

Service Training



Linde IC-Engined Fork Truck H 50/60/70/80 D/T H 50/60/70/80 D-02/T-02 H 50/60/70/80 D-03/T-03 Type 353

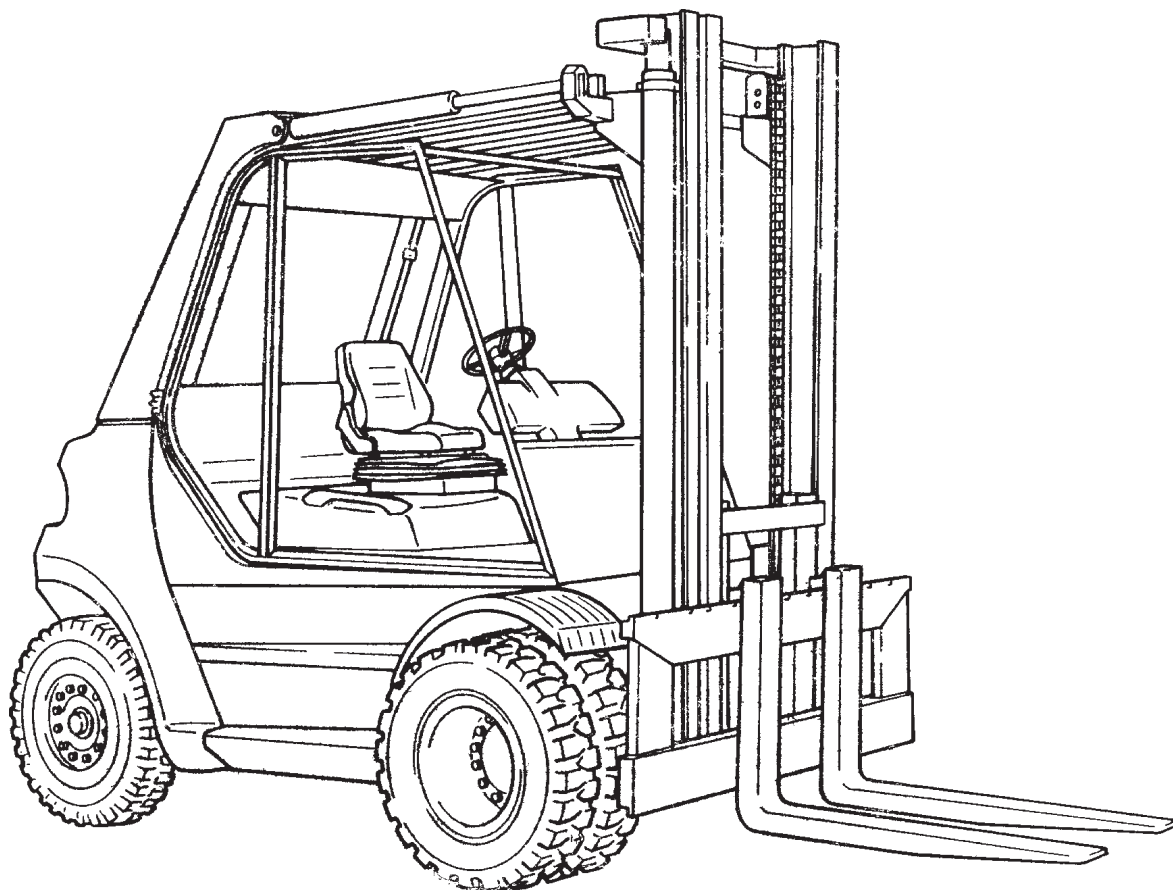


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4 IC-ENGINE FORKTRUCK H 50/60/70/80, TYPE 353

