

Services, Wärtsilä Netherlands B.V.

Engine section	Ref.	Date	Issue	Document No.	Page
99 Service information	WNL-Services	12 April 2013	01	TBD620/99/7005	1(1) +encl.

Maintenance schedules

Engine type	TBD620 engines
Engine manual ref.	Ch. 5 "Maintenance" – Operation manual Ch. 9.1 "Overviews" – Operation manual and Workshop manual
General	The set up of the maintenance schedules has been changed.
Instruction	Replace the pages in the operation and workshop manual with enclosed pages.
Documentation	Add this information to your engine manual.
Ordering parts	Contact your closest Wärtsilä Services Unit. When ordering parts please specify the engine serial number and the material numbers.
Letter distribution	The Wärtsilä Services Network and users/owners of engines concerned.
Feedback	E-mail to: service.sales.nl@wartsila.com
Letter validity	Until further notice. Herewith spare parts notice SND620/99/7001 has been cancelled.
Enclosure(s)	Ch. 5 "Maintenance"; including maintenance schedules TBD620. Ch. 9.1.1 "Job cards Alphabetically ordered overview" Ch. 9.1.2 "Job cards Numerically ordered overview"

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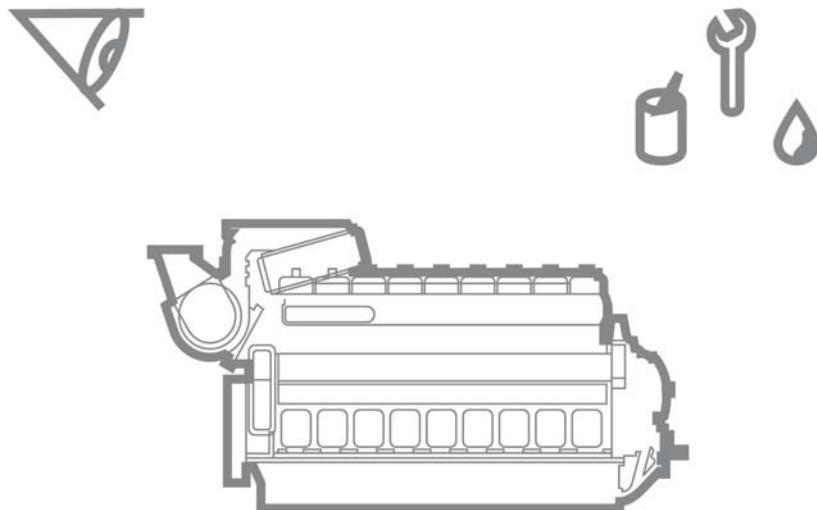
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5.1 General

The information given in the maintenance schedules are recommendations based on experience. No guarantee as to the useful life can be derived from this information. The maintenance intervals specified in the tables below apply to the operation of the engine under normal conditions. The following also applies:

- The use of fuels and consumables as stipulated in Section 4.
- Regular monitoring with duly installed and intact equipment.
- Proper and expert completion of all maintenance work.
- Exclusive use of original Wärtsilä Deutz parts. This also includes filters, seals and O-rings, etc.

Depending on the engine application, deviations from these prerequisites may shorten the maintenance intervals

After the maintenance work has been correctly carried out, the operating hours as indicated on the counter, date and signature or stamp must be recorded.

All the fuel system fittings, locking and regulating elements not named in the below tables, as well as those of the pneumatic system, must be maintained in accordance with the manufacturer's instructions.

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5.3 Periodic maintenance work

See section 5.2.

5.3.1 Power rating

Turbocharger ABB TPS		IACS ** / ISO 3046-1 *				
Performance group		A-G			B	C ***
Engine speed	n ⁻¹	1500	1650	1800	1860	1860
V8	kW	915	960	1016	1120	1168
V12	kW	1370	1440	1524	1680	1752
V16	kW	1830	1920	2032	2240	2336

Turbocharger ABB RR 151		ISO 3046-1 *			
Performance group		A-G			B
Engine speed	n ⁻¹	1500	1650	1800	1860
V8	kW	915	960	1016	1120
V12	kW	1370	1440	1524	1680
V16	kW	1830	1920	2032	2240
		IACS **			
Performance group		A-G			B ***
Engine speed	n ⁻¹	1500	1650	1800	1860
V8	kW	829	870	920	1016
V12	kW	1240	1304	1380	1524
V16	kW	1658	1740	1840	2032

*ISO 3046-1: 25 °C Air temperature; 25 °C charge air coolant inlet temperature; 1000 mbar air pressure @ 100 m height; 30% rel. air humidity

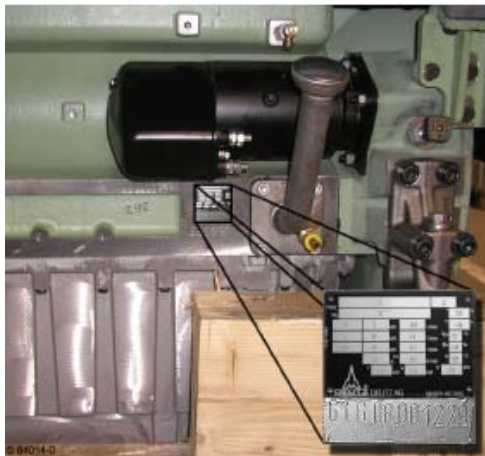
**IACS: 45 °C Air temperature; 32 °C charge air coolant inlet temperature; 1000 mbar air pressure @ 100 m height; 60% rel. air humidity


