

# Maintenance Schedule

Diesel Engine

**EPA/CARB**

**12V4000Cx5**

**16V4000Cx5**

**1900 rpm**

**Application Group 5B**

**MSE50174/01E**



*Power. Passion. Partnership.*

Engine model	kW/cyl.	rpm	Application group
12V4000C55	146 kW/cyl.	1900	5B, Continuous operation, variable
12V4000C65	155 kW/cyl.	1900	5B, Continuous operation, variable
16V4000C45	125 kW/cyl.	1900	5B, Continuous operation, variable
16V4000C55	140 kW/cyl.	1900	5B, Continuous operation, variable

*Table 1: Applicability*

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# 1 Maintenance Schedule

## 1.1 Preface

The maintenance schedule is applicable to products certified in accordance with U.S. emissions regulations and operated in the area of applicability of these regulations.

Information about the latest maintenance schedule is available at: <http://www.mtu-online.com>.

The following instructions must be observed for these products:

The maintenance schedule is an integral part of the emissions certification. Nonobservance of the maintenance instructions can result in violation of the statutory emission specifications. Modification or removal of mechanical or electronic components or the installation of additional components as well as the execution of calibration processes that might affect the emission characteristics of the product are prohibited by emission regulations. Emission-relevant components may only be maintained, exchanged or repaired if the components used for this purpose are approved by MTU or equivalent components. Emission-relevant components are for instance control units, data records, sensors, injectors, exhaust flaps and all components of exhaust aftertreatment systems.

The maintenance system for MTU products is based on a preventive maintenance concept. Preventive maintenance facilitates advance operational planning and ensures a high level of equipment availability. The maintenance intervals and the scope of required maintenance activities are the result of operational experience and therefore represent recommendations. Severe operating and ambient conditions may require additional maintenance work and/or modification of the maintenance intervals.

Maintenance activities are specified with intervals based on hours in operation and time limits. Whichever value is reached first shall apply.

The individual maintenance intervals are classified in accordance with the qualification levels QL1 to QL4.

- QL1: Operational monitoring and maintenance work which does not require disassembly of the product.
- QL2: Exchange of components and parts (corrective only, not part of the maintenance schedule).
- QL3: Maintenance work which requires partial disassembly of the product.
- QL4: Maintenance work which requires complete disassembly of the product.

### **Additional notes on maintenance and preservation:**

For change intervals for fluids and lubricants as well as for preservation specifications, refer to the relevant instructions of the component manufacturers and the MTU Fluids and Lubricants Specifications. The latest version for drive systems is available online at: <http://www.mtu-online.com>, and for power generation systems at: <http://www.mtuonsiteenergy.com>.

Components which are not listed in this maintenance schedule must be serviced in accordance with Manufacturer's Instructions.

## 1.2 Allocation matrix application group 5B (Haul truck)

Load profile		12V/16V4000Cx5, 1900 rpm						
Load %	Time %	Load factor %	Load indicator %	0 - 112 kW/cyl.	113 - 125 kW/cyl.	126 - 150 kW/cyl.	151 - 156 kW/cyl.	
110 (100-110)	—	0 - 31	≤ 17	36,000	30,000	24,000	21,000	
100 (90-100)	12							
90 (80-90)	12							
80 (65-80)	—							
65 (50-65)	—							
50 (30-50)	—							
30 (5-30)	16							
Idle (0-5)	60							
110 (100-110)	—	32 - 35	≤ 19	36,000	30,000	21,000	21,000	
100 (90-100)	17							
90 (80-90)	—							
80 (65-80)	13							
65 (50-65)	—							
50 (30-50)	—							
30 (5-30)	15							
Idle (0-5)	55							
110 (100-110)	—	36 - 45	≤ 32	30,000	27,000	18,000	18,000	
100 (90-100)	26							
90 (80-90)	15							
80 (65-80)	—							
65 (50-65)	—							
50 (30-50)	—							
30 (5-30)	12							
Idle (0-5)	47							
110 (100-110)	—	46 - 55	≤ 41	27,000	24,000	15,000	15,000	
100 (90-100)	35							
90 (80-90)	15							
80 (65-80)	—							
65 (50-65)	—							
50 (30-50)	—							
30 (5-30)	15							
Idle (0-5)	35							

Table 2: Allocation matrix application group 5B (Haul truck)

TIM-ID: 0000055291 - 002





Task	Limit	Operating hours [h]																											
		30,000	31,000	32,000	33,000	34,000	35,000	36,000																					
W0508	-																												
W1864	6 m	X	X	X	X	X	X	X																					
W1463	1 a	X	X	X	X	X	X	X																					
W1001	2 a	X	X	X	X	X	X	X																					
W1481	2 a	X	X	X	X	X	X	X																					
W1675	2 a	X	X	X	X	X	X	X																					
W1716	1 a	X			X			X																					
W1003	2 a	X			X			X																					
W1207	2 a	X			X			X																					
W1689	2 a	X			X			X																					
W1296	3 a	X			X			X																					
W1055	6 a			X				X																					
W1551	-	X						X																					
W1817	-	X						X																					
W1525	6 a	X						X																					
W1526	6 a	X						X																					
W1011	6 a							X																					
W1006	9 a							X																					
W1636	9 a							X																					
W1575	1 a							X																					
W1610	9 a							X																					
W1940	9 a							X																					
W1577	9 a	X						X																					
W1812	5 a							X																					
W1026	5 a							X																					
W1250	6 a							X																					
W1043	9 a							X																					
W1818	9 a							X																					
W2001	9 a							X																					
W2004	9 a							X																					
W2006	9 a							X																					
W2007	9 a							X																					
W2009	9 a							X																					
W2010	9 a							X																					
W2062	9 a							X																					
W2070	9 a							X																					
W2110	9 a							X																					
W1038	18 a							X																					
W1051	18 a							X																					
W1058	18 a							X																					
W1134	18 a							X																					
W1251	6 a							X																					
W1035	6 a							X																					
W1124	18 a							X																					
W1819	18 a							X																					
W1901	18 a							X																					
W3000	18 a							X																					

w = weeks  
m = months  
a = years

TIM-ID: 000005921 - 001

Task	Limit	Operating hours [h]																											
		30,000	31,000	32,000	33,000	34,000	35,000	36,000																					
W3001	18 a							X																					
W3002	18 a							X																					
W3003	18 a							X																					
W3004	18 a							X																					
W3005	18 a							X																					
W3018	18 a							X																					
W3021	18 a							X																					
W3182	18 a							X																					
W3097	18 a							X																					
W3100	18 a							X																					
W3101	18 a							X																					
W3103	18 a							X																					
W3108	18 a							X																					
W3143	18 a							X																					
W3144	18 a							X																					
W3165	18 a							X																					
W3177	18 a							X																					

