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Workshop Manual

competence level 2

2011

0312 4004 en

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1 Foreword

1



Notes

- Read and observe the information in this documentation. You will avoid accidents, retain the manufacturer's warranty and have a fully functional, ready to use engine at your disposal.
- This engine is built exclusively for the purpose according to the scope of delivery - defined by the equipment manufacturer (use for the intended purpose). Any use above and beyond this is considered improper use. The manufacturer will not be liable for damages resulting from this. The user will bear the sole risk in this case.
- Use for the intended purpose also includes observance of the operating, maintenance and repair instructions specified by the manufacturer. The engine may only be used, maintained and repaired by persons who are familiar with it and instructed in the dangers.
- Make sure that this documentation is available to everyone involved in the operation, maintenance and repair and that they have understood the contents.
- Failure to observe this documentation can lead to malfunctions and engine damage as well as injury to persons for which the manufacturer will accept no liability.
- Prerequisite for the proper maintenance and repair is the availability of all necessary equipment, commercial tools and special tools as well as their perfect working order.
- Engine parts such as springs, clamps, elastic retaining rings etc. constitute an increased risk of injury when not used properly.
- The pertinent rules for the prevention of accidents and other generally recognized safety and industrial medicine rules must be observed.
- Maximum cost effectiveness, reliability and long life is only guaranteed when DEUTZ original parts are used.
- Repair of the engine must comply with use for the intended purpose. Only parts released by the manufacturer for the respective purpose may be used for conversion work. Unauthorized modification to the engine exclude manufacturer liability for resulting damages. Failure to observe this will lead to voiding of the warranty!
- The engines made by DEUTZ are developed for a wide range of applications. A wide range of variants ensures that the respective special requirements are met.
- The engine is equipped according to the installation, i.e. not all the parts and components described in this documentation are installed in your engine.
- We have done our best to clearly identify the differences so that you can easily find the operating, maintenance and repair instructions relevant to your engine.

We are at your service for any questions you may have in this matter.

Your DEUTZ AG



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2 General

2

Notes

DEUTZ engines

are the product of years of research and development. The profound know-how gained in connection with high quality requirements is the guarantee for manufacturing of engines with a long life, high reliability and low fuel consumption. Naturally the high requirements for protection of the environment are also met.

Maintenance and care

are decisive for whether the engine satisfactorily meets the set demands. Compliance with the prescribed maintenance times and the careful execution of maintenance and care are therefore essential. Difficult operating conditions deviation from normal operation must be observed especially.

DEUTZ AG

Please consult one of our service representatives responsible for operating faults and spare parts questions. Our trained specialist personnel ensures fast, professional repairs using original parts in the event of damage. Original parts of the DEUTZ AG are always produced according to the latest state of the art. Information about our service can be found at the end of this documentation.

2**Take care when the engine is running**

Only perform maintenance work or repairs when the engine is at a standstill. Replace any removed protective devices upon completion of the work. When working on the running engine, work clothing must be close fitting.

**Safety**

This symbol accompanies all safety notes. Observe these carefully. Also pass on the safety instructions to your operating personnel. The "General safety regulations and rules for the prevention of accidents" of the legislator must be observed additionally.

**Note**

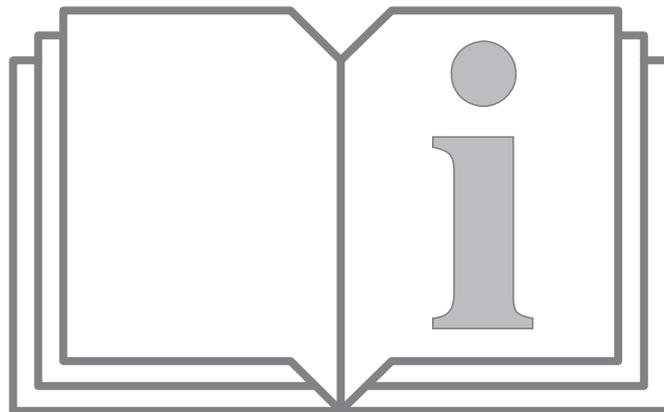
This symbol accompanies information of a general kind. Observe these carefully.

