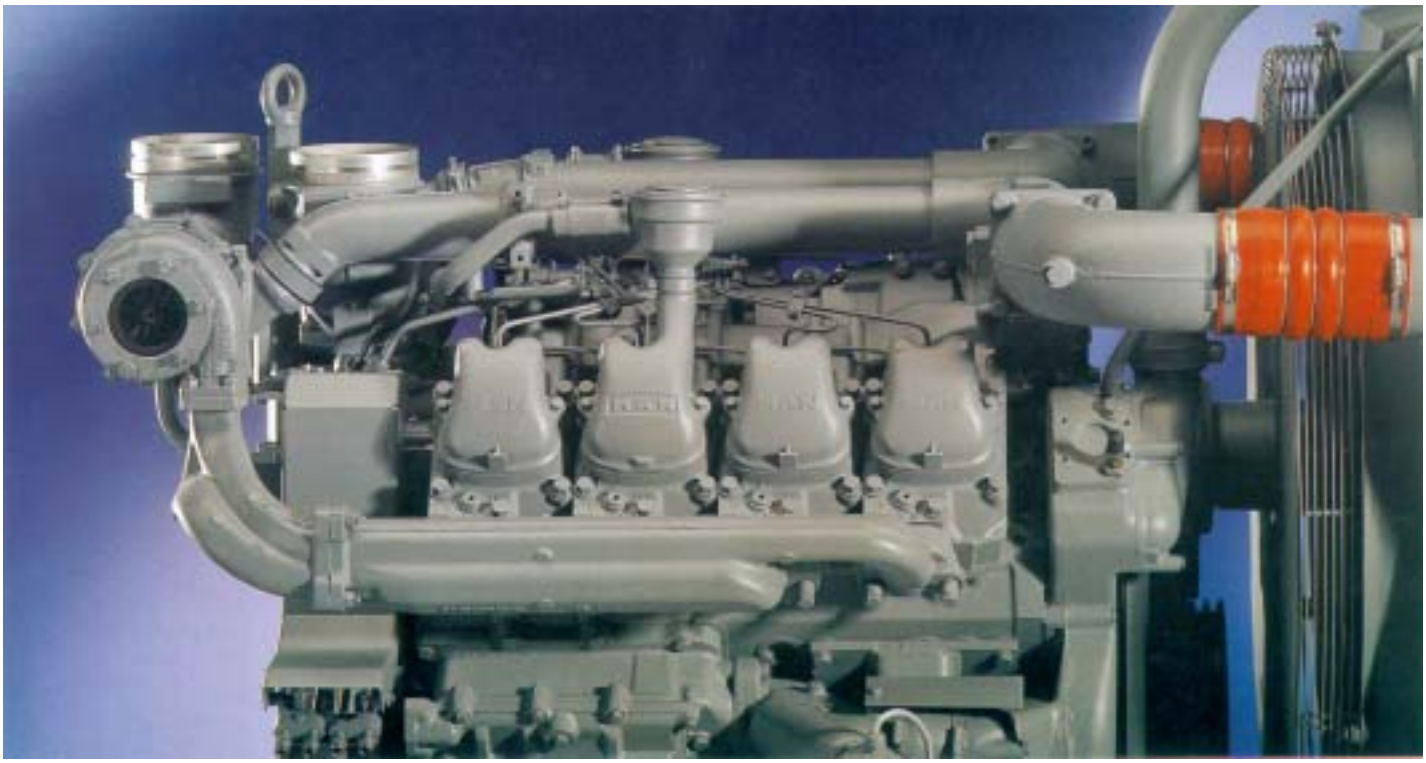
MAN industrial Diesel engines
Engineering • Data • Setting values

D 2848 LE 2..
D 2840 LE 2..
D 2842 LE 2..



Introduction

This print should inform about the test values, setting data and technical details of MAN 8-, 10- and 12-cylinder industrial Diesel engines.

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

Yours faithfully,
MAN Nutzfahrzeuge Aktiengesellschaft
Werk Nürnberg

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

MTDA Technical status: 05.1998 51.99493–8491

Contents

All the engines dealt with here are related by design and together form a family.

The sequence of letters and numbers which make up the model designation reveal a number of characteristic properties of the engine in question to those familiar with the basic nomenclature.

We will explain the system using model D 2842 LE 201 as an example:

D — The “D” at the beginning of the model designation stands for **“Diesel”**

28 — The number “28” indicates that the engine has a 1**28** mm bore

4 — The “4” means 1**4**2 mm stroke

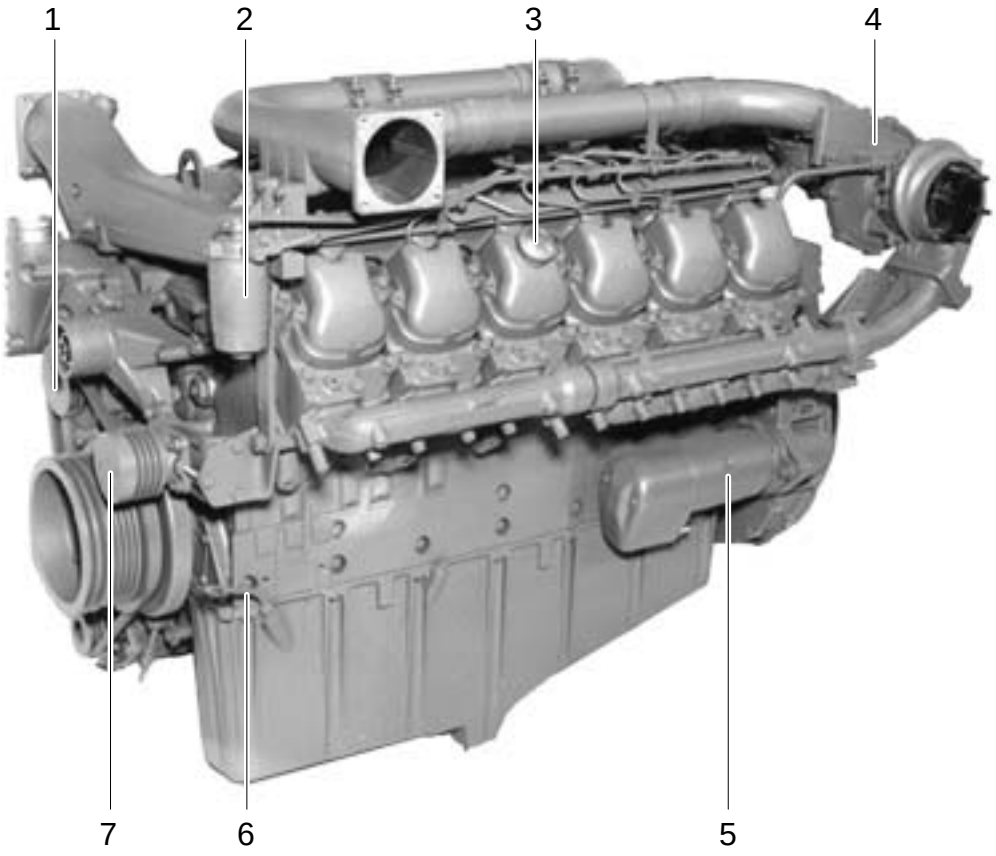
2 — The “2” shows that the engine has 12 cylinders. If there is a 0 here instead, the engine is a 10-cylinder model

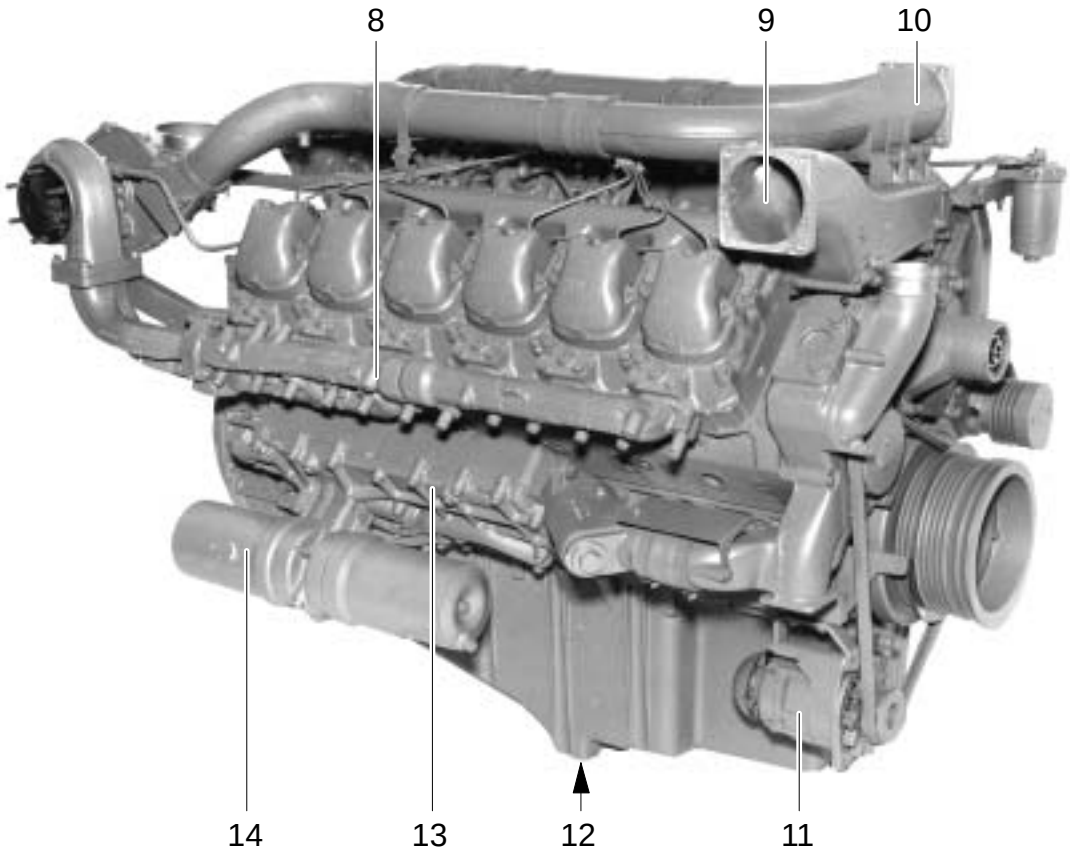
L — This letter stands for the German word “Ladeluftkühlung”, meaning **“intercooling”**

E — “E” stands for the German word “Einbaumotor”, meaning **“installation engine”**, and distinguishes these engines from MAN vehicle engines

201/2.. — This is a Works internal development number. This engine generation was introduced early 1994 with modified turbocharger, high-pressure injection and, fitted as standard, an electronically controlled quantity regulator.

Engine views





Taking the 12-cylinder D 2842 LE 201 engine as an example, we shall explain the components of the engine singly using the adjacent drawing. The only difference between the general design of this engine and the 10 and 8-cylinder models, D 2840 LE 2.. and D 2848 LE 2.., is in the number of cylinders.

1 Water pump

2 Fuel filter

3 Oil filler neck

4 Turbocharger

5 Starter motor

6 Oil dipstick

7 Tensioning pulley

8 Exhaust manifold

9 Combustion air pipe from intercooler

10 Combustion air pipe to intercooler

11 Alternator

12 Oil drain plug

13 Oil cooler

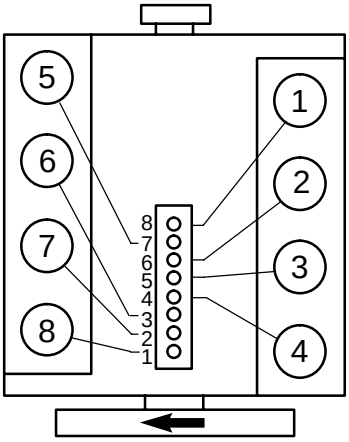
14 Oil filter

General engine data

Mode of operation	4-stroke Diesel with turbocharger and intercooler
Combustion system	Direct injection
Design	V-form, 90°
Bore	128 mm
Stroke	142 mm
Compression ratio	15,5 : 1
Rotation viewed from flywheel	anti-clockwise
Maximum engine rating to DIN 3046–1	
D 2848 LE 203	414 kW at 1500 rpm 449 kW at 1800 rpm
D 2848 LE 201	363 kW at 1500 rpm 409 kW at 1800 rpm
D 2848 LE 202	320 kW at 1500 rpm 368 kW at 1800 rpm
D 2840 LE 201	443 kW at 1500 rpm 515 kW at 1800 rpm
D 2840 LE 202	357 kW at 1500 rpm 449 kW at 1800 rpm
D 2842 LE 201	532 kW at 1500 rpm 620 kW at 1800 rpm
D 2842 LE 202	446 kW at 1500 rpm 534 kW at 1800 rpm
Rated speed	see model plate
Lubrication	forced-feed lubrication
By	gear oil pumps
Cooling	liquid cooled
By	impeller pump
Coolant temperature	
D 2848 / 40 / 42 LE 201 / 202	
Normal	90°C
Short time	max. 95°C
D 2848 / 40 / 42 LE 203	
Normal	100°C
Short time	max. 105°C

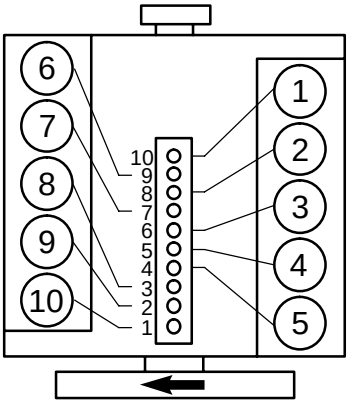
D 2848 LE 2..

