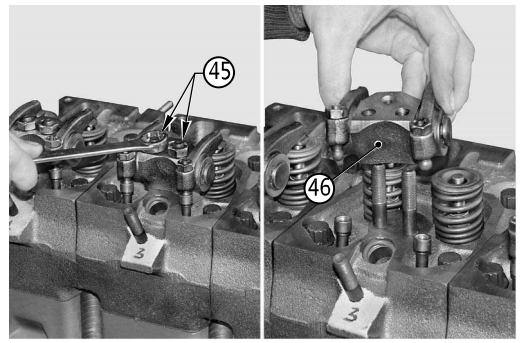
15.

Loosen nuts (43) of rollers (44) and unscrew the rollers to free the rocker arms.



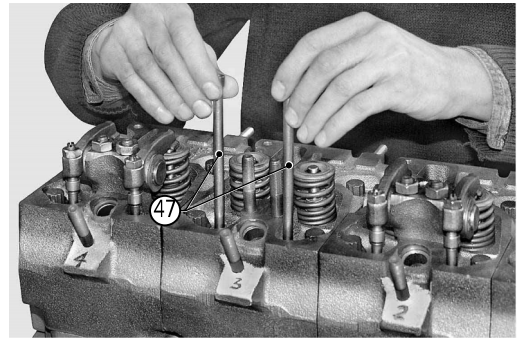
16.

Remove nuts (45) and remove rocker arm supports assembly (47).



17.

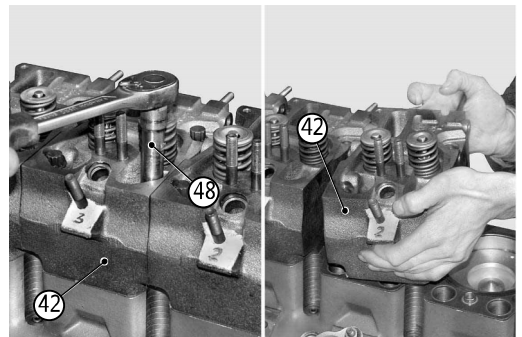
Remove rocker arm pushrods (47).



18.

Unscrew and remove screws (48) responsible for fastening cylinder heads (42).


Remove complete cylinder heads (42).



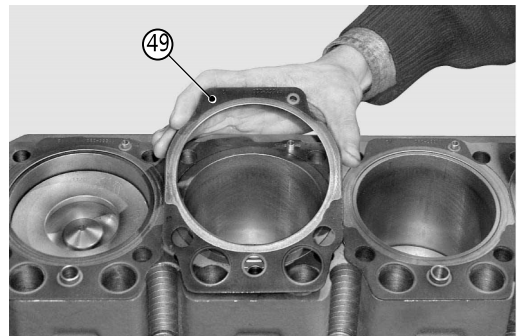
19.

Remove cylinder head gaskets (49).

**NOTE**



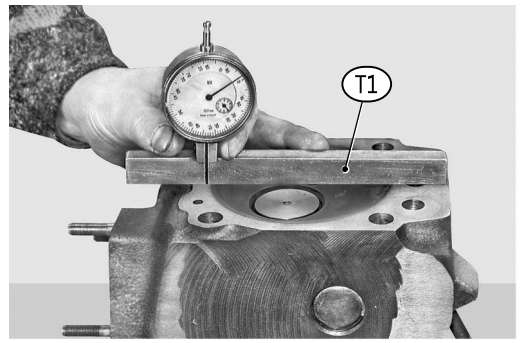
When the heads are to be refitted without renewing cylinder liners, make a note of the type of gasket installed under each head. The gaskets feature different thicknesses identified by the presence or absence of identification holes on the side with the centring hole on the oilway and the holes for the push rods.



20.

Before proceeding with the disassembly, clean the surfaces of the heads and the valves.

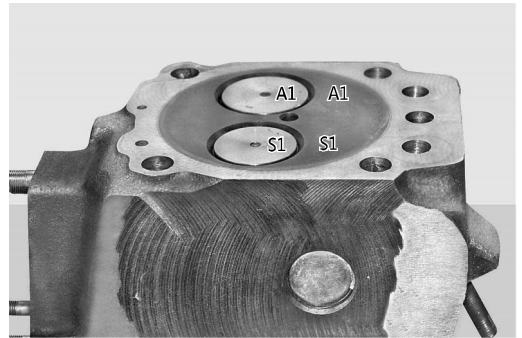
Check with tool T1 (P/N 5.9030.433.0) and a dial gauge that the recess of the intake and exhaust valves is within the range of permissible values (see "CHECKS AND TECHNICAL DATA").