**Asbestos**

Gaskets used in this engine are asbestos-free. Please use the appropriate spare parts for maintenance and repair work.

Notes

3 User notes



Notes

3.1 General

The maintenance work prescribed in the operating manual and in the workshop manual must be performed on schedule and completely.

The maintenance personnel must possess the necessary technical knowledge to perform the work. Safety and protection devices which are removed during maintenance work must be replaced again afterwards.



Caution!

The rules for the prevention of accidents and the safety regulations must be observed during maintenance work.

Also observe the special safety regulations for the different maintenance groups which are listed in detail as job cards in the Job cards chapter (cf. also section 1.2).

See the maintenance schedules for the maintenance intervals. These also inform you of the work to be performed.

The job cards provide technical instructions for performing the work.

3.2 Specifications

3.2.1 Safety regulations and rules for the prevention of accidents

For various maintenance groups, detailed safety notes in the form of job cards have been compiled, these precede the job cards of the respective maintenance groups.

The legally prescribed rules for the prevention of accidents (available from professional associations or from dealers) must be observed. These are dependent on the installation site, operating mode and the operating and auxiliary materials being used.

Special protection measures depending on the respective work are specified and identified in the job description.

It generally applies among other things:

- for the personnel
 - Only instructed personnel may operate or maintain the engine. Unauthorized persons may not enter the engine room.
 - Wear close fitting clothing and ear protectors in the engine room when the engine is running.
 - Only appoint qualified personnel to do repairs and maintenance.
- for the engine room:
 - Ensure adequate ventilation (do not cover air shafts)
 - Install first aid kit and suitable fire extinguishers. Check the filling and readiness for operation regularly.
 - Only store inflammable materials in the engine room if these are necessary for operating the system.
 - Smoking and naked lights are prohibited in the engine room.
- For operation and maintenance of the engine:
 - Only start the engine when all protection devices are installed. Make sure that no-one is standing in the danger area.
 - Only perform cleaning, maintenance and repair work when the engine has been shut down and secured against starting.

3.2.2 Disposal regulations

The work described in the operating manual and workshop manual necessitates renewal of parts and operating materials. The renewed parts / operating materials must be stored, transported and disposed of properly. The owner himself is responsible for this.

Disposal includes recycling and the scrapping of parts / operating materials whereby recycling has priority.

Details of disposal and their monitoring are governed by regional, national and international laws and directives which the system operator must observe on his own responsibility.

3.3 Operating manual and workshop manual

To structure the information to suit the user, the service documentation is divided into operating manual and workshop manual.

The **operating manual** contains a general description and instructions for all other maintenance work.

It contains the following chapters:

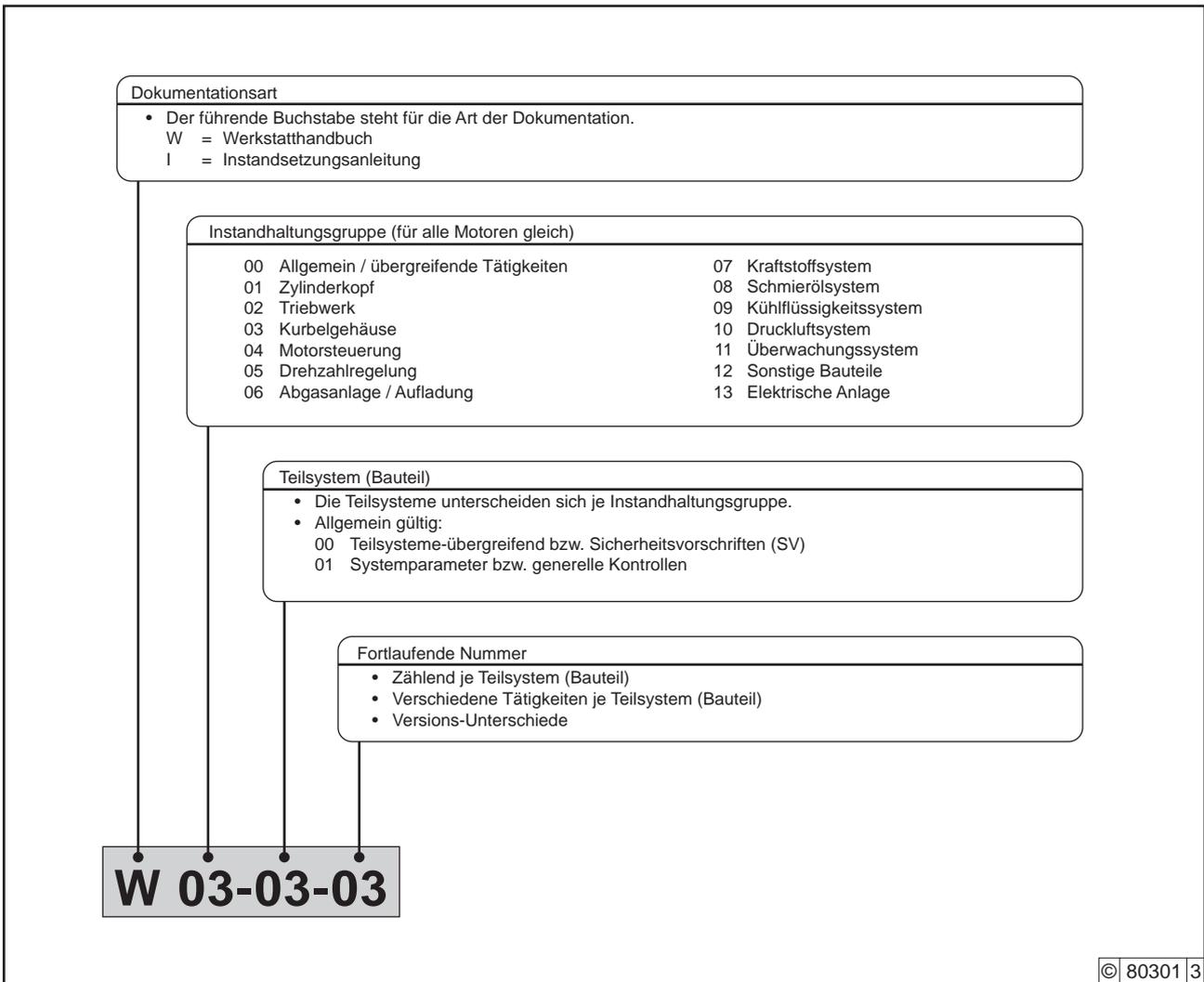
1. General, Contents
2. Engine description
3. Operation
4. Operating materials
5. Maintenance
6. Care and maintenance work
7. Faults, causes and remedies
8. Engine corrosion protection
9. Technical data
10. Service

The **workshop manual** assumes knowledge of the contents of the operating manual, this applies especially for the safety regulations. Minor repairs and emergency measures on components are described the execution of which requires more effort and appropriately qualified personnel.