w = weeks  
m = months  
a = years

## 1.4 Maintenance tasks 36,000 h

Qualification level	Interval [h]	Limit	Item	Maintenance tasks	Option	Task
Engine						
QL1	-	-	EPA label	Check if emission label is fitted and legible, and if it contains the correct information.		W0800
QL1	-	2 a	Engine oil filter	Fit new engine oil filters each time the engine oil is changed or, at the latest, on expiry of the time limit (given in years).	X	W1008
QL1	-	2 a	Centrifugal oil filter	Check thickness of oil residue layer. Clean. Fit new sleeve, at the latest, each time the engine oil is changed.		W1009
QL1	Daily	-	Engine operation	Check engine oil level.		W0500
				Carry out visual inspection of engine for general condition and leaks.		W0501
				Check relief bores of coolant pump(s).		W0505
				Check for abnormal running noises, exhaust gas color and vibration.		W0506
				Drain off water and contamination from fuel prefilter.		W0507
				Check differential pressure gauge of fuel prefilter.		W0508
QL1	1000	6 m	Automatic engine oil filter	Check and clean oil indicator filter.	X	W1864
QL1	1000	1 a	Engine mounts	Carry out visual inspection of engine mounts for general condition.		W1463
QL1	1000	2 a	Fuel filter	Fit new fuel filter or new fuel filter insert.		W1001
QL1	1000	2 a	Intermediate fuel filter	Replace intermediate fuel filter or filter element of intermediate fuel filter.		W1481
QL1	1000	2 a	Fuel prefilter	Fit new fuel prefilter or new fuel prefilter insert.		W1675
QL1	3000	1 a	Battery charging alternator	Clean battery-charging generator.		W1716
QL1	3000	2 a	Belt drive	Check belt condition and tension Fit new belt(s) if necessary.		W1003
QL1	3000	2 a	Valve gear	Check valve clearance, adjust if required. ATTENTION! Initial adjustment after 1,000 operating hours and subsequently 1,000 operating hours after each cylinder-head overhaul..		W1207
QL1	3000	2 a	Cylinder heads	Measure valve stem end to cylinder head top distance.		W1689
QL1	3000	3 a	Coolant expansion tank	Replace valve.	X	W1296
QL1	4000	6 a	Crankcase breathers	Fit new oil separators.		W1055
QL1	6000	-	Exhaust gas recirculation	Check operation of exhaust flap actuators.		W1551
				Check coupling bars of EGR flaps for play.		W1817
QL1	6000	6 a	NOx sensor	Fit new sensor.		W1525
QL1	6000	6 a	Oxygen sensor	Fit new sensor.		W1526
QL1	12000	6 a	Combustion chambers	Inspect cylinder chambers using endoscope.		W1011
QL1	12000	9 a	Fuel injectors	Replace fuel injectors.		W1006
QL1	12000	9 a	Engine governor	Reset parameters of drift correction (CDC) and enter injector coding (IIG).		W1636
QL1	18000	1 a	Engine mounts	Carry out visual inspection of Trunion mounts for general condition.		W1575
QL1	18000	9 a	Engine mounts	Check securing screws of trunion mounts for secure seating.		W1610
QL1	18000	9 a	Auxiliary PTO	Replace auxiliary PTO of generator.		W1940
QL3	6000	9 a	Turbochargers	Check turbine housing for cracks (externally by visual inspection and internally by endoscopic examination), replace if necessary..		W1577
QL3	18000	5 a	Engine mounts	Check for cracks. Measure height of rubber element.		W1812
				Check buffer clearance of mounts, check proper seating of securing screws.		W1026
QL3	18000	6 a	Rubber sleeves	Replace all rubber sleeves.		W1250
QL3	18000	9 a	Battery charging alternator	Overhaul battery-charging generator.		W1043
QL3	18000	9 a	Exhaust gas recirculation	Replace EGR actuators and check EGR flaps for wear, replace if necessary.		W1818

w = weeks  
m = months  
a = years

TID-ID: 0000065922 - 001

Qualification level	Interval [h]	Limit	Item	Maintenance tasks	Option	Task
QL3	18000	9 a	Component maintenance	Inspect rocker arms and valve bridge for wear. Insert an endoscope through the pushrod bore to visually inspect swing followers and camshaft running surfaces.		W2001
				Fit new high-pressure fuel sensor.		W2004
				Check engine coolant thermostat and fit new thermal actuator.		W2006
				Check charge-air coolant thermostat and fit new thermal actuator.		W2007
				Inspect centrifugal oil filter for wear.		W2009
				Overhaul starter.		W2010
				Fit new seals/sealing materials for all disassembled components.		W2062
				Overhaul charge-air coolant pump.		W2070
				Overhaul engine coolant pump.		W2110
				QL3	18000	18 a
QL3	18000	18 a	Fuel delivery pump	Fit new fuel delivery pump.		W1051
QL3	36000	18 a	HP fuel pump	Fit new high-pressure fuel pump.		W1058
QL3	36000	18 a	Cylinder heads	Overhaul cylinder heads.		W1134
QL4	36000	6 a	Hose lines	Replace all hose lines.		W1251
QL4	36000	6 a	Automatic engine oil filter	Remove filter housing and clean. Fit new filter candles.	X	W1035
QL4	36000	18 a	Engine mounts	Fit new Trunnion mount element.		W1124
QL4	36000	18 a	Exhaust gas recirculation	Replace EGR flaps.		W1819
				Replace EGR cooler.		W1901
QL4	36000	18 a	Extended component maintenance	Completely disassemble the engine. Inspect engine components as per assembly instructions and repair or fit new components as required.		W3000
				Replace all elastomeric parts and seals with new ones.		W3001
				Fit new piston rings.		W3002
				Fit new conrod bearings.		W3003
				Fit new crankshaft bearings.		W3004
				Fit new cylinder liners.		W3005
				Fit new camshaft bearings and camshaft thrust bearings.		W3018
				Fit new pressure relief valve in high-pressure fuel system.		W3021
				Gear train: Check tooth flanks for wear (visual inspection), replace bearing bushings.		W3182
				Fit new shaft misalignment coupling.		W3097
				Fit new rubber elements of engine mounts.		W3100
				Fit new turbine wheels for turbochargers.		W3101
				Replace swing followers and swing-follower shafts.		W3103
				Check vibration damper, fit new one if necessary.		W3108
				Replace pulley.		W3143
				Insulated flywheel: Check and repair if required.		W3144
				Overhaul fan clutch.		W3165
Check engine oil pump, replace if necessary.		W3177				