*** Performance group not available for new engines

5.3.2 Explanation

Performance Groups Wärtsilä Deutz TBD620

Application	Marine propulsion engines			Marine Genset
Performance group	A	B	C	G
Area of application & examples	Continuous operation; unrestricted in time (work boats, tug boats, pusher tugs, supply boats, ferries, harbour boats)	Continuous operation (fast passenger ships and ferries)	Operation restricted in time (police, customs and fast patrol boats, sport fishing boats, commercial yachts)	Continuous operation; unrestricted in time
Standard reference conditions	ICFN	ICFN	IFN	ICXN
Marine conditions	MCFN	MCFN	MFN	M CXN
Typical operating time per year	> 4000 h	3000 h	2000 h	> 4000 h
Operating time period over the 90% of the maximum power	> 80%	max. 80%	max. 20%	> 80%



		DEUTZ AG WERK MANNHEIM	Acceptance Test Report Engine Acceptance Department				Sheet 1 of 10
Customer :		DEUTZ ASIA PACIFIC	Engine type :		TBD 620 V 16		
Order no.:		61 - 8324 - 5 - 0247	Engine no.:		220 1689		
Guarantee (Power to DIN 6271 / ISO 3046 / 1)							
ISO - power				Service power			
Pe =	"MCXN" 1935	kW	n = 1800	rpm	Pe =	"MCFN" 1935	kW n = 1800 rpm
Pe =	"MON" 2129	kW	n = 1860	rpm	Pe =		kW n = rpm
Pe =		kW	n =	rpm	Pe =		kW n = rpm
Power absorbed by auxiliaries : List F				61	kW	List G	kW List H kW

Wärtsilä Deutz Maintenance & service schedules		Performed by
E10	50 hours after commissioning and after E60 & E70	Technicians
E20	Daily check	
E23	Periodic maintenance (small scope)	
E25	Periodic maintenance (small scope)	
E30	Periodic maintenance (small scope)	
E40	Periodic maintenance (medium scope)	
E50	Periodic maintenance (extended scope)	Authorized specialists
E60	Intermediate overhaul	
E70	Major overhaul	
Definition of activities in the maintenance schedule		
Renew	Renew parts, assembly groups and liquids.	
Check	Check according to the criteria in the job card. Rejection of the part, if not all criteria are fulfilled.	
Clean	Cleaning by hand or machine, renewal of cleaning parts (e.g. air filters) may be necessary.	
Visual check	Visual check according to job card. Rejection of the part, if not all criteria are fulfilled.	
Service	Service according to job card. Checking of functions; reworking or renewal of parts may be necessary.	
Tighten	Tighten bolt connections according tightening instructions of manual.	
	Cleaning should be done more frequently if increased contamination prevails.	
Note:	In special situations of engine application the maintenance interval can be shorter!	

5.3.3 Hour independent maintenance

As required	Monthly	Every 6 months	Every year	Every 2 years	Every 4 years	Every 10 years	CG	Description	Action	Job card
x							01	Drain holes of the combustion chamber of the crankcase	Clean	B 3-1-8
x							01	Crankcase ventilation when the maintenance indicator shows "RED"	Service	B 3-1-9
			x	x	x	x	15	Centrifugal lubricating oil filter	Service	B 8-13-1
			x	x	x	x	15	Duplex lubricating oil filter	Service	B 8-10-1
			x	x	x	x	16	Lubricating oil	Renew	B 8-1-1/2
x							22	Vacuum limiter when suction air filter is renewed	Renew	B 6-3-4
x							22	Suction air filter element when the maintenance indicator shows "RED"	Renew	B 6-3-6
				x	x	x	30	Compressed air vessel (or according class regulations)	Visual check	-
					x	x	30	Pressure test compressed air vessel (or according class regulations)	Check	-
					x	x	34	Rubber vibration dampers (or 16,000 hrs, whichever is reached first)	Renew	B 12-1-2
						x	34	Viscosity vibration dampers (or 16,000 hrs, whichever is reached first)	Renew	B 12-1-2
		x	x	x	x	x	38	Cooling water level	Check	TB00-99-2091
				x	x	x	38	Cooling water + treatment	Renew	TB00-99-2091
	x	x	x	x	x	x	44	Battery (After engine standstill > 1 month)	Check	
x							99	Engine	Clean	
x							99	Engine / Test run after maintenance work	Service	B 0-1-4
x							99	Run in engine after changing bearings, pistons, cylinder liners (by authorized experts)		W 0-1-3
	x	x	x	x	x	x	99	Trial run (After engine standstill > 1 month, at long period of standstill preserve engine)		