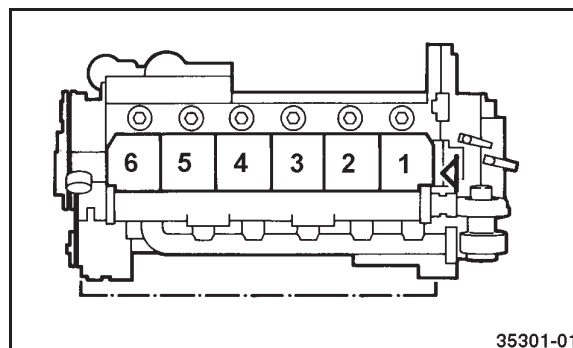
4.1 ENGINE DRIVE

4.1.1 ENGINE MODEL BF6M 1012 E

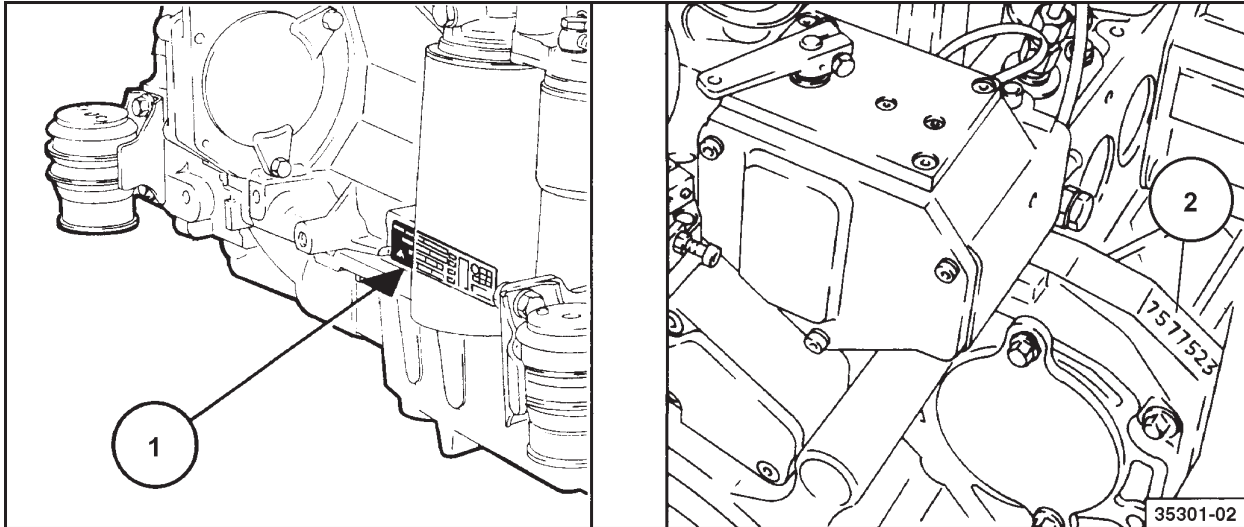
4.1.1.1 ENGINE SPECIFICATIONS

Engine model	BF6M 1012 E
Displacement	4790 cc
Power	85 kW at 2250 rpm
Opening pressure of injection valve	260 bar
Compression ratio	17,5 : 1
Compression	28 - 33 bar
Maximum difference in pressure	4 bar
Firing order	1 - 5 - 3 - 6 - 2 - 4
Valve clearance (cold)	inlet: 0,3 ^{+0,1} mm outlet: 0,5 ^{+0,1} mm
Lower idling speed	750 ⁺⁵⁰ rpm
Upper idling speed	2300 ⁺⁵⁰ rpm
Oil pressure at lower idling speed and 125 °C oil temperature	min. 0,8 bar

Count the cylinders beginning at the flywheel end.



4.1.1.1.1 EXPLANATION OF THE ENGINE NUMBER

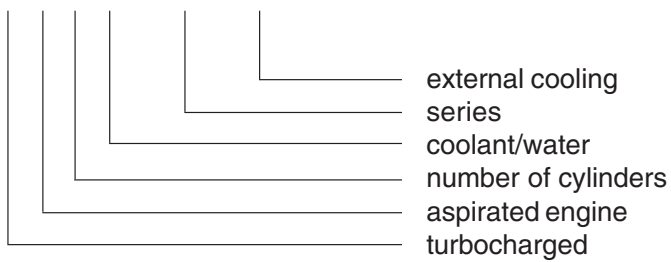


- 1 Manufacturer's plate with type and engine number
- 2 Engine number stamped on the crankcase

NOTE: A second type plate was affixed to the rocker cover by Linde.