Number of cylinders	8
Swept volume	14,62 l
Firing order	1-5-7-2-6-3-4-8-1



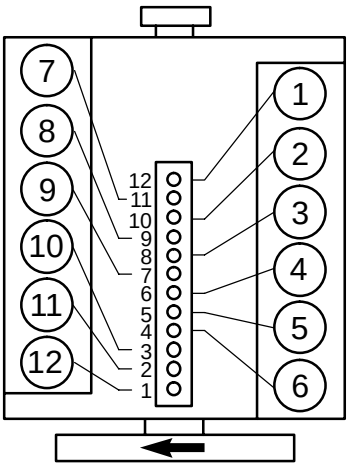
D 2840 LE 2..

Number of cylinders	10
Swept volume	18,27 l
Firing order	1-6-5-10-2-7-3-8-4-9-1

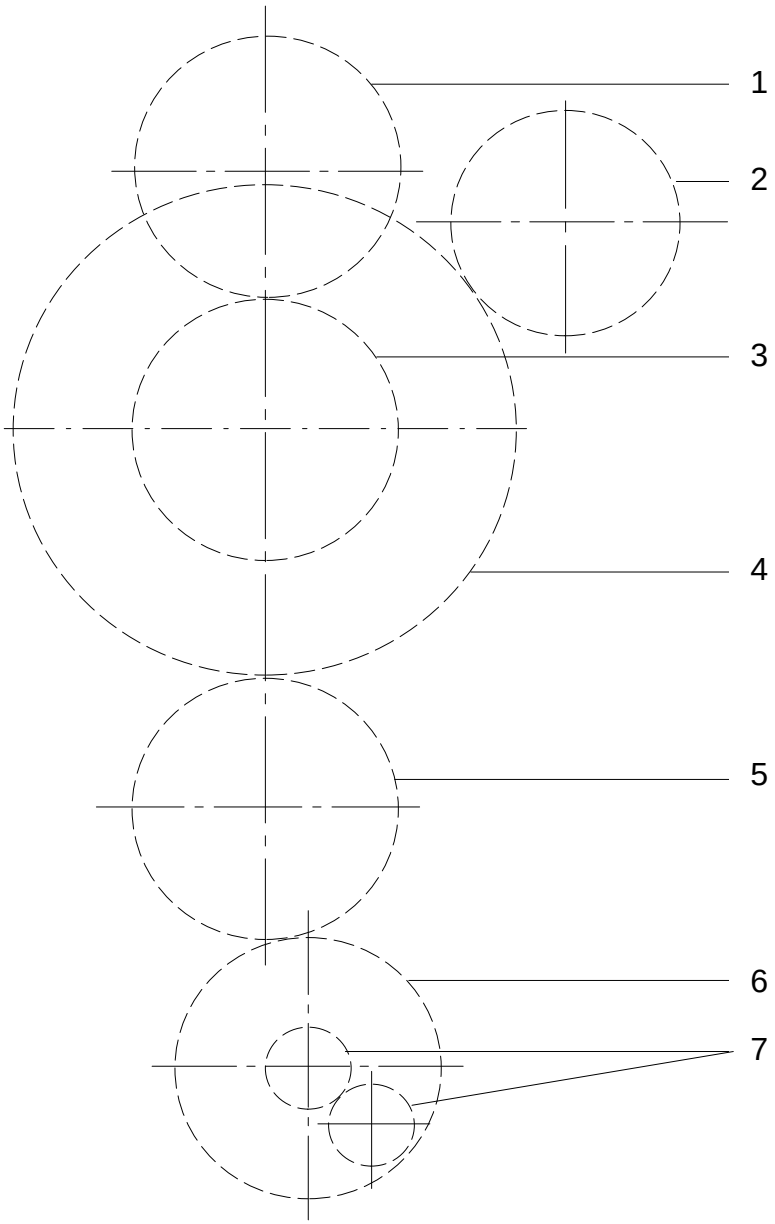


D 2842 LE 2..

Number of cylinders	12
Swept volume	21,93 l
Firing order	1-12-5-8-3-10-6-7-2-11-4-9-1



Timing gear arrangement
(viewed from flywheel)



	Gear designation	No. of teeth	Module	Gear tooth cutting
1	Drive gear, injection pump	51	2,75	straight
2	Power take-off	34	2,75	helical (23°40')
3	Intermediate gear	51	2,75	straight
4	Drive gear, camshaft	86	2,75	helical (23°40')
5	Crankshaft gear	43	2,75	helical (23°40')
6	Drive gear, oil pump	44	2,75	helical (23°40')
7	Oil pump supply gear	7	5,75	straight

Valve train
The checking values are valid for all engines dealt with 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 safely and that an effective seal is formed even when the engine is warm.

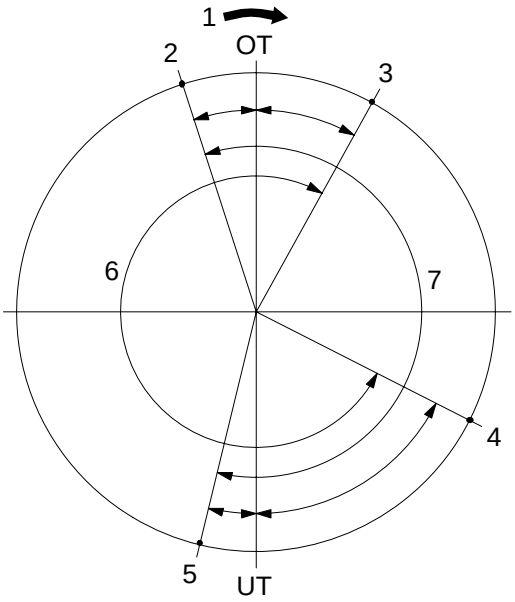
Valve clearance too small:
The valves do not sit correctly on the valve seat inserts when closed and are therefore no longer able to conduct the heat to the cylinder head. In this situation the exhaust valves in particular are prone to burning because of the high thermal stress to which they are exposed 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 worsens. Valve train wear and valve noise is increased greatly.

Timing diagram

1 = Direction of engine rotation
(viewed from V-belt pulley)
2 = Inlet opens 24° before TDC
3 = Exhaust closes 27° after TDC
4 = Exhaust opens 63° before BDC
5 = Inlet closes 36° after BDC
6 = Exhaust open for 270°
7 = Inlet open for 240°

Figures in degrees refer to the crankshaft angle



Compression pressures
(Engine has run before the measurement and is warm to the touch)

good	over 28 bar
permissible	25–28 bar
reconditioning necessary	under 24 bar
pressure difference (between individual cylinders)	max. 4 bar

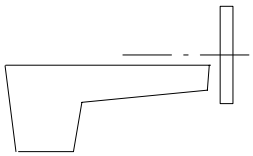
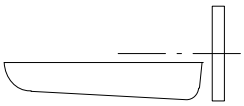
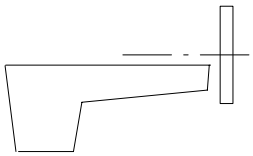
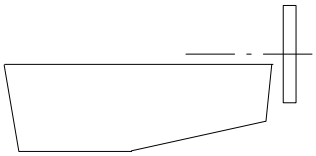
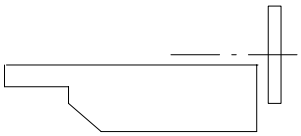
Lubricating system

Oil pump capacity at oil pump speed (with SAE 20W/20 oil, at 90°C and p = 6 bar)
oil pump speed = engine speed x 0.977

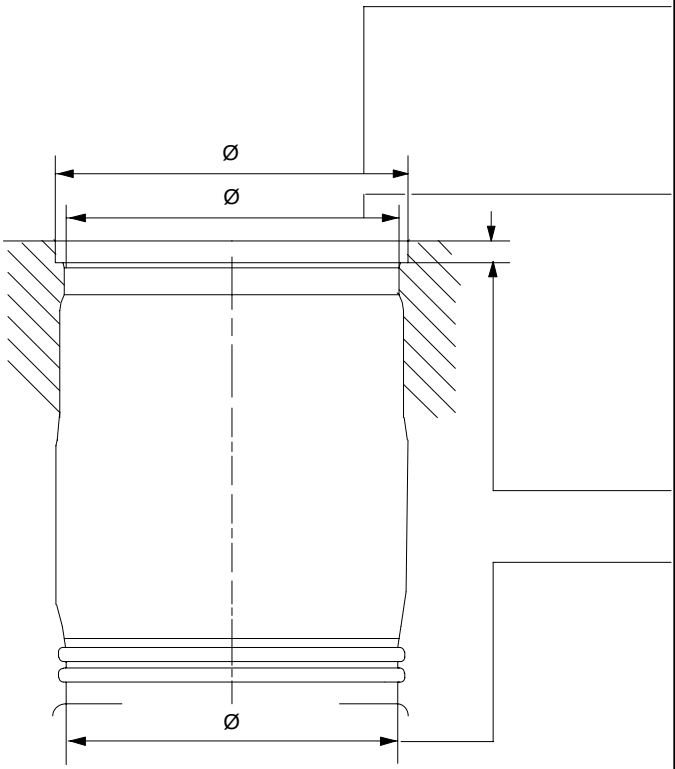
Two-wheel oil pump – D 2848 / 40 LE 2..	
at n = 635 rpm	42 l / min
at n = 1465 rpm	105 l / min
at n = 1759 rpm	127 l / min
Three-wheel oil pump – D 2842 LE 2..	
Gear wheel width 28 mm	
at n = 635 rpm	49 l / min
at n = 1465 rpm	128 l / min
at n = 1759 rpm	159 l / min
Gear wheel width 34 mm	
at n = 635 rpm	60 l / min
at n = 1465 rpm	154 l / min
at n = 1759 rpm	194 l / min

Valve opening pressures	
By-pass valve for oil filter	
Single horizontal, 2-fold horizontal	2,8–3,6 bar
2-fold vertical, 2-fold vertical reversible	2,2–2,8 bar
Oil pump pressure regulating valve	9–10 bar
Pressure valve of oil spray jets	
Opening pressure	1,6–1,9 bar
Closing pressure	1,3–1,6 bar

Filling capacities

Engine model	Oil pan	Min. capacity	Max. capacity
D 2848 LE 2..	deep 	12 l	18 l
D 2848 LE 2..	flat 	20 l	24 l
D 2840 LE 2..	deep 	24 l	30 l
D 2840 LE 2..	flat 	26 l	30 l
D 2842 LE 2..	deep 	24 l	32 l
D 2842 LE 2..	semi-flat 	22 l	32 0

Crankcase



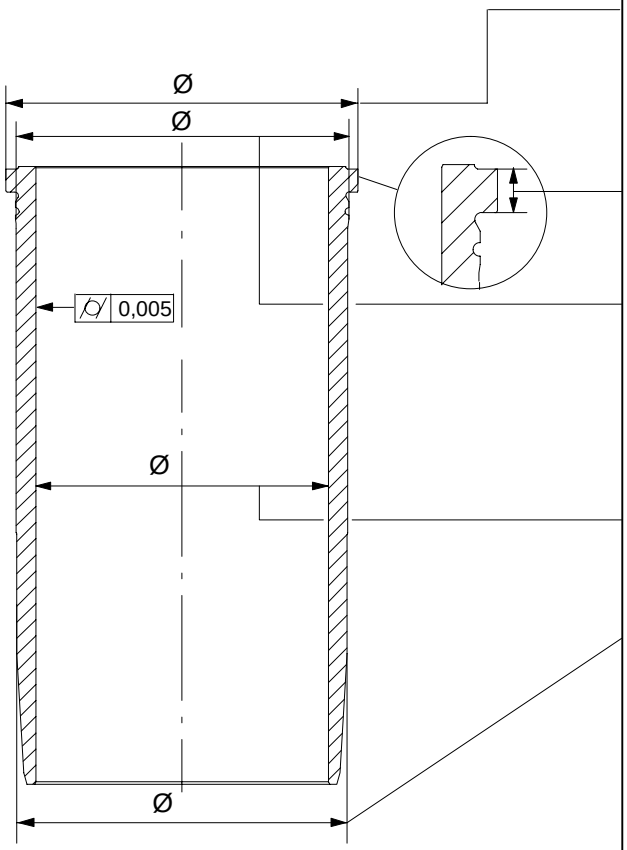
Standard:
153,90–154,00 mm (Ø 153,9 H9)
for cylinder liners with 0,5 and 1,0 mm larger outside diameter:
154,40–154,50 mm (Ø 154,4 H9)

Standard:
145,80–145,84 mm (Ø 145,8 H7)
for cylinder liners with 0,5 mm larger outside diameter:
146,30–146,34 mm (Ø 146,3 H7)
for cylinder liners with 1,0 mm larger outside diameter:
146,80–146,84 mm (Ø 146,8 H7)

9,97–9,99 mm

Standard:
144,50–144,54 mm (Ø 144,5 H7)
for cylinder liners with 0,5 mm larger outside diameter:
145,00–145,04 mm (Ø 145 H7)
for cylinder liners with 1,0 mm larger outside diameter:
145,50–145,54 mm (Ø 145,5 H7)

Cylinder liner



Standard:
153,761–153,786 mm (Ø 153,8 f8)
with 0,5 and 1,0 mm larger outside diameter:
154,194–154,257 mm (Ø 154,3 f8)

