



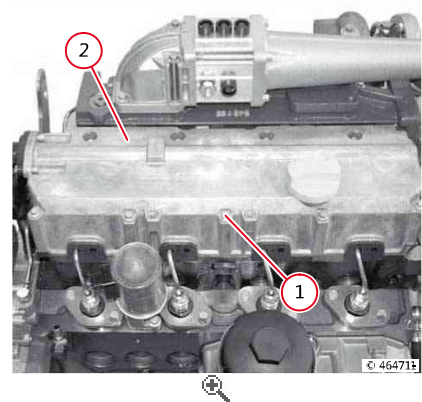
Disassembly and assembly of the cylinder head

Commercially available tools:

- Box spanner insert Torx E14: 8113

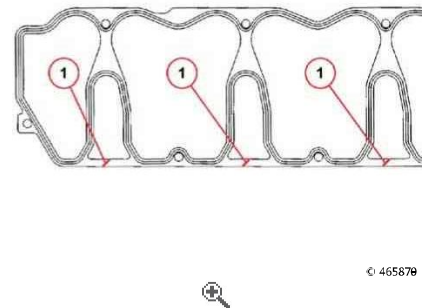
Removal of the cylinder head cover

- Remove all the screws (1).
- Remove cylinder head cover (2).



1.

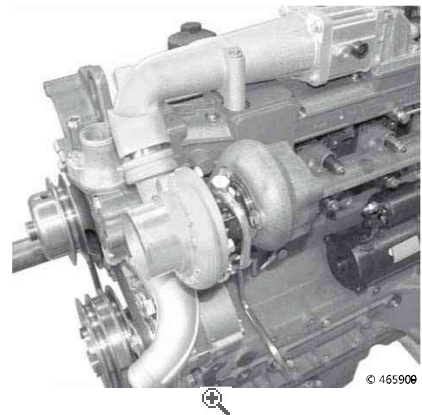
- Cut the gasket at the ribs (1).
- Remove the gasket.
- Carry out a visual inspection of the components.



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2.

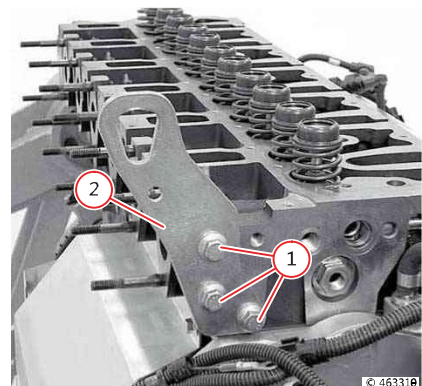
- Disassemble the fan support.
[See para. Removal and refitting of the fan support](#)
- Disassemble the exhaust pipe.
[See para. Removal and refitting of the exhaust manifold](#)



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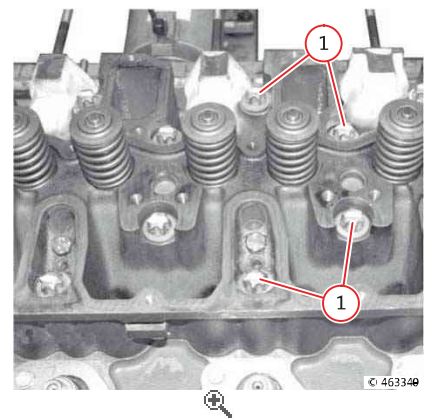
3.

- Disassemble the injection valves.
[See para. Fitting and removing injection valves](#)
- Disassemble the rocker support.
[See para. Removal and refitting of the rocker arms and pedestals](#)
- Disassemble the turbocharging air duct.
[See para. Removal and refitting of the charge air duct](#)
- Remove screws (1).
- Remove support (2).



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4.
 - o Unscrew all the screws (1) using the long reach socket.
 - o Remove the cylinder head.
 - o Remove the gasket.
 - o Clean the mating surfaces.



5.

Assembly of the cylinder head

NOTE
 Measure the protrusion of all pistons. Select the cylinder head seal based on the greatest measured piston protrusion.

