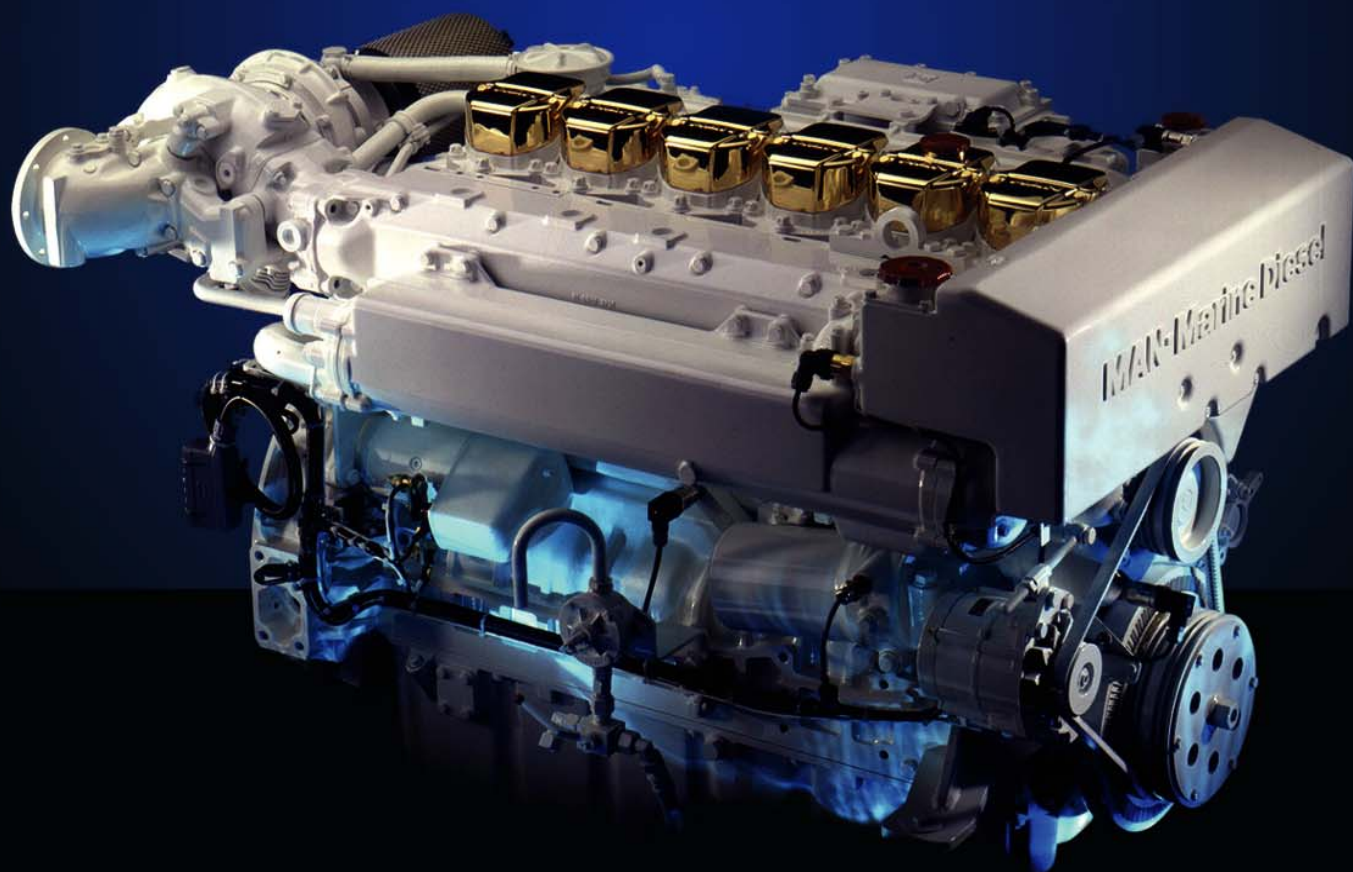


MAN marine Diesel engines Engineering ♦ Data ♦ Setting values



D 2876 LE 401 / 402 / 404 / 405



The purpose of this publication is to inform you about the checking values, setting data and technical details of MAN's 6-cylinder high-performance marine Diesel engines.

It is intended to serve as a basis for maintenance and repair.

Instructions

Important instructions which concern technical safety and protection of persons are emphasised as shown below.

**Danger:**

This refers to working and operating procedures which must be complied with so as not to endanger persons.

**Caution:**

This refers to working and operating procedures which must be complied with in order to prevent damage to or destruction of material.

**Note:**

Explanations that are useful for understanding the working or operating procedure to be performed.

MAN Nutzfahrzeuge Aktiengesellschaft
Nuremberg Works

We reserve the right to make technical modifications in the course of further development.

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Contents

Technical data	3
Checking and setting values	4
Filling capacities	6
Service Data	
Crankcase	7
Cylinder liner	7
Crankshaft	8
Flywheel	10
Conrods	12
Pistons	13
Cylinder head	14
Valve gear	16
Camshaft	17
Oil pump	18
Cooling system	19
Turbocharger	21
Fuel system	22
Starter motor	23
Alternator	23
V-belts / Powerband	24
Torque guide values	
New cylinder head seal and modified cylinder bush from March 2003	28
Retightening of the cylinder head bolts on engines up to 28.02.2003	28
Tightening the cylinder-head bolts following a repair	29
Retightening the cylinder-head bolts following a repair	29
Retightening of new and rebuilt engines from 01.03.2003	30
Tightening the cylinder-head bolts following a repair	31
Retightening the cylinder-head bolts following a repair	32
Index	33



Engine models D 2876 LE 401 / 402 / 404 / 405

Design	in-line
Cycle	4–stroke Diesel with turbocharger and intercooler
Number of cylinders	6
Compression ratio	
D 2876 LE 401 / 404	15 : 1
D 2876 LE 402 / 405	15,5 : 1
Bore	128 mm
Stroke	166 mm
Engine capacity	12 816 cm ³
Direction of rotation viewed from flywheel	anti clockwise
Firing sequence	1–5–3–6–2–4
Firing interval	120°
Max. engine output	
D 2876 LE 401	515 kW / 700 hp at 2200 rpm
D 2876 LE 402	412 kW / 560 hp at 2100 rpm
D 2876 LE 404	463 kW / 630 hp at 2200 rpm
D 2876 LE 405	537 kW / 730 hp at 2200 rpm
Lubrication	Pressure circulation
by	gear oil pump
Cooling	Fluid cooling
by	impeller pump
Coolant temperature	
before start of full load	60°C
normal	90°C
temporarily	95°C

Valve train

The checking values are valid for all engines listed in this publication

Valve clearance:

(when engine is cold)

Inlet	0.50 mm
Exhaust	0.60 mm

Valve clearance:

The individual valve train components expand slightly as they warm up. Valve clearance ensures that the valves close reliably and that an effective seal is formed even when the engine is warm.

Valve clearance too small:

The valves do not sit correctly on the valve seat inserts when closed and are therefore no longer able to conduct the heat to the cylinder head. In this situation the exhaust valves in particular are prone to burning because of the high thermal stress to which they are exposed as a result of the hot combustion gases which are constantly flowing past them.

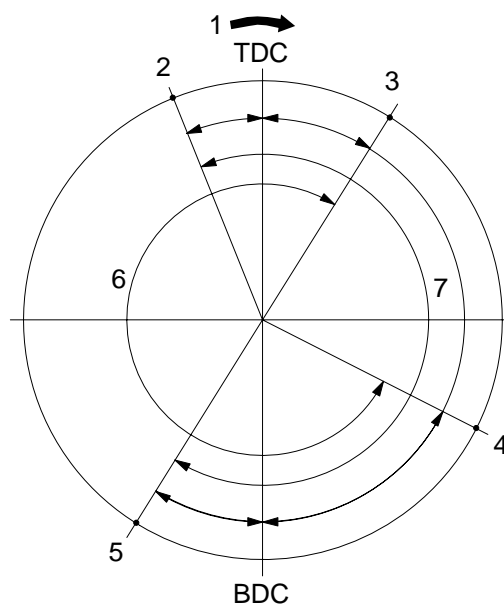
Valve clearance too large:

The valve opening cross-sections are reduced and cylinder charging is impaired. Valve train wear and valve noise is greatly increased.

Valve timing

- 1 = direction of engine rotation
- 2 = intake valve opens 23° before TDC
- 3 = exhaust valve closes 30° after TDC
- 4 = exhaust valve opens 60° before BDC
- 5 = intake valve closes 37° after BDC
- 6 = exhaust valve open for 270°
- 7 = intake valve open for 240°

The degrees specified refer to the crankshaft angle





Compression pressures

(Engine was run before measurement, warm to the touch)

good	bar	over 28
permissible	bar	25–28
in need of repair	bar	under 24
pressure difference (between the individual cylinders)	bar	max. 4

Fuel system

Delivery rate of fuel supply pump:

n = 2.200 rpm l/h 280

Opening pressure of overflow valve:

at injection pump bar 2.0–2.5

Lubricating system

Oil pump delivery rate:

The speeds are pump speeds.

Oil pump speed: Engine speed x 0.977 (i = 1.023).