EXPLANATION OF THE ENGINE NUMBER

B F 6 M 1012 E



4.1.1.2 CHANGING AND TIGHTENING THE DRIVEBELT

CHANGING THE DRIVEBELT

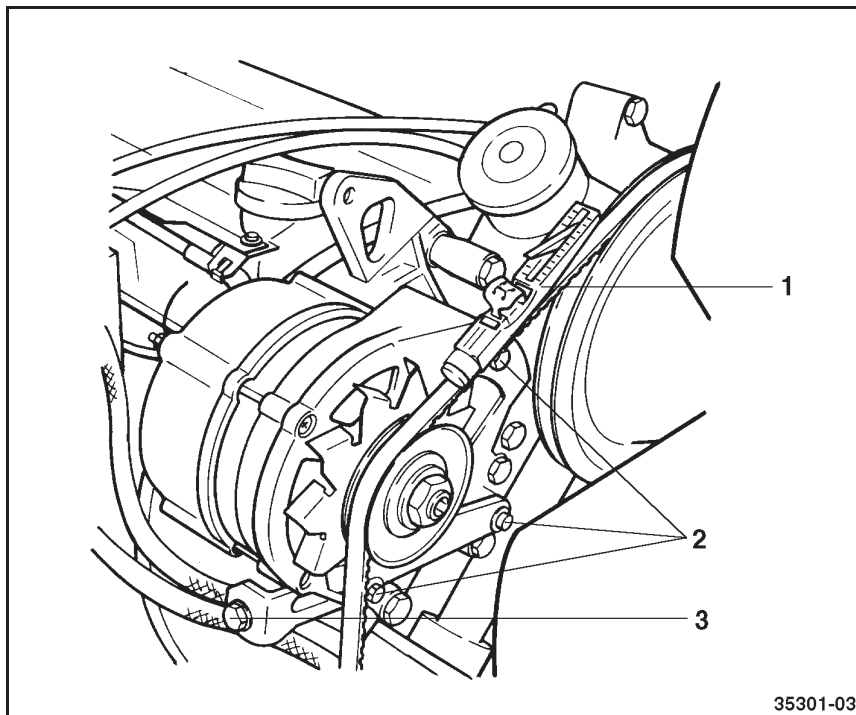
- Slacken the alternator and tensioner fastening screws (2).
- Turn the tensioning screw (3) anti-clockwise, press the alternator in and remove the drivebelt.
- Check the pulley for wear, renewing it if necessary.
- Install a new drivebelt.

TIGHTENING THE DRIVEBELT

- Turn the tensioning screw (3) clockwise until the required tension is obtained.
- Check the tension with a gauge (1), Part No. 000 941 9435.
- Tighten the screws (2) again.

Settings:

Initial installation	400 + 50 N
Check after 15 minutes Operation under load and retighten the belt, if necessary	300 ± 50 N
With re-use	250 ± 50 N



4.1.1.3 ADJUSTING VALVE CLEARANCE

The adjustment can be carried out when the engine is cool or warm after a cooling period of at least 30 minutes (oil temperature < 80 °C).

Valve clearance: Inlet 0.3 mm
Outlet 0.5 mm

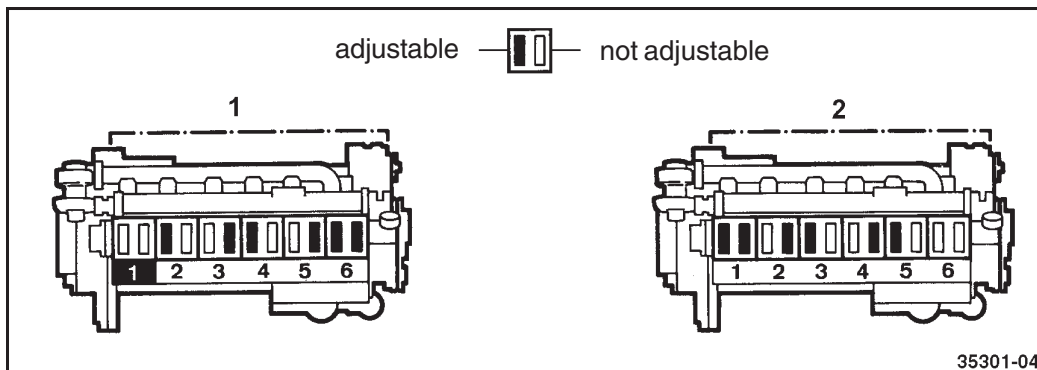
VALVE CLEARANCE SCHEMATIC

Crankshaft position 1

Turn the engine until the valve inlet and outlet of cylinder 1 are just open.