- o Measure the piston protrusion.
 See para. Measuring piston protrusion



© 425659

1.
 - o Select the cylinder head seal based on the greatest measured piston protrusion.

Piston protrusion	Hole
0.33 - 0.55 mm	1
0.56 - 0.65 mm	2
0.66 - 0.76 mm	3

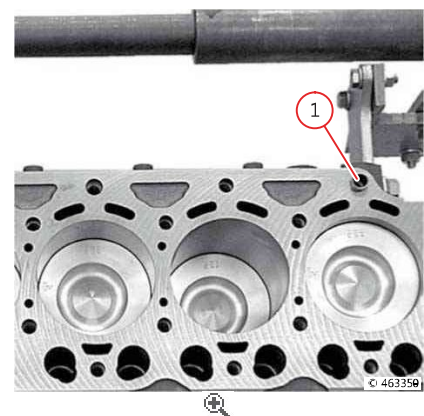
Example:
 piston protrusion = 0.7 mm corresponds to a cylinder head seal with 3 holes (arrow).



© 441549

2.

NOTE
 Check that tightening bush (1) is present.

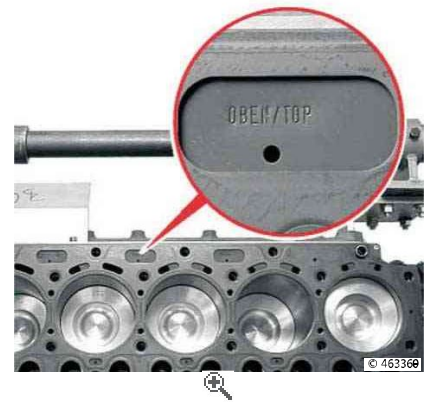


3.

- o Apply a new cylinder head seal.

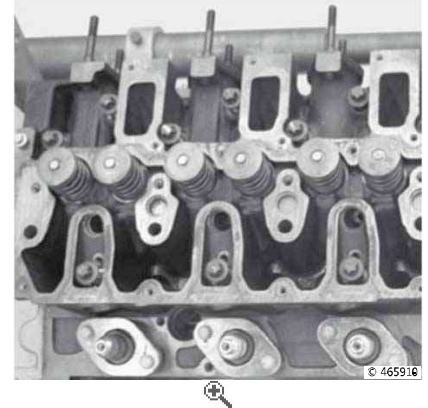
**NOTE**

The sealing surfaces of the cylinder head seal must be clean and free of oil. The mark IN ALTO / TOP is facing the direction of the cylinder head.



4.

- o Insert the cylinder head.

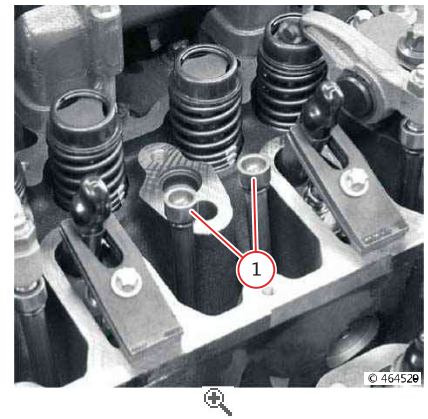


5.

- o Insert pushrods (1).

**NOTE**

Ensure that the pushrods are installed correctly. The ball ends of the pushrods must locate in the cups of the tappets.

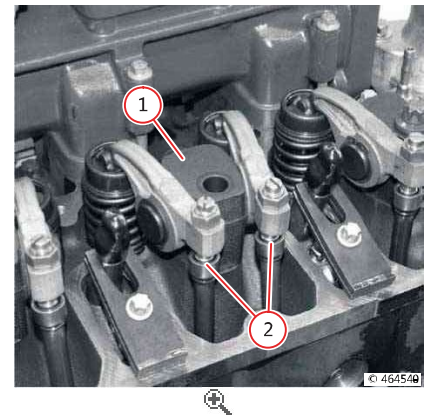


6.

- o Fit rocker pedestal (1).

**NOTE**

The ball heads (2) must be in the pivots of the pushrods.