Delivery rates with SAE 20 oil at 90°C and 6 bar oil pressure.

n = 585 rpm	l / min	42
n = 2.150 rpm	l / min	195

Valve opening pressures in lubricating oil circuit:

Bypass valve for oil filter

Opening pressure	bar	2
Pressure at maximum opening	bar	4
Relief valve on oil pump	bar	9–10

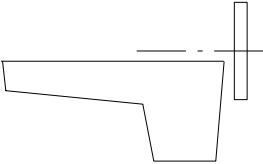
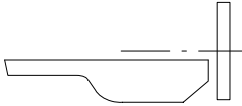
Pressure valve of the oil injection nozzles

Opening pressure	bar	1.9–2.1
Pressure at maximum opening	bar	1.4–1.6


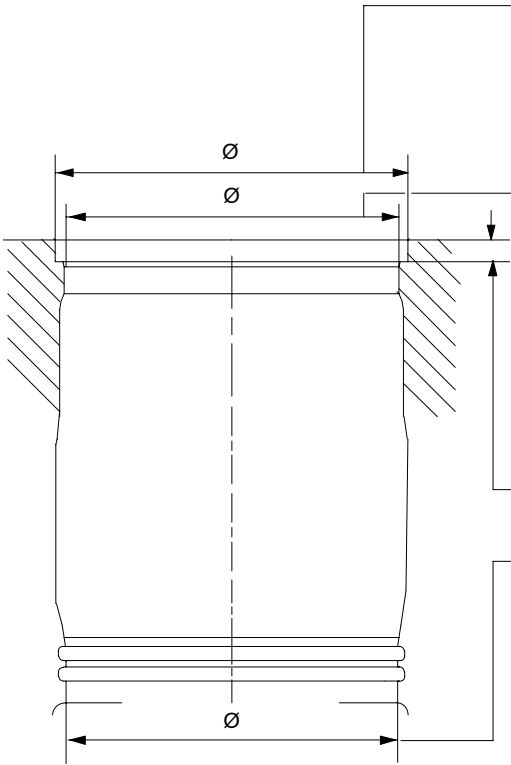
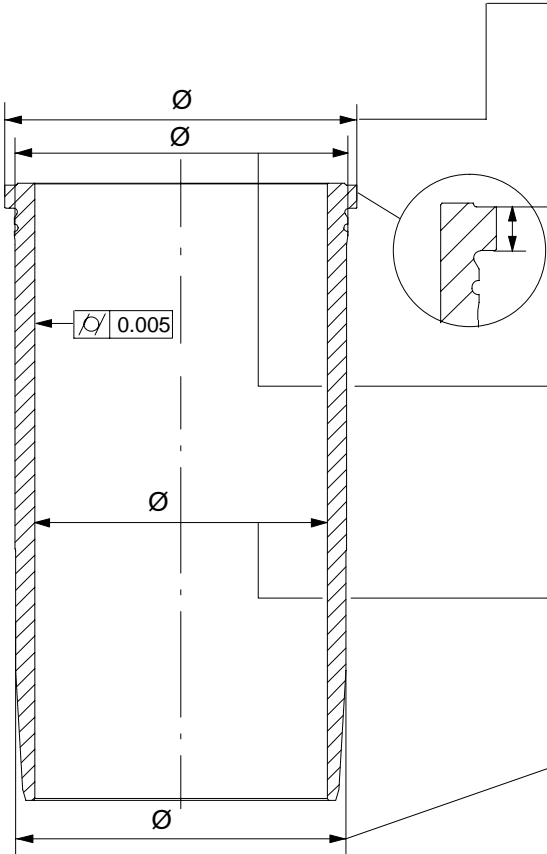
Filling capacities


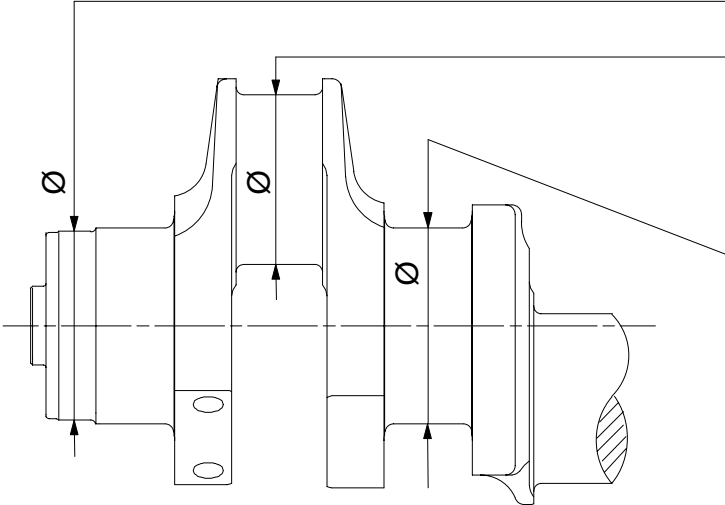
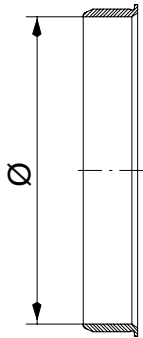
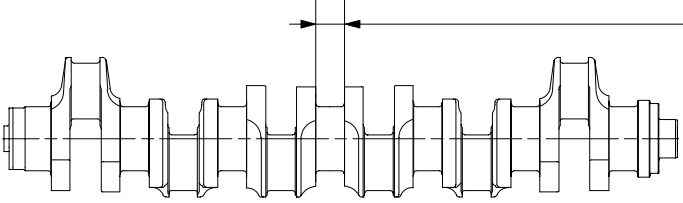



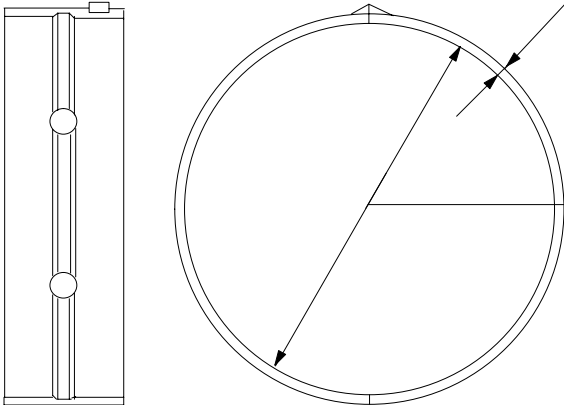
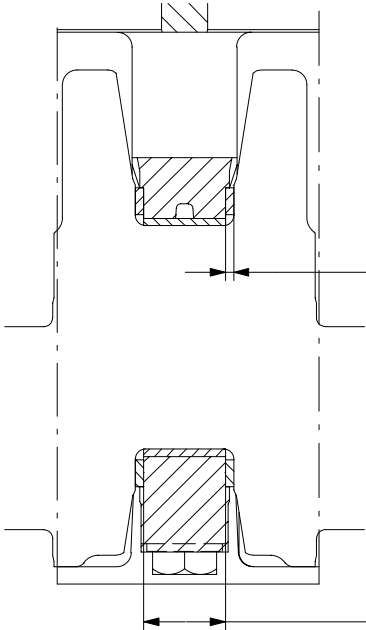
Oil filling capacities

Model	Oil pan		Min. capacity	Max. capacity
D 2876 L..	deep Sump FW*		26 l	30 l
D 2876 L..	flat		29 l	34 l

*FW = adjacent to flywheel

Service data	Dimensions Limit values	
<p>Crankcase</p> 	<p>Standard size: 153.90–153.94 mm for cylinder liners with 0.5 and 1.0 mm larger outside Ø: 154.40–154.44 mm</p> <p>standard size: 145.80–145.84 mm for cylinder liners with 0.5 mm larger out- side diameter: 146.30–146.34 mm for cylinder liners with 1.0 mm larger out- side diameter: 146.80–146.84 mm</p> <p>9.955–10.025 mm</p> <p>Standard size: 144.50–144.54 mm for cylinder liners with 0.5 mm larger out- side diameter: 145.00–145.04 mm for cylinder liners with 1.0 mm larger out- side diameter: 145.50–145.54 mm</p>	
<p>Cylinder liner</p> 	<p>Standard size: 153.694–153.757 mm with 0.5 and 1.0 mm larger outside diameter: 154.194–154.257 mm</p> <p>Standard size: 10.05–10.07 mm with 0.5 mm more flange height: 10.55–10.57 mm Liner protrusion above upper deck of crankcase: 0.03–0.08 mm</p> <p>Standard size: 145.761–145.786 mm with 0.5 mm larger outside diameter: 146.261–146.286 mm with 1.0 mm larger outside diameter: 146.761–146.786 mm</p> <p>127.990–128.010 Max. wear limit: 0.15 mm below base dimension</p> <p>Standard size: 144.432–144.457 mm with 0.5 mm larger outside diameter: 144.932–144.957 mm with 1.0 mm larger outside diameter: 145.432–145.457 mm</p>	

Service data	Dimensions Limit values	
Crankshaft		
Crankshaft front end (opposite end to flywheel) 	<p>99.985–100.020 mm</p> <p>Standard size: 89.98–90.00 mm undersize –0.25: 89.73–89.75 mm undersize –0.50: 89.48–89.50 mm undersize –0.75: 89.23–89.25 mm undersize –1.00: 88.98–89.00 mm</p> <p>Standard size: 103.98–104.00 mm undersize –0.25: 103.73–103.75 mm undersize –0.50: 103.48–103.50 mm undersize –0.75: 103.23–103.25 mm undersize –1.00: 102.98–103.00 mm</p>	
Bearing race for crankshaft, front end 	<p>Inner diameter: 99.907–99.942 mm</p>	
Thrust bearing journal 	<p>Standard size: 46.000–46.062 mm undersize: –0.25 and –0.50: 46.500–46.562 mm –0.75 and –1.00: 47.000–47.062 mm</p>	