Crankshaft position 2

Turn the engine one full revolution (360 °).



NOTE: When a new rocker cover is installed, increase the valve clearance by 0.1 mm. Adjust the valve clearance to normal values after 50 service hours.

VALVE CLEARANCE ADJUSTMENT BY MEANS OF A TORQUE ANGLE GAUGE FROM SERIAL NUMBER E1 X353 T 000268

In engines which are equipped with a thrust washer in the valve spring retainer (Fig. A1), the valve clearance can only be adjusted **by means of a torque angle gauge**.

This method using a torque angle gauge may also be applied for the DEUTZ engines BF6M 1012 / 2012 installed in series 353 trucks up to now, which have so far been adjusted by means of the feeler gauge method.

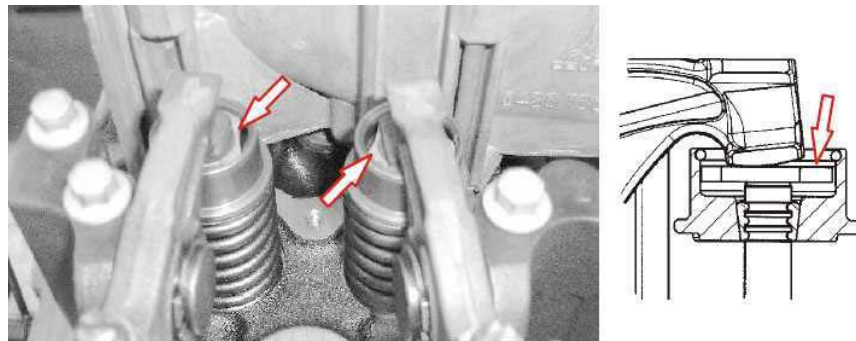


Fig. A1 Valve gear with pressure disk

New method for checking and adjusting the valve clearance (with torque angle gauge)

Prerequisite: The engine must have cooled down for at least 30 minutes; oil temperature below 80 °C.

- Carry out the preparations (e.g. remove cylinder head cover).
- Turn crankshaft until valve overlap on cylinder no. 1 is reached. This means: Inlet valve starts opening, outlet valve closes.
- Crankshaft position 1 in accordance with corresponding adjustment diagram (see "valve clearance schematic").
- Fix magnet of torque angle gauge on cylinder head.
- Place torque angle gauge 8190 with screw driver bit on setting screw. Use screw driver bit 8191.

Checking the valve clearance

- Put T-handle (4) on torque angle gauge (1) (Fig. 5).
- Loosen locknut (3) on rocker arm and support setting screw (2) with T-handle against turning (figure A5).
- Set torque angle gauge to 0 (zero) and support setting screw (2) with T-handle against turning (figure A4).
- Turn setting screw with screw driver bit clockwise until rocker arm contacts thrust washer free from clearance.
- Read the value (setting angle) on the torque angle gauge.

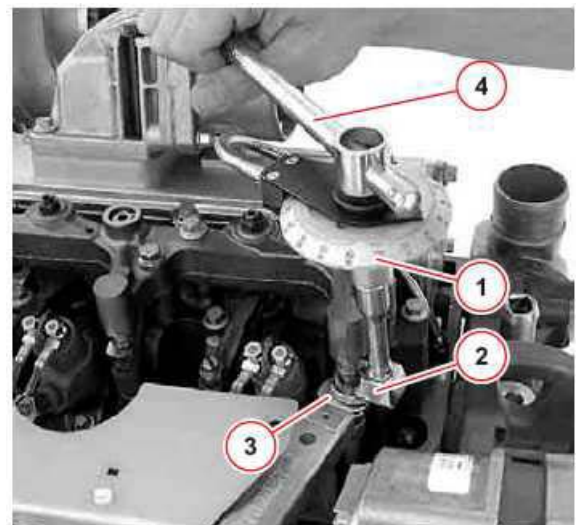


Fig. A5

Adjustment of valve clearance

- Set torque angle gauge to 0 (zero) (Fig. A4). Take care not to turn the setting screw!
- Turn setting screw back (counter-clockwise) until reaching the corresponding setting angle.