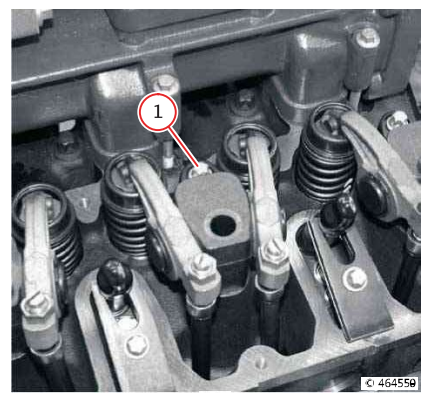


7.

- o Screw in the screw (1).

**NOTE**

Do not tighten the screw at this stage.



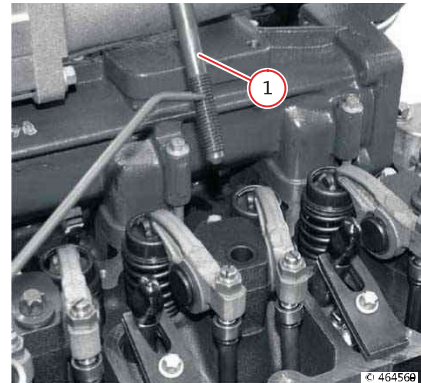
8.

WARNING



In the case of written certification, the cylindrical head screws can be used a maximum of 3 times, otherwise replace them each time they are removed.

- o Lightly oil the cylindrical head screw (1).
- o Screw the cylindrical head screw (1).



9.

- o Orient the rocker pedestals symmetrically about the axes of the valves
- o Tighten the cylindrical head screws with the socket wrench insert, 30 Nm.

WARNING

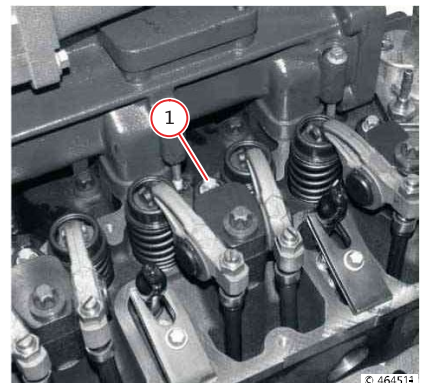


Before tightening the screw, check that the pushrods are not under load due to valve overlap.



10.

- o Tighten (1) the screw: 21 Nm.



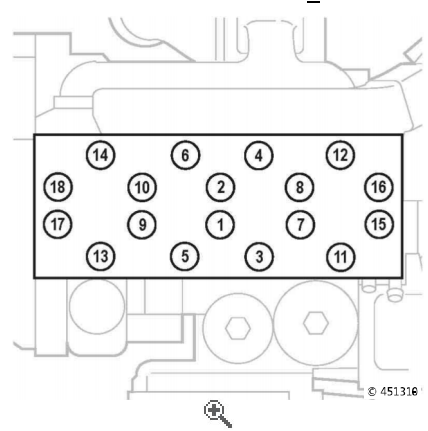
11.

- o Tighten all the cylindrical head screws according to the tightening sequence.
 - Retightening value: 30 Nm + 80 Nm + 90°.



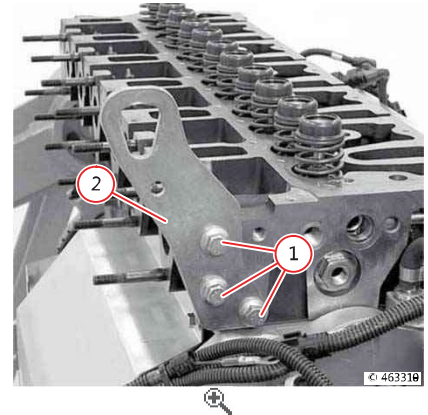
NOTE

Use the box spanner insert.



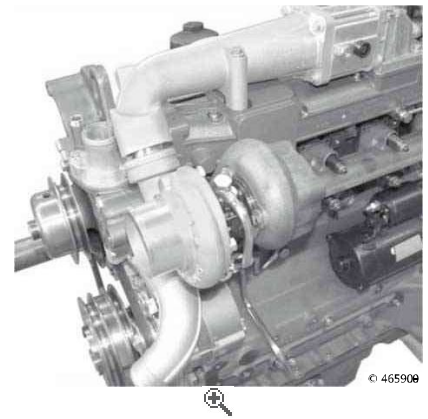
12.