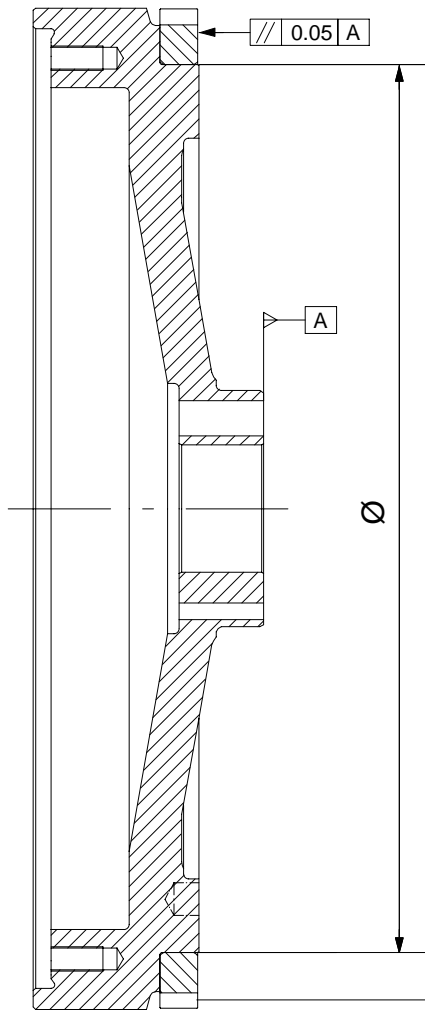
Service data	Dimensions Limit values	
<p>Main bearing</p> 	<p>Standard size: 3.466–3.478 mm undersize –0.25: 3.591–3.603 mm undersize –0.50: 3.716–3.728 mm undersize –0.75: 3.841–3.853 mm undersize –1.00: 3.966–3.978 mm</p> <p>Internal bearing \varnothing when fitted: Standard size: 104.060–104.106 mm undersize –0.25: 103.810–103.856 mm undersize –0.50: 103.560–103.606 mm undersize –0.75: 103.310–103.356 mm undersize –1.00: 103.060–103.106 mm</p> <p>Spread: 0.3–1.2 mm</p> <p>Marking: top / bottom standard: 0005 / 0006 undersize –0.25: 0011 / 0012 undersize –0.50: 0013 / 0014 undersize –0.75: 0015 / 0016 undersize –1.00: 0017 / 0018</p>	
	<p>Permissible axial clearance of crankshaft: 0.200–0.401 mm</p> <p>Thrust bearing width (thrust washer): Standard size: 3.350–3.400 mm Repair stage 1: 3.600–3.650 mm Repair stage 2: 3.850–3.900 mm</p> <p>38.961–39.000 mm</p>	

Service data

Dimensions
Limit values



Flywheel



Ø Flywheel:
432.490–432.645 mm
Internal gear ring Ø:
432.000–432.155 mm

Interference: 0.335–0.645 mm
Installation temperature: 200–230°C

$m = 52.3 \text{ kg}$ (with gear ring)
 $J = 1.975 \text{ kgm}^2$

Number of teeth: $Z = 160$, module 3
Matching gear: Starter pinion ($Z = 9$)

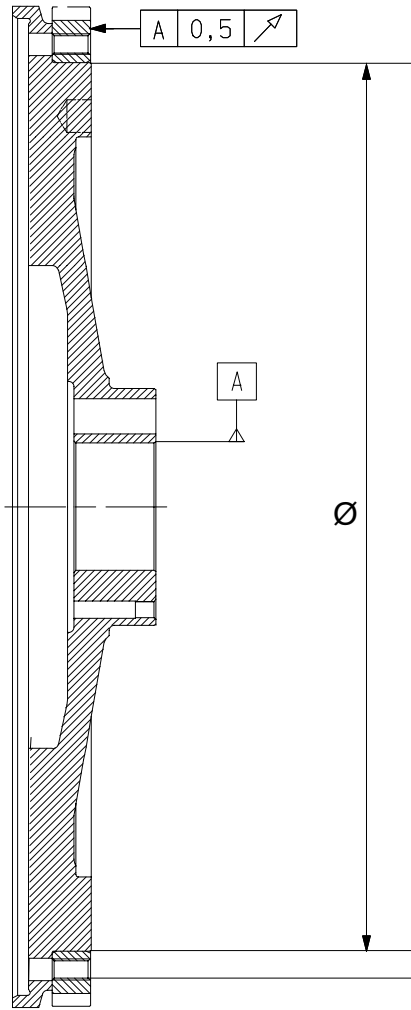
Backlash: 0.6–0.9 mm

Service data

**Dimensions
Limit values**



Flywheel



Ø Flywheel:
432.490–432.645 mm
Internal gear ring Ø:
432.000–432.155 mm

Interference: 0.335–0.645 mm
Installation temperature: 200–230°C

m = 32.5 kg (with gear ring)
J = 1.10 kgm²

Number of teeth: Z = 160, module 3
Matching gear: Starter pinion (Z = 9)

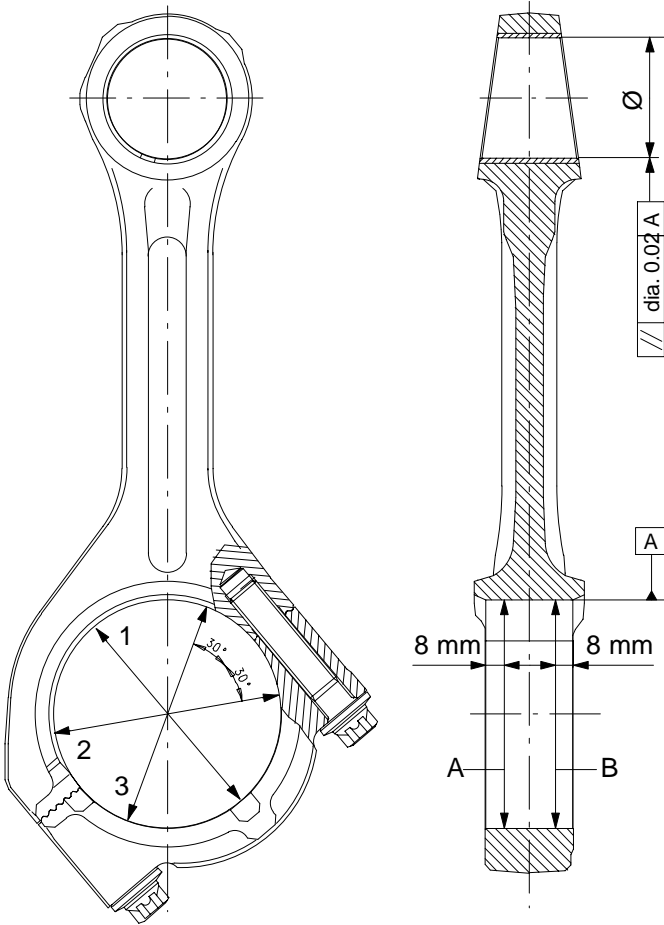
Backlash: 0.6–0.9 mm

Service data

Dimensions
Limit values



Conrods



50.055–50.065 mm

Conrods which are discoloured at the big end must not be re-installed.

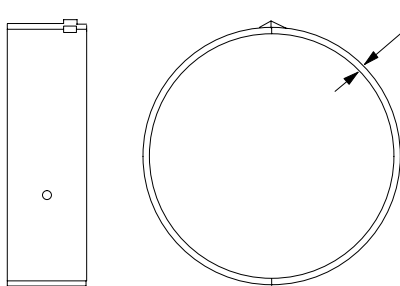
Bearing bore in measuring directions 1, 2 and 3 and in measuring planes a and b:

90.044–90.086 mm

Edge condition:

New conrod bearing in place,
conrod assembled

Conrod bearings



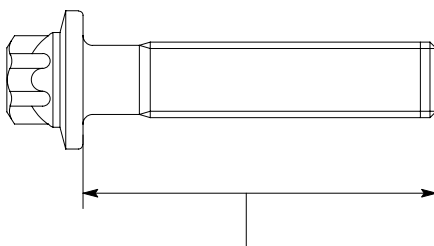
Standard size:	2.468–2.478 mm
undersize –0.25:	2.593–2.603 mm
undersize –0.50:	2.718–2.728 mm
undersize –0.75:	2.843–2.853 mm
undersize –1.00:	2.968–2.978 mm

Spread: 0.6–1.5 mm

If signs of wear are present (scores, anti-wear coating damaged), replace both bearing shells.


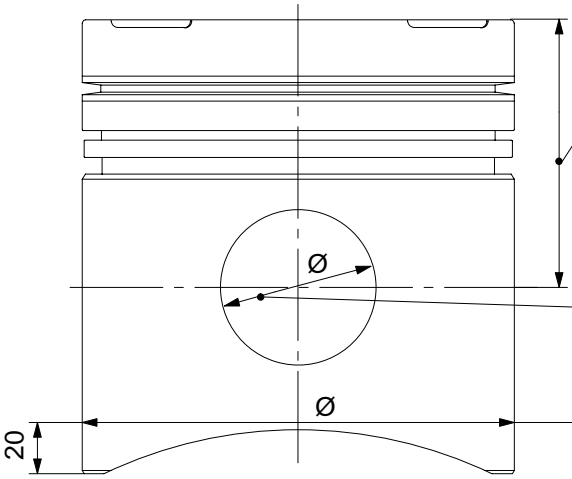
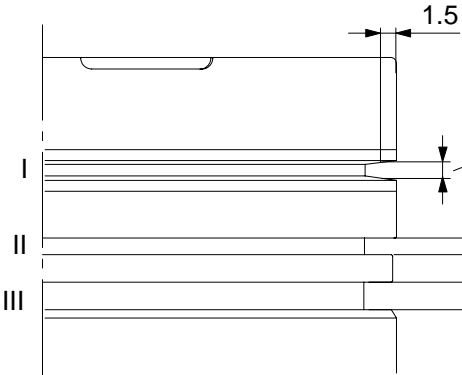
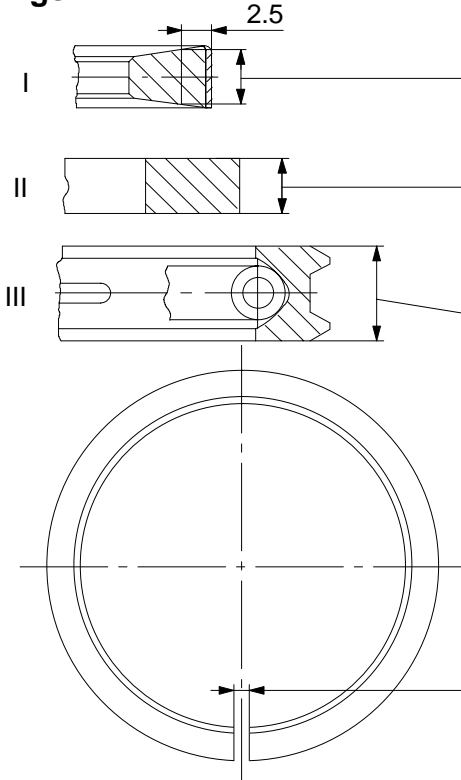
Important: Note installation position (upper half bearing shell has red mark on the side)

Connecting rod bolts



Length With each tightening, the bolts are deliberately stressed beyond the stretch limit and each tightening thus extends their length permanently.