Setting angle of inlet valve: 75°
outlet valve: 120°
Locknut tightening torque: 20 Nm

- Put T-handle on torque angle gauge (Fig. A5).
- Support setting screw with T-handle and tighten locknut with socket wrench (open end). Observe instructions for tightening!
- Adjust valve clearance for the remaining valves as described above.
- Remove tools.

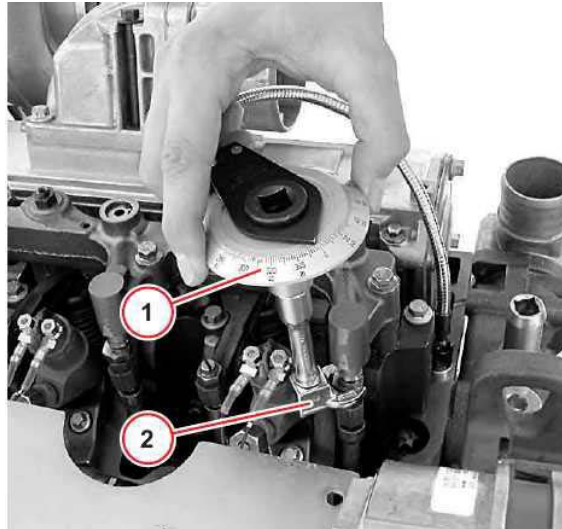
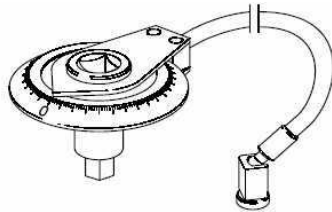


Fig. A 4 Valve clearance adjustment
(example: TCD 2012 2V with exhaust gas recirculation)

1 = Torque angle gauge 8190

Tools required for adjustment



Deutz part number

8190



8191

The required special tools may be ordered from the address below.
Please quote the corresponding ordering number.

WILBÄR
Wilhelm Bäcker GmbH & Co. KG
Postfach 140580
D42826 Remscheid
E-Mail: info@wilbaer.de
Tel.: ++49 (0) 2191 9339-0

4.1.1.4 ADJUSTING THE INJECTION VALVE

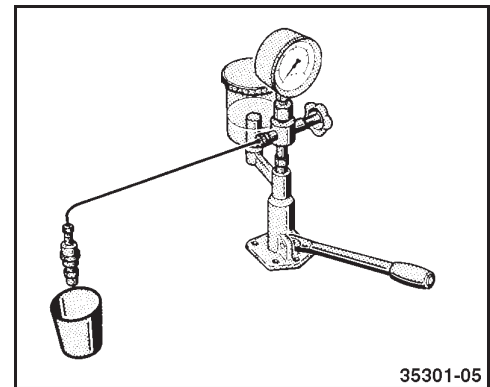
CHECKING THE OPENING PRESSURE

NOTE: Use only test oil acc. to ISO 4113 or diesel fuel for the test.

CAUTION: When checking injection nozzles, take care that the fuel jet does not hit the hands. Due to the high pressure, the fuel can penetrate the skin and cause severe injuries.

- Install the injection nozzle on the nozzle tester.
- Press the lever down slowly. Read the pressure at the start of fuel ejection and adjust the pressure, if necessary, by changing the shims.