- o Fit support (2).
- o Tighten (1) the screws.
- o Assemble the turbocharging air duct.
See para. Removal and refitting of the charge air duct
- o Assemble the rocker support.
See para. Removal and refitting of the rocker arms and pedestals
- o Adjust valve clearance.
See para. Adjustment of valve clearance
- o Assemble the injection valves.
See para. Fitting and removing injection valves



13.

- o Assemble the exhaust pipe.
See para. Removal and refitting of the exhaust manifold
- o Assemble the fan support.
See para. Removal and refitting of the fan support



14.

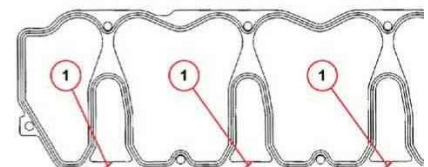
Refitting the cylinder head cover

- o Cut the new gasket at the ribs (1).



WARNING

Do not bend the flat gasket with metal ribbing. Sand the cut areas.



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1.

- o Clean the mating surfaces.
- o Fit a new gasket.

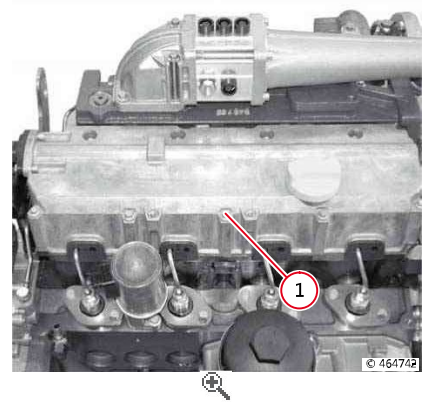


NOTE

Check the installation position is correct.

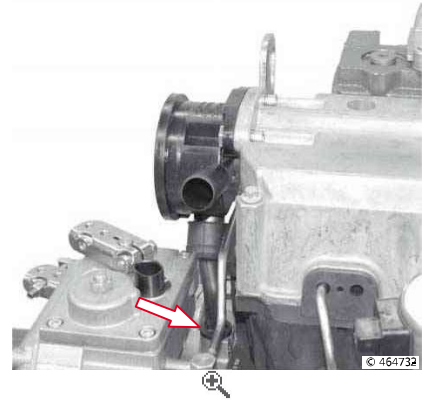
- o Fit the cylinder head cover.

- o Tighten all screws (1) alternately: 11 Nm.



2.

 **NOTE**
Make sure the assembly position is correct (arrow).



3.



Grinding the cylinder head seal surface

Commercially available tools:

- Flattener
- Roughness gauge
- Depth gauge



NOTE

When the flattener is used, following the specific instructions of the manufacturer.

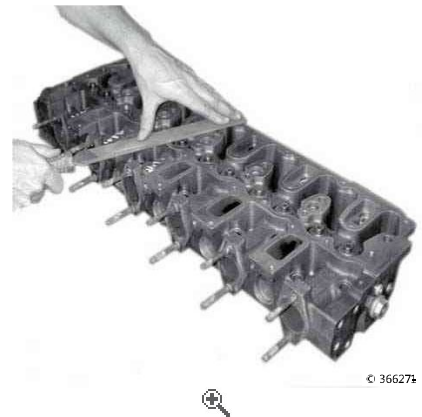
Preparation of the cylinder head

- Disassemble the valves.
See para. Valve assembly and disassembly.
- Deburr the top of the cylinder head.



NOTE

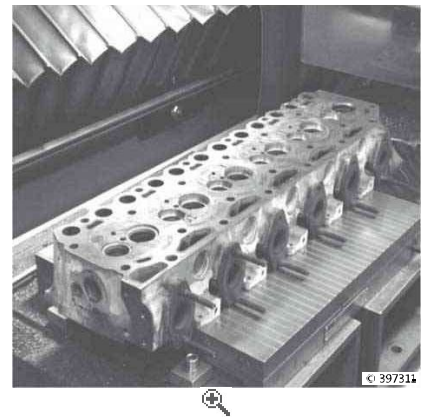
To ensure a correct fit, the cylinder head surface must be free of burr or gasket residue.