21.

If the valves recess is within the limits, before removing the valves mark the positions with respect to the cylinder head so that, if undamaged, they can be refitted in their original positions.

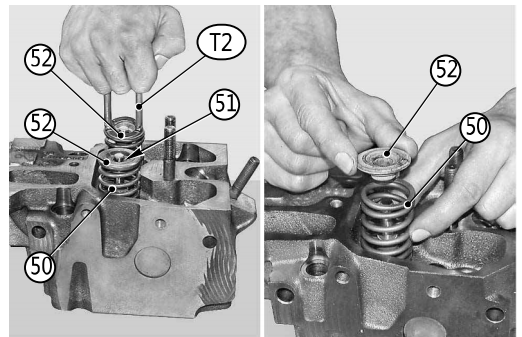
Example: Head 1 - A1 - S1, 2 - A2 - S2



22.

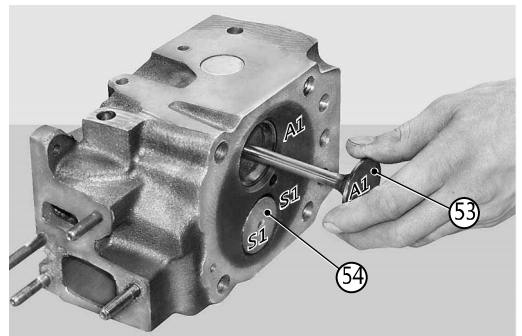
Using tool T2 (P/N 5.9030.012.0), compress springs (50) and remove valve retaining half cones (51).

Release and remove springs (50) and plates (52).



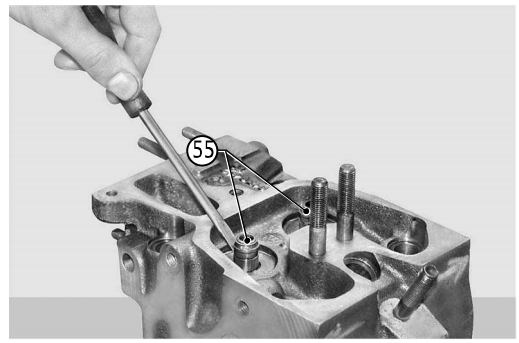
23.

Remove valves (53) and (54).



24.

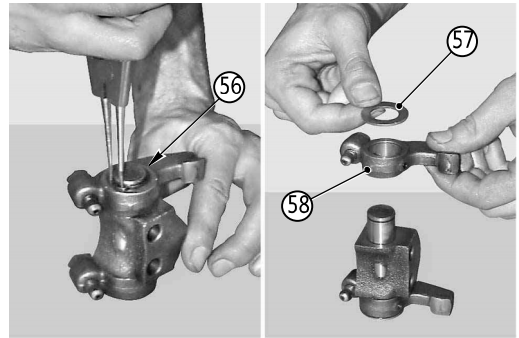
Using a screwdriver or a lever, remove valve O-rings (55).



25.

Remove circlips (56).

Remove thrust washers (57) and remove rocker arms (58).



26.

## Installing the heads

Fit heads (1) complete with valves on the relative cylinders.



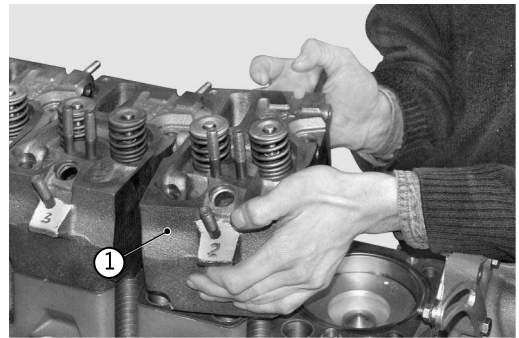
### NOTE

Fit the valves by performing the removal steps in reverse sequence.



### NOTE

Do not change or mismatch the head positions.



1.

Lubricate screws (2) responsible for fixing cylinder heads (1) and screw them in by hand.

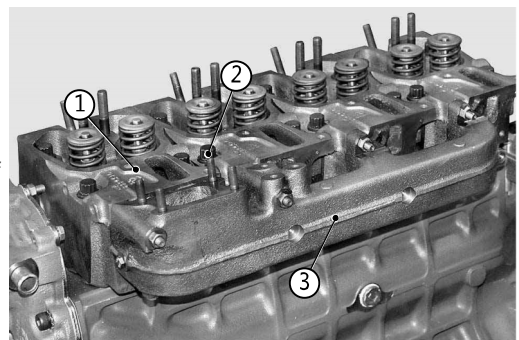
Screws: Engine oil

Check that the mating surfaces are clean and temporarily fit exhaust manifolds (3); secure them with the relative nuts tightened to a torque of about 15 Nm (11 lb.ft.).