5.3.4 Specific maintenance schedule according job interval

Performance group	Maintenance job interval										Periodic maintenance jobs	Action	Job Card
	E10	E20	E23	E25	E30	E40	E50	E60	E70				
			Every 6 months		Every year	Every 2 years	Every 4 years	Every 8 years	Every 10 years				
A-G	50 hours after large overhauls										<p>Note: Always check manual for special jobs</p> <p>1) Change annually if the operating hours are not reached. For distillate fuel operation every 500 operating hours / for mixed fuel operation every 250 operating hours, see chapter 4.</p> <p>2) Earlier if the maintenance indicator shows "RED"</p> <p>3) 10 years after commissioning at the latest and with every crankshaft and coupling damage.</p> <p>4) With rigid engine mounting.</p> <p>MD = Manufacturer Documents CG = Construction Group</p>	Action	Job Card
B	Daily												
C	Every 500 oh												
				Every 1,000 oh	Every 1,000 oh	Every 2,000 oh	Every 4,000 oh	Every 8,000 oh	Every 16,000 oh	Every 32,000 oh			
				Every 1,000 oh	Every 1,000 oh	Every 2,000 oh	Every 4,000 oh	Every 8,000 oh	Every 16,000 oh	Every 32,000 oh			
				Every 3,000 oh	Every 3,000 oh	Every 6,000 oh	Every 12,000 oh	Every 12,000 oh	Every 12,000 oh	Every 12,000 oh			
				Every 1,000 oh	Every 1,000 oh	Every 2,000 oh	Every 4,000 oh	Every 8,000 oh	Every 16,000 oh	Every 32,000 oh			
E10	E20	E23	E25	E30	E40	E50	E60	E70	Periodic maintenance jobs	Action	Job Card		

E10	E20	E23	E25	E30	E40	E50	E60	E70	C G	Periodic maintenance jobs	Action	Job Card
				x	x	x	x	x	01	Drain holes of the combustion chamber of the crankcase	Clean	B 3-1-8
			x	x	x	x	x	x	01	Crankcase ventilation system	Service	B 3-1-1/9
								x	01	Main bearing	Renew	W 2-7-1/2
								x	01	Crankshaft wearing rings	Renew	W 2-7-3
								x	01	Cylinder head: stay bolts	Check	
								x	01	Main bearing: stay bolts	Renew	
							x	x	04	Cylinder liner	Renew	W 3-2-3
				x	x	x	x	x	05	Elastic coupling	Check	B 2-17-1
x		x	x	x	x	x	x	x	05	Engine alignment and elastic mounting	Check	B 3-7-1
				x	x	x	x	x	05	Flywheel: Toothed gear	Visual check	
								x	05	Crankshaft	Check	W 2-1-7
							x	x	05	Crankshaft web breathing ⁴⁾	Check	
							x	x	06	Big end bearing	Renew	W 2-5-1
							x	x	06	Small end bearing	Renew	W 2-13-1
							x	x	06	Connecting rod	Check	W 2-3-3
							x	x	07	Piston	Renew	W 3-2-3
x			x	x	x	x	x	x	08	Inlet and exhaust valve clearance	Check	B 1-1-1
x	x	x	x	x	x	x	x	x	08	Cylinder head Swirl valve	Check	B 1-14-1
				x	x	x			08	Combustion chamber by endoscope	Check	W 1-5-4
							x	x	08	Cylinder head	Service	W 1-8-1
							x		09	Wheel drive: Intermediate wheel and wearing ring	Check	W 4-8-1
								x	09	Wheel drive	Service	W 4-4-1
								x	11	Lower valve drive	Check	W 4-2-1
								x	11	Lower valve drive	Renew	W 4-2-1
							x	x	10	Camshaft: fastening parts	Renew	W 4-4-1
							x	x	10	Camshaft	Renew	W 4-5-1
								x	10	Camshaft bearing	Renew	W 4-1-1
								x	14	Lubricating oil pump	Service	W 8-4-1
							x	x	14	Lubricating oil pump: pressure regulating valve	Service	W 8-11-1
x		x	x	x	x	x	x	x	15	Duplex lubricating oil filter	Service	B 8-10-1
							x	x	15	Duplex lubricating oil filter: Steel strainer	Renew	B 8-10-1
x		x	x	x	x	x	x	x	15	Centrifugal lubricating oil filter every 250 hours	Service	B 8-13-1
							x	x	15	Lubricating oil cooler	Clean	W 8-8-1
							x	x	15	Lubricating oil cooler: wear of by-pass valve	Check	W 8-11-1
x		x	x	x	x	x	x	x	16	Fastening screws of the Lubricating oil tray	Tighten	-
x		x	x	x	x	x	x	x	16	Lubricating oil ¹⁾	Renew	B 8-1-1/2
							x	x	16	Lubricating oil system: pressure regulating valve	Service	W 8-11-1
							x	x	16	Pre-lubricating oil pump	Service	
							x	x	17	Injection pump	Service	W 7-4-2