w = weeks  
m = months  
a = years

TIN-ID: 0000065922 - 001





Task	Limit	Operating hours [h]																							
		30,000																							
W0508	-																								
W1864	6 m	X																							
W1463	1 a	X																							
W1001	2 a	X																							
W1481	2 a	X																							
W1675	2 a	X																							
W1716	1 a	X																							
W1003	2 a	X																							
W1207	2 a	X																							
W1689	2 a	X																							
W1296	3 a	X																							
W1055	6 a	X																							
W1551	-	X																							
W1817	-	X																							
W1525	6 a	X																							
W1526	6 a	X																							
W1011	6 a	X																							
W1006	9 a	X																							
W1636	9 a	X																							
W1575	1 a	X																							
W1610	9 a	X																							
W1940	9 a	X																							
W1577	9 a	X																							
W1812	5 a	X																							
W1026	5 a	X																							
W1250	6 a	X																							
W1043	9 a	X																							
W1818	9 a	X																							
W2001	9 a	X																							
W2004	9 a	X																							
W2006	9 a	X																							
W2007	9 a	X																							
W2009	9 a	X																							
W2010	9 a	X																							
W2062	9 a	X																							
W2070	9 a	X																							
W2110	9 a	X																							
W1038	18 a	X																							
W1051	18 a	X																							
W1058	18 a	X																							
W1134	18 a	X																							
W1251	6 a	X																							
W1035	6 a	X																							
W1124	18 a	X																							
W1819	18 a	X																							
W1901	18 a	X																							
W3000	18 a	X																							

w = weeks  
m = months  
a = years

TIM-ID: 000005925 - 001

Task	Limit	Operating hours [h]																												
		30,000																												
W3001	18 a	X																												
W3002	18 a	X																												
W3003	18 a	X																												
W3004	18 a	X																												
W3005	18 a	X																												
W3018	18 a	X																												
W3021	18 a	X																												
W3182	18 a	X																												
W3097	18 a	X																												
W3100	18 a	X																												
W3101	18 a	X																												
W3103	18 a	X																												
W3108	18 a	X																												
W3143	18 a	X																												
W3144	18 a	X																												
W3165	18 a	X																												
W3177	18 a	X																												

w = weeks  
m = months  
a = years

## 1.6 Maintenance tasks 30,000 h

Qualification level	Interval [h]	Limit	Item	Maintenance tasks	Option	Task
Engine						
QL1	-	-	EPA label	Check if emission label is fitted and legible, and if it contains the correct information.		W0800
QL1	-	2 a	Engine oil filter	Fit new engine oil filters each time the engine oil is changed or, at the latest, on expiry of the time limit (given in years).	X	W1008
QL1	-	2 a	Centrifugal oil filter	Check thickness of oil residue layer. Clean. Fit new sleeve, at the latest, each time the engine oil is changed.		W1009
QL1	Daily	-	Engine operation	Check engine oil level.		W0500
				Carry out visual inspection of engine for general condition and leaks.		W0501
				Check relief bores of coolant pump(s).		W0505
				Check for abnormal running noises, exhaust gas color and vibration.		W0506
				Drain off water and contamination from fuel prefilter.		W0507
				Check differential pressure gauge of fuel prefilter.		W0508
QL1	1000	6 m	Automatic engine oil filter	Check and clean oil indicator filter.	X	W1864
QL1	1000	1 a	Engine mounts	Carry out visual inspection of engine mounts for general condition.		W1463
QL1	1000	2 a	Fuel filter	Fit new fuel filter or new fuel filter insert.		W1001
QL1	1000	2 a	Intermediate fuel filter	Replace intermediate fuel filter or filter element of intermediate fuel filter.		W1481
QL1	1000	2 a	Fuel prefilter	Fit new fuel prefilter or new fuel prefilter insert.		W1675
QL1	3000	1 a	Battery charging alternator	Clean battery-charging generator.		W1716
QL1	3000	2 a	Belt drive	Check belt condition and tension Fit new belt(s) if necessary.		W1003
QL1	3000	2 a	Valve gear	Check valve clearance, adjust if required. ATTENTION! Initial adjustment after 1,000 operating hours and subsequently 1,000 operating hours after each cylinder-head overhaul..		W1207
QL1	3000	2 a	Cylinder heads	Measure valve stem end to cylinder head top distance.		W1689
QL1	3000	3 a	Coolant expansion tank	Replace valve.	X	W1296
QL1	3000	6 a	Crankcase breathers	Fit new oil separators.		W1055
QL1	6000	-	Exhaust gas recirculation	Check operation of exhaust flap actuators.		W1551
				Check coupling bars of EGR flaps for play.		W1817
QL1	6000	6 a	NOx sensor	Fit new sensor.		W1525
QL1	6000	6 a	Oxygen sensor	Fit new sensor.		W1526
QL1	10000	6 a	Combustion chambers	Inspect cylinder chambers using endoscope.		W1011
QL1	10000	9 a	Fuel injectors	Replace fuel injectors.		W1006
QL1	10000	9 a	Engine governor	Reset parameters of drift correction (CDC) and enter injector coding (IIG).		W1636
QL1	15000	1 a	Engine mounts	Carry out visual inspection of Trunion mounts for general condition.		W1575
QL1	15000	9 a	Engine mounts	Check securing screws of trunion mounts for secure seating.		W1610
QL1	15000	9 a	Auxiliary PTO	Replace auxiliary PTO of generator.		W1940
QL3	6000	9 a	Turbochargers	Check turbine housing for cracks (externally by visual inspection and internally by endoscopic examination), replace if necessary..		W1577
QL3	15000	5 a	Engine mounts	Check for cracks. Measure height of rubber element.		W1812
				Check buffer clearance of mounts, check proper seating of securing screws.		W1026
QL3	15000	6 a	Rubber sleeves	Replace all rubber sleeves.		W1250
QL3	15000	9 a	Battery charging alternator	Overhaul battery-charging generator.		W1043
QL3	15000	9 a	Exhaust gas recirculation	Replace EGR actuators and check EGR flaps for wear, replace if necessary.		W1818