Specified pressure
New injection nozzles 260 ⁺⁸ bar
Pressure for re-usability 255 ⁺⁸ bar



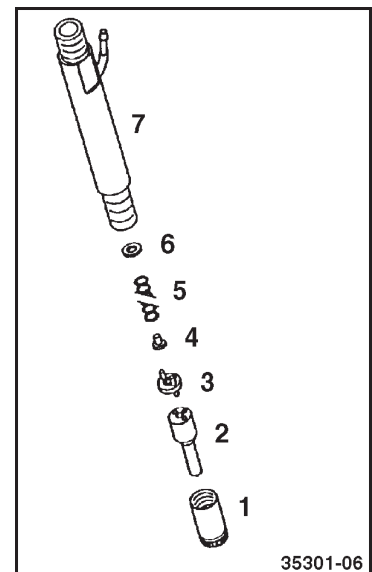
ADJUSTING THE INJECTION NOZZLE OPENING PRESSURE

- Clamp the holder 110110 for the injection valve in a vise.
- Place the top part of the injection holder into the holder 110110 and unscrew the union nut.

Sequence of disassembly:

1. Union nut
2. Injection nozzle
3. Intermediate piece
4. Pressure spindle
5. Compression spring
6. Shims
7. Nozzle body

- Adjust the pressure by fitting the correct shim. The thicker the shim, the higher the opening pressure will be. Re-assemble the injection valve. Tighten the union nut to a torque of 40 - 50 Nm. Check the injection valve with the nozzle tester.



CHECKING FOR LEAKS

- Dry the nozzle and nozzle holder - blow dry with an air jet.
- Slowly press the tester hand lever down until a pressure approx. 20 bar under the previously obtained opening pressure is reached.
- The nozzle does not leak if no drops of fuel show within 10 seconds.

If a drop of fuel leaks out, disassemble the injection valve and eliminate the leak by cleaning the injection nozzle. If this does not remedy the leak, renew the injection valve.

Do not rework the valve.

BUZZING AND JET TEST

- Shut off the compression tester pressure gauge.

The buzzing test is an audible test for determining if the needle is moving easily in the nozzle body. New injection nozzles have a different buzzing behaviour as opposed to used ones. Wear in the area of the needle seat lets the buzzing behaviour deteriorate. A nozzle that does not buzz despite cleaning must be replaced.

A used injection valve must buzz audibly if the hand lever is operated quickly and it must produce a finely atomized spray. The shape of the spray can vary greatly from that of a new injection valve.

INSTALLING THE INJECTION NOZZLE

- Using some grease, slide the seal onto the injection valve.
- Insert the injection valve.
- Put the clamping shoe in place.
- Torque the screws to 16 ⁺⁵ N.

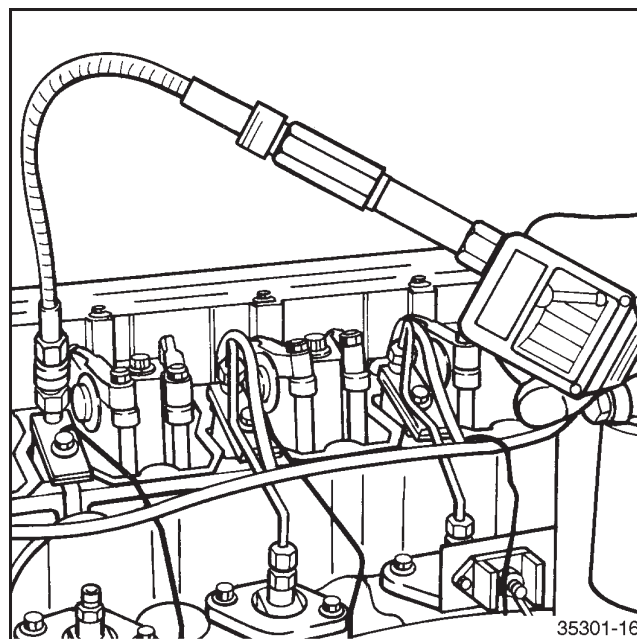
4.1.1.5 CHECKING THE COMPRESSION PRESSURE

- Remove the injection nozzle.
- Check the valve clearance.
- Insert and fasten connector 100110 along with the special seal.
- Connect a compressometer and crank the engine with the starter.