1.

Flattening the cylinder head

- Tighten the cylinder head on the flattener.
- Align the cylinder head.
- Flattener tool for aligning the cylinder head.



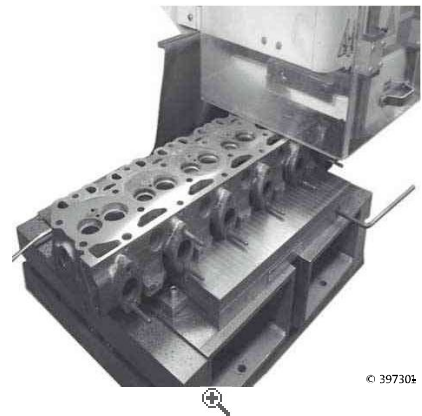
1.

- Flattening the sealing surface of the cylinder head.



NOTE

The lapping procedure must be repeated if the seal surface of the cylinder head is not perfectly flat (recognisable by variations in colour in the ground surface). The tool supply dimension is maximum 0.2 mm for the flattening process.



2.

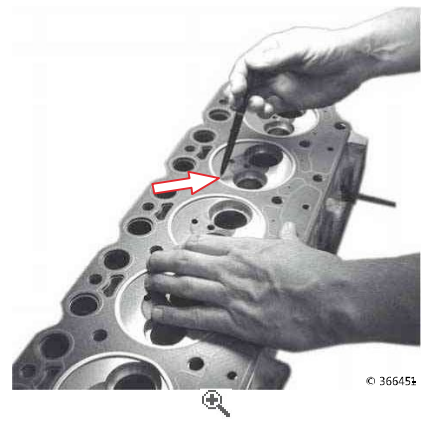
Check of the sealing surface of the cylinder head

- o Visual inspection of the sealing surface of the cylinder head.
- o Visually inspect the surface of the combustion chamber.
- o Fit the cylinder head gasket.
- o Mark the surface of the combustion chamber (arrow).



NOTE

Do not mark with a pointed implement as this may damage to the cylinder head seal surface.



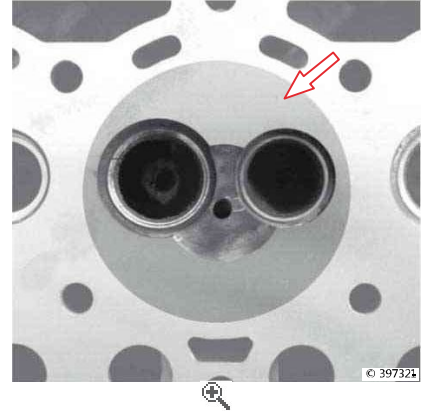
1.

- o Remove the cylinder head seal.
- o Visual inspection of the sealing surface of the cylinder head.



NOTE

Minor damage to the combustion chamber surface is permitted (as indicated by arrow). The lapping procedure for the cylinder head must be repeated, however, even if minor damage to the cylinder head surface is visible. The cylinder head wear limit was reached, replace it.



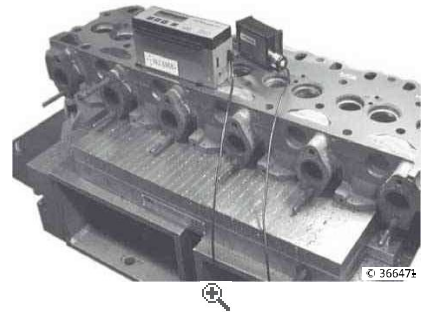
2.

- o Measure the roughness of the cylinder head seal surface with the roughness gauge: Rz 25.



NOTE

If the value measured is not within the permissible range, the cylinder head seal surface must be lapped again using different settings for the lapping machine.