E10	E20	E23	E25	E30	E40	E50	E60	E70	C G	Periodic maintenance jobs	Action	Job Card
								x	18	Injection pump coupling	Renew	W 7-4-16
							x	x	18	Injection pump drive	Service	
x			x	x	x	x	x	x	19	Injectors: Clamping brackets	Tighten	B 7-7-1
				x	x	x	x	x	19	Injectors	Check	B 7-8-1
						x	x	x	19	Injector	Service	W 7-9-1
		x	x	x	x	x	x	x	20	Fuel duplex filter, filter inserts and round sealing rings	Service	B 7-10-1
x			x	x	x	x	x	x	21	Injection lines	Check	B 7-3-3
								x	21	Fuel delivery pump	Service	W 7-11-4
								x	21	Fuel delivery pump	Renew	W 7-11-1
							x	x	21	Low pressure fuel system: non-return valves	Renew	W 7-12-1
		x							22	Vacuum limiter (also when the suction air filter is renewed)	Clean	B 6-3-4
			x	x	x	x	x	x	22	Vacuum limiter (also when the suction air filter is renewed)	Renew	B 6-3-4
			x	x	x	x	x	x	22	Suction air filter element ²⁾	Renew	B 6-3-11
				x	x	x	x	x	27	Control linkage setting	Check	B 5-4-14
x		x	x	x	x	x			27	Speed governing: Wear of stop and shut-off magnets	Check	B 5-4-14
							x	x	27	Speed governing: Stop and shut-off magnets	Renew	B 5-4-14
				x	x	x	x	x	27	Speed adjustment	Check	
						x			27	Speed governor actuator (Heinzmann / Proact)	Check	MD
							x	x	27	Speed governor actuator (Heinzmann / Proact)	Renew	MD
						x			27	Speed governor PSG	Check	MD
							x	x	27	Speed governor PSG	Service	MD
								x	27	Speed governor PSG: drive	Service	MD
x	x	x	x	x	x	x	x	x	30	Compressed air line: dirt trap	Clean	B 10-3-2
			x	x	x	x			34	Rubber vibration dampers	Check	B 12-1-2
							x	x	34	Rubber vibration dampers	Renew	B 12-1-2
							x	x	34	Viscosity vibration dampers ³⁾	Renew	W 12-1-1
					x	x			36	Cooling water system: thermostat inserts	Check	B 9-8-1
							x	x	36	Cooling water thermostat inserts	Renew	W 9-8-2
						x	x	x	36	Raw water system: filling pump	Renew	
								x	36	Cooling water expansion tank: cap	Renew	
					x	x	x	x	36	Plate heat exchanger	Clean	W 9-10-1
						x	x	x	37	Fresh cooling water pump	Service	W 9-7-2
						x	x	x	37	Raw water pump	Service	W 9-7-2
			x	x	x	x	x	x	38	Coolant level (renew after 2 years at latest)	Check	Chapter 4
				x	x	x	x	x	38	Cooling water pre-heater	Service	B 9-9-1
							x	x	41	Exhaust pipe: Compensators and gaskets	Renew	W 6-10-1

E10	E20	E23	E25	E30	E40	E50	E60	E70	C G	Periodic maintenance jobs	Action	Job Card
							x	x	41	Exhaust gas waste gate	Service	
x		x	x	x	x	x	x	x	43	Turbocharger TPS: Belt clips.	Tighten	-
					x				43	Turbocharger: compressor	Clean	MD
						x	x	x	43	Turbocharger (according to MD and/or rating plate)	Service	MD
			x	x					44	V-belt	Check	B 12-2-1
					x	x	x	x	44	V-belt	Renew	B 12-2-1
		x	x	x	x	x	x	x	44	Battery	Service	B 13-4-1
				x	x	x	x	x	44	Starter: Pinion wear	Visual check	B 13-3-1
				x	x	x	x	x	44	Starter	Service	B 13-3-1
								x	44	Electrical starter	Renew	B 13-3-1
					x	x			44	Alternator	Service	B 13-2-1
							x	x	44	Alternator	Renew	W 13-2-1
x		x	x	x	x	x	x	x	48	Monitoring and shut-off devices	Check	B 11-1-1/2/3/21 B 11-3-1 B 11-7-1
							x	x	48	Electric sensors, lifting and pushing magnets of injection pump and quick closing flap	Check	MD
								x	48	Solenoid valves	Renew	MD
					x	x	x	x	58	Charge air cooler: water side	Clean	W 6-4-1
						x	x	x	58	Charge air cooler: water and air side	Clean	W 6-4-2
x		x	x	x	x	x	x	x	87	Fastening screws of the charge air line on the cylinder head	Tighten	-
x	x	x	x	x	x	x	x	x	87	Charge air line	Check	B 6-2-2
x	x	x	x	x	x	x			87	Quick closing flaps	Check	B 6-2-4
							x	x	87	Quick closing flaps	Service	W 6-2-4
		x	x	x	x	x	x	x	99	Engine / Test run after maintenance work	Service	B 0-1-4
x	x	x	x	x	x	x	x	x	99	Engine / engine systems	Visual check	B 0-1-5
x		x	x	x	x	x	x	x	99	External screw connections, hoses and gaskets	Visual check	-
							x	x	99	Other connected parts	Check	MD