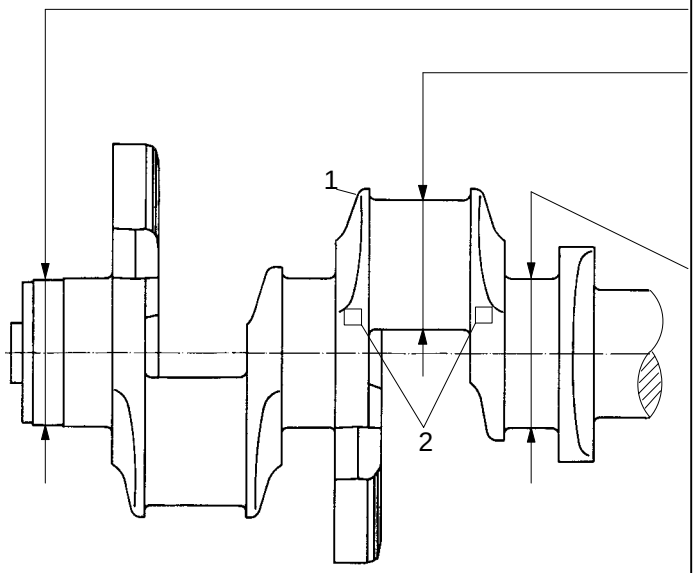
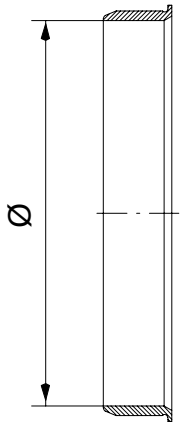
Standard: 10,03–10,05 mm
with 0,2 mm more flange height:
10,23–10,23 mm

Standard:
145,761–145,786 mm (Ø 145,8 g6)
with 0,5 mm larger outside diameter:
146,261–146,286 mm (Ø 146,3 g6)
with 1,0 mm larger outside diameter:
146,761–146,786 mm (Ø 146,8 g6)

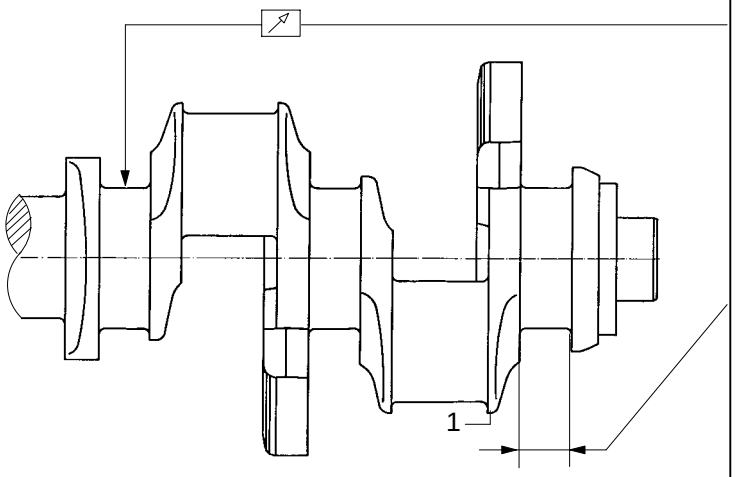
127,990–128,010
Max. wear limit:
0,15 mm larger than basic size

Standard:
144,432–144,457 mm (Ø 144,5 f6)
with 0,5 mm larger outside diameter:
144,932–144,957 mm (Ø 145,0 f6)
with 1,0 mm larger outside diameter:
145,432–145,457 mm (Ø 145,5 f6)

Permissible cylinder liner protrusion:
0,04–0,08 mm

Service Data	Dimensions Limiting values
Crankshaft	
Crankshaft front end (opposite end to flywheel) 	99,985–100,020 mm (Ø 100 j7) 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 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 1 = Colour marking for size identification of crank pin diameter 2 = Colour marking for size identification of main bearing journal diameter Undersize –0,25: red Undersize –0,50: white Undersize –0,75: yellow Undersize –1,00: lilac max. axial play of crankshaft: 0,190–0,322 mm
Bearing race for crankshaft, front end 	Inner diameter: 99,907–99,942 mm (Ø 100 S7)

Crankshaft rear end (adjacent to flywheel)



Max. permissible runout with crankshaft taken up in end bearings:

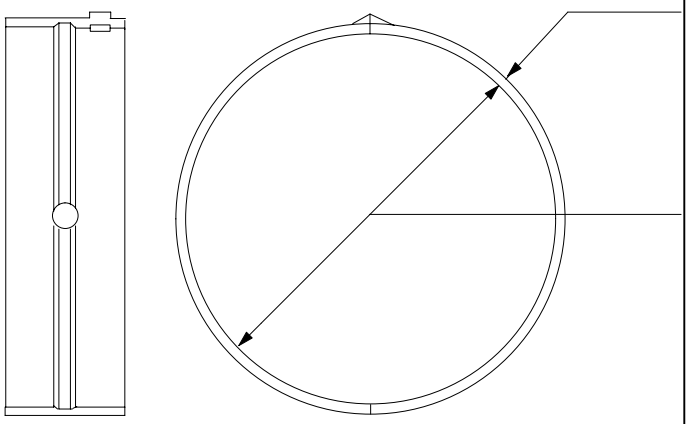
D 2848 L	at bearing 3	0,06 mm
D 2840 L	at bearing 3 and bearing 4	0,06 mm
D 2842 L	at bearing 4	0,08 mm

Standard size:
38,000–38,062 mm (Ø 38 H9)
Undersize -0,25 and -0,50:
38,500–38,562 mm (Ø 38,50 H9)
Undersize -0,75 and 1,00:
39,000–39,062 mm (Ø 39 H9)

1 = Colour marking for size identification of thrust bearing journal length

Undersize –0,25: red
Undersize –0,50: white
Undersize –0,75: yellow
Undersize –1,00: lilac

Main bearing



Data for wall thickness and bearing bore also apply to thrust bearing

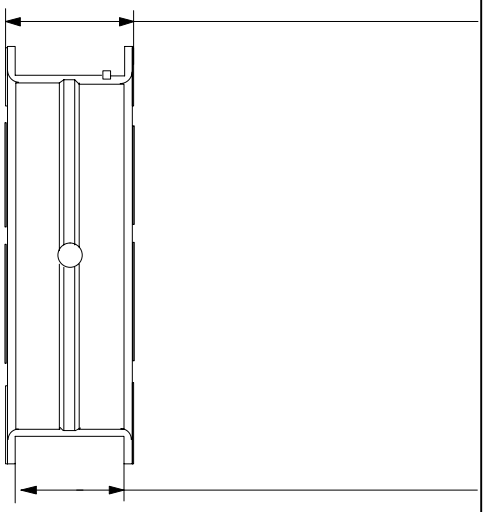
Standard size: 3,455–3,467 mm
Undersize –0,25: 3,580–3,592 mm
Undersize –0,50: 3,705–3,717 mm
Undersize –0,75: 3,830–3,842 mm
Undersize –1,00: 3,955–3,967 mm

Bearing bore in installed condition:
Standard size: 104,066–104,112 mm
Undersize –0,25: 103,816–103,862 mm
Undersize –0,50: 103,566–103,612 mm
Undersize –0,75: 103,316–103,362 mm
Undersize –1,00: 103,066–103,112 mm

Spread: 0,3–1,2 mm

Marking: top / bottom
Standard size: 0958 / 0959
Undersize –0,25: 0962 / 0963
Undersize –0,50: 0964 / 0965
Undersize –0,75: 0966 / 0967
Undersize –1,00: 0968 / 0969

Thrust bearing



Standard size: 37,74–37,81 mm
Undersize –0,25: 38,24–38,31 mm
Undersize –0,50: 38,24–38,31 mm
Undersize –0,75: 38,74–38,81 mm
Undersize –1,00: 38,74–38,81 mm

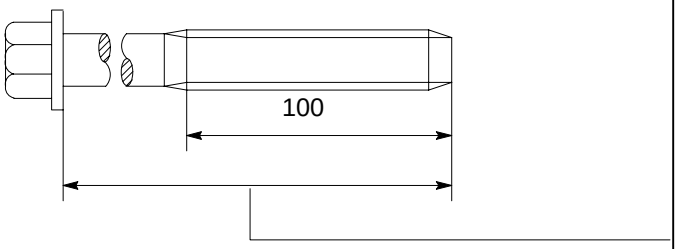
Spread: 0,1–0,5 mm

Marking: top / bottom
Standard size: 0164 / 0165
Undersize –0,25: 0168 / 0169
Undersize –0,50: 0170 / 0171
Undersize –0,75: 0172 / 0173
Undersize –1,00: 0174 / 0175

31,01–31,04 mm

Data for wall thickness and bearing bore see “main bearing”

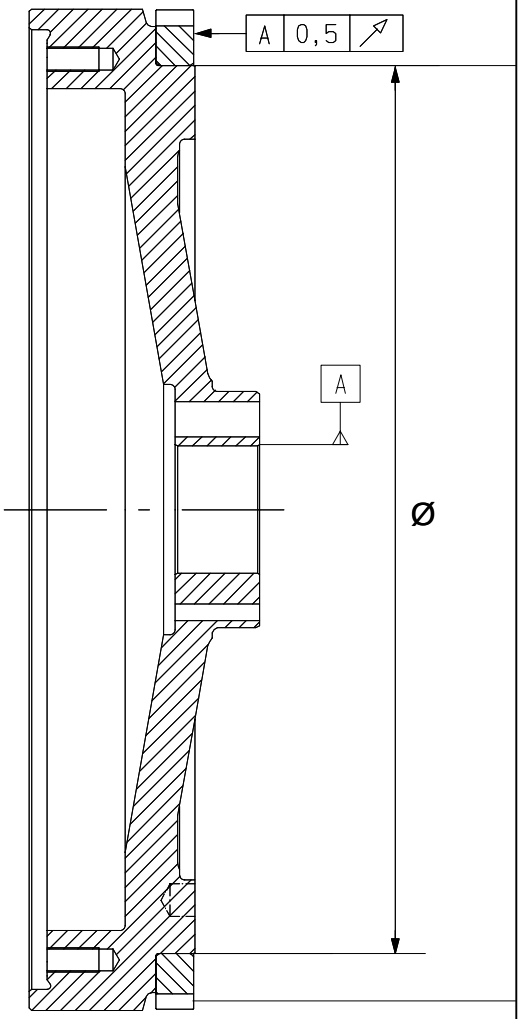
Mounting bolts for crankshaft bearing caps



Length: During tightening the bolts are intentionally stressed beyond the yield point and therefore subjected to some permanent elongation each time they are tightened. When the bolt has reached its maximum length it must not be reused.

new: 152,5–153 mm
max. 154,5 mm

Flywheel and starter gear ring



Ø Flywheel:
432,490–432,645 mm (Ø 432 u9)

Starter gear ring, inside diameter:
432,000–432,155 mm (Ø 432 H9)

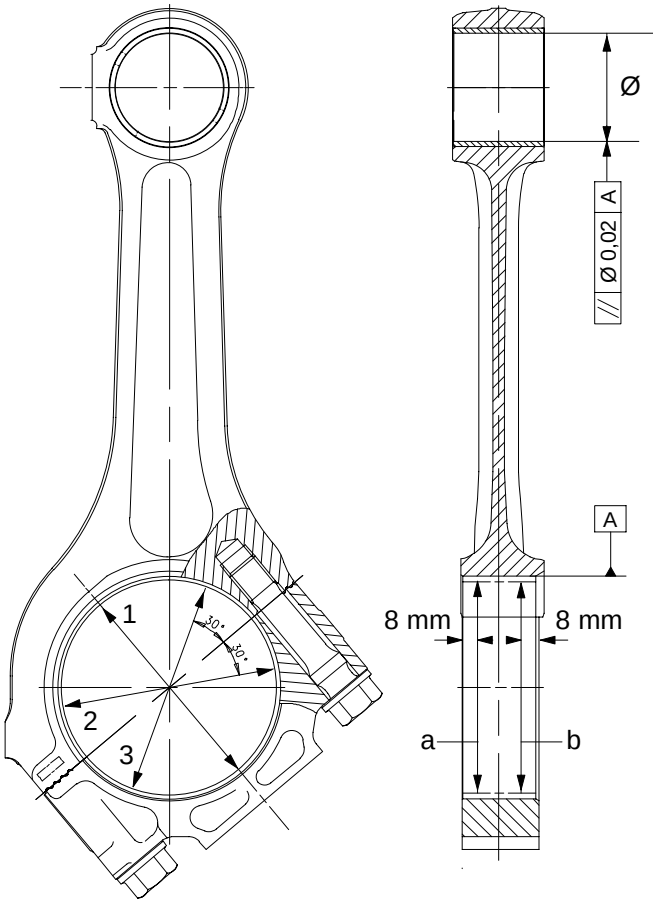
Interference: 0,335–0,645 mm
Installation temperature: 200–230°C

m = 65,1 kg (with starter gear)
J = 2,412 kgm^2

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

Backlash: 0,6–0,9 mm

Connecting rods



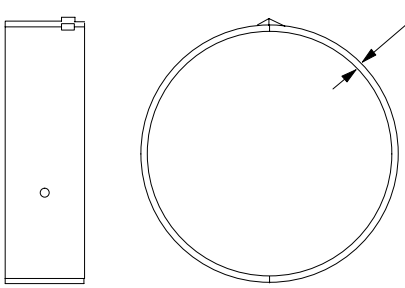
up to engine No. ... 8628 999 ....