w = weeks  
m = months  
a = years

TIM-ID: 0000065926 - 001

Qualification level	Interval [h]	Limit	Item	Maintenance tasks	Option	Task
QL3	15000	9 a	Component maintenance	Inspect rocker arms and valve bridge for wear. Insert an endoscope through the pushrod bore to visually inspect swing followers and camshaft running surfaces.		W2001
				Fit new high-pressure fuel sensor.		W2004
				Check engine coolant thermostat and fit new thermal actuator.		W2006
				Check charge-air coolant thermostat and fit new thermal actuator.		W2007
				Inspect centrifugal oil filter for wear.		W2009
				Overhaul starter.		W2010
				Fit new seals/sealing materials for all disassembled components.		W2062
				Overhaul charge-air coolant pump.		W2070
				Overhaul engine coolant pump.		W2110
				QL3	15000	18 a
QL3	30000	18 a	Fuel delivery pump	Fit new fuel delivery pump.		W1051
QL3	30000	18 a	HP fuel pump	Fit new high-pressure fuel pump.		W1058
QL3	30000	18 a	Cylinder heads	Overhaul cylinder heads.		W1134
QL4	30000	6 a	Hose lines	Replace all hose lines.		W1251
QL4	30000	6 a	Automatic engine oil filter	Remove filter housing and clean. Fit new filter candles.	X	W1035
QL4	30000	18 a	Engine mounts	Fit new Trunnion mount element.		W1124
QL4	30000	18 a	Exhaust gas recirculation	Replace EGR flaps.		W1819
				Replace EGR cooler.		W1901
QL4	30000	18 a	Extended component maintenance	Completely disassemble the engine. Inspect engine components as per assembly instructions and repair or fit new components as required.		W3000
				Replace all elastomeric parts and seals with new ones.		W3001
				Fit new piston rings.		W3002
				Fit new conrod bearings.		W3003
				Fit new crankshaft bearings.		W3004
				Fit new cylinder liners.		W3005
				Fit new camshaft bearings and camshaft thrust bearings.		W3018
				Fit new pressure relief valve in high-pressure fuel system.		W3021
				Gear train: Check tooth flanks for wear (visual inspection), replace bearing bushings.		W3182
				Fit new shaft misalignment coupling.		W3097
				Fit new rubber elements of engine mounts.		W3100
				Fit new turbine wheels for turbochargers.		W3101
				Replace swing followers and swing-follower shafts.		W3103
				Check vibration damper, fit new one if necessary.		W3108
				Replace pulley.		W3143
				Insulated flywheel: Check and repair if required.		W3144
				Overhaul fan clutch.		W3165
Check engine oil pump, replace if necessary.		W3177				

w = weeks  
m = months  
a = years

TIM-ID: 0000065926 - 001







Task	Limit	Operating hours [h]																												
		25,000	26,000	27,000																										
W3001	18 a			X																										
W3002	18 a			X																										
W3003	18 a			X																										
W3004	18 a			X																										
W3005	18 a			X																										
W3018	18 a			X																										
W3021	18 a			X																										
W3182	18 a			X																										
W3097	18 a			X																										
W3100	18 a			X																										
W3101	18 a			X																										
W3103	18 a			X																										
W3108	18 a			X																										
W3143	18 a			X																										
W3144	18 a			X																										
W3165	18 a			X																										
W3177	18 a			X																										

w = weeks  
m = months  
a = years

## 1.8 Maintenance tasks 27,000 h

Qualification level	Interval [h]	Limit	Item	Maintenance tasks	Option	Task
Engine						
QL1	-	-	EPA label	Check if emission label is fitted and legible, and if it contains the correct information.		W0800
QL1	-	2 a	Engine oil filter	Fit new engine oil filters each time the engine oil is changed or, at the latest, on expiry of the time limit (given in years).	X	W1008
QL1	-	2 a	Centrifugal oil filter	Check thickness of oil residue layer. Clean. Fit new sleeve, at the latest, each time the engine oil is changed.		W1009
QL1	Daily	-	Engine operation	Check engine oil level.		W0500
				Carry out visual inspection of engine for general condition and leaks.		W0501
				Check relief bores of coolant pump(s).		W0505
				Check for abnormal running noises, exhaust gas color and vibration.		W0506
				Drain off water and contamination from fuel prefilter.		W0507
				Check differential pressure gauge of fuel prefilter.		W0508
QL1	1000	6 m	Automatic engine oil filter	Check and clean oil indicator filter.	X	W1864
QL1	1000	1 a	Engine mounts	Carry out visual inspection of engine mounts for general condition.		W1463
QL1	1000	2 a	Fuel filter	Fit new fuel filter or new fuel filter insert.		W1001
QL1	1000	2 a	Intermediate fuel filter	Replace intermediate fuel filter or filter element of intermediate fuel filter.		W1481
QL1	1000	2 a	Fuel prefilter	Fit new fuel prefilter or new fuel prefilter insert.		W1675
QL1	3000	1 a	Battery charging alternator	Clean battery-charging generator.		W1716
QL1	3000	2 a	Belt drive	Check belt condition and tension Fit new belt(s) if necessary.		W1003
QL1	3000	2 a	Valve gear	Check valve clearance, adjust if required. ATTENTION! Initial adjustment after 1,000 operating hours and subsequently 1,000 operating hours after each cylinder-head overhaul..		W1207
QL1	3000	2 a	Cylinder heads	Measure valve stem end to cylinder head top distance.		W1689
QL1	3000	3 a	Coolant expansion tank	Replace valve.	X	W1296
QL1	3000	6 a	Crankcase breathers	Fit new oil separators.		W1055
QL1	5400	-	Exhaust gas recirculation	Check operation of exhaust flap actuators.		W1551
				Check coupling bars of EGR flaps for play.		W1817
QL1	5400	6 a	NOx sensor	Fit new sensor.		W1525
QL1	5400	6 a	Oxygen sensor	Fit new sensor.		W1526
QL1	9000	6 a	Combustion chambers	Inspect cylinder chambers using endoscope.		W1011
QL1	9000	9 a	Fuel injectors	Replace fuel injectors.		W1006
QL1	9000	9 a	Engine governor	Reset parameters of drift correction (CDC) and enter injector coding (IIG).		W1636
QL1	13500	1 a	Engine mounts	Carry out visual inspection of Trunion mounts for general condition.		W1575
QL1	13500	9 a	Engine mounts	Check securing screws of trunion mounts for secure seating.		W1610
QL1	13500	9 a	Auxiliary PTO	Replace auxiliary PTO of generator.		W1940
QL3	5400	9 a	Turbochargers	Check turbine housing for cracks (externally by visual inspection and internally by endoscopic examination), replace if necessary..		W1577
QL3	13500	5 a	Engine mounts	Check for cracks. Measure height of rubber element.		W1812
				Check buffer clearance of mounts, check proper seating of securing screws.		W1026
QL3	13500	6 a	Rubber sleeves	Replace all rubber sleeves.		W1250
QL3	13500	9 a	Battery charging alternator	Overhaul battery-charging generator.		W1043
QL3	13500	9 a	Exhaust gas recirculation	Replace EGR actuators and check EGR flaps for wear, replace if necessary.		W1818