5.3.5 Recommended maintenance list for emergency stand by application

Job number	Week	Month	6 Months	12 Months / 1 Year	10 Years	Job description	Action	CG	Job card / Reference / Remark
1	x	x	x	x	x	Test run up to full load, 1 hour	Check parameters	99	FAT
2			x	x	x	Engine lubricating oil	Renew	15	TB00/99/2090, B8-1-1/2
3			x	x	x	Lubricating oil filter	Renew	15	B 8-10-1, B 8-13-1
4		x	x	x	x	V-belt tension and condition	Inspect	57	B 12-2-1
5	x	x	x	x	x	Air filter cleanliness	Check	22	
6			x	x	x	Replace air filter	Renew	22	B 6-3-6
7	x	x	x	x	x	Cooling water level	Check	37	TB00/99/2091
8	x	x	x	x	x	Lubricating oil level	Check	15	B 8-2-1
9				x	x	Endoscopic inspection of one unit	Inspect	99	W 1-5-4
10				x	x	Injection nozzles	Renew	20	B 7-7-3, W 7-9-1
11				x	x	Valve clearance	Check	11	B 1-1-1
12			x	x	x	Fuel filter elements	Renew	20	B 7-10-1
13	x	x	x	x	x	General inspection	Inspect	99	Check for outside leakages and appearance
14				x	x	Control and monitoring system	Inspect	48	B 11-1- 1/2/3/21, B 11- 3-1, B 11-7-1
15				x	x	Exhaust piping tightness	Check	41	B 6-1-1
16				x	x	Fuel oil injection piping	Check	21	
17			x	x	x	Centrifugal lubricating oil filter	Clean	15	B 8-13-1
19				x	x	Concentration of coolant additive	Check	37	TB00/99/2091
20				x	x	LP fuel lines and leak-off lines	Inspect	21	
24				x	x	Charge air cooler, air and cooling water side	Clean	58	W 6-4-1, W 6-4-2
25		x	x	x	x	Linkage of governor and fuel injection pump	Inspect and grease	20	
26				x	x	Cooling water thermostats	Inspect	37	B 9-8-1
27				x	x	Turbocharger	Inspect	43	
28				x	x	Raw / fresh water cooler	Clean	36	W 9-10-1
30				x	x	Flexible connections	Inspect	99	
31				x	x	Coupling and alignment	Check	99	
32			x	x	x	Maintaining the battery	Inspect	99	B 13-4-1
33				x	x	Starter: Visually inspect pinion wear	Inspect	48	

Job number	Week	Month	6 Months	12 Months / 1 Year	10 Years	Job description	Action	CG	Job card / Reference / Remark
34				x	x	Removing, installing and cleaning the frequency pick up	Inspect	48	W 5-3-13
35				x	x	Renew vacuum limiter	Renew	22	B 6-3-4
36			x	x	x	Tighten the clamping brackets of the injection valves	Inspect	20	B 7-7-1
34					x	Viscosity vibration dampers and fastening bolts	Renew	34	W 12-1-1
36					x	Cooling water thermostat inserts	Renew	36	W 9-8-2
37					x	Inspect big end bearing two units	Inspect	06	W 2-5-1
38					x	Inspect piston of two units	Inspect	07	W 3-2-3

Additional: Renew V-belts every 4 years.

5.4 Maintenance parts

For business activities it is necessary to make fast offers. For this purpose there is a calculation application in Wärtsilä's portal: Service Calculation Office (SCO). The function of SCO is to aid in the making of service agreements by calculating the maintenance work costs, spare parts cost, personnel cost and operations cost.

The TBD620 is one of the engines that is added to the SCO database. To obtain data from SCO access to the Wärtsilä portal is necessary. The Wärtsilä service units have this access.

The report from SCO is indicative! As soon as an order is assigned, it is absolutely necessary to have the indicative parts checked whether the parts can be used for the specific engine. The engine number should be used to confirm the engine configuration.

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9.1 Overviews

9.1.1 Alphabetically ordered overview

Assembly term / Activity	Job Card	Maintenance group	
Air filter	B 6-3-11	Charging	06
Battery	B 13-4-1	Electrical system	13
Camshaft	W 4-5-1 W 4-6-1	Engine control	04
Camshaft bearing	W 4-1-1	Engine control	04
Carbon brushes	B 13-3-1	Electrical system	13
Charge air cooler	W 6-4-1 W 6-4-2	Charging	06
Charge air pipe	B 6-2-2	Charging	06
Charge air system	W 6-2-1	Charging	06
Checking engine alignment (and bearing)	B 3-7-1 W 3-7-1	Crankcase	03
Checking injection line	B 7-3-3	Fuel system	07
Checking of upper cylinder liner seating	W 3-10-4	Crankcase	03
Cleaning the cooling plates	W 9-10-4	Coolant system	09
Compensators	W 0-3-4	General	00
Compressed air system	B 10-1-1	Compressed air system	10
Connecting rod / bearing	W 2-3-2 W 2-3-3 W 2-4-1 W 2-5-1 W 2-6-1	Driving mechanism	02
Connecting rod piston pins	W 2-3-4	Driving mechanism	02
Control agents	W 0-3-5	General	00
Control rod	B 5-4-14	Speed control	05
Coolant preheating	B 9-9-1	Coolant system	09
Coolant pumps	B 9-7-1 W 9-7-2	Coolant system	09
Coolant system	B 9-0-1	Coolant system	09
Cooling water thermostat	B 9-8-1	Coolant system	09
Coupling	B 2-17-1	Driving mechanism	02
Crack check	B 0-3-2	General	00
Crank chamber pressure monitor	B 11-1-21	Monitoring system	11
Crankcase drainage hole	B 3-1-8	Crankcase	03
Crankcase ventilation	B 3-1-1	Crankcase	03
Crankshaft	W 2-1-7	Driving mechanism	02
Crankshaft axial ring	W 2-1-4	Driving mechanism	02
Crankshaft ring gear	W 4-11-1	Engine control	04
Crankshaft sealing ring	W 4-9-3 W 4-9-5	Engine control	04
Crankshaft thrust ring	W 2-7-3	Driving mechanism	02