Torx bolt M14x1.5

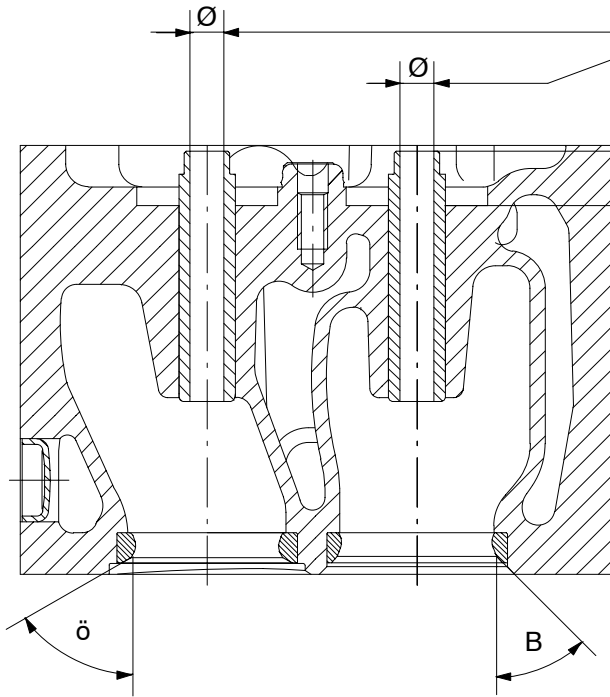
Service data	Dimensions Limit values							
<p>Pistons</p> 	<p>Compression height: 79.20–79.25 mm with undersize:</p> <table border="0"> <tr> <td>0.2 mm</td> <td>79.00–79.05 mm</td> </tr> <tr> <td>0.4 mm:</td> <td>78.80–78.85 mm</td> </tr> <tr> <td>0.6 mm:</td> <td>78.60–78.65 mm</td> </tr> </table> <p>Piston protrusion above crankcase top: 0.013–0.331 mm</p> <p>50.01–50.018 mm</p> <p>Piston pin diameter: 49.994–50.0 mm</p> <p>127.855–127.895 mm</p> <p>Max. difference in weight per engine piston set: 100g</p>	0.2 mm	79.00–79.05 mm	0.4 mm:	78.80–78.85 mm	0.6 mm:	78.60–78.65 mm	
0.2 mm	79.00–79.05 mm							
0.4 mm:	78.80–78.85 mm							
0.6 mm:	78.60–78.65 mm							
<p>Piston ring grooves</p> 	<p>3.47–3.50 mm</p> <p>3.05–3.07 mm</p> <p>4.02–4.04 mm</p>							
<p>Piston rings</p> 	<p>1st ring – keystone ring Height: 3.296–3.330 mm</p> <p>2nd ring – Minute ring: Height: 2.97–3.0 mm Axial clearance: 0.05–0.10 mm</p> <p>3rd ring – bevelled ring Height: 3.975–3.990 mm Axial clearance: 0.03–0.065 mm</p> <p>Ring gap:</p> <table border="0"> <tr> <td>1st ring:</td> <td>0.5–0.7 mm</td> </tr> <tr> <td>2nd ring:</td> <td>0.7–0.9 mm</td> </tr> <tr> <td>3rd ring:</td> <td>0.25–0.55 mm</td> </tr> </table>	1st ring:	0.5–0.7 mm	2nd ring:	0.7–0.9 mm	3rd ring:	0.25–0.55 mm	
1st ring:	0.5–0.7 mm							
2nd ring:	0.7–0.9 mm							
3rd ring:	0.25–0.55 mm							

Service data

Dimensions
Limit values



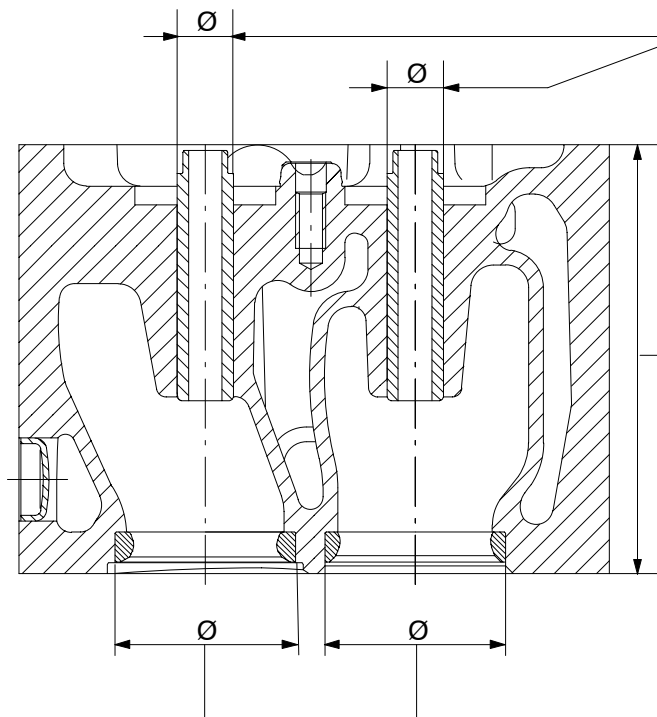
Cylinder head



9.000–9.015 mm

14.1–14.5 mm


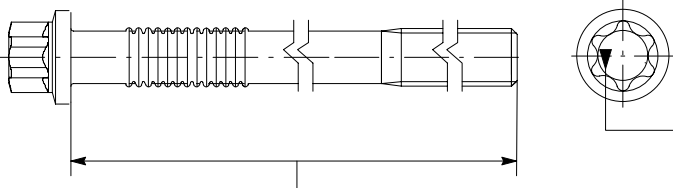
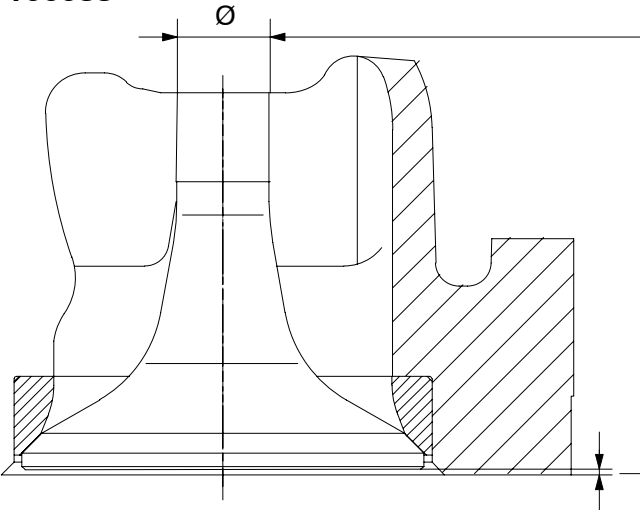
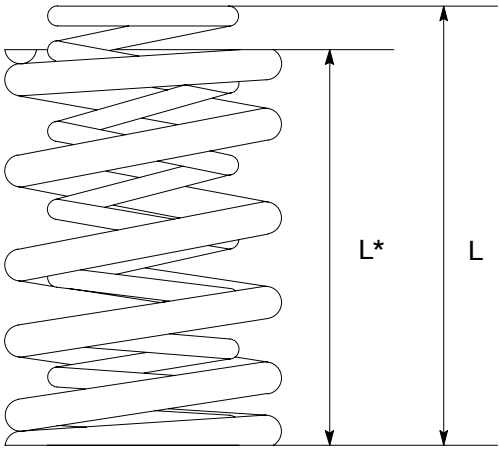
Intake valve $\varphi = 60^\circ$
Exhaust valve $\beta = 45^\circ$


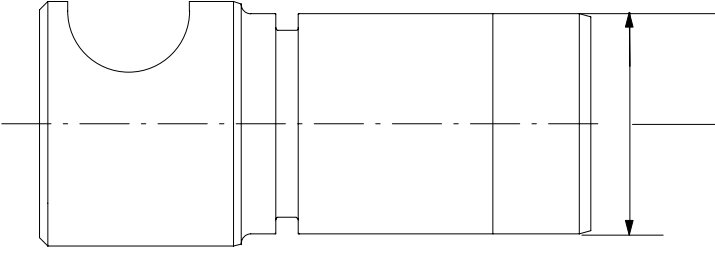
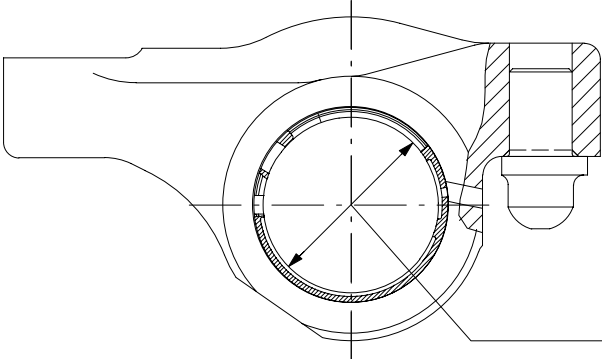