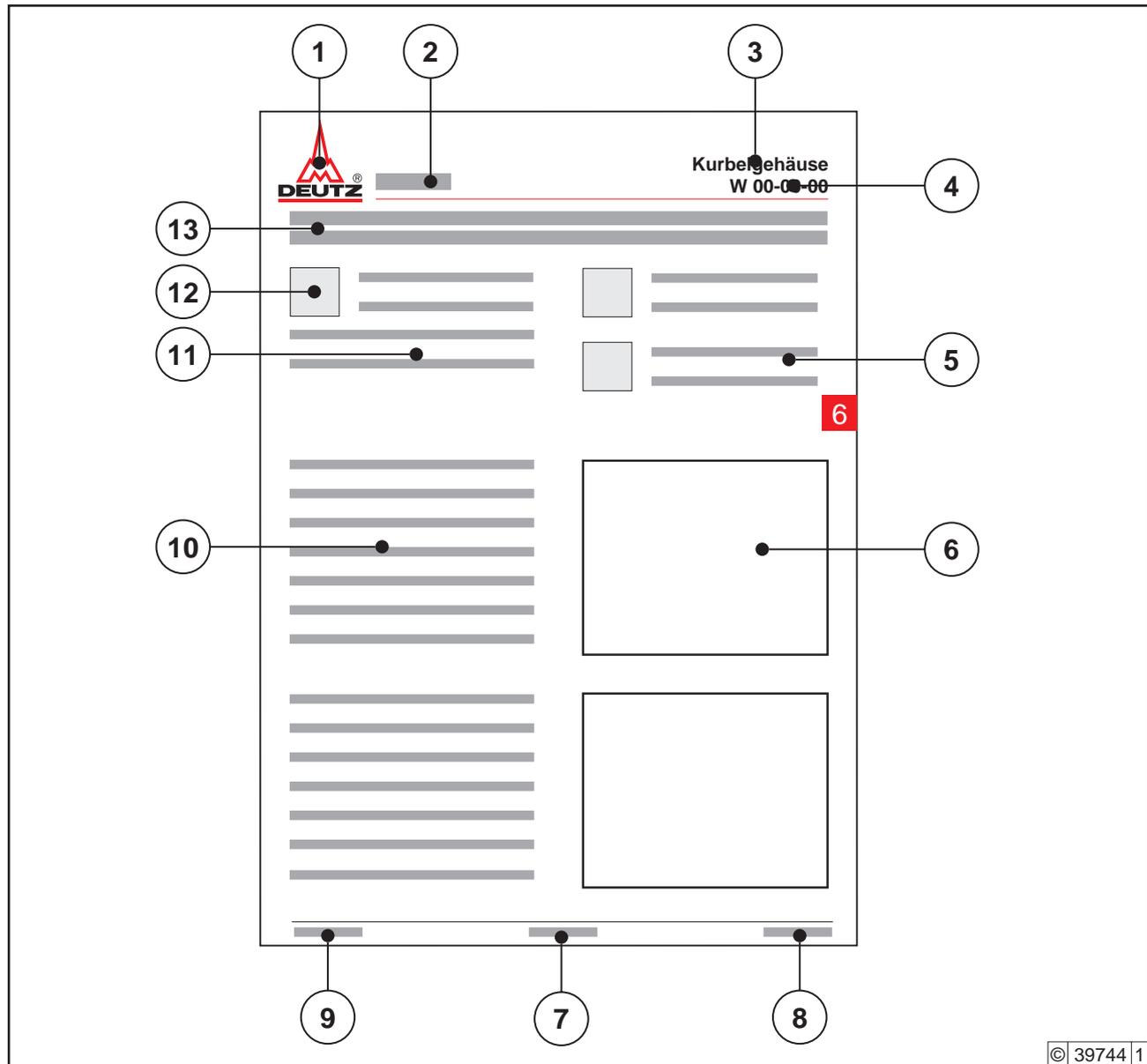
3.4 Job cards

The **job cards** are divided into job cards of the **workshop manual** e. g. **W 04-05-01** and the **maintenance manual I 04-05-01**.

Numbering of job cards



Structure of a job card



- | | |
|---|--|
| 1. DEUTZ, publisher of the service documentation | 8. DEUTZ-internal part number of job card and technical order number |
| 2. Engine type (e. g. 914) | 9. Date of issue of the job card |
| 3. Maintenance group | 10. Work sequence |
| 4. Job card number | 11. Safety and general notes |
| 5. Reference to other job cards, Specifications and similar | 12. Necessary tools, auxiliary materials and spare parts |
| 6. Explanatory graphics | 13. Title of the job card |
| 7. Page number | |



Note

For inquiries about the job card please always state the engine type (2), the job card number (4), the page number (7), the date of issue (9) or alternatively the DEUTZ-internal part number (8).

3.5 Explanation of symbols



Caution!



Auxiliary material

For example: Lifting gear, adhesive



Tools

for example: 100 400 - meter



Note

For example: Cylinder head is dismantled.