### NOTE

This operation serves to keep the head surfaces in line with manifold surfaces: do not fit the gaskets of the manifolds.



2.

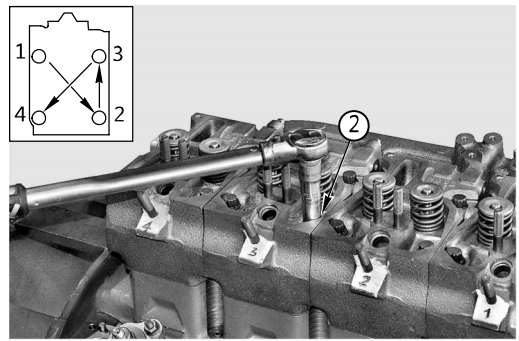
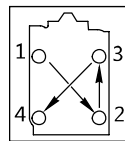
Tighten head fixing screws (2) to the 1st torque stage with a torque wrench.

Screws: 50 Nm (37 lb.ft.)

### NOTE



Tighten the screws following the sequence indicated.



3.

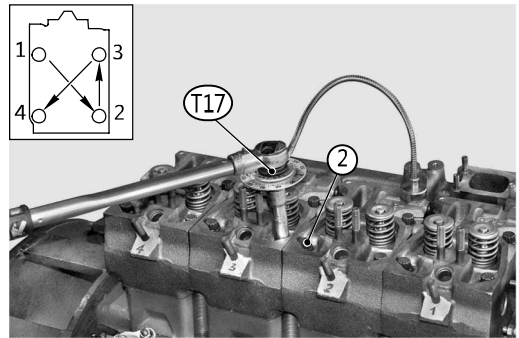
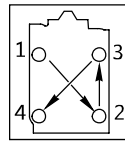
Using the same torque wrench and an angular tightening goniometer T17 (P/N 5.9030.640.0) fully tighten head screws (2).

Screws: Rotation  $50 \pm 3^\circ + 50 \pm 3^\circ$



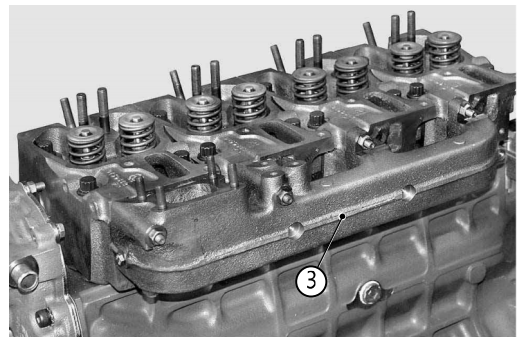
**NOTE**

Tighten the screws following the sequence indicated.



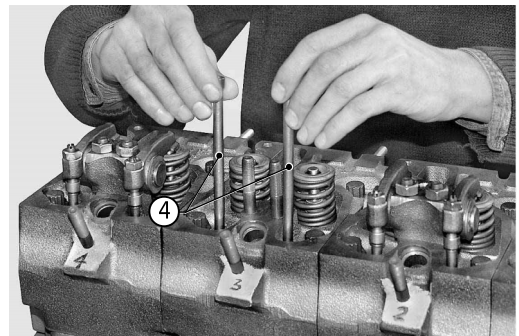
4.

Remove exhaust manifolds (3).



5.

Fit rocker arm pushrods (4).



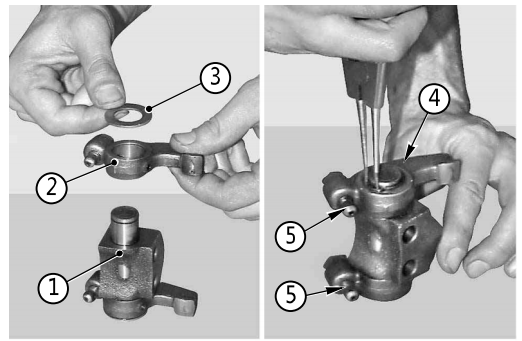
6.

**Completion of cylinder heads installation**

Install the rocker arm assemblies by fitting rocker arms (2), thrust washers (3) and circlips (4) on support (1).

Fully loosen valve clearance set screws (5).