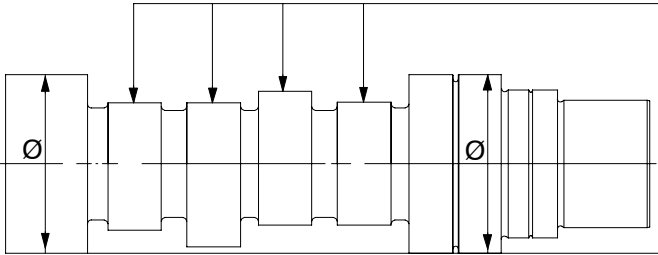
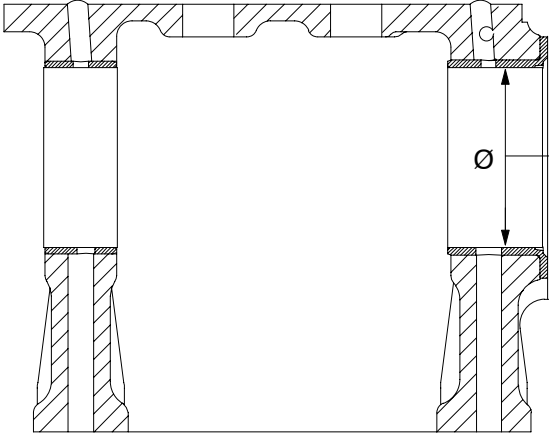
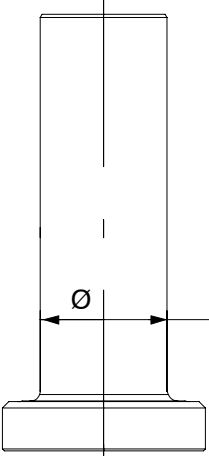
Bore in cylinder head for
valve guide:
15.000–15.018 mm
External diameter of valve guide:
15.028–15.046 mm


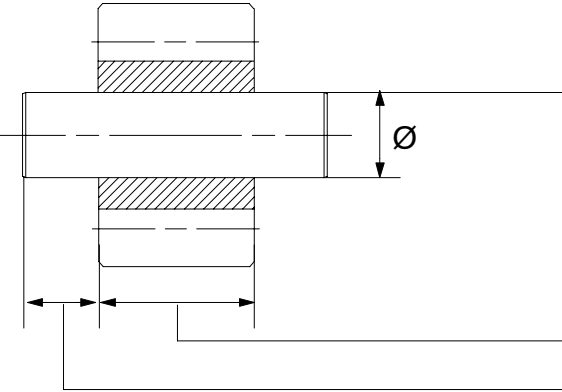
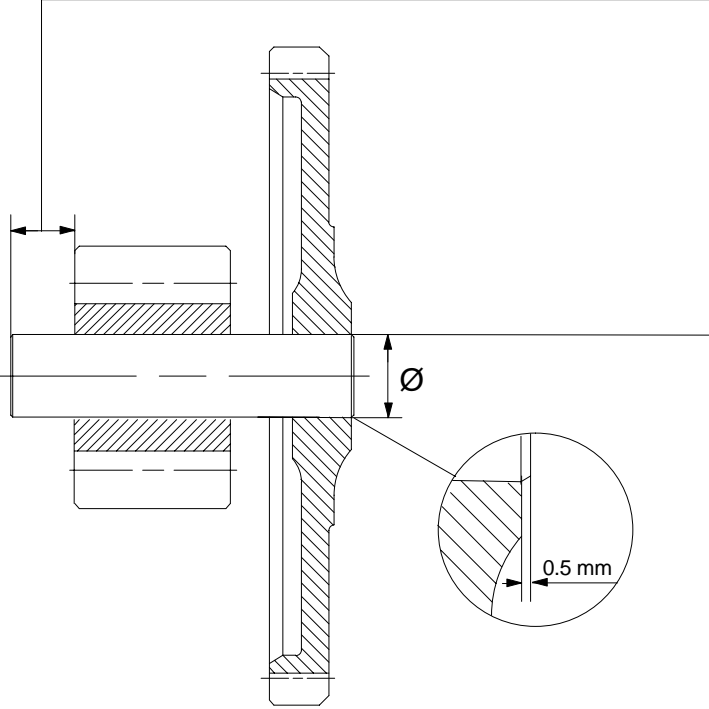
Standard size: 114–114.2 mm
(observe specified dimensions for injector
projection and valve recess)


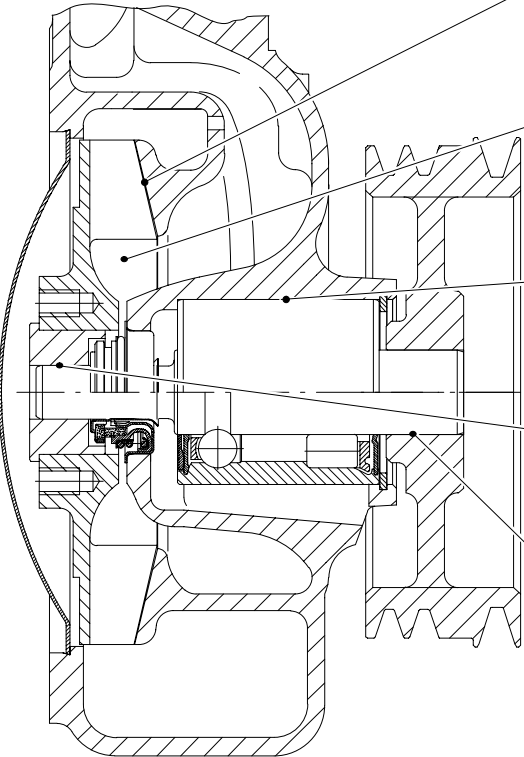
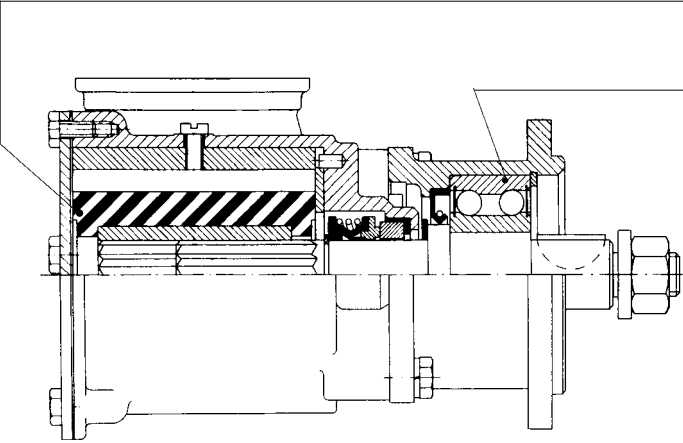
Bore in cylinder head:
48.00–48.025 mm
External diameter of valve seat ring:
48.10–48.11 mm

Service data	Dimensions Limit values	
<p>Cylinder head bolts</p> 	<p>Length With each tightening, the bolts are deliberately stressed beyond the stretch limit and each tightening thus extends their length permanently. When the bolt has reached its maximum length, it must not be re-used.</p> <p>Angle of rotation symbol</p> <p>51.90490-0041 / 0070: new: 259-259.5 mm, max. 261.5 mm 51.90490-0042 / 0071: new: 197.5-198 mm, max. 200 mm</p>	
<p>Valve recess</p> 	<p>Intake valve: 8.963-8.977 mm Exhaust valve: 8.95-8.964 mm</p> <p>Valve recess: 0.80 mm</p>	
<p>Valve springs</p> 	<p>Inner spring: Free length (L), approx. 64.8 mm Spring force at L = 38 mm: 142-158 N Spring force at L = 26 mm: 213-239 N</p> <p>Outer spring: Free length (L*), approx. 63.3 mm Spring force at L* = 45 mm: 410-470 N Spring force at L* = 33 mm: 714-790 N</p> <p>The lowest spring force is at the same time the wear limit value.</p>	

Service data	Dimensions Limit values	
Valve gear		
Rocker arm shaft 	27.961–27.97 mm	
Rocker arm 	28.005–28.021 mm Rocker arm radial clearance: 0.035–0.06 mm	

Service data	Dimensions Limit values	
<p>Camshaft</p> 	<p>Replace if signs of wear are present</p> <p>Camshaft axial clearance: 0.20–0.90 mm</p> <p>Wear limit: 1.5 mm</p> <p>69.910–69.940 mm</p> <p>Backlash: Crankshaft gear and camshaft gear: 0.128 mm–0.252 mm</p>	
<p>Camshaft bearing</p> 	<p>70.000–70.030 mm</p>	
<p>Valve tappet</p> 	<p>Matching bore in crankcase: 20.000–20.021 mm</p> <p>19.944–19.965 mm</p>	

Service data	Dimensions Limit values	
Oil pump		
Oil pump gear 	Shaft: 21.930–21.940 mm Bore in housing lid: 22.000–22.021 mm Radial clearance: 0.060–0.091 mm Housing depth: 28.000–28.033 mm Gear axial clearance: 0.040–0.106 mm 27.927–27.960 mm 14.5–14.7 mm	
Drive wheel with oil pump gear 	14.5–14.7 mm Shaft: 21.930–21.940 mm Bore in drive gear: 21.870–21.885 mm Press on force: 12.000 N Backlash: Drive wheel and crankshaft wheel: 0.099–0.451 mm	

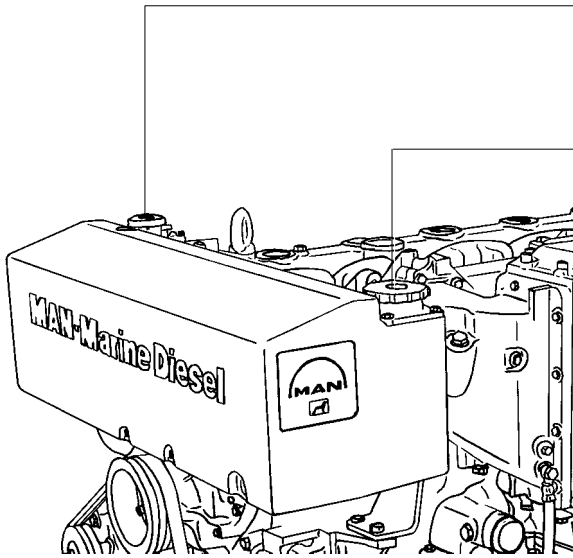
Service data	Dimensions Limit values	
Cooling system		
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p data-bbox="220 297 438 331">Coolant pump</p>  </div> <div style="width: 50%;"> <p data-bbox="978 353 1316 387">Gap: 0.7–0.8 mm</p> <p data-bbox="978 510 1348 544">Ø impeller: 149.5–150 mm</p> <p data-bbox="978 689 1444 813"> Bearing seat in housing: 54.940–54.970 mm Ø of bearing: 54.981–54.994 mm Interference: 0.011–0.054 mm </p> <p data-bbox="978 869 1412 1025"> Bore for bearing shaft in impeller: 16.008–16.010 mm Ø of bearing shaft: 16.043–16.056 mm Interference: 0.033–0.048 mm </p> <p data-bbox="978 1070 1444 1193"> Hub bore: 25.007–25.020 mm Ø of bearing shaft : 25.048–25.061 mm Interference: 0.028–0.054 mm </p> </div> </div>		
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p data-bbox="220 1305 710 1339">Raw water pump 51.06500-7026</p>  </div> <div style="width: 50%;"> <p data-bbox="978 1368 1476 1429">If impeller is worn, replace it together with seals (repair kit)</p> <p data-bbox="978 1458 1444 1518">If wear in the bearing can be felt (air in bearing), replace the bearing</p> <p data-bbox="978 1547 1332 1608">Speed of raw water pump: 1.53 x engine speed (i=0.65)</p> </div> </div>		