Always renew when assembling

For example: Gaskets



References

For example: Job card no. W xx-yy-zz



See technical data (test and setting data)

Line note, for example: "01 61 – Valve clearance (inlet)"



See technical data (tightening specifications)

Line note, for example: "01001 – Cylinder head on crankcase"



Notes

4 Technical data

4.1 Test and adjustment data



Notes

00 00 Engine general

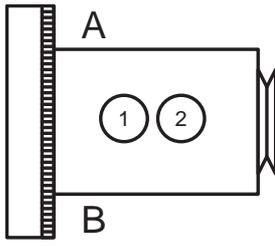
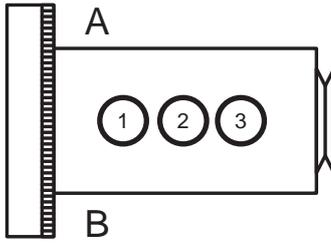
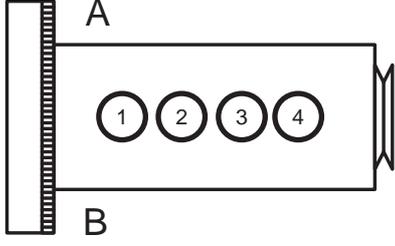
ID No.	Name	Remark	Value	Unit
00 04	Engine weight according to DIN 70020-A	F2L engine	175	kg
		F3L engine	217	
		F4L engine	256	
		F2M engine	169	
		F3M engine	210	
		F4M engine	248	
		BF3L engine	222	
		BF4L engine	257	
		BF3M engine	215	
		BF4M engine	250	
00 10	Working principle		four-stroke diesel	
00 20	Combustion process		Direct injection	
00 31	Bore	Diameter	94	mm
00 32	Stroke		112	mm
00 40	Compression ratio	FL/M engines	19:1	
		BFL/M engines	17.5:1	
00 50	Direction of rotation	looking onto the flywheel	left	
00 51	Compression pressure	FL/M engines	25 to 30	bar
		BFL/M engines	22 to 27	bar
00 70	Ignition distance	2 and 4 cylinder	180	°
		3-cylinder	120	°

4 Technical data

4.1 Test and adjustment data

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ID No.	Name	Remark	Value	Unit
00 71	Ignition sequence	2-cylinder	1 - 2	
		3-cylinder	1 - 2 - 3	
		4-cylinder	1 - 3 - 4 - 2	
00 81	Cylinder arrangement 2-cylinder A = Manifold side B = Operating side		© 39617 0	
	Cylinder arrangement 3-cylinder A = Manifold side B = Operating side		© 39618 0	
	Cylinder arrangement 4-cylinder A = Manifold side B = Operating side		© 39619 0	

4

01 00 Cylinder head

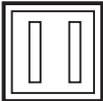
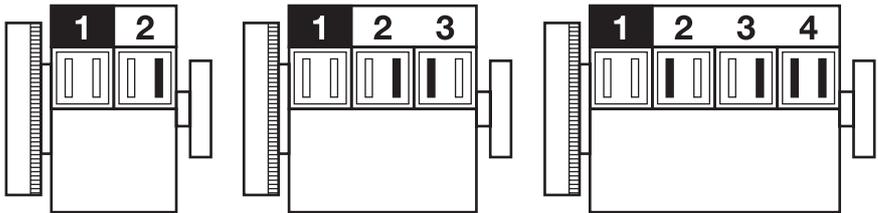
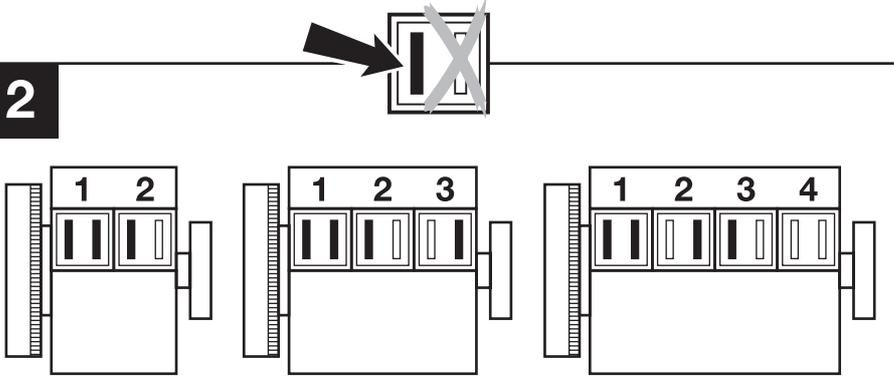
ID No.	Name	Additional information	Value	Unit
01 60	Valve clearance			