46,055–46,065 mm

Bearing bore in directions 1, 2 and 3 and in planes a and b:
90,064–90,106 mm

Pre-condition:
new big-end bearing in place,
conrod assembled

Conrod bearing

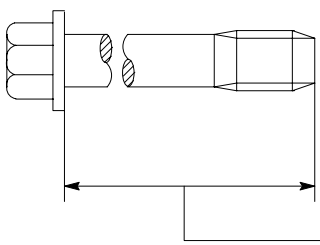


up to engine No. ... 8628 999 ....
Standard size: 2,463–2,473 mm
Undersize -0,25: 2,588–2,598 mm
Undersize -0,50: 2,713–2,723 mm
Undersize -0,75: 2,838–2,848 mm
Undersize -1,00: 2,963–2,973 mm

Spread: 0,6–1,5 mm

If signs of wear are present (scores, anti-wear coating damaged) change both bearing shells.
Important: Note installation position (upper half bearing shell has red mark on side)

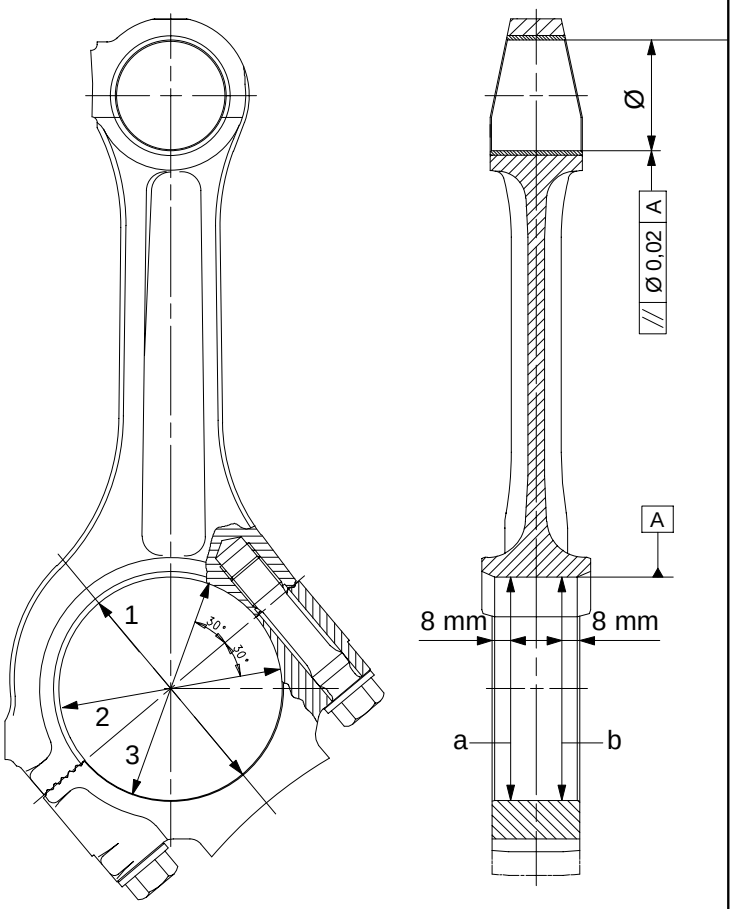
Connecting rod bolt



up to engine No. ... 8628 999 ....
51. 90020-0139
Length: During tightening the bolts are intentionally stressed beyond the yield point and therefore subjected to some permanent elongation each time they are tightened.
When the bolt has reached its maximum length it must not be reused.

new: 67,2–67,5 mm, max. 69 mm

Connecting rods



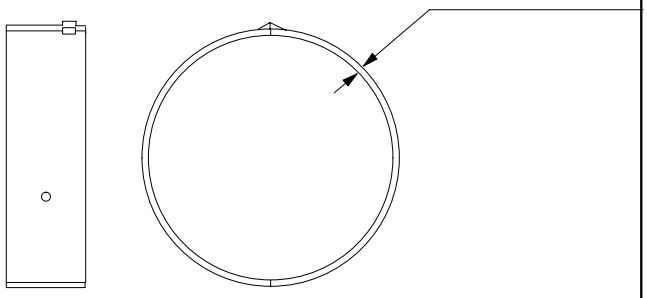
from engine No. ... 8629 001 ....

46,055–46,065 mm

Bearing bore in directions 1, 2 and 3 and in planes a and b:
90,064–90,106 mm

Pre-condition:
new big-end bearing in place, conrod assembled

Conrod bearing



from engine No. ... 8629 001 ....
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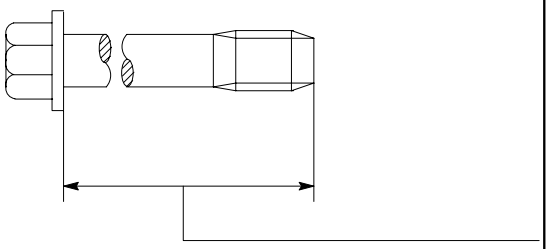
If signs of wear are present (scores, anti-wear coating damaged) change both bearing shells.
Important: Note installation position (upper half bearing shell has red mark on side)

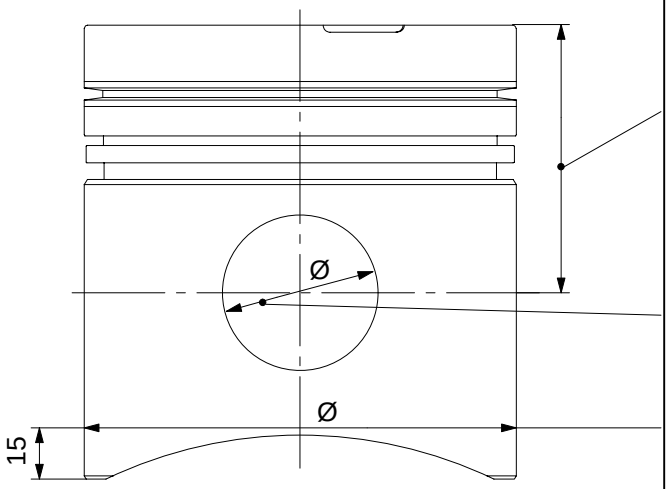
Connecting rod bolt



from engine No. ... 8629 001 ....
51. 90020-0338
Length: During tightening the bolts are intentionally stressed beyond the yield point and therefore subjected to some permanent elongation each time they are tightened.
When the bolt has reached its maximum length it must not be reused.

new: 68,2–68,5 mm, max. 69,5 mm

Piston



D 2848 LE 2..
up to engine No. ...8628 999....

Compression height: 81,250–81,300 mm
with undersize
0,2 mm: 81,050–81,100 mm
0,4 mm: 80,850–80,900 mm
0,6 mm: 80,650–80,700 mm

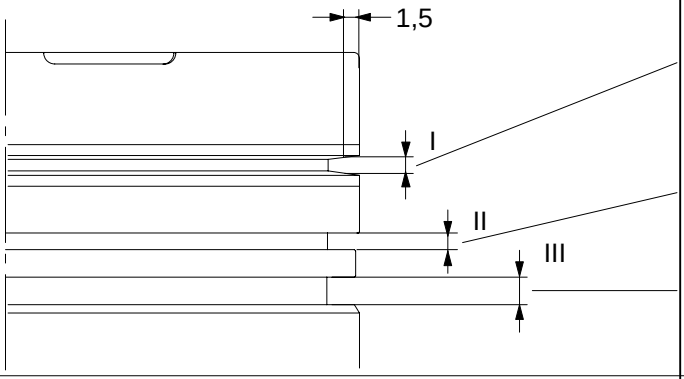
Piston protrusion above crankcase top:
0,01–0,38 mm

46,005–46,013 mm
Piston pin diameter:
45,994–46,000 mm

127,840 –127,870 mm

Max. difference in weight per
engine piston set: 100g

Piston ring grooves



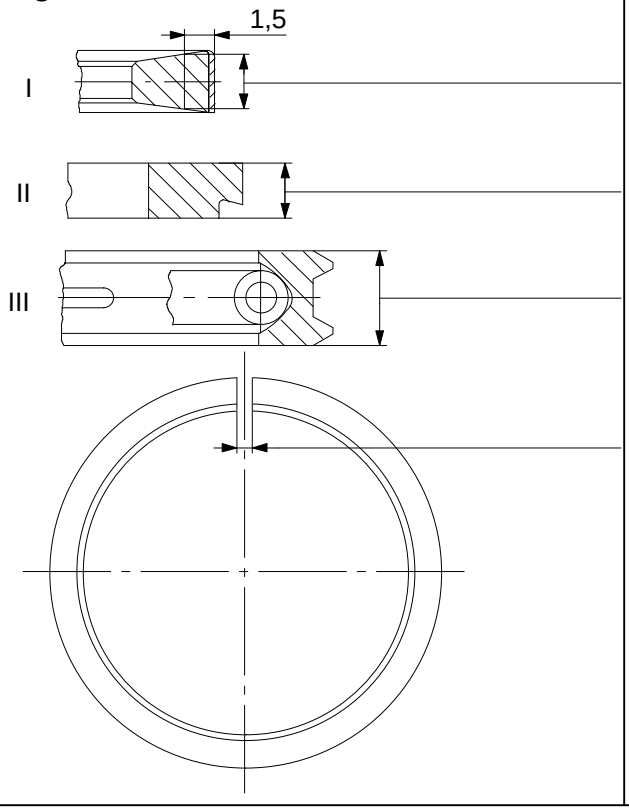
D 2848 LE 2..
up to engine No. ...8628 999....

3,195–3,225 mm

3,040–3,060 mm

5,020–5,040 mm

Piston rings



D 2848 LE 2..
up to engine No. ...8628 999....

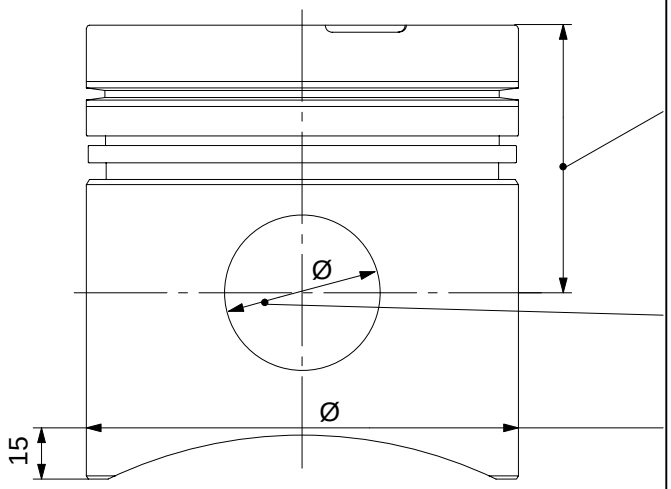
1st. ring – keystone-type ring:
height: 3,075–3,095 mm

2nd. ring – taper face ring:
height: 2,978–2,990 mm

3rd. ring – bevelled ring:
height: 4,978–4,990 mm

Ring gap:
1st. ring: 0,40–0,55 mm
2nd. ring: 0,45–0,70 mm
3rd. ring: 0,25–0,40 mm

Piston



D 2840 / 42 LE 2..
up to engine No. ...8358 999....

Compression height: 81,250–81,300 mm
with undersize
0,2 mm: 81,050–81,100 mm
0,4 mm: 80,850–80,900 mm
0,6 mm: 80,650–80,700 mm

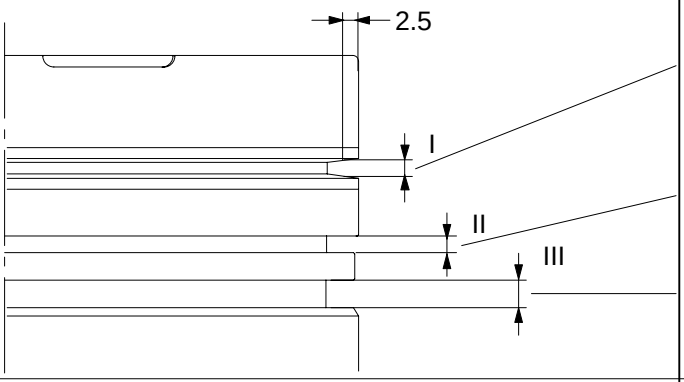
Piston protrusion above crankcase top:
0,01–0,38 mm

46,005–46,013 mm
Piston pin diameter:
45,994–46,000 mm

127,840 –127,870 mm

Max. difference in weight per
engine piston set: 100g

Piston ring grooves



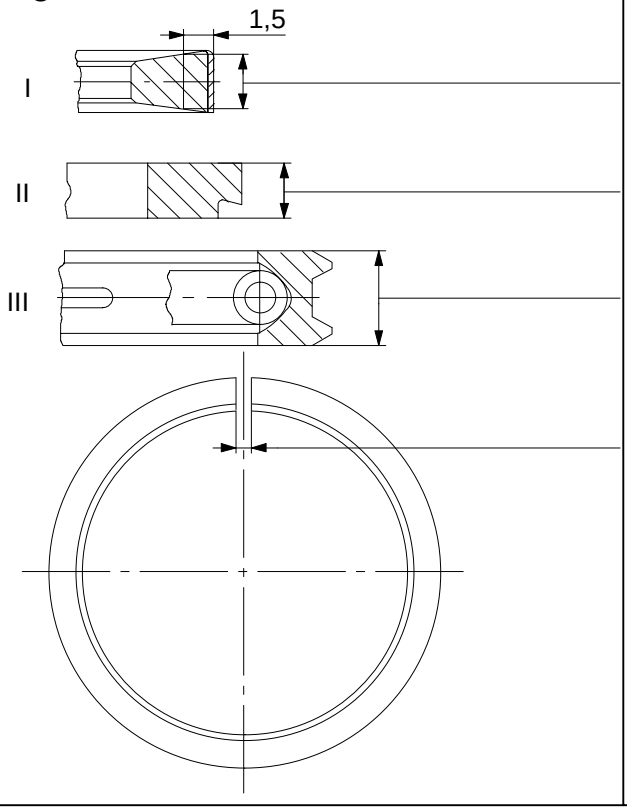
D 2840 / 42 LE 2..
up to engine No. ...8358 999....