Specified pressure 28 - 33 bar

Max. difference in pressure 4 bar

NOTE: The measured compression pressure depends on the RPM of the starter when the measurement is carried out and on the altitude of the place the engine is operated in. For this reason it is not possible to define exact limits. The compression pressure check is only recommended as a means of comparing all cylinders in relation to each other. If the difference in pressure exceeds 15 %, dismantle the appropriate cylinder unit and determine the cause.



4.1.1.6 CYLINDER HEAD

REMOVING THE CYLINDER HEAD

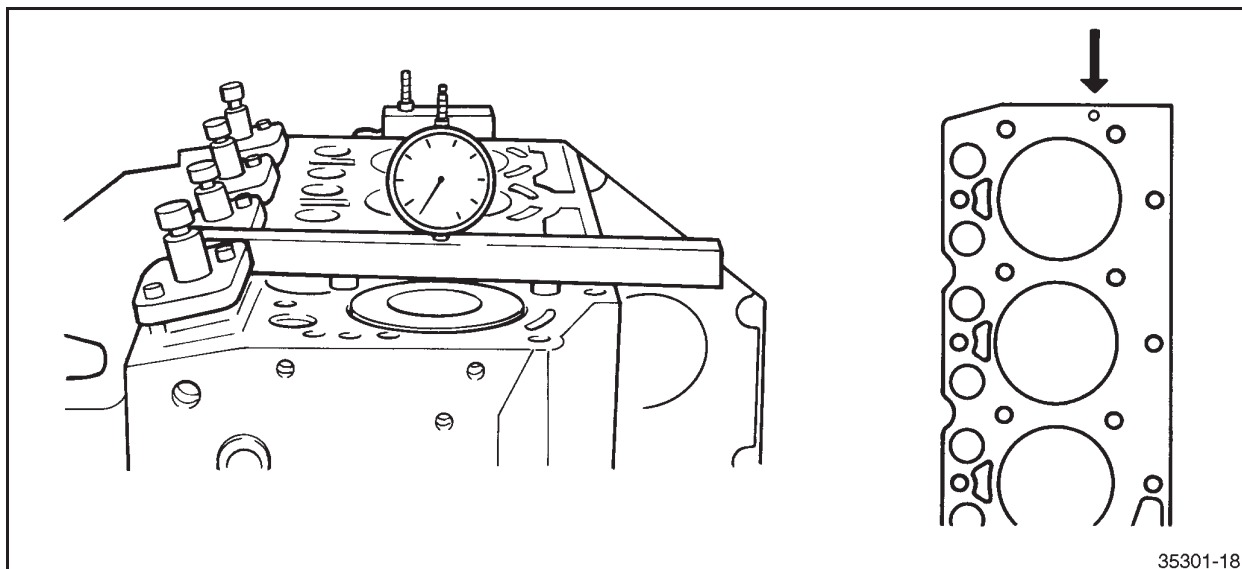
- With the engine cool, slacken the cylinder head bolts evenly and in steps in the reverse order as given in the schematic "Cylinder head bolt tightening sequence".

DETERMINING THE CYLINDER HEAD GASKET

NOTE: For the adjustment of the gap, there are 3 different cylinder head gaskets, which identifiable by holes.

- Place the dial gauge along with spacers 10075C on the sealing surface of the cylinder block and set the dial gauge to "0".
- Turn the piston to TDC and note the projecting length of the piston at the points of measurement.
- Select the correct cylinder head gasket according to the largest projecting length of the piston.

Projecting length of piston	Identification of cylinder head gasket
0.43 - < 0.64 mm	1 hole
0.64 - < 0.74 mm	2 holes
0.74 - 0.85 mm	3 holes