w = weeks  
m = months  
a = years

Qualification level	Interval [h]	Limit	Item	Maintenance tasks	Option	Task
QL3	13500	9 a	Component maintenance	Inspect rocker arms and valve bridge for wear. Insert an endoscope through the pushrod bore to visually inspect swing followers and camshaft running surfaces.		W2001
				Fit new high-pressure fuel sensor.		W2004
				Check engine coolant thermostat and fit new thermal actuator.		W2006
				Check charge-air coolant thermostat and fit new thermal actuator.		W2007
				Inspect centrifugal oil filter for wear.		W2009
				Overhaul starter.		W2010
				Fit new seals/sealing materials for all disassembled components.		W2062
				Overhaul charge-air coolant pump.		W2070
				Overhaul engine coolant pump.		W2110
				QL3	13500	18 a
QL3	27000	18 a	Fuel delivery pump	Fit new fuel delivery pump.		W1051
QL3	27000	18 a	HP fuel pump	Fit new high-pressure fuel pump.		W1058
QL3	27000	18 a	Cylinder heads	Overhaul cylinder heads.		W1134
QL4	27000	6 a	Hose lines	Replace all hose lines.		W1251
QL4	27000	6 a	Automatic engine oil filter	Remove filter housing and clean. Fit new filter candles.	X	W1035
QL4	27000	18 a	Engine mounts	Fit new Trunnion mount element.		W1124
QL4	27000	18 a	Exhaust gas recirculation	Replace EGR flaps.		W1819
				Replace EGR cooler.		W1901
QL4	27000	18 a	Extended component maintenance	Completely disassemble the engine. Inspect engine components as per assembly instructions and repair or fit new components as required.		W3000
				Replace all elastomeric parts and seals with new ones.		W3001
				Fit new piston rings.		W3002
				Fit new conrod bearings.		W3003
				Fit new crankshaft bearings.		W3004
				Fit new cylinder liners.		W3005
				Fit new camshaft bearings and camshaft thrust bearings.		W3018
				Fit new pressure relief valve in high-pressure fuel system.		W3021
				Gear train: Check tooth flanks for wear (visual inspection), replace bearing bushings.		W3182
				Fit new shaft misalignment coupling.		W3097
				Fit new rubber elements of engine mounts.		W3100
				Fit new turbine wheels for turbochargers.		W3101
				Replace swing followers and swing-follower shafts.		W3103
				Check vibration damper, fit new one if necessary.		W3108
				Replace pulley.		W3143
				Insulated flywheel: Check and repair if required.		W3144
				Overhaul fan clutch.		W3165
Check engine oil pump, replace if necessary.		W3177				

w = weeks  
m = months  
a = years

TIM-ID: 0000065928 - 001

# 1.9 Maintenance schedule matrix 24,000 h

## 0 to 24,000 Operating hours

Task	Limit	Operating hours [h]																										
		Daily	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000	11,000	12,000	13,000	14,000	15,000	16,000	17,000	18,000	19,000	20,000	21,000	22,000	23,000	24,000		
Engine																												
W0800	-																											
W1008	2 a																											
W1009	2 a																											
W0500	-	X																										
W0501	-	X																										
W0505	-	X																										
W0506	-	X																										
W0507	-	X																										
W0508	-	X																										
W1864	6 m	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W1463	1 a	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W1001	2 a	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W1481	2 a	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W1675	2 a	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W1716	1 a			X			X			X			X			X			X			X			X			X
W1003	2 a			X			X			X			X			X			X			X			X			X
W1207	2 a	X		X			X			X			X			X			X			X			X			X
W1689	2 a			X			X			X			X			X			X			X			X			X
W1296	3 a			X			X			X			X			X			X			X			X			X
W1055	6 a				X			X			X			X			X			X			X			X		X
W1551	-						X					X						X									X	
W1817	-						X					X						X									X	
W1525	6 a						X					X						X									X	
W1526	6 a						X					X						X									X	
W1011	6 a								X								X										X	
W1006	9 a								X								X										X	
W1636	9 a								X								X										X	
W1575	1 a													X													X	
W1610	9 a												X														X	
W1940	9 a												X														X	
W1577	9 a						X					X					X				X						X	
W1812	5 a												X														X	
W1026	5 a												X														X	
W1250	6 a												X														X	
W1043	9 a												X														X	
W1818	9 a												X														X	
W2001	9 a												X														X	
W2004	9 a												X														X	
W2006	9 a												X														X	
W2007	9 a												X														X	
W2009	9 a												X														X	
W2010	9 a												X														X	

w = weeks  
m = months  
a = years

TIM-ID: 00005570 - 003

Task	Limit	Operating hours [h]																									
		Daily	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000	11,000	12,000	13,000	14,000	15,000	16,000	17,000	18,000	19,000	20,000	21,000	22,000	23,000	24,000	
W2062	9 a												X														X
W2070	9 a												X														X
W2110	9 a												X														X
W1038	18 a												X														X
W1051	18 a																										X
W1058	18 a																										X
W1134	18 a																										X
W1251	6 a																										X
W1035	6 a																										X
W1124	18 a																										X
W1819	18 a																										X
W1901	18 a																										X
W3000	18 a																										X
W3001	18 a																										X
W3002	18 a																										X
W3003	18 a																										X
W3004	18 a																										X
W3005	18 a																										X
W3018	18 a																										X
W3021	18 a																										X
W3182	18 a																										X
W3097	18 a																										X
W3100	18 a																										X
W3101	18 a																										X
W3103	18 a																										X
W3108	18 a																										X
W3143	18 a																										X
W3144	18 a																										X
W3165	18 a																										X
W3177	18 a																										X