Service data

Dimensions
Limit values



Cover for heat exchanger



Working valve opens at
0.85–1.15 bar overpressure
0.02–0.08 bar negative pressure

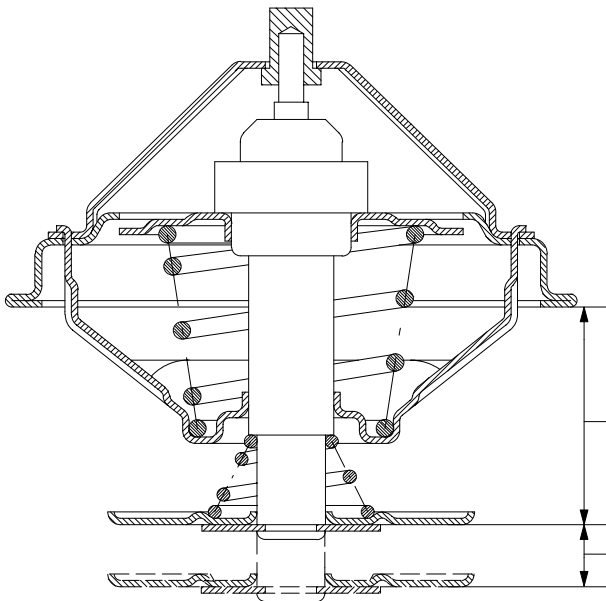
Valve cap:
Safety valve opens at
1.3–1.7 bar overpressure
(pressure: 1.5 LR1103)

Warning:
When opening the cap with the working
valve there is a risk that it may remain
non-tight after it has been closed again.

The overpressure required in the cooling
system no longer builds up. Premature
boiling occurs and coolant is lost.

To prevent damage to the engine, this cap
should only be opened in exceptional cir-
cumstances and then replaced with a new
one.

Thermostat



Opening begins at: 83°C ($\pm 2^\circ$)
Fully open: 95°C

(The temperature for the start of opening
is printed on the thermostat)

24.5–25.8 mm

Lift at least 8 mm at 95°C

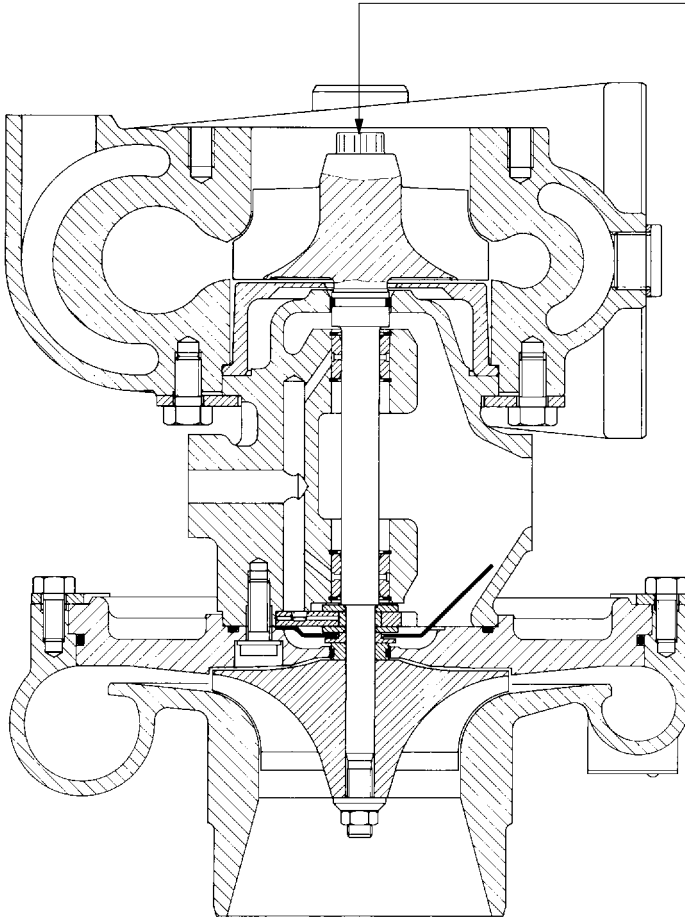
Service data

Dimensions
Limit values



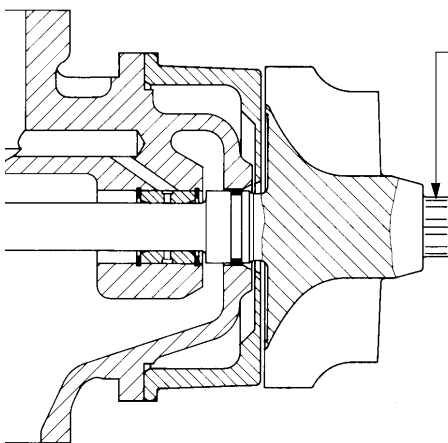
Turbocharger

Axial clearance


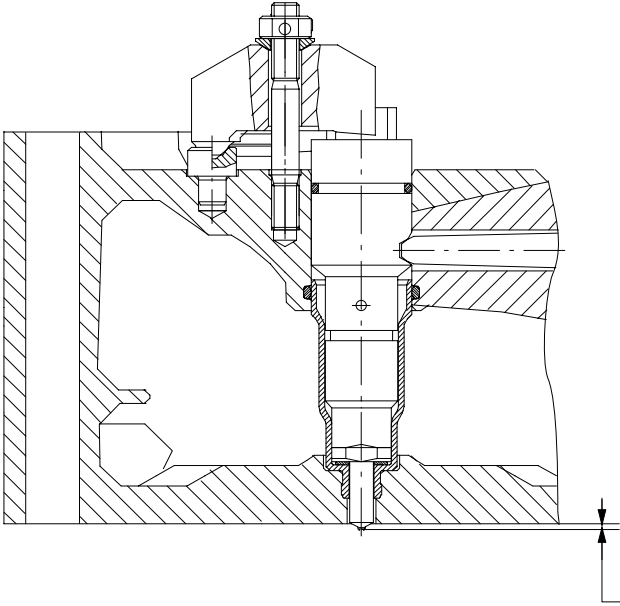



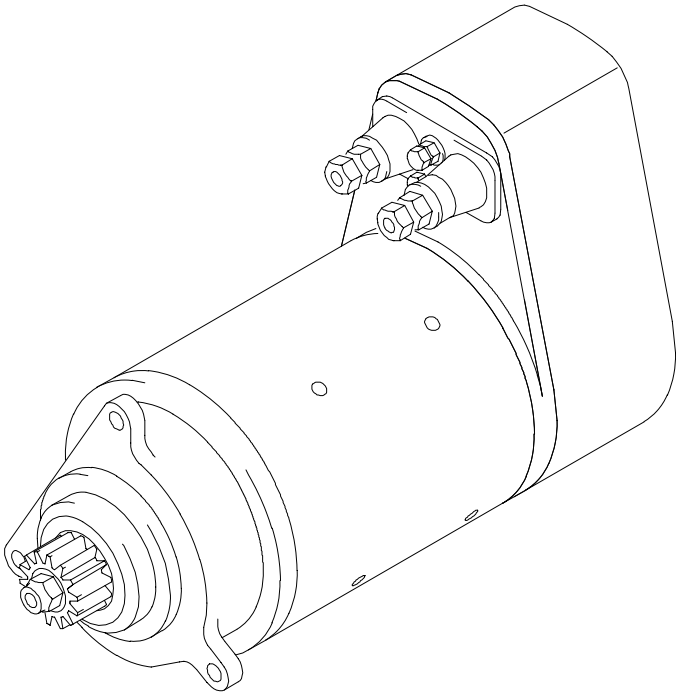
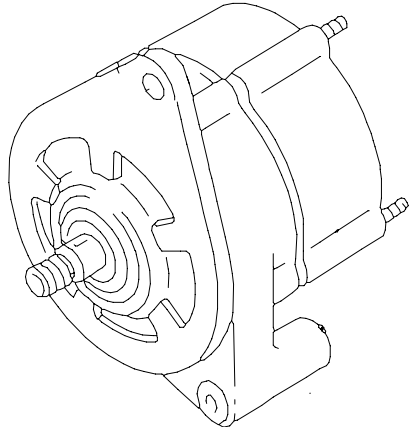
Axial clearance max. 0.16 mm
for turbochargers KKK K36 and all en-
gines D 2876 LE 4..

Radial clearance



Radial clearance max. 0.58 mm
for turbochargers KKK K36 and all en-
gines D 2876 LE 4..