2,935–2,965 mm

3,040–3,060 mm

5,020–5,040 mm

Piston rings



D 2840 / 42 LE 2..
up to engine No. ...8358 999....

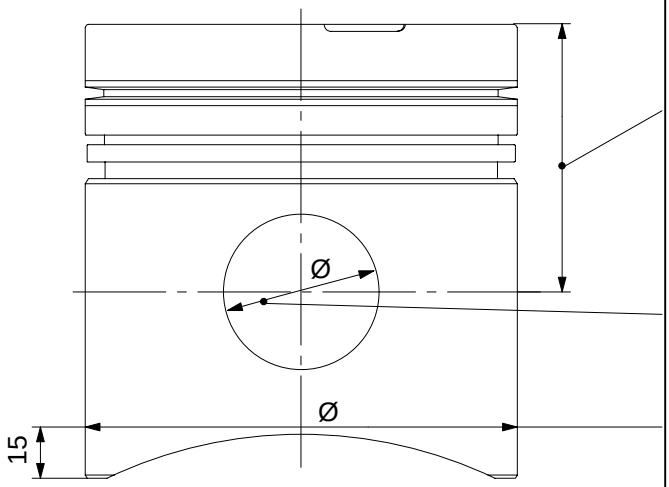
1st. ring – keystone-type ring:
height: 3,075–3,095 mm

2nd. ring – taper face ring:
height: 2,978–2,990 mm

3rd. ring – bevelled ring:
height: 4,978–4,990 mm

Ring gap:
1st. ring: 0,40–0,55 mm
2nd. ring: 0,45–0,70 mm
3rd. ring: 0,25–0,40 mm

Piston



D 2848 LE 2.. from
engine No. ...8629 001....
D 2840 / 42 LE 2.. from
engine No. ...8359 001....

Compression height: 81,250–81,300 mm
with undersize
0,2 mm: 81,050–81,100 mm
0,4 mm: 80,850–80,900 mm
0,6 mm: 80,650–80,700 mm

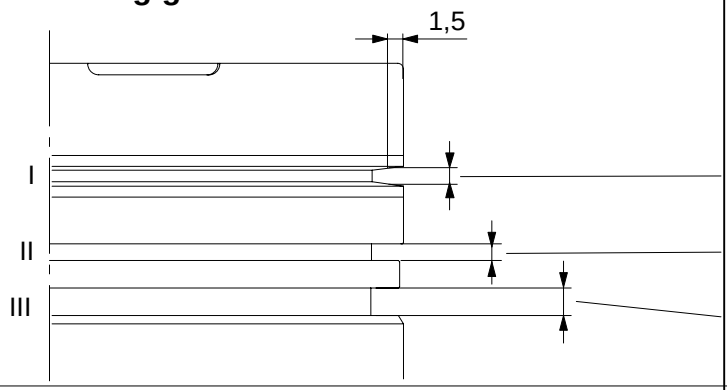
Piston protrusion above crankcase top:
0,01–0,38 mm

46,005–46,013 mm
Piston pin diameter:
45,994–46,000 mm

127,840 –127,870 mm

Max. difference in weight per
engine piston set: 100g

Piston ring grooves



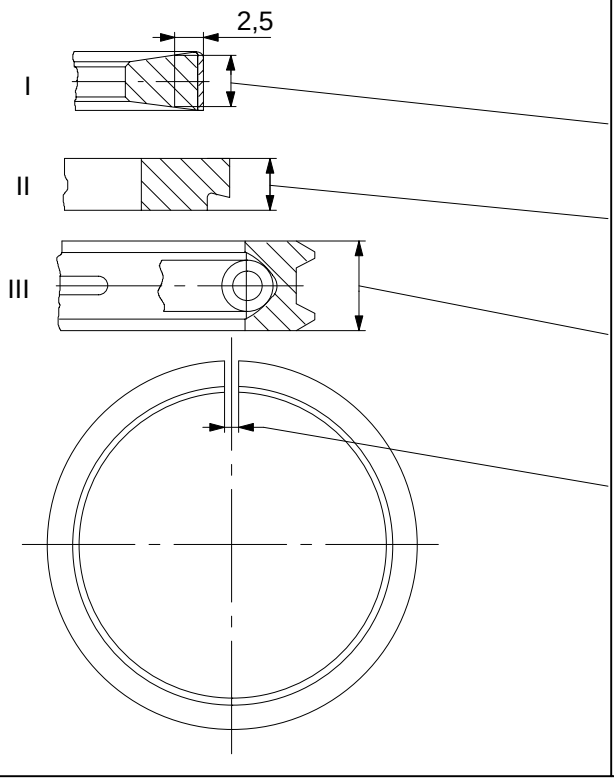
D 2848 LE 2.. from
engine No. ...8629 001....
D 2840 / 42 LE 2.. from
engine No. ...8359 001....

3,695–3,725 mm

3,040–3,060 mm

4,020–4,040 mm

Piston rings



D 2848 LE 2.. from
engine No. ...8629 001....
D 2840 / 42 LE 2.. from
engine No. ...8359 001....

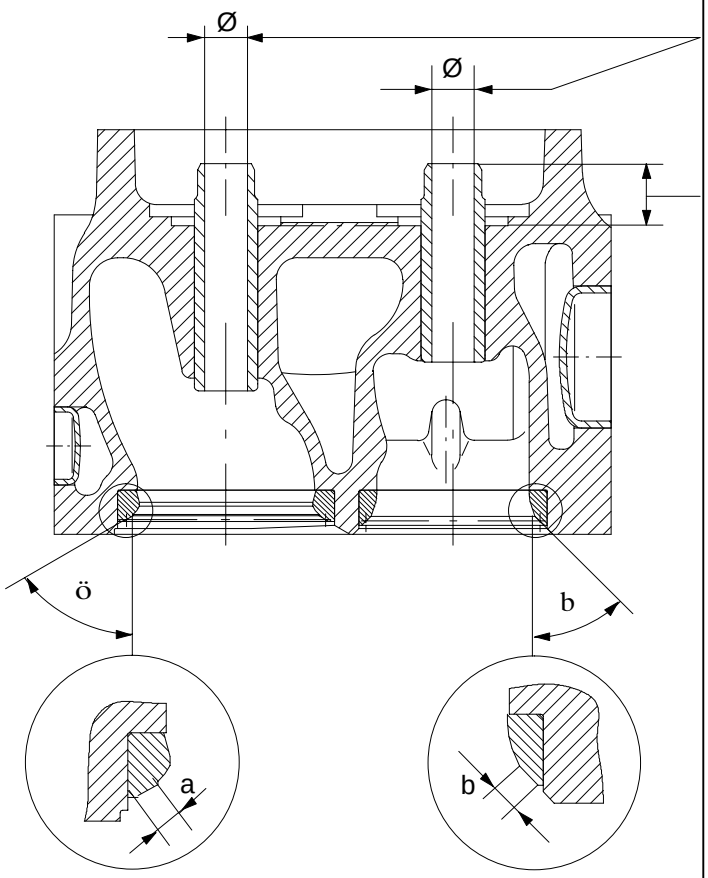
1st. ring – keystone-type ring:
height: 3,296–3,330 mm

2nd. ring – taper face ring:
height: 2,978–2,990 mm

3rd. ring – bevelled ring:
height: 4,978–4,990 mm

Ring gap:
1st. ring: 0,50–0,70 mm
2nd. ring: 0,45–0,70 mm
3rd. ring: 0,25–0,40 mm

Cylinder head

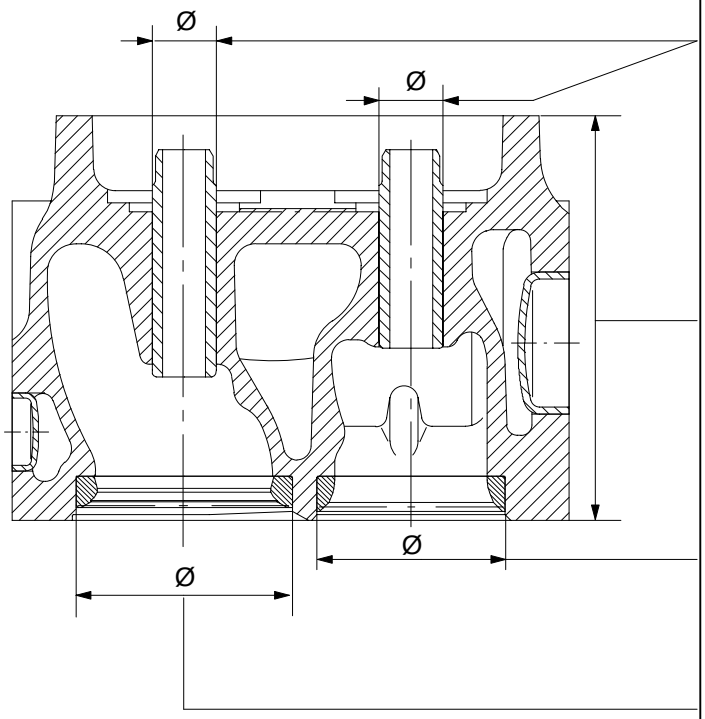


12,000–12,018 mm (Ø 12 H7)

17,1–17,5 mm

Intake valve ö = 60°
Exhaust valve b = 45°

a = 3,3–3,8 mm
b = 3,3–3,8 mm



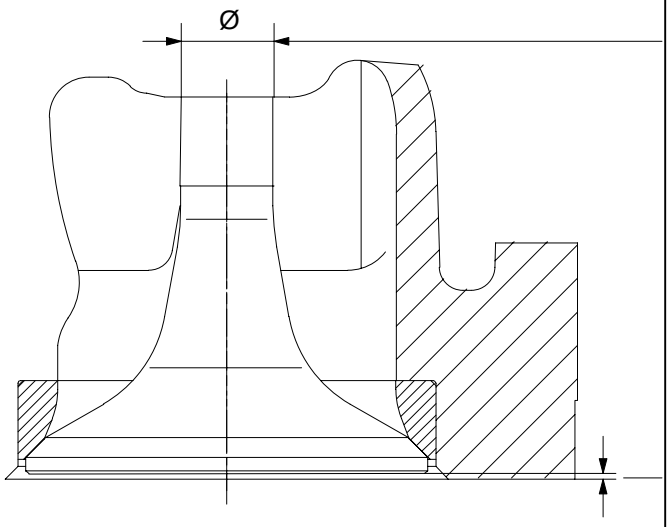
Valve guide bore in cylinder head:
18,000–18,018 mm (Ø 18 H7)
Valve guide outside diameter:
18,028–18,046 mm (Ø 18 s7)

standard: 113,9–114 mm
minimum: 112,9 mm
(observe specified dimensions for valve recess and injector projection)

Valve seat insert bore in cylinder head:
53,00–53,03 mm (Ø 53 H7)
Valve seat insert outside diameter:
53,10–53,11 mm

Valve seat insert bore in cylinder head:
61,00–61,03 mm (Ø 61 H7)
Valve seat insert outside diameter:
61,10–61,11 mm

Valves

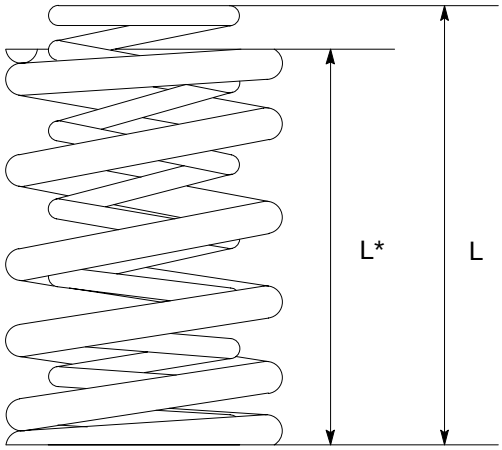


Intake valve: 11,969–11,980 mm
Exhaust valve: 11,944–11,955 mm

Max. wear limit: max. 0,1 mm

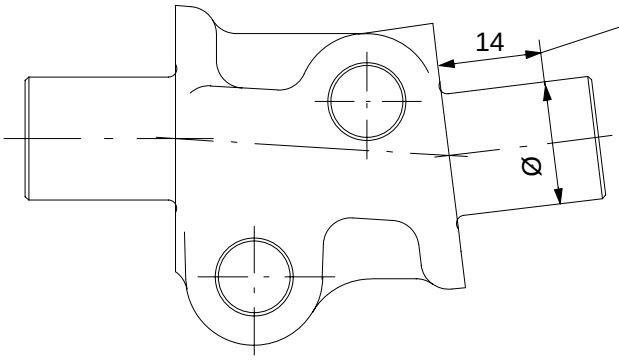
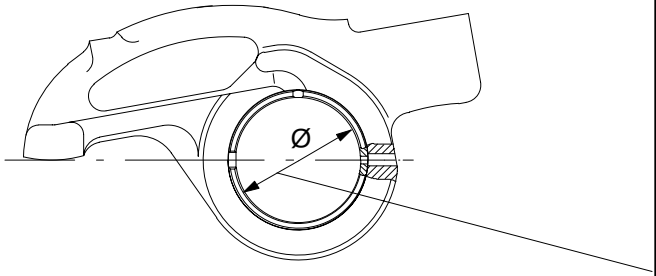
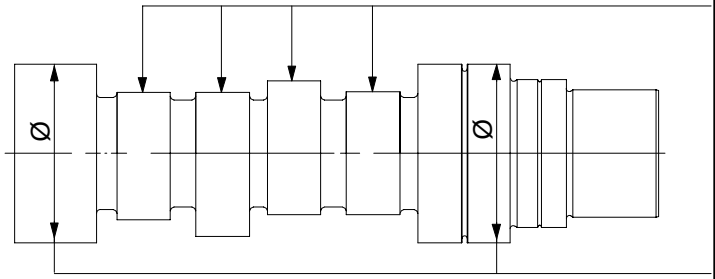
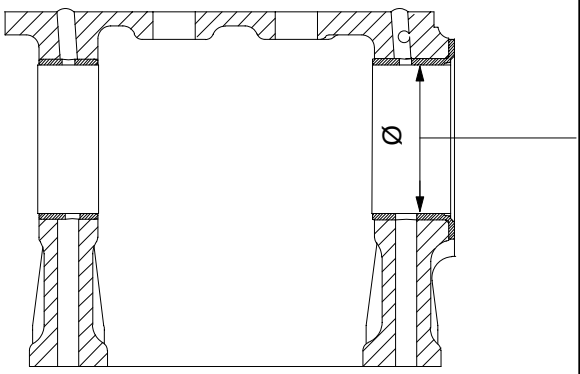
Valve recess for intake and exhaust valve: 0,7–1,3 mm