Assembly term / Activity	Job Card	Maintenance group
Cylinder head	W 1-4-1 W 1-4-5 W 1-5-4 W 1-8-1 W 1-9-1	Cylinder head 01
Cylinder liner	W 3-3-1 W 3-4-1 W 3-5-1 W 3-6-1	Crankcase 03
Dirt collector	B 10-3-2	Compressed air system 10
Disassemble and assemble the plate cooler	W 9-10-3	Coolant system 09
Driving mechanism	B 2-1-1 W 3-8-1	Driving mechanism 02
Electrical system	B 13-0-1 B 13-1-1	Electrical system 13
Emergency hand adjustment of the coolant thermostats	B 0-2-3	General 00
Emergency operation	B 0-2-1	General 00
Engine	W 0-5-1	General 00
Exhaust gas pipe	B 6-1-1	Exh. gas system / Charg. 06
Exhaust gas turbocharger	W 6-6-1	Exh. gas system / Charg. 06
Flexible lines	W 0-3-4	General 00
Floating switch	B 11-7-1	Monitoring system 11
Flow monitor	B 11-1-3	Monitoring system 11
Flywheel	W 4-9-1 W 4-9-2 W 4-9-3	Engine control 04
Frequency pickup	W 5-3-15	Governor 05
Fuel distribution block	W 7-12-1	Fuel system 07
Fuel feed pump	W 7-11-1	Fuel system 07
Fuel filter	B 7-3-2 B 7-10-1	Fuel system 07
Gear drive	W 4-4-1 W 4-8-1	Engine control 04
Hydraulic tensioning device	W 1-4-5 W 2-7-4	Cylinder head 01 Driving mechanism 02
Injection pipe	B 7-3-1 B 7-3-3 B 7-3-6	Fuel system 07
Injection pump	W 7-4-1	Fuel system 07
Injection valve	B 7-7-1 B 7-8-1 W 7-9-1	Fuel system 07

Assembly term / Activity	Job Card	Maintenance group	
Injection valve - protective tube	W 1-10-1	Cylinder head	01
Inlet valve	B 1-1-1 W 1-5-1 W 1-7-1	Cylinder head	01
Inspecting the thermostat and -housing	W 9-8-3	Coolant system	09
Installation piston for cylinder liner with coke scraper ring	W 2-14-1b	Driving mechanism	02
Intermediate gear	W 4-4-1	Engine control	04
Liquid nitrogen	B 0-3-1	General	00
Lower valve drive	W 4-2-1	Engine control	04
Lube oil centrifuge	B 8-13-1	Lube oil system	08
Lube oil cooler	W 8-8-1	Lube oil system	08
Lube oil filter	B 8-10-1 B 8-10-2	Lube oil system	08
Lube oil pressure retaining valve	W 8-11-1	Lube oil system	08
Lube oil pump	W 8-4-1	Lube oil system	08
Lube oil pump removal and installation	W 8-4-5	Lube oil system	08
Lube oil system	B 8-2-1	Lube oil system	08
Main bearing	W 2-7-1	Driving mechanism	02
Monitoring and shutdown devices	B 11-3-1 B 11-7-2	Monitoring units	11
Outlet valve	B 1-1-1 W 1-5-1 W 1-5-4 W 1-7-1	Cylinder head	01
Performance Limitation	W 7-4-15	Fuel system	07
Piston bolt	W 2-12-	Driving mechanism	02
Piston cooling oil nozzles	W 2-15-1 W 2-15-2	Driving mechanism	02
Piston rings	W 2-9-1 W 2-9-1b W 2-10-1 W 2-10-2 W 2-14-1 W 2-14-1b	Driving mechanism	02
Pressure monitor	B 11-1-2	Monitoring system	11
Pressure relief valve maintenance	W 8-4-2	Lube oil system	08
Protective tube for injection valve (with fixing thread)	W 1-10-1b	Cylinder head	01
Racor Crankcase Ventilation System	B 3-1-9	Crankcase	03
Removal and installation of lube oil sump	W 3-5-2	Crankcase	03
Removal piston for cylinder liner with coke scraper ring	W 2-9-1b	Driving mechanism	02

Assembly term / Activity	Job Card	Maintenance group	
Remove and install plate cooler	W 9-10-2	Coolant system	09
Removing and installing the fuel delivery pump, make Rickmeier	W 7-11-1	Fuel system	07
Removing and installing the fuel injection pump .../10/... and shaft coupling	W 7-4-16	Fuel system	07
Repairing the fuel delivery pump, make Rickmeier	W 7-11-4	Fuel system	07
Replace crankshaft bearings	W 2-7-2	Driving mechanism	02
Rocker arm	W 1-2-2	Cylinder head	01
Rubber hoses	W 0-3-4	General	00
Run-In order	B 0-1-3	General	00
Safety regulations	B 0-0-3	General	00
Setting control linkage zero position and travel display	W 7-4-17		
Small end bush	W 2-13-1	Driving mechanism	02
Speed governor	B 5-0-1 B 5-3-13 B 5-4-14 W 5-5-1 W 5-5-3	Speed control	05
Stop valve	W 6-2-4 B 6-2-4	Exhaust system	06
Start auxiliary device	B 7-1-1	Fuel system	07
Starter	B 13-3-1	Electrical system	13
Swirl valve	B 1-14-1 W 1-14-2 W 1-14-3	Cylinder head	01
Temperature monitor	B 11-1-1	Monitoring system	11
Thermostat with emergency manual adjustment, remove and install	W 9-8-2b	Coolant system	09
Thermostat without emergency manual adjustment, remove and install	W 9-8-2a	Coolant system	09
Three-phase alternator	B 13-2-1	Electrical system	13
Thrust ring	W 4-9-2 W 4-9-4	Engine control	04
Torsional vibration damper	W 12-1-1 B 12-1-2	Other components	
Trial run	B 0-1-4	General	00