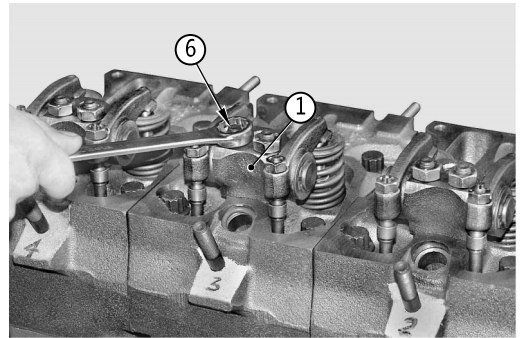


1.

Lubricate pivot pins and fit rocker arm supports assembly (1).

Lock the supports with nuts (6).

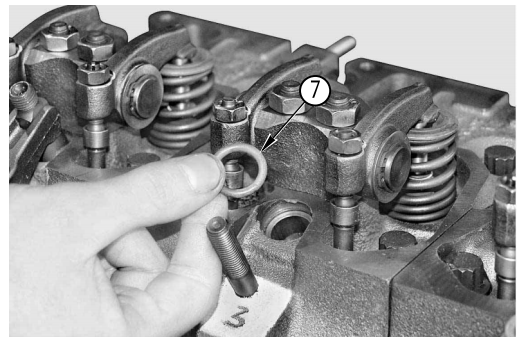
Nuts: 39 Nm (28.7 lb.ft.).



2.

Fit new injector O-rings (7) in the cylinder heads.

Adjust valve clearance following the procedure described below.



3.



## Calculation of cylinder head gasket thicknesses

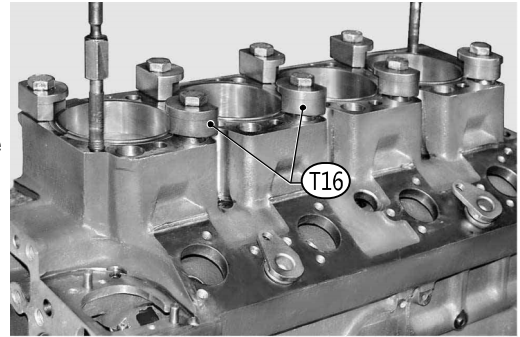


### DANGER

This procedure must be carried out for each cylinder.

Once the 4 hours required for polymerisation have elapsed, remove clamping blocks T16 (P/N 5.9030.631.4/10) applied for insertion of the cylinder liners.

Remove carefully sealant residues from all the surfaces.



1.

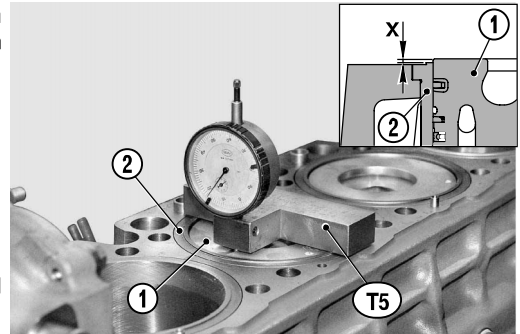
Bring piston (1) of the cylinder in question to TDC, checking the position using tool T5 (P/N 5.9030.967.0) and a dial gauge preloaded by about 4 mm on the piston; reset the gauge at TDC.



### NOTE

The tool must be positioned in the middle of the piston parallel to the gudgeon pin axis.

Move the tool aside and check distance "X" between piston crown (1) and the gasket mating surface on liner (2).



2.

3. depending on measurement reading "X", select the gasket from among the available thicknesses.

Measured value "X" mm (in.)	Gasket thickness mm (in.)	Gasket colour	Number of holes
0.15...0.40 (0.0059 - 0.0157)	1,2 (0.0472)	Red	1
0.41...0.60 (0.0161 - 0.0236)	1,4 (0.0551)	Black	2
0.61...0.80 (0.0240 - 0.0315)	1,6 (0.0630)	Green	1



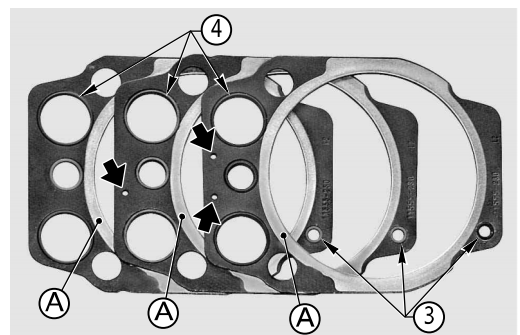
### NOTE

The holes that identify the thickness of the gaskets are the ones shown in the figure.



### NOTE

Position the gasket of each cylinder and check to ensure O-rings (3) and (4) are present. The gaskets have an obligatory direction of assembly: check that the gasket code and flame guard ring "A" are facing upwards.



4.

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