w = weeks  
m = months  
a = years

## 1.10 Maintenance tasks 24,000 h

Qualification level	Interval [h]	Limit	Item	Maintenance tasks	Option	Task
Engine						
QL1	-	-	EPA label	Check if emission label is fitted and legible, and if it contains the correct information.		W0800
QL1	-	2 a	Engine oil filter	Fit new engine oil filters each time the engine oil is changed or, at the latest, on expiry of the time limit (given in years).	X	W1008
QL1	-	2 a	Centrifugal oil filter	Check thickness of oil residue layer. Clean. Fit new sleeve, at the latest, each time the engine oil is changed.		W1009
QL1	Daily	-	Engine operation	Check engine oil level.		W0500
				Carry out visual inspection of engine for general condition and leaks.		W0501
				Check relief bores of coolant pump(s).		W0505
				Check for abnormal running noises, exhaust gas color and vibration.		W0506
				Drain off water and contamination from fuel prefilter.		W0507
				Check differential pressure gauge of fuel prefilter.		W0508
QL1	1000	6 m	Automatic engine oil filter	Check and clean oil indicator filter.	X	W1864
QL1	1000	1 a	Engine mounts	Carry out visual inspection of engine mounts for general condition.		W1463
QL1	1000	2 a	Fuel filter	Fit new fuel filter or new fuel filter insert.		W1001
QL1	1000	2 a	Intermediate fuel filter	Replace intermediate fuel filter or filter element of intermediate fuel filter.		W1481
QL1	1000	2 a	Fuel prefilter	Fit new fuel prefilter or new fuel prefilter insert.		W1675
QL1	3000	1 a	Battery charging alternator	Clean battery-charging generator.		W1716
QL1	3000	2 a	Belt drive	Check belt condition and tension Fit new belt(s) if necessary.		W1003
QL1	3000	2 a	Valve gear	Check valve clearance, adjust if required. ATTENTION! Initial adjustment after 1,000 operating hours and subsequently 1,000 operating hours after each cylinder-head overhaul..		W1207
QL1	3000	2 a	Cylinder heads	Measure valve stem end to cylinder head top distance.		W1689
QL1	3000	3 a	Coolant expansion tank	Replace valve.	X	W1296
QL1	4000	6 a	Crankcase breathers	Fit new oil separators.		W1055
QL1	6000	-	Exhaust gas recirculation	Check operation of exhaust flap actuators.		W1551
				Check coupling bars of EGR flaps for play.		W1817
QL1	6000	6 a	NOx sensor	Fit new sensor.		W1525
QL1	6000	6 a	Oxygen sensor	Fit new sensor.		W1526
QL1	8000	6 a	Combustion chambers	Inspect cylinder chambers using endoscope.		W1011
QL1	8000	9 a	Fuel injectors	Replace fuel injectors.		W1006
QL1	8000	9 a	Engine governor	Reset parameters of drift correction (CDC) and enter injector coding (IIG).		W1636
QL1	12000	1 a	Engine mounts	Carry out visual inspection of Trunion mounts for general condition.		W1575
QL1	12000	9 a	Engine mounts	Check securing screws of trunion mounts for secure seating.		W1610
QL1	12000	9 a	Auxiliary PTO	Replace auxiliary PTO of generator.		W1940
QL3	6000	9 a	Turbochargers	Check turbine housing for cracks (externally by visual inspection and internally by endoscopic examination), replace if necessary..		W1577
QL3	12000	5 a	Engine mounts	Check for cracks. Measure height of rubber element.		W1812
				Check buffer clearance of mounts, check proper seating of securing screws.		W1026
QL3	12000	6 a	Rubber sleeves	Replace all rubber sleeves.		W1250
QL3	12000	9 a	Battery charging alternator	Overhaul battery-charging generator.		W1043
QL3	12000	9 a	Exhaust gas recirculation	Replace EGR actuators and check EGR flaps for wear, replace if necessary.		W1818

w = weeks  
m = months  
a = years

TIM-ID: 000055371 - 003

Qualification level	Interval [h]	Limit	Item	Maintenance tasks	Option	Task
QL3	12000	9 a	Component maintenance	Inspect rocker arms and valve bridge for wear. Insert an endoscope through the pushrod bore to visually inspect swing followers and camshaft running surfaces.		W2001
				Fit new high-pressure fuel sensor.		W2004
				Check engine coolant thermostat and fit new thermal actuator.		W2006
				Check charge-air coolant thermostat and fit new thermal actuator.		W2007
				Inspect centrifugal oil filter for wear.		W2009
				Overhaul starter.		W2010
				Fit new seals/sealing materials for all disassembled components.		W2062
				Overhaul charge-air coolant pump.		W2070
				Overhaul engine coolant pump.		W2110
				QL3	12000	18 a
QL3	24000	18 a	Fuel delivery pump	Fit new fuel delivery pump.		W1051
QL3	24000	18 a	HP fuel pump	Fit new high-pressure fuel pump.		W1058
QL3	24000	18 a	Cylinder heads	Overhaul cylinder heads.		W1134
QL4	24000	6 a	Hose lines	Replace all hose lines.		W1251
QL4	24000	6 a	Automatic engine oil filter	Remove filter housing and clean. Fit new filter candles.	X	W1035
QL4	24000	18 a	Engine mounts	Fit new Trunnion mount element.		W1124
QL4	24000	18 a	Exhaust gas recirculation	Replace EGR flaps.		W1819
				Replace EGR cooler.		W1901
QL4	24000	18 a	Extended component maintenance	Completely disassemble the engine. Inspect engine components as per assembly instructions and repair or fit new components as required.		W3000
				Replace all elastomeric parts and seals with new ones.		W3001
				Fit new piston rings.		W3002
				Fit new conrod bearings.		W3003
				Fit new crankshaft bearings.		W3004
				Fit new cylinder liners.		W3005
				Fit new camshaft bearings and camshaft thrust bearings.		W3018
				Fit new pressure relief valve in high-pressure fuel system.		W3021
				Gear train: Check tooth flanks for wear (visual inspection), replace bearing bushings.		W3182
				Fit new shaft misalignment coupling.		W3097
				Fit new rubber elements of engine mounts.		W3100
				Fit new turbine wheels for turbochargers.		W3101
				Replace swing followers and swing-follower shafts.		W3103
				Check vibration damper, fit new one if necessary.		W3108
				Replace pulley.		W3143
				Insulated flywheel: Check and repair if required.		W3144
				Overhaul fan clutch.		W3165
Check engine oil pump, replace if necessary.		W3177				