Assembly term / Activity	Job Card	Maintenance group
Upper valve drive	W 1-2-2	Cylinder head 01
Vacuum limiter	B 6-3-4	Charger 06
Valve bridge	W 1-2-3	Cylinder head 01
Valve guide	W 1-6-1	Cylinder head 01
Valve mounting / cone	W 1-7-1 W 1-13-1	Cylinder head 01
Valve rotating device	W 1-3-1 W 1-3-2	Cylinder head 01
V-belt	B 12-2-1	Other components 12

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9.1.2 Numerically ordered overview

Job card number	Assembly term / Activity	The job cards contain the following activities:			
		Check	Servicing	Repairing	Assembly
	General				
B 0-0-3	Safety regulations for fluoroc elastomers				
B 0-1-3	Starting regulations	X			
B 0-1-4	Trial run	X	X		
B 0-2-1	Operation with damaged exhaust gas turbocharger			X	X
B 0-2-3	Emergency hand adjustment of the coolant thermostats				
B 0-3-1	Application of liquid nitrogen				X
B 0-3-2	Crack check by diffusion liquid process	X			
W 0-3-4	Renewal of rubber hoses, compensators, flexible lines and vibration dampers			X	
W 0-3-5	Repairing the fittings and the control agents of the engine components			X	
W 0-5-1	Engine lift and set down				X
	Cylinder head				
B 1-1-1	Inlet and outlet valves	X			
B 1-14-1	Variable swirl valve control	X			
W 1-2-2	Removal and installation of rocker arm	X			X
W 1-2-3	Valve bridge	X		X	
W 1-3-1	Valve rotating device	X			
W 1-3-2	Valve rotating device				X
W 1-4-1	Removal cylinder head				X
W 1-4-5	Cylinder head attachment, installation instructions				X
W 1-5-1	Removal and installation inlet valve and outlet valves				X
W 1-5-4	Combustion chamber check with endoscope	X			
W 1-6-1	Valve guide	X		X	
W 1-7-1	Valve mounting and valve cone	X		X	
W 1-8-1	Cylinder head		X		
W 1-9-1	Attachment cylinder head				X
W 1-10-1	Injection valve - protective tube				X
W 1-10-1b	Protective tube for injection valve (with fixing thread)				X
W 1-13-1	Valve mounting				X
W 1-14-2	Variable swirl valve control		X		
W 1-14-3	Variable swirl valve		X		

Job card number	Assembly term / Activity	The job cards contain the following activities:			
		Check	Servicing	Repairing	Assembly
	Driving mechanism				
B 2-0-1	Safety regulations				
B 2-1-1	Driving mechanism	X			
B 2-17-1	Flexible Coupling	X			
W 2-1-4	Crankshaft axial clearance	X			
W 2-1-7	Crankshaft inspection	X			
W 2-3-2	Connecting rod bearing shell spread	X			
W 2-3-3	Connecting rod bearing clearance	X			
W 2-3-4	Connecting rod piston pins	X			
W 2-4-1	Assessment of run bearing shells	X			
W 2-5-1	Removal of connecting rod bearing				X
W 2-6-1	Installation of connecting rod bearing				X
W 2-7-1	Main bearing			X	
W 2-7-2	Replace crankshaft bearings				X
W 2-7-3	Crankshaft thrust ring				X
W 2-7-4	Hydraulic tensioning facility for vertical support bearing screw-connection				X
W 2-9-1	Removal piston				X
W 2-9-1b	Removal piston for cylinder liner with coke scraper ring				X
W 2-10-1	Piston rings				X
W 2-10-2	Piston ring grooves		X		
W 2-12-1	Piston bolt	X			X
W 2-13-1	Small end bush	X		X	
W 2-14-1	Piston installation				X
W 2-14-1b	Installation piston for cylinder liner with coke scraper ring				X
W 2-15-1	Piston cooling oil nozzles				X
W 2-15-2	Piston cooling oil nozzle unit	X			
W 2-17-2	Flexible Coupling		X		
	Crankcase				
B 3-1-1	Ventilation		X		
B 3-1-8	Drainage hole		X		
B 3-1-9	Crankcase ventilation		X		
B 3-7-1	Checking the engine alignment and bearing	X			
W 3-2-1	Cylinder liner		X		
W 3-2-3	Cylinder unit			X	
W 3-3-1	Cylinder liner	X			
W 3-4-1	Removal cylinder liner				X
W 3-5-1	Installation cylinder liner				X