Service data	Dimensions Limit values	
Fuel system Injection nozzles		
Manufacturer	Bosch	
Type of injector	DLLA 154 P 945	
Number of holes	6	
Opening pressure of injector New nozzle holder: Used nozzle holder:	320+8 bar	
Projection above cylinder head contact surfaces 		
Injection pump	Bosch control-slide pump RP 39 Governor Bosch-EDC MS 5	
Start of delivery		
Model	Crank angle before TDC	
D 2876 LE 401 up to engine no ... 9838 999	$7.5^{\circ} \pm 0.5^{\circ}$	
D 2876 LE 401 engine no. and up ... 9839 001	$8^{\circ} \pm 0.5^{\circ}$	
D 2876 LE 402	$6^{\circ} \pm 0.5^{\circ}$	
D 2876 LE 404 / 405	$8^{\circ} \pm 0.5^{\circ}$	

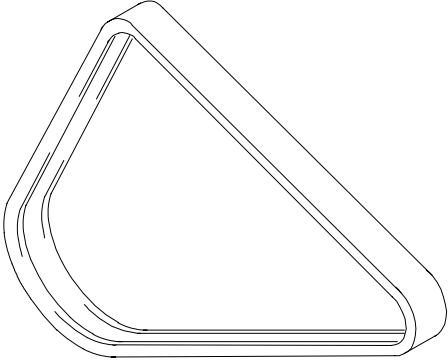
Service data	Dimensions Limit values	
<p>Starter motor</p> 	<p>Manufacturer: Bosch Type: KB Operating method: splined shaft</p> <p>Starter motor pinion: Number of teeth: Z = 9 Module: 3</p> <p>Nominal power: 5.4 kW Nominal voltage: 24 V</p>	
<p>Alternator</p> 	<p>Manufacturer: Bosch Type: N1 Type: 2-pole, insulated Operation method: Threephase current Voltage: 28 V Max. current: 55 A</p>	

Service data

Dimensions
Limit values



V-belts / Powerband



Replace damaged V-belts (cracks, wear, oil)

Measuring tension with tension tester

Belt width	Tensioning forces according to the kg graduation on the tester		
	New installation		When servicing after long running time
	Installation	After 10 min. running time	
2/3VX	90-100	70-80	60

Note:

All screw connections, the purpose of which is not stated in the following table, are to be tightened in accordance with the guide values in our company standard M 3059 (see page 27). Fit the bolts slightly oiled!

Screw plugs

DIN 908

M14x1.5, M16x1.5	80 Nm
M18x1.5, M22x1.5	100 Nm
M24x1.5, M26x1.5	120 Nm
M30x1.5	150 Nm

DIN 7604

AM10x1, M12x1.5	50 Nm
AM14x1.5	80 Nm

Crankcase, crankshaft drive

Gear case to crankcase M14, 12.9	225 Nm
Gear case to crankcase M10, 12.9	75 Nm
Inspection port cover to gear case M8, 12.9	40 Nm
Inspection port cover to gear case M8, 8.8	10 Nm
Crankshaft bearing caps to crankcase M18x2	
Initial torque	300–330 Nm
Angle tightening	90–100°
Vibration damper to crankshaft M16x1.5, 12.9	260 Nm
Flywheel to crankshaft M16x1.5	
Initial torque	100–110 Nm
1st angle tightening	90–100°
2nd angle tightening	90–100°
Connecting rod bearing caps M14x1.5	
Initial torque	100–110 Nm
Angle tightening	90 to 100°

Cylinder head

Tightening / retightening the cylinder-head bolts, see page 28

Lubrication system

Oil pump to crankcase M8, 8.8	22 Nm
Cover oil pump M8, 8.8	22 Nm
Oil cooler to oil filter head M8, 8.8	22 Nm
Filter box to oil filter head M8, 10.9	50 Nm
Oil pan to crankcase	22 Nm
Oil drain plug to oil pan M26x1.5	80 Nm
Oil jet flange to crankcase M14x1.5	70 Nm

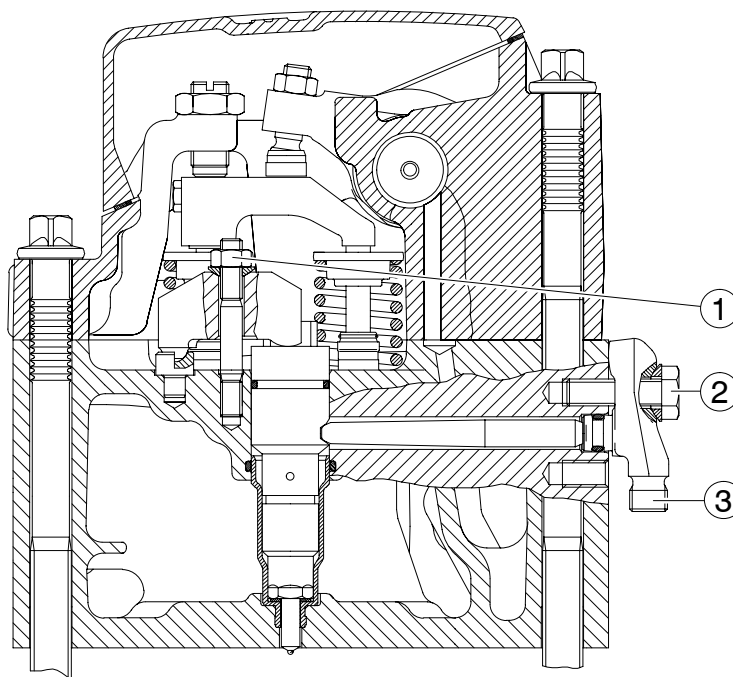
Exhaust / intake manifold

Exhaust manifold to intermediate plate M10	45 Nm
Exhaust manifold to intermediate plate M8	22 Nm
Intermediate plate to cylinder head M10	
Initial torque	60 Nm
Angle tightening	90°
Intake pipe to cylinder head M8, 8.8	22 Nm

Fuel system

Assembly sequence for injector and injection line:

- | | |
|--|-------|
| 1. Collar nut for injector retainer ①, initial torque | 10 Nm |
| 2. Injection line ③, initial torque | 10 Nm |
| 3. Mounting bolt for connector to injection line ②, initial torque | 10 Nm |
| 4. Collar nut for injector retainer ① | |
| Initial torque | 25 Nm |
| Rotation angle | 90° |
| 5. Mounting bolt for connector to injection line ② | |
| Final torque | 20 Nm |
| Rotation angle | 90° |
| 6. Injection line ③ | |
| Rotation angle for first installation | 60° |
| Rotation angle for assembly sequence | 30° |
| 7. Collar nut for injector retainer ① | |
| Rotation angle | 45° |
| Let engine warm up | |
| Rotation angle | 90° |



Starter / alternator

- | | |
|------------------------------------|----------|
| Starter to crankcase M12x1,5 | 80 Nm |
| V-belt pulley on alternator | 40–50 Nm |

Torque guide values



Installation tightening torques according to company standard M 3059

Bolts / nuts with external or internal hexagon, head without collar or flange

Thread size x pitch	Grades / tightening torques in Nm		
	for 8.8 / 8	for 10.9 / 10	for 12.9 / 12
M4	2.5	4.0	4.5
M5	5.0	7.5	9.0
M6	9.0	13.0	15.0
M7	14.0	20.0	25.0
M8	22.0	30.0	35.0
M8x1	23.0	35.0	40.0
M10	45.0	65.0	75.0
M10x1.25	45.0	65.0	75.0
M10x1	50.0	70.0	85.0
M12	75.0	105.0	125.0
M12x1.5	75.0	110.0	130.0
M12x1.25	80.0	115.0	135.0
M14	115.0	170.0	200.0
M14x1.5	125.0	185.0	215.0
M16	180.0	260.0	310.0
M16x1.5	190.0	280.0	330.0
M18	260.0	370.0	430.0
M18x2	270.0	290.0	450.0
M18x1.5	290.0	410.0	480.0
M20	360.0	520.0	600.0
M20x2	380.0	540.0	630.0
M20x1.5	400.0	570.0	670.0
M22	490.0	700.0	820.0
M22x2	510.0	730.0	860.0
M22x1.5	540.0	770.0	900.0
M24	620.0	890.0	1040.0
M24x2	680.0	960.0	1130.0
M24x1.5	740.0	1030.0	1220.0

New cylinder head seal and modified cylinder bush from March 2003

From March 2003 the cylinder bush, the upper seal on the cylinder bush, the cylinder head seal and the torque regulations on various series D 2876 four valve engines without Common Rail have been modified as standard.



Note:

To aid recognition, these engines do not have the sticker “First retightening of cylinder-head bolts completed” on one of the valve caps.

Retightening of the cylinder head bolts on engines up to 28.02.2003

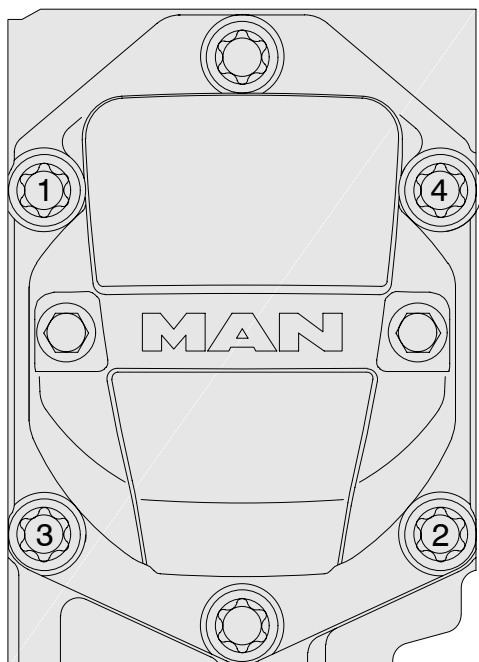
(Engine cold or warm)

Erster Nachzug der Zylinderkopfschrauben erledigt

First retightening of cylinder-head-bolts completed

Spare part no. 51.97801-0211

Intake side



Exhaust side

Tightening schedule “1”

Zweiter Nachzug der Zylinderkopfschrauben erledigt

Second retightening of cylinder-head-bolts completed

Spare part no. 51.97801-0212

The cylinder heads are fitted with cylinder-head bolts for rotation angle tightening. On new engines, the cylinder-head bolts are retightened at the factory after running in and marked by the sticker “**First retightening of cylinder-head bolts ...**” on a cylinder head cover.