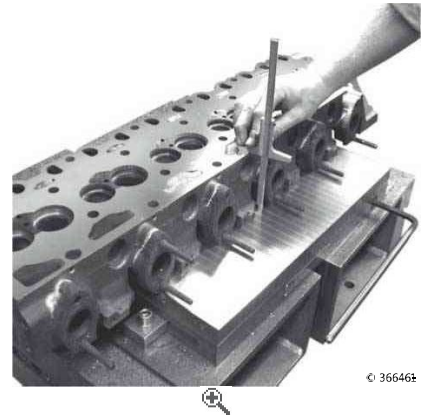
3.

- o Measure the height of the cylinder head with a depth gauge.
 - Standard: 90 mm.
 - Undersizing value: 89.4 mm.



NOTE

The cylinder head wear limit was reached, replace it.



4.

- o Remove the cylinder head from the flattener.
- o Apply the repair date and factory mark on the cylinder head.



WARNING

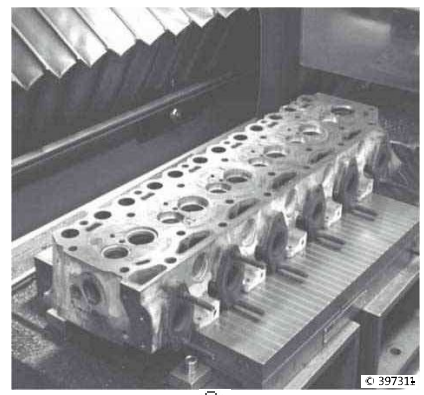
Do not apply the label to a sealing surface.



NOTE

Mark the cylinder head after each repair.

- o Assemble the valves.
See para. Valve assembly and disassembly.



5.



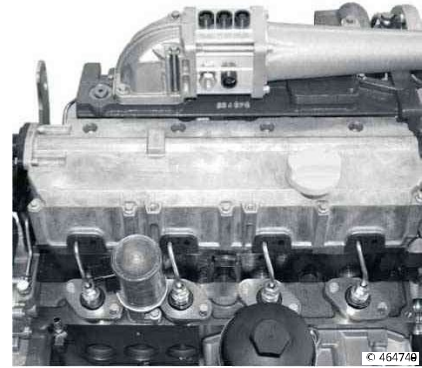
Measuring piston protrusion

Special tools:

- Rotation device: 100330
- Dial gauge: 100400
- Measurement device: 100750

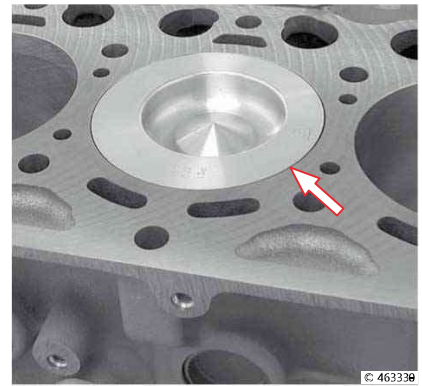
Measuring piston protrusion

- Fit the rotation device.
[See para. Removal and refitting of the rotation device](#)
- Disassemble the cylinder head.
[See para. Disassembly and assembly of the cylinder head](#)



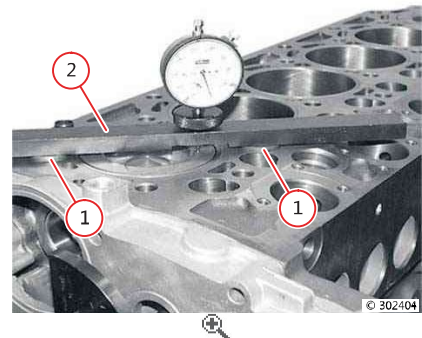
1.

- Turn the crankshaft until the respective piston is positioned just before the top dead centre (arrow).



2.

- Insert the dial gauge in the sliding vernier scale.
- Apply the spacer disc (1) and the sliding vernier scale (2) on the sealing surface of the crankcase.



3.

- Move the sliding vernier scale.
- Apply the preloaded dial gauge probe on the sealing surface of the crankcase (arrow).
- Adjust the dial gauge to "0".

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