ID No.	Name	Additional information	Value	Unit
01 61	Valve clearance (inlet)	<ul style="list-style-type: none"> after a cooling time of at least 0.5 h (oil temperature < 80 °C) 	0.3 ±0.05	mm
		<ul style="list-style-type: none"> Test and setting values in inspections from a running time of 50 operating hours of the engine or life of the cylinder head gasket (see maintenance schedule) Setting values when changing the cylinder head gasket 	(0.4 ±0.05)	
01 62	Valve clearance (outlet)	<ul style="list-style-type: none"> after a cooling time of at least 0.5 h (oil temperature < 80 °C) 	0.5 ±0.05	mm
		<ul style="list-style-type: none"> Test and setting values in inspections from a running time of 50 operating hours of the engine or life of the cylinder head gasket (see maintenance schedule) Setting values when changing the cylinder head gasket 	(0.6 ±0.05)	

4 Technical data

4.1 Test and adjustment data

4

ID No.	Name	Additional information	Value	Unit
01 63	Valve clearance setting scheme			
<ul style="list-style-type: none"> • Turn over engine up until reaching the valve overlap cyl. no. 1. <div data-bbox="271 526 351 604" style="display: inline-block; vertical-align: middle;">  </div> <div data-bbox="383 526 1380 627" style="display: inline-block; vertical-align: middle;"> <p>Note According to the order below (see table) the valve clearance setting is possible with 2 crankshaft revolutions á 360°.</p> </div>				
Crankshaft setting 1			Cyl. no. 1 = overlap	
			white = not adjustable black = adjustable	
Crankshaft setting 2			white = not adjustable black = adjustable	
<div style="display: flex; flex-direction: column; align-items: center;"> <div style="margin-bottom: 20px;"> <div style="background-color: black; color: white; padding: 5px 15px; font-weight: bold; margin-bottom: 5px;">1</div>  </div> <div style="margin-bottom: 20px;"> <div style="background-color: black; color: white; padding: 5px 15px; font-weight: bold; margin-bottom: 5px;">2</div>  </div> </div>				

ID No.	Name	Additional information	Value	Unit
01 70	toggle lever / toggle lever block			
01 72	toggle lever bore for toggle lever axle (outlet)		18 ±0.27	mm
01 73	toggle lever bore for toggle lever axle (inlet)		18 ±0.27	mm
01 74	diameter of the toggle lever axle		17.97 ±0.01	mm
01 98	Length of the cylinder head screw	Standard	150.000 ^{+0.8} _{-0.8}	mm

02 00 Drive system

ID No.	Name	Additional information	Value	Unit
02 70	Piston			
02 75	Piston overlap for cylinder head gasket	1 Notch	0.514 - 0.69	mm
02 76	Piston overlap for cylinder head gasket	2 Notches	0.691 - 0.76	mm
02 77	Piston overlap for cylinder head gasket	3 Notches	0.761 - 0.83	mm

08 00 Lube oil system

ID No.	Name	Additional information	Value	Unit
08 74	Length of the compression spring for the lube oil thermostat		116.7	mm

4 Technical data

4.1 Test and adjustment data

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09 00 Cooling system

ID No.	Name	Additional information	Value	Unit
09 91	Gap dimension between running wheel and blower jacket inlet		min. = 0.2 max. = 0.8	mm

12 00 Other components

ID No.	Name	Additional information	Value	Unit
12 11	Tension of the single V-belt	First assembly	450 \pm 50	N
12 21	Tension of the single V-belt	Check after 15 min running under load	300 \pm 20	N

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4 Technical data

4.1 Test and adjustment data

Notes

4 Technical data

4.2 Tightening specifications