Valve springs

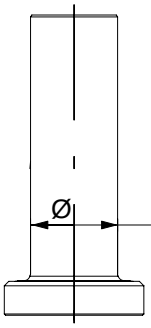


Inner spring:
Free length (L), approx. 65,5 mm
Spring force at L= 46,3 mm: 128–152 N
Spring force at L= 32,3 mm: 255–294 N

Outer spring:
Free length (L*), approx. 59 mm
Spring force at L*= 46,8 mm: 324–353 N
Spring force at L*= 32,8 mm: 696–755 N

Service Data	Dimensions Limiting values
Valve train	
Rocker bracket 	24,967–24,980 mm (Ø 25 f6)
Rocker arm 	Rocker arm radial clearance: 0,025–0,054 mm Max. wear limit: 0,08 mm 25,005 –25,021 mm
Camshaft 	Change if signs of wear are present Camshaft axial clearance: 0,20–0,90 mm Max. wear limit: 1,5 mm 69,910–69,940 mm (Ø 70 e7) Backlash between crankshaft gear and camshaft gear: 0,118 mm–0,242 mm
Camshaft bearing 	70,000–70,030 mm (Ø 70 H7) 70,070–70,090 mm for bush 5 (V8), 6 (V10) or 7 (V12) = bush at timing case end

Valve tappet

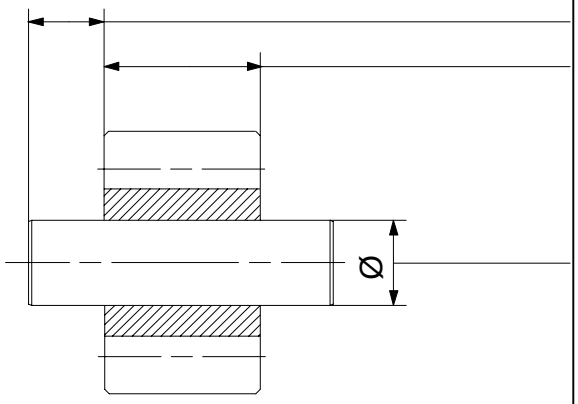


Matching bore in crankcase:
20,000–20,021 mm (Ø 20 H7)

19,944–19,965 mm

Engine lubrication

Oil pump
Two-gears oil pump for D 2848 / 40 LE 2..
Oil pump gear



11,5–11,7 mm

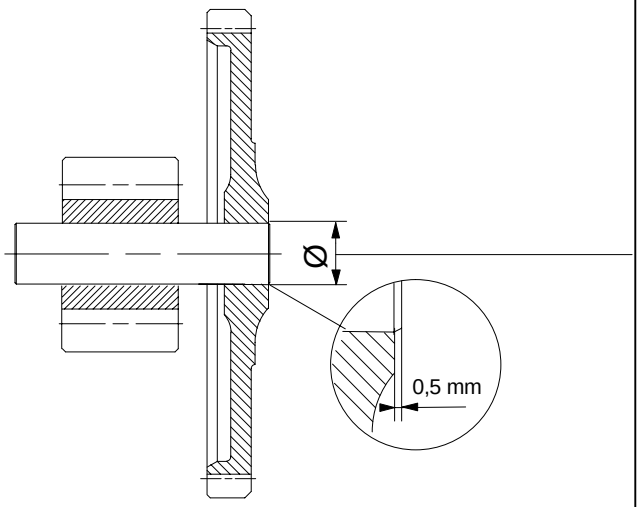
42,911–42,950 mm (Ø 43 e8)

Housing depth:
43,000–43,039 mm (Ø 43 H8)

Gear axial play: 0,050–0,128 mm

Shaft: 21,930–21,940 mm
Matching bore in housing:
22,000–22,021 mm (Ø 22 H7)

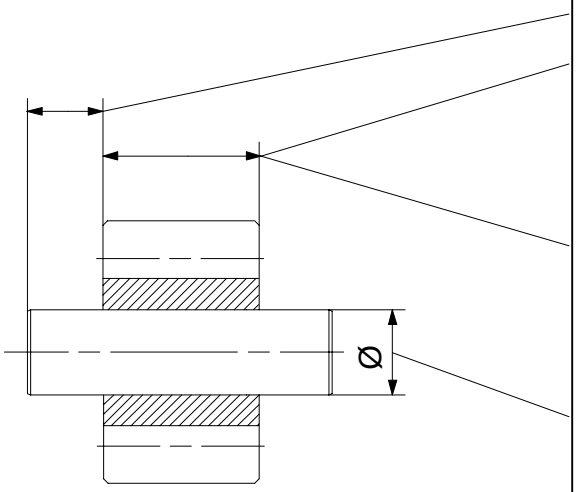
Drive gear with oil pump gear



Shaft: 21,930–21,940 mm
Bore in drive gear:
21,870–21,885 mm
Pressing force: 12000 N

Backlash:
Drive gear and crankshaft gear:
0,099–0,451 mm

Three-gears oil pump for D 2842 LE 2..
Oil pump gear



14,5–14,7 mm

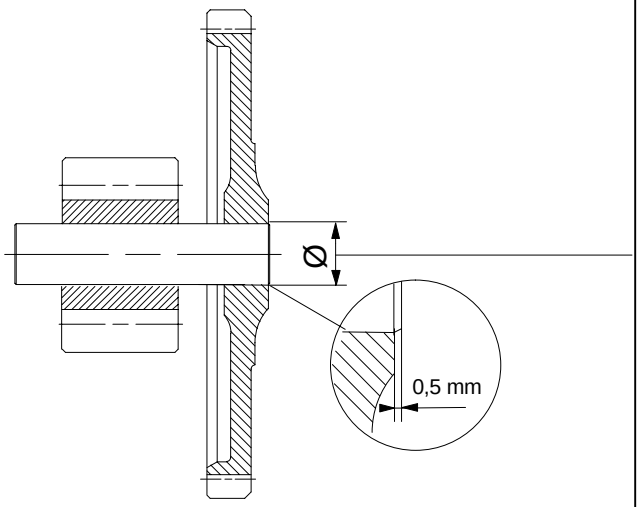
28,927–28,960 mm (Ø 28 e8)
Housing depth:
28,000–28,033 mm (Ø 28 H8)
Radial clearance: 0,040–0,106 mm

or

33,911–33,950 mm (Ø 34 e8)
Housing depth:
34,000–34,039 mm (Ø 34 H8)
Radial clearance: 0,050–0,128 mm

Shaft: 21,930–21,940 mm
Matching bore in housing:
22,000–22,021 mm (Ø 22 H7)

Drive gear with oil pump gear

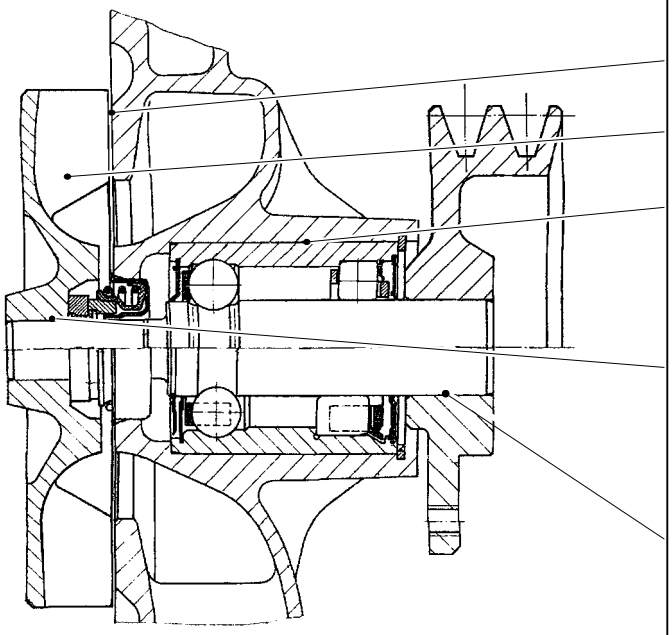


Shaft: 21,930–21,940 mm
Bore in drive gear:
21,870–21,885 mm
Pressing force: 12000 N

Backlash:
Drive gear and crankshaft gear:
0,099–0,451 mm

Cooling system

Engine coolant pump



D 2840 LE 2..

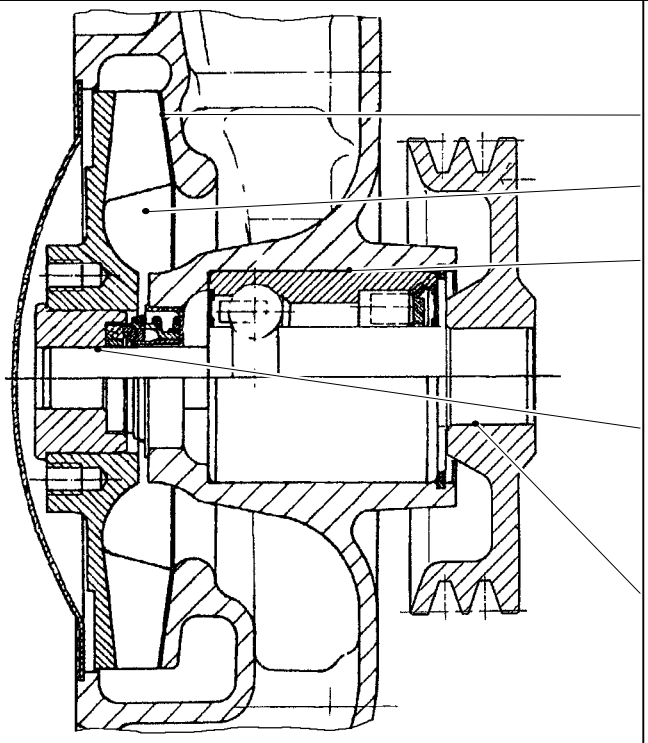
gap: 0,5–0,9 mm

Ø impeller: 135–136 mm

Bearing seat in housing:
54,940–54,970 mm (Ø 55 R7)
Ø of bearing: 54,981–54,994 mm
Interference: 0,011–0,054 mm

Bore for bearing shaft in impeller:
16,000–16,018 mm (Ø 16 H7)
Ø of bearing shaft: 16,043–16,056 mm
Interference: 0,027–0,058 mm

Bore in hub / belt pulley:
25,007–25,020 mm (Ø 25 G6)
Ø of bearing shaft: 25,048–25,061 mm
Interference: 0,028–0,054 mm



D 2848 / 42 LE 2..

gap: 0,3–0,4 mm

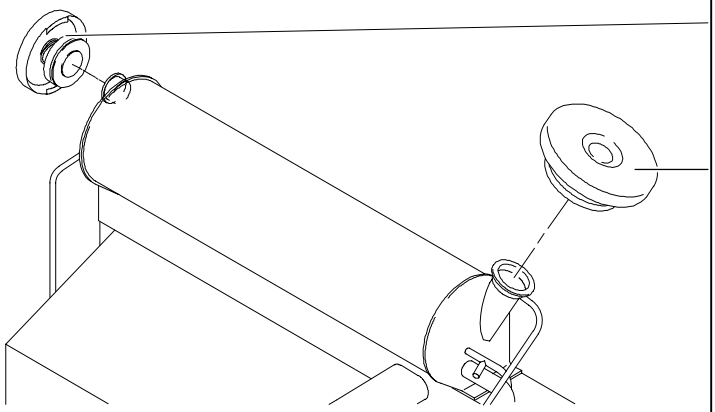
Ø impeller: 149,5–150,0 mm

Bearing seat in housing:
54,940–54,970 mm (Ø 55 R7)
Ø of bearing: 54,981–54,994 mm
Interference: 0,011–0,054 mm

Bore for bearing shaft in impeller:
15,992–16,010 mm (Ø 16 J7)
Ø of bearing shaft: 16,043–16,056 mm
Interference: 0,033–0,064 mm

Bore in hub / belt pulley:
25,007–25,020 mm (Ø 25 G6)
Ø of bearing shaft: 25,048–25,061 mm
Interference: 0,028–0,054 mm