Job card number	Assembly term / Activity	The job cards contain the following activities:			
		Check	Servicing	Repairing	Assembly
W 3-5-2	Removal and installation of lube oil sump				X
W 3-7-1	Checking engine alignment	X			
W 3-8-1	Driving mechanism			X	
W 3-10-4	Checking of upper cylinder liner seating	X			
	Engine control				
W 4-1-1	Camshaft bearing	X	X		
W 4-2-1	Lower valve drive	X			
W 4-4-1	Removal and installation gears				X
W 4-5-1	Camshaft removal	X			
W 4-6-1	Camshaft installation				X
W 4-8-1	Gear drive	X			
W 4-9-1	Flywheel removal and attachment				X
W 4-9-2	Thrust ring coupling side			X	X
W 4-9-3	Shaft sealing ring coupling side			X	X
W 4-9-4	Thrust ring coupling counter side			X	X
W 4-9-5	Shaft seal coupling counter side			X	X
W 4-11-1	Removal and installation crankshaft ring gear				X
	Speed control				
B 5-0-1	Safety regulations				
B 5-3-13	Setting magnetic speed generator	X			
W 5-3-13	Removal, installation and cleaning the frequency pick-up		X		
B 5-4-14	Setting speed control objects		X		
W 5-5-1	Speed governor, removal and installation				X
W 5-5-3	Set speed regulator				
	Exhaust gas system/charging				
B 6-1-1	Exhaust gas collection pipe	X			
B 6-2-2	Charge air pipe	X			
B 6-2-4	Stop valve	X			
B 6-3-4	Vacuum limiter		X		
B 6-3-6	Air filter element				X
B 6-3-11	Intake air filter				X
W 6-2-1	Charge air system	X			
W 6-2-4	Stop valve		X		
W 6-4-1	Charge air cooler, water side		X		
W 6-4-2	Charge air cooler, air side		X		
W 6-6-1	Exhaust gas turbocharger	X		X	

Job card number	Assembly term / Activity	The job cards contain the following activities:			
		Check	Servicing	Repairing	Assembly
	Fuel system				
B 7-0-1	Regulations				
B 7-1-1	Filler start auxiliary device fill	X			
B 7-3-1	Injection pipe				X
B 7-3-2	Bleed fuel system		X		
B 7-3-3	Injection lines check	X			
B 7-3-6	Injection lines, double walled			X	
B 7-7-1	Removal and installation injection valve				X
B 7-8-1	Injection valve	X			
B 7-10-1	Fuel dual filter	X			
W 7-4-1	Dismounting and mounting injection pump				X
W 7-4-2	Injection pump			X	
W 7-4-15	Check and adjust performance limitation	X			
W 7-4-16	Removing and installing the fuel injection pump .../10/... and shaft coupling				X
W 7-4-17	Setting control linkage zero position and travel display	X			
W 7-6-1	Set start of delivery	X			
W 7-9-1	Injection valve		X		
W 7-11-1	Fuel feed pump				X
W 7-11-4	Repairing the delivery pump, make Rickmeier		X	X	
W 7-12-1	Fuel distribution block, service		X		
	Lube oil system				
B 8-0-1	Regulations				
B 8-1-1	Lube oil sample	X			
B 8-2-1	Lube oil system	X			
B 8-2-2	Lube oil change		X		
B 8-10-1	Double, easy-change filter		X		
B 8-10-2	Bleed double filter	X			
B 8-13-1	Centrifuge		X		
W 8-4-1	Gear wheel lube oil pump	X		X	
W 8-4-2	Pressure relief valve maintenance				
W 8-4-5	Lube oil pump removal and installation				
W 8-8-1	Lube oil cooler	X		X	
W 8-11-1	Pressure retainer valve	X			
	Coolant system				
B 9-0-0	Safety instructions during coolant preliminary heating				
B 9-0-1	Drain system				X

Job card number	Assembly term / Activity	The job cards contain the following activities:			
		Check	Servicing	Repairing	Assembly
B 9-7-1	Coolant pumps	X			
B 9-8-1	Coolant, check thermostat	X		X	
B 9-9-1	Coolant preheating		X		
W 9-7-2	Coolant and untreated water pump	X		X	
W 9-8-2a	Thermostat without emergency manual adjustment, remove and install				X
W 9-8-2b	Thermostat with emergency manual adjustment, remove and install				X
W 9-8-3	Inspecting the thermostat and -housing	X			
W 9-10-1	Clean attached heat exchanger		X		
W 9-10-2	Remove and install plate cooler				X
W 9-10-3	Disassemble and assemble the plate cooler				X
W 9-10-4	Cleaning the cooling plates		X		
	Compressed air				
B 10-1-1	Compressed air system	X			
B 10-2-2	Compressed air starter, oiler		X		
B 10-3-2	Dirt collector		X		
	Monitoring system				
B 11-1-1	Temperature monitor	X			
B 11-1-2	Pressure monitor	X			
B 11-1-3	Flow monitor		X		
B 11-1-21	Crank chamber pressure monitor	X			
B 11-3-1	Monitoring and shutdown devices	X			
B 11-7-1	Floating switch	X			
B 11-7-2	Monitoring and shutdown devices		X		
	Other components				
B 12-1-2	Rubber torsional vibration damper	X			X
B 12-2-1	V-belt	X			X
W 12-1-1	Viscosity torsional vibration damper				X
	Electrical system				
B 13-0-1	Safety regulations				
B 13-1-1	Electrical system	X			
B 13-2-1	Three-phase alternator		X		
B 13-3-1	Starter		X		
B 13-4-1	Battery	X			

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