w = weeks  
m = months  
a = years

TIM-ID: 0000055371 - 003



Task	Limit	Operating hours [h]																									
		Daily	1,000	2,000	3,000	4,000	5,000	5,250	6,000	7,000	8,000	9,000	10,000	10,500	11,000	12,000	13,000	14,000	15,000	15,750	16,000	17,000	18,000	19,000	20,000	21,000	
W2062	9 a												X														X
W2070	9 a												X														X
W2110	9 a												X														X
W1038	18 a												X														X
W1051	18 a																										X
W1058	18 a																										X
W1134	18 a																										X
W1251	6 a																										X
W1035	6 a																										X
W1124	18 a																										X
W1819	18 a																										X
W1901	18 a																										X
W3000	18 a																										X
W3001	18 a																										X
W3002	18 a																										X
W3003	18 a																										X
W3004	18 a																										X
W3005	18 a																										X
W3018	18 a																										X
W3021	18 a																										X
W3182	18 a																										X
W3097	18 a																										X
W3100	18 a																										X
W3101	18 a																										X
W3103	18 a																										X
W3108	18 a																										X
W3143	18 a																										X
W3144	18 a																										X
W3165	18 a																										X
W3177	18 a																										X

w = weeks  
m = months  
a = years

## 1.12 Maintenance tasks 21,000 h

Qualification level	Interval [h]	Limit	Item	Maintenance tasks	Option	Task
Engine						
QL1	-	-	EPA label	Check if emission label is fitted and legible, and if it contains the correct information.		W0800
QL1	-	2 a	Engine oil filter	Fit new engine oil filters each time the engine oil is changed or, at the latest, on expiry of the time limit (given in years).	X	W1008
QL1	-	2 a	Centrifugal oil filter	Check thickness of oil residue layer. Clean. Fit new sleeve, at the latest, each time the engine oil is changed.		W1009
QL1	Daily	-	Engine operation	Check engine oil level.		W0500
				Carry out visual inspection of engine for general condition and leaks.		W0501
				Check relief bores of coolant pump(s).		W0505
				Check for abnormal running noises, exhaust gas color and vibration.		W0506
				Drain off water and contamination from fuel prefilter.		W0507
				Check differential pressure gauge of fuel prefilter.		W0508
QL1	1000	6 m	Automatic engine oil filter	Check and clean oil indicator filter.	X	W1864
QL1	1000	1 a	Engine mounts	Carry out visual inspection of engine mounts for general condition.		W1463
QL1	1000	2 a	Fuel filter	Fit new fuel filter or new fuel filter insert.		W1001
QL1	1000	2 a	Intermediate fuel filter	Replace intermediate fuel filter or filter element of intermediate fuel filter.		W1481
QL1	1000	2 a	Fuel prefilter	Fit new fuel prefilter or new fuel prefilter insert.		W1675
QL1	3000	1 a	Battery charging alternator	Clean battery-charging generator.		W1716
QL1	3000	2 a	Belt drive	Check belt condition and tension Fit new belt(s) if necessary.		W1003
QL1	3000	2 a	Valve gear	Check valve clearance, adjust if required. ATTENTION! Initial adjustment after 1,000 operating hours and subsequently 1,000 operating hours after each cylinder-head overhaul..		W1207
QL1	3000	2 a	Cylinder heads	Measure valve stem end to cylinder head top distance.		W1689
QL1	3000	3 a	Coolant expansion tank	Replace valve.	X	W1296
QL1	3000	6 a	Crankcase breathers	Fit new oil separators.		W1055
QL1	5250	-	Exhaust gas recirculation	Check operation of exhaust flap actuators.		W1551
				Check coupling bars of EGR flaps for play.		W1817
QL1	5250	6 a	NOx sensor	Fit new sensor.		W1525
QL1	5250	6 a	Oxygen sensor	Fit new sensor.		W1526
QL1	10500	1 a	Engine mounts	Carry out visual inspection of Trunion mounts for general condition.		W1575
QL1	10500	6 a	Combustion chambers	Inspect cylinder chambers using endoscope.		W1011
QL1	10500	9 a	Fuel injectors	Replace fuel injectors.		W1006
QL1	10500	9 a	Engine governor	Reset parameters of drift correction (CDC) and enter injector coding (IIG).		W1636
QL1	10500	9 a	Engine mounts	Check securing screws of trunion mounts for secure seating.		W1610
QL1	10500	9 a	Auxiliary PTO	Replace auxiliary PTO of generator.		W1940
QL3	5250	9 a	Turbochargers	Check turbine housing for cracks (externally by visual inspection and internally by endoscopic examination), replace if necessary..		W1577
QL3	10500	5 a	Engine mounts	Check for cracks. Measure height of rubber element.		W1812
				Check buffer clearance of mounts, check proper seating of securing screws.		W1026
QL3	10500	6 a	Rubber sleeves	Replace all rubber sleeves.		W1250
QL3	10500	9 a	Battery charging alternator	Overhaul battery-charging generator.		W1043
QL3	10500	9 a	Exhaust gas recirculation	Replace EGR actuators and check EGR flaps for wear, replace if necessary.		W1818