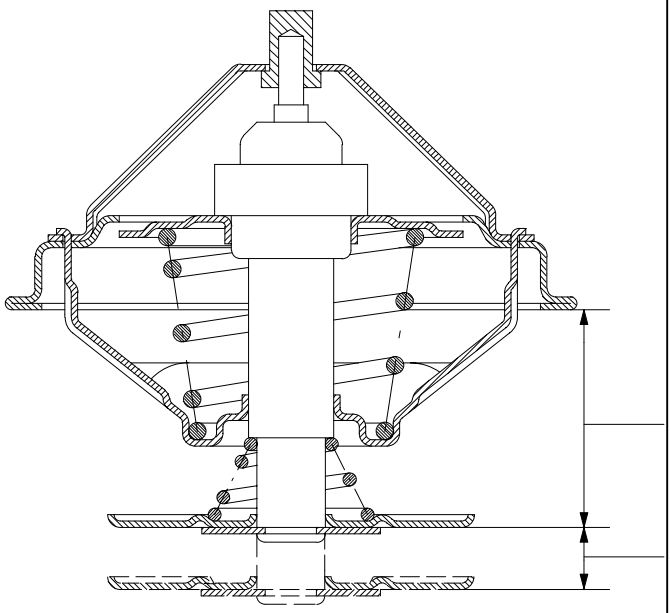
Valve cover on expansion tank



Valve cover with working valve (small cover) opens at
0,6 bar–0,7 bar overpressure,
0,02 bar–0,08 bar underpressure

Valve cover with safety valve (for filler, big cover) opens at
0,85 bar–1,2 bar overpressure

Thermostat



opening begins at: 79°C (□ 2°)
Fully open: 94°C

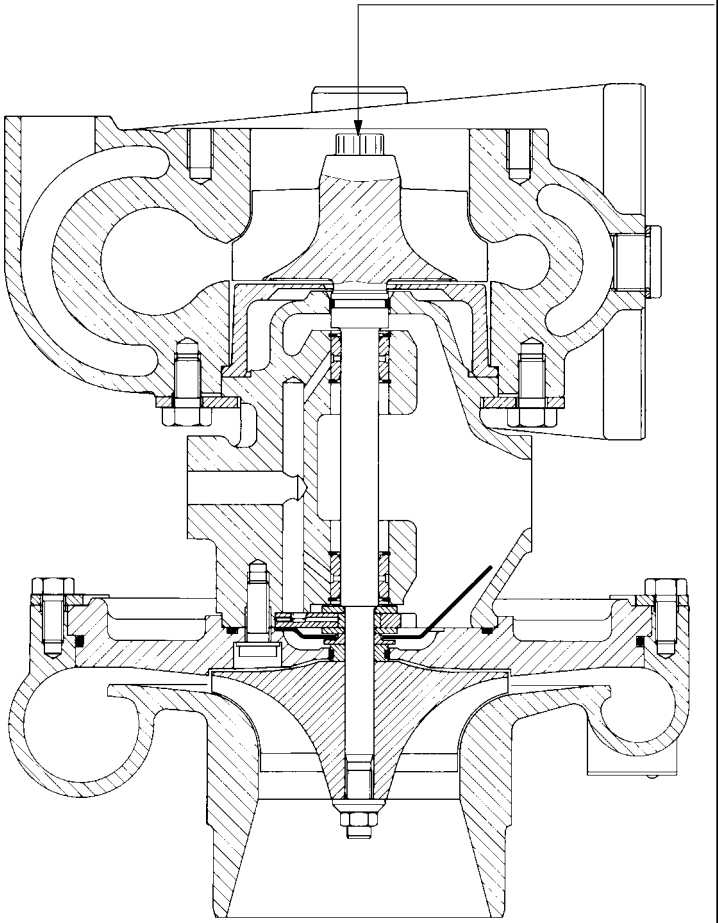
24,5–25,8 mm

Lift at least 8 mm at 94°C

Turbocharger

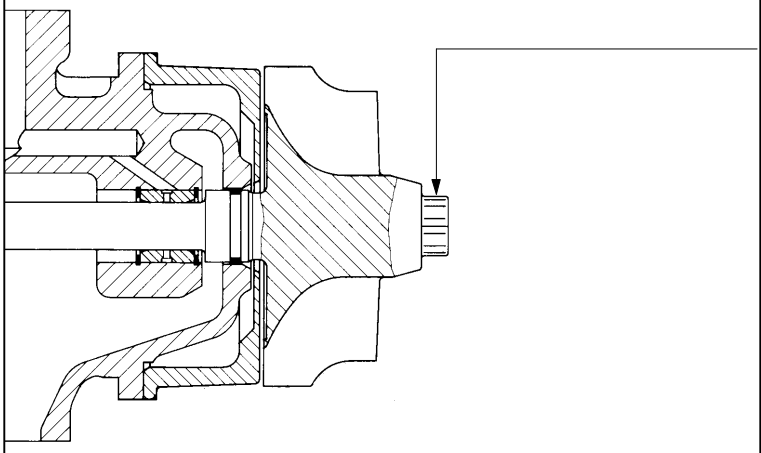
Manufacturer	KKK
D 2848 LE 201 / 202 / 203	K27–3267 MLCKA 21.22
D 2840 LE 201 / 202 – 1500 1/min	K28–3464 MOA 25.22
D 2840 LE 201 / 202 – 1800 1/min	K28–3470 MOA 25.22
D 2842 LE 201 / 202	K361–4064 MNA–21.22

Axial clearance

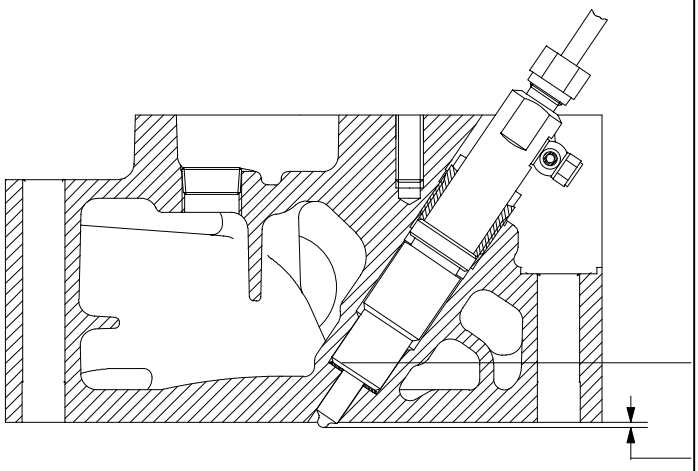


K27 / K28	max. 0,16 mm
K361	max. 0,156 mm

Radial clearance



K27 / K28	max. 0,43 mm
K361	max. 0,63 mm

Service Data	Dimensions Limiting values
Fuel system	
Injectors	
D 2848 LE 2..	
Manufacturer	Bosch
Type of injector	DLLA 144 P 581
Number of holes	6
Opening pressure of injector	
New nozzle holder	295 + 8 bar
Used nozzle holder	280 + 8 bar
Injectors	KDEL 82 P 7
D 2840 LE 2.. , D 2842 LE 2..	
Manufacturer	Bosch
Type of injector	DLLA 144 P 184
Number of holes	4
Opening pressure of injector	
New nozzle holder	295 + 8 bar
Used nozzle holder	280 + 8 bar
Injectors	KDEL 82 P 7
or	
Manufacturer	Bosch
Type of injector	DLLA 144 P 581
Number of holes	6
Opening pressure of injector	
New nozzle holder	295 + 8 bar
Used nozzle holder	280 + 8 bar
Injectors	KDEL 82 P 7
Projection above cylinder head contact surfaces 	Adjust nozzle protrusion by using Cu sealing rings of different thickness. These sealing rings are available in thicknesses of 0,5 / 1,0 / 1,5 / 2,0 / 2,5 / 3,0 mm 2,42–3,25 mm

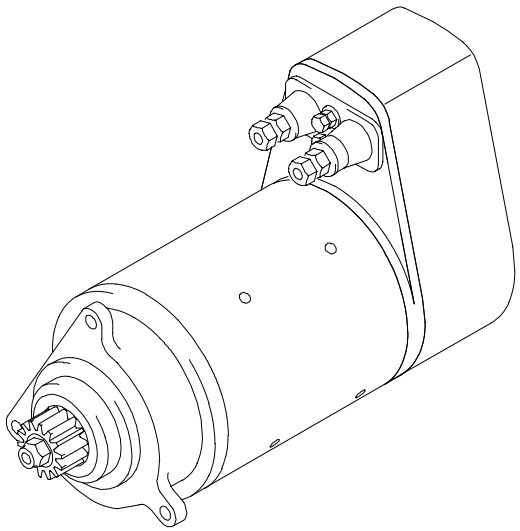
Injection pumps and governors

D 2848 LE 201 / 202 / 203		
In-line injection pump:	GAC governor	PE 8 P120 A500 LS7891
Governor:	GAC governor	ACB 275 H
D 2840 LE 201 / 202		
In-line injection pump:	RQ governor HZM governor GAC governor	PE 10 P120 A520 LS7876 PE 10 P120 A520 LS7876 PE 10 P120 A520 LS7881
Governor:	RQ governor HZM governor GAC governor	RQ 750 PA 1158 RQ 950 PAV B420 032 968 ACB 275 H
D 2842 LE 201 / 202		
In-line injection pump:	RQ governor HZM governor GAC governor	PE 12 P120 A520 LS7877 PE 12 P120 A520 LV B401 890 820 PE 12 P120 A520 LS7882
Governor:	RQ governor HZM governor GAC governor	RQ 750 PA 1158 RQ 950 PAV B420 032 968 ACB 275 H

Start of delivery

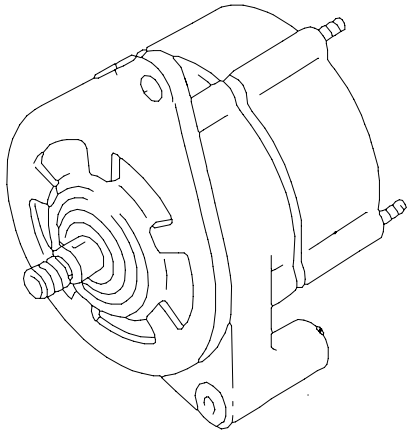
Model	Start of delivery ± 1° crank angle before TDC (Speed constant = without timing adjustment)	
	with optimised consumption	with optimised NO_X
D 2848 LE 201 / 203		
1500 1/min, constant	14°	9°
1800 1/min, constant	14°	12°
D 2848 LE 202		
1500 1/min, constant	14°	9°
1800 1/min, constant	14°	10°
D 2840 LE 201 / 202		
1500 1/min, constant	16°	12°
1800 1/min, constant	18°	14°
D 2842 LE 201 / 202		
1500 1/min, constant	17°	11°
1800 1/min, constant	17°	14°

Starter



Manufacturer:	Bosch
Type:	KB
Operation:	sliding-gear type
Starter pinion:	
Number of teeth:	Z = 9
Modules:	3
Output:	6,6 kW
Voltage:	24 V

Alternator

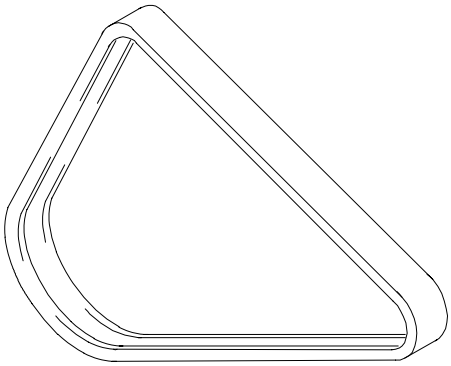


Manufacturer:	Bosch
Type:	K1
Design:	1-pole, insulated
Operation:	Threephase current
Voltage:	28V
Max. current:	35A

or

Manufacturer:	Bosch
Type:	N1
Design:	2-pole, insulated
Operation:	Threephase current
Voltage:	28V
Max. current:	55A

V-belts



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

Measuring tension with tension tester

Drive belt width	Tension 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	80–90	60
4/3VX	180–200	160–180	120

Note:
All screws and bolts not listed in the following table must be tightened according to the guiding values of MAN works standard M 3059 (see page 36).
Apply a light film of oil to all screws and bolts before they are fitted!