After the first 400 hours of operation, tighten the cylinder-head bolts 1 – 4 in the order specified in tightening schedule “1” by 90° (1/4 turn).

The two outer bolts (intake and exhaust side) must not be retightened.

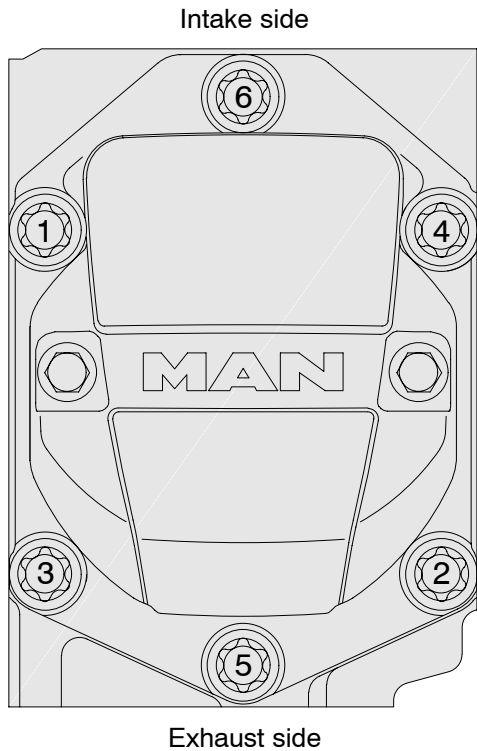


Note:

The cylinder-head bolts to be retightened must not be loosened; they are to be tightened further from their current position by 90° (1/4 turn).

Remove the sticker “**First retightening of the cylinder-head bolts ...**” and attach the sticker “**Second retightening of the cylinder-head bolts ...**” to verify the second retightening.

Tightening the cylinder-head bolts following a repair (engine cold)



Tightening schedule "2"

Before inserting the cylinder head bolts, apply engine oil to the threads (not the tapped holes) and "Optimoly White T" installation past to the bolt head contact faces. Do not use oils or oil additives containing MoS₂. The bolts are to be tightened using the rotation angle method according to tightening schedule "2" as follows.

- 1st pretightening = to 10 Nm
- 2nd pretightening = to 80 Nm
- 3rd pretightening = to 150 Nm
- 4th pretightening = 90°
- Final tightening = 90°

Set the valve clearance.



Note:

When the head has been removed, the cylinder head gasket must always be replaced.

Retightening the cylinder-head bolts following a repair (Engine cold or warm)

After the first 10 to 20 hours of operation, following a repair, retighten the cylinder-head bolts in the order specified in tightening schedule "2" by 90° (1/4 turn).

The cylinder-head bolts to be retightened must not be loosened; they are to be tightened further from their current position by 90° (1/4 turn).

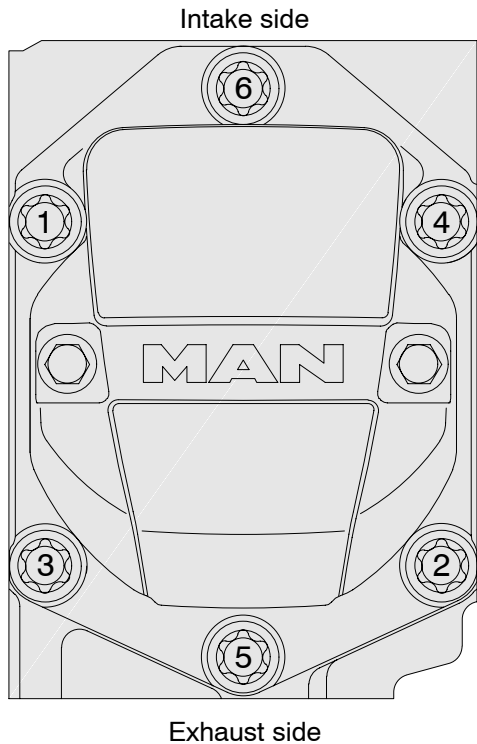
Attach the sticker "**First retightening of cylinder-head bolts ...**" (remove sticker that might already be attached).

After the first 400 hours of operation, following a repair, tighten cylinder-head bolts 1 to 4 in the order specified in tightening schedule "1" by another 90° (1/4 turn).

The two outer bolts (intake and exhaust side) must not be retightened.

Attach sticker "**Second retightening of cylinder-head bolts ...**".

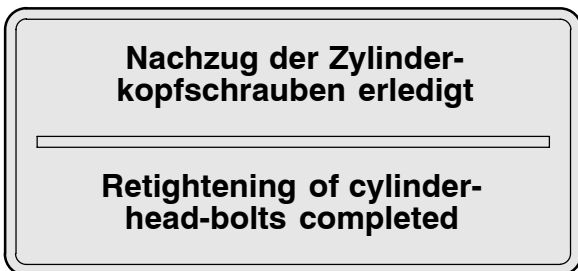
Retightening of new and rebuilt engines from 01.03.2003



On engines which have modified cylinder liners, the cylinder-head bolts are no longer retightened at the factory.

Therefore the “First retightening of cylinder-head bolts completed” sticker is omitted

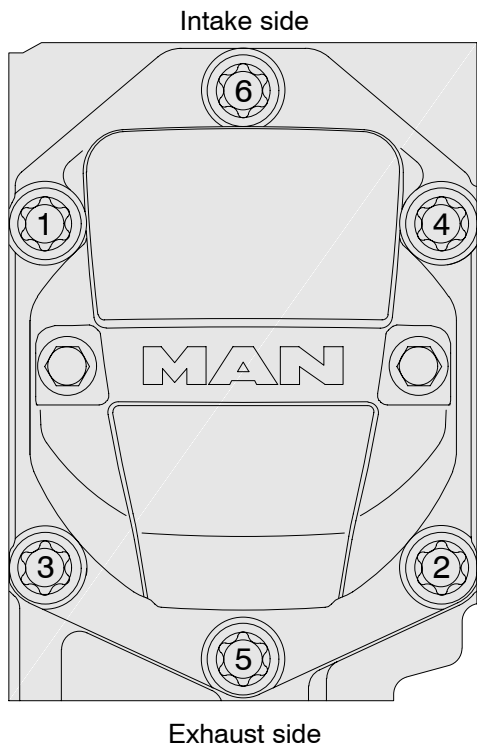
After 400 hours of operation, retighten the cylinder-head bolts by 90° (1/4 turn) in accordance with the tightening schedule on the left without loosening them first.



Following successful tightening, attach the “**Retightening of cylinder-head bolts completed**” sticker to one of the valve caps.

Spare part no. 51.97801-0315

Tightening the cylinder-head bolts following a repair (engine cold)



Before inserting the cylinder head bolts, apply engine oil to the threads (not the tapped holes) and "Optimoly White T" installation past to the bolt head contact faces. Do not use oils or oil additives containing MoS₂. The bolts must be tightened using the torque angle method according to the tightening sequence on the left.

- 1st pretightening = to 10 Nm
- 2nd pretightening = to 80 Nm
- 3rd pretightening = to 150 Nm
- 4th pretightening = 90°
- Final tightening = 90°

Set the valve clearance.

Following successful first tightening during a repair, remove the existing sticker from the valve cap.

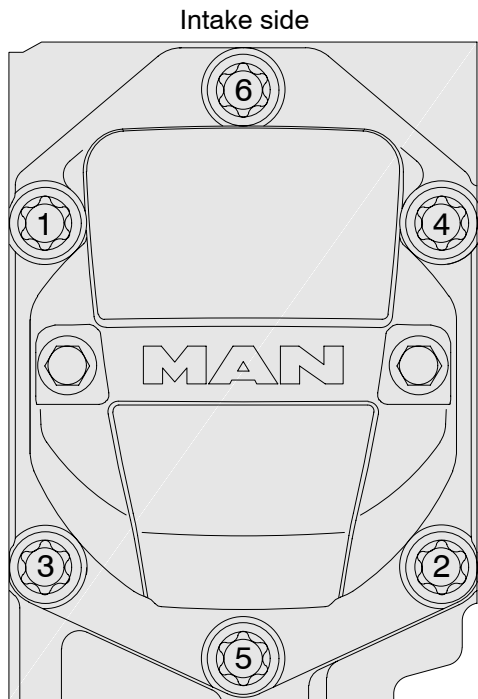


Note:

When the head has been removed, the cylinder head gasket must always be replaced.

Retightening the cylinder-head bolts following a repair (Engine cold or warm)

Following successful repair, retighten with cylinder head bolts **once** using the angle-of-rotation method.



Exhaust side

After 400 hours of operation, tighten the cylinder-head bolts without unscrewing them by 90° (1/4 turn) in accordance with the tightening schedule on the left.

Nachzug der Zylinderkopfschrauben erledigt

Retightening of cylinder-head-bolts completed

Following successful tightening, attach the “**Retightening of cylinder-head bolts completed**” sticker to one of the valve caps.

Spare part no. 51.97801-0315

A		S	
Alternator	23	Start of delivery	22
		Starter motor	23
C		T	
Camshaft	17	Technical Data	3
Compression pressure	5	Thermostat	20
Coolant pump	19	Torque guide values	25–28
Cooling	3	Turbocharger	21
Cooling system	19		
Crankcase	7	V	
Crankshaft	8	V-belts	24
Crankshaft axial clearance	9	Valve clearance	4
Crankshaft bearing	9	Valve gear	16
Cylinder head	14	Valve timing	4
Cylinder head bolts	15	Valves	15
Cylinder liner protrusion	7		
E			
Engine lubrication	3, 5		
F			
Flywheel	10, 11		
Fuel supply pump	5		
Fuel system	22		
I			
Injection nozzles	22		
Injection pump	22		
O			
Oil filling capacities	6		
Oil pump	18		
P			
Piston rings	13		
Pistons	13		
R			
Retightening the cylinder head	28		
Retightening the cylinder head bolts	28–30		
Rocker arm	16		





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