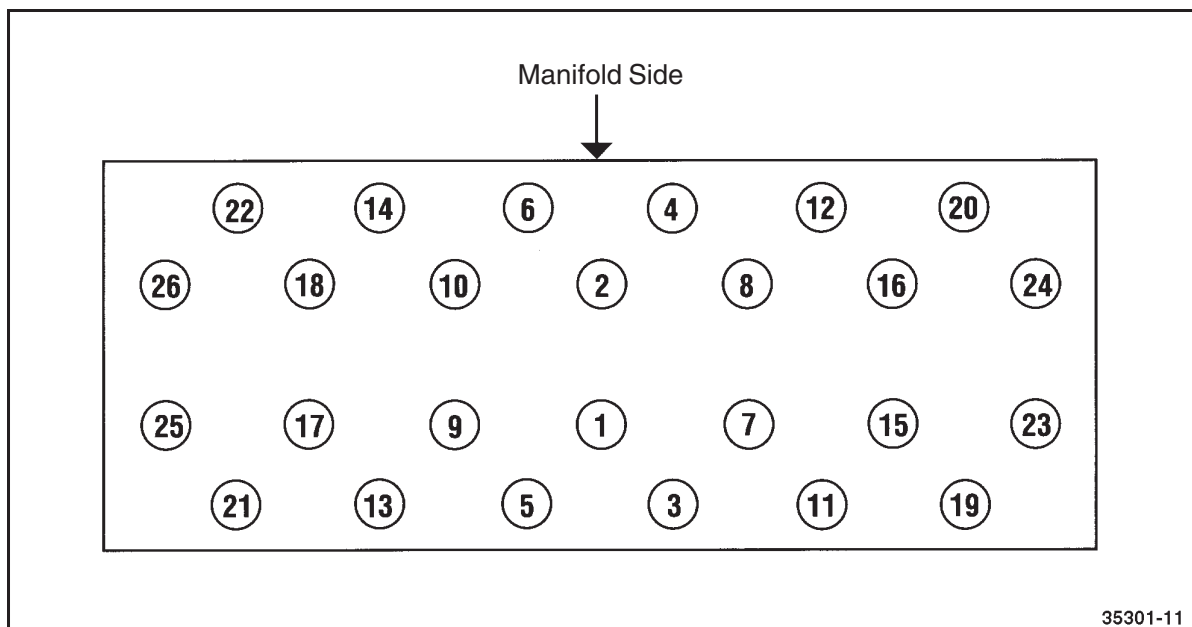
INSTALLING THE CYLINDER HEAD

NOTE: Sealing surfaces for cylinder head gaskets must be clean and free of oil. Pay attention to the fitting sleeve.

- Check the cylinder head for warping.
- Put the cylinder head in place.
- Check the cylinder head bolts for stretching, see "Visual check".
- Lightly the oil and screw in the cylinder head bolts.
NOTE: Use the cylinder head bolts no more than 5 times.
- Insert the push rods.
- Mount the rocker arm bracket.
- Slightly oil and screw in the long cylinder head bolts.

- Torque the cylinder head bolts as specified and according to the tightening sequence.
Pre-tightening: 1st step 30 Nm
 2nd step 80 Nm
Retightening: 90°

CYLINDER HEAD BOLT TIGHTENING SEQUENCE





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4.1.1.7 ADJUSTING THE BEGIN OF DELIVERY

If an injection pump must be replaced, the begin of delivery must be re-adjusted by determining the shim thickness anew.

DETERMINING THE SHIM THICKNESS

The old injection pump and shim are not required for this procedure.

NOTE: From 4/95, the mounting depth of the injection pump has been increased by 10 mm so that the EP code changes from 70 to 170 and the basic dimension L_0 of the injection pump from 109 mm to 119 mm.
The method of determining the thickness of the shims for the old versions remains the same.

Proceed as follows:

In the column marked "EP", read the EP code for cylinder 3 on the type plate on the rocker cover, e.g. 070 or 170 (reading sequence: line 1 = cylinder 1, line 2 = cylinder 2, etc.).

Mot. - Typ		Code	Mot. - Nr.	kw(G) red.	EP	K		0122 3189		
kw(G)	kw(S)	1/min	→*	kw(S) red.						
kw(W)				°C	070					
DEUTZ MOTOR Industriemotoren GmbH			MADE IN GERMANY	m						
Mot. - Typ		Code	Mot. - Nr.	kw(G) red.	EP	K				0122 3189
kw(G)	kw(S)	1/min	→*	kw(S) red.						
kw(W)				°C	170					
DEUTZ MOTOR Industriemotoren GmbH			MADE IN GERMANY	m						

35301-19