Plugs

DIN 908
- M 14 x 1,5, M 16 x 1,5 . . . . . 80 Nm
- M 18 x 1,5, M 22 x 1,5 . . . . . 100 Nm
- M 24 x 1,5, M 26 x 1,5 . . . . . 120 Nm
- M 30 x 1,5 . . . . . 150 Nm

DIN 7604
- AM 10 x 1, M 12 x 1,5 . . . . . 50 Nm
- AM 14 x 1,5 . . . . . 80 Nm

Crankcase, crankshaft assembly

Timing case to crankcase M10, 12.9 . . . . . 75 Nm
Timing case to crankcase M12x1,5, 12.9 . . . . . 100 Nm
Thrust washer to timing case M8, 12.9 . . . . . 40 Nm
Crankshaft bearing caps to crankcase M18 x 2
- initial torque . . . . . 300–330 Nm
- rotation angle . . . . . 90–100°

Crankshaft main bearing caps (side)
- Hex bolt M 12 x 1,5 x 85, 10.9 (06.01494–4316)
  - initial torque . . . . . 80 Nm
  - rotation angle . . . . . 90°
- Hex collar bolt M 12 x 1,5 x 85, 12.9 (51.90020–0382)
  - initial torque . . . . . 80 Nm
  - rotation angle . . . . . 180°

Counterweight to crankshaft M16 x 1,5
- initial torque . . . . . 140–160 Nm
- rotation angle . . . . . 90–100°

Vibration damper hub to crankshaft M16 x 1,5, 10.9 . . . . . 260 Nm
Flywheel to crankshaft M16 x 1,5
- initial torque . . . . . 100–110 Nm
- 1st rotation angle . . . . . 90–100°
- 2nd rotation angle . . . . . 90–100°

Connecting rod bearing caps M14 x 1,5
- initial torque . . . . . 100–110 Nm
- rotation angle . . . . . 90–100°

Cylinder head

Tightening / retightening of cylinder head bolts, see page 37.
Rocker arm bracket to cylinder head . . . . . 65 Nm
Locknut on valve adjusting screw . . . . . 50 Nm

Tightening torque guide values

Timing devices

Adjusting segment to camshaft gear M10 . . . . . 90 Nm
Adjusting segment to intermediate gear M10 . . . . . 90 Nm

Lubrication system

Oil pump to crankcase M8, 8.8 . . . . . 22 Nm
Oil pump cover M8, 8.8 . . . . . 22 Nm
Oil cooler to oil filter head M8, 8.8 . . . . . 22 Nm
Filter bowl to oil filter head M12, 12.9 . . . . . 50 Nm
Plug (oil drain plug) in oil pan M26 x 1,5 . . . . . 80 Nm
Oil jet flange to crankcase M14 x 1,5 . . . . . 70 Nm

Exhaust / Intake manifolds

Exhaust manifold to cylinder head M10
  initial torque . . . . . 60–65 Nm
  rotation angle . . . . . 90–100°
Intake pipe to cylinder head M8, 8.8 . . . . . 22 Nm

Fuel system

Injector to cylinder head M28 x 1,5 . . . . . 120–125 Nm
Fuel filter M12, 8.8 . . . . . 80 Nm
Pressure pipe to injector . . . . . 15–25 Nm
Pressure pipe to injection pump . . . . . 15–25 Nm

Starter / alternator

Starter to timing case M12 x 1,5 . . . . . 80 Nm
. . . . . 40–50 Nm

Transmitter

Oil pressure transmitter . . . . . 80 Nm
Temperature transmitter . . . . . 20 Nm

Tightening torque guide values

Tightening torque values according to Works Standard M 3059

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

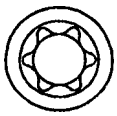
Thread size x pitch	Grade / Tightening torque in Nm		
	for **8.8 / 8**	for **10.9 / 10**	for **12.9 / 12**
M 4	2,5	4,0	4,5
M 5	5,0	7,5	9,0
M 6	9,0	13,0	15,0
M 7	14,0	20,0	25,0
M 8	22,0	30,0	35,0
M 8 x 1	23,0	35,0	40,0
M 10	45,0	65,0	75,0
M 10 x 1,25	45,0	65,0	75,0
M 10 x 1	50,0	70,0	85,0
M 12	75,0	105,0	125,0
M 12 x 1,5	75,0	110,0	130,0
M 12 x 1,25	80,0	115,0	135,0
M 14	115,0	170,0	200,0
M 14 x 1,5	125,0	185,0	215,0
M 16	180,0	260,0	310,0
M 16 x 1,5	190,0	280,0	330,0
M 18	260,0	370,0	430,0
M 18 x 2	270,0	290,0	450,0
M 18 x 1,5	290,0	410,0	480,0
M 20	360,0	520,0	600,0
M 20 x 2	380,0	540,0	630,0
M 20 x 1,5	400,0	570,0	670,0
M 22	490,0	700,0	820,0
M 22 x 2	510,0	730,0	860,0
M 22 x 1,5	540,0	770,0	900,0
M 24	620,0	890,0	1040,0
M 24 x 2	680,0	960,0	1130,0
M 24 x 1,5	740,0	1030,0	1220,0

Cylinder head bolts
General notes

The engine may have either of the following two types of cylinder head bolt:

- Cylinder head bolts with hex head tightened y the angle-of-rotation method, socket size 19

- Cylinder head bolts with Torx head tightened by the angle-of-rotation method, Torx wrench size E18



Bolts to be used in event of repairs:

Bolts with hex head may be replaced by bolts with Torx head if all the bolts on the engine are to be changed.

Do not use bolts with hex head and bolts with Torx head on the same engine.

Retightening cylinder head bolts on new engines (engine cold or warm)

The cylinder heads are mounted with cylinder head bolts which are tightened by the angle-of-rotation method. On new engines the cylinder head bolts are tightened up for the first time at the factory after the engine has been broken in. The sticker **"First retightening of cylinder head bolts ..."** is then attached to one of the cylinder head covers.

<u>Erster</u> Nachzug der Zylinderkopfschrauben erledigt

<u>First</u> retightening of cylinder-head-bolts completed

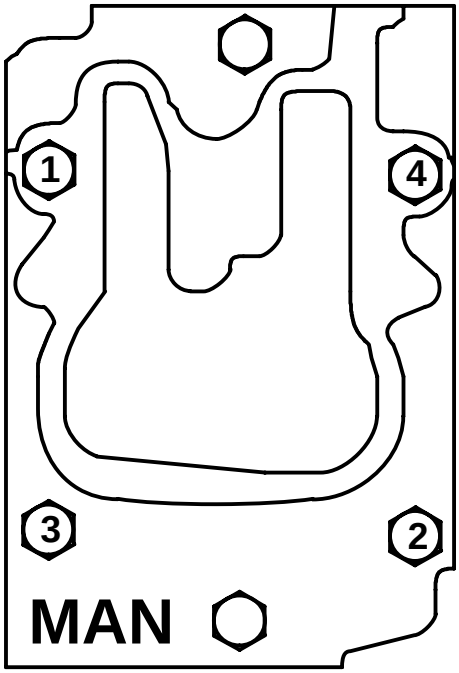
Spare part No. 51.97801-0211

After the first 400 hours of operation retighten cylinder head bolts 1 to 4 in the order shown in Tightening diagram **"1"** by a further 90° (1/4 revolution).

The two outer screws (intake and exhaust sides) must not be retightened.

Note:
The cylinder head bolts to be retightened must not be loosened first, but simply tightened by a further 90° (1/4 revolution) from their actual position.

Intake side / injector



Exhaust side

Tightening diagram **"1"**

Remove the sticker **"First retightening of cylinder head bolts ..."** and attach the sticker **"Second retightening of cylinder head bolts** ...**"** to show that the cylinder head bolts have been retightened for the second time.

<u>Zweiter</u> Nachzug der Zylinderkopfschrauben erledigt

<u>Second</u> retightening of cylinder-head-bolts completed

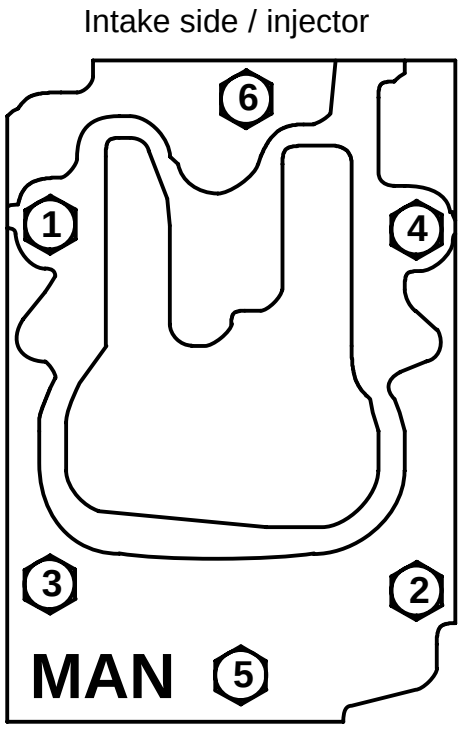
Spare part No. 51.97801-0212

Tightening cylinder head bolts after a repair (engine cold)

Before inserting the cylinder head bolts oil them with engine oil on the thread (not to the bore) and coat the contact face of the bolt head with “Optimoly White T” assembly paste. Do not use any oils or oil additives that contain MoS_2. The bolts must be tightened by the angle-of-rotation method as shown in Tightening diagram **“2”**.

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

Adjust valve clearance.



Tightening diagram **“2”**

Retightening cylinder head bolts after repairs (engine cold or warm)

After the first 10 to 20 hours of operation after a repair turn the cylinder head bolts by a further 90° (1/4 revolution) in the order shown in Tightening diagram **“2”**.
The cylinder head bolts to be retightened must not be loosened first, but simply tightened by a further 90° (1/4 revolution) from their actual position.
Attach the sticker **“First retightening of cylinder head bolts ...”** (Remove any other stickers which may already be attached).
After the first 400 hours of operation after a repair tighten cylinder head bolts 1 to 4 in the order shown in Tightening diagram **“1”** again by a further 90° (1/4 revolution).
The two outside screws (intake and exhaust side) must not be retightened.
Attach the sticker **“Second retightening of cylinder head bolts ...”**.

Note:
When a cylinder head has been removed the cylinder head gasket must always be changed.

Re-using old cylinder head bolts

Checking

Before re-using old cylinder head bolts check them as follows:

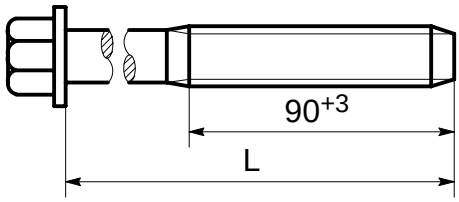
Length

During tightening the bolts are intentionally stressed beyond the yield point and therefore subjected to some permanent elongation each time they are tightened.

Surface

The surface of the bolts must be in satisfactory condition, i.e. the phosphate coating must be intact and there must be no rust.

Rusted or damaged bolts or bolts elongated beyond the maximum permissible length must immediately be made unusable – e.g. by destroying the threads with a hammer – and scrapped.

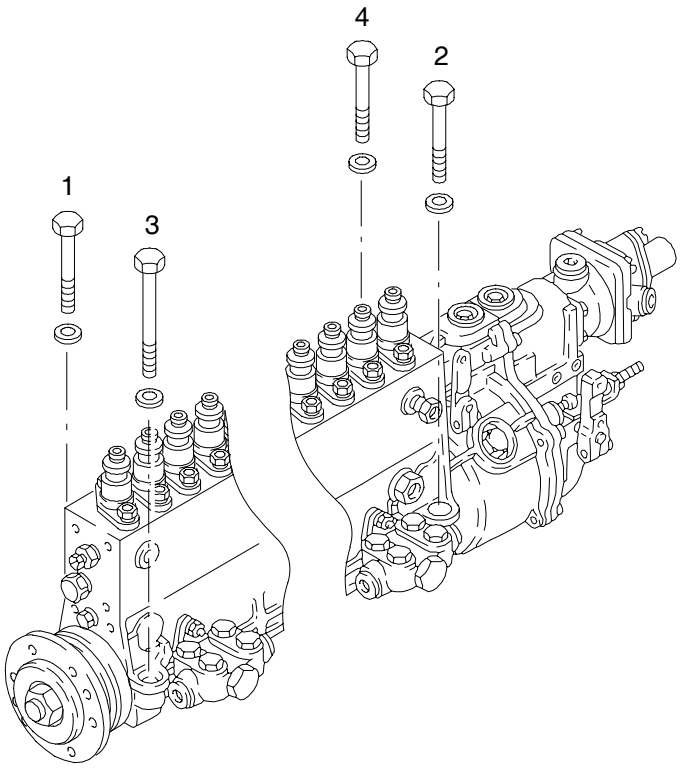


L = Shank length

Shank lengths “L” on new bolts	Permissible maximum dimension
109 mm	111 mm
144 mm	146 mm
168 mm	170 mm

Tightening torque values, injection pumps

D 2848 L.., D 2840 L..

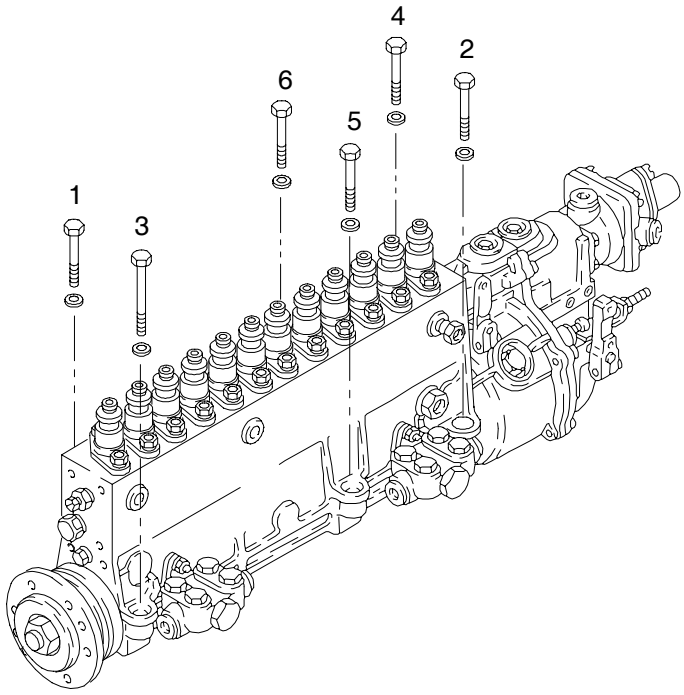


Order of tightening: 1-2-3-4
in the steps:

1. initial torque: 10 Nm
2. initial torque: 50-55 Nm
3. final torque: 90°

Bracket tightening method effective only if bolts of the strength class 8.8 (no more) are used.

D 2842 L..



Order of tightening: 1-2-3-4-5-6
in the steps:

1. initial torque: 10 Nm
2. initial torque: 50-55 Nm
3. final torque: 90°

Bracket tightening method effective only if bolts of the strength class 8.8 (no more) are used.

Memoranda

Index

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