w = weeks  
m = months  
a = years

TIM-ID: 0000065932 - 001

Qualification level	Interval [h]	Limit	Item	Maintenance tasks	Option	Task
QL3	10500	9 a	Component maintenance	Inspect rocker arms and valve bridge for wear. Insert an endoscope through the pushrod bore to visually inspect swing followers and camshaft running surfaces.		W2001
				Fit new high-pressure fuel sensor.		W2004
				Check engine coolant thermostat and fit new thermal actuator.		W2006
				Check charge-air coolant thermostat and fit new thermal actuator.		W2007
				Inspect centrifugal oil filter for wear.		W2009
				Overhaul starter.		W2010
				Fit new seals/sealing materials for all disassembled components.		W2062
				Overhaul charge-air coolant pump.		W2070
				Overhaul engine coolant pump.		W2110
				QL3	10500	18 a
QL3	21000	18 a	Fuel delivery pump	Fit new fuel delivery pump.		W1051
QL3	21000	18 a	HP fuel pump	Fit new high-pressure fuel pump.		W1058
QL3	21000	18 a	Cylinder heads	Overhaul cylinder heads.		W1134
QL4	21000	6 a	Hose lines	Replace all hose lines.		W1251
QL4	21000	6 a	Automatic engine oil filter	Remove filter housing and clean. Fit new filter candles.	X	W1035
QL4	21000	18 a	Engine mounts	Fit new Trunnion mount element.		W1124
QL4	21000	18 a	Exhaust gas recirculation	Replace EGR flaps.		W1819
				Replace EGR cooler.		W1901
QL4	21000	18 a	Extended component maintenance	Completely disassemble the engine. Inspect engine components as per assembly instructions and repair or fit new components as required.		W3000
				Replace all elastomeric parts and seals with new ones.		W3001
				Fit new piston rings.		W3002
				Fit new conrod bearings.		W3003
				Fit new crankshaft bearings.		W3004
				Fit new cylinder liners.		W3005
				Fit new camshaft bearings and camshaft thrust bearings.		W3018
				Fit new pressure relief valve in high-pressure fuel system.		W3021
				Gear train: Check tooth flanks for wear (visual inspection), replace bearing bushings.		W3182
				Fit new shaft misalignment coupling.		W3097
				Fit new rubber elements of engine mounts.		W3100
				Fit new turbine wheels for turbochargers.		W3101
				Replace swing followers and swing-follower shafts.		W3103
				Check vibration damper, fit new one if necessary.		W3108
				Replace pulley.		W3143
				Insulated flywheel: Check and repair if required.		W3144
				Overhaul fan clutch.		W3165
Check engine oil pump, replace if necessary.		W3177				

w = weeks  
m = months  
a = years

TIM-ID: 0000065932 - 001

# 1.13 Maintenance schedule matrix 18,000 h

## 0 to 18,000 Operating hours

Task	Limit	Operating hours [h]																		
		Daily	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000	11,000	12,000	13,000	14,000	15,000	16,000	17,000	18,000
Engine																				
W0800	-																			
W1008	2 a																			
W1009	2 a																			
W0500	-	X																		
W0501	-	X																		
W0505	-	X																		
W0506	-	X																		
W0507	-	X																		
W0508	-	X																		
W1864	6 m	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W1463	1 a	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W1001	2 a	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W1481	2 a	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W1675	2 a	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W1716	1 a			X			X			X			X			X			X	
W1003	2 a			X			X			X			X			X			X	
W1207	2 a	X		X			X			X			X			X			X	
W1689	2 a			X			X			X			X			X			X	
W1296	3 a			X			X			X			X			X			X	
W1055	6 a			X			X			X			X			X			X	
W1551	-						X						X						X	
W1817	-						X						X						X	
W1525	6 a						X						X						X	
W1526	6 a						X						X						X	
W1575	1 a									X									X	
W1011	6 a									X									X	
W1006	9 a									X									X	
W1636	9 a									X									X	
W1610	9 a									X									X	
W1940	9 a									X									X	
W1577	9 a						X						X						X	
W1812	5 a									X									X	
W1026	5 a									X									X	
W1250	6 a									X									X	
W1043	9 a									X									X	
W1818	9 a									X									X	
W2001	9 a									X									X	
W2004	9 a									X									X	
W2006	9 a									X									X	
W2007	9 a									X									X	
W2009	9 a									X									X	
W2010	9 a									X									X	

w = weeks  
m = months  
a = years

TIM-ID: 000005936 - 001

Task	Limit	Operating hours [h]																			
		Daily	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000	11,000	12,000	13,000	14,000	15,000	16,000	17,000	18,000	
W2062	9 a									X										X	
W2070	9 a									X										X	
W2110	9 a									X										X	
W1038	18 a									X										X	
W1051	18 a																			X	
W1058	18 a																			X	
W1134	18 a																			X	
W1251	6 a																			X	
W1035	6 a																			X	
W1124	18 a																			X	
W1819	18 a																			X	
W1901	18 a																			X	
W3000	18 a																			X	
W3001	18 a																			X	
W3002	18 a																			X	
W3003	18 a																			X	
W3004	18 a																			X	
W3005	18 a																			X	
W3018	18 a																			X	
W3021	18 a																			X	
W3182	18 a																			X	
W3097	18 a																			X	
W3100	18 a																			X	
W3101	18 a																			X	
W3103	18 a																			X	
W3108	18 a																			X	
W3143	18 a																			X	
W3144	18 a																			X	
W3165	18 a																			X	
W3177	18 a																			X	

w = weeks  
m = months  
a = years

## 1.14 Maintenance tasks 18,000 h

Qualification level	Interval [h]	Limit	Item	Maintenance tasks	Option	Task
Engine						
QL1	-	-	EPA label	Check if emission label is fitted and legible, and if it contains the correct information.		W0800
QL1	-	2 a	Engine oil filter	Fit new engine oil filters each time the engine oil is changed or, at the latest, on expiry of the time limit (given in years).	X	W1008
QL1	-	2 a	Centrifugal oil filter	Check thickness of oil residue layer. Clean. Fit new sleeve, at the latest, each time the engine oil is changed.		W1009
QL1	Daily	-	Engine operation	Check engine oil level.		W0500
				Carry out visual inspection of engine for general condition and leaks.		W0501
				Check relief bores of coolant pump(s).		W0505
				Check for abnormal running noises, exhaust gas color and vibration.		W0506
				Drain off water and contamination from fuel prefilter.		W0507
				Check differential pressure gauge of fuel prefilter.		W0508
QL1	1000	6 m	Automatic engine oil filter	Check and clean oil indicator filter.	X	W1864
QL1	1000	1 a	Engine mounts	Carry out visual inspection of engine mounts for general condition.		W1463
QL1	1000	2 a	Fuel filter	Fit new fuel filter or new fuel filter insert.		W1001
QL1	1000	2 a	Intermediate fuel filter	Replace intermediate fuel filter or filter element of intermediate fuel filter.		W1481
QL1	1000	2 a	Fuel prefilter	Fit new fuel prefilter or new fuel prefilter insert.		W1675
QL1	3000	1 a	Battery charging alternator	Clean battery-charging generator.		W1716
QL1	3000	2 a	Belt drive	Check belt condition and tension Fit new belt(s) if necessary.		W1003
QL1	3000	2 a	Valve gear	Check valve clearance, adjust if required. ATTENTION! Initial adjustment after 1,000 operating hours and subsequently 1,000 operating hours after each cylinder-head overhaul..		W1207
QL1	3000	2 a	Cylinder heads	Measure valve stem end to cylinder head top distance.		W1689
QL1	3000	3 a	Coolant expansion tank	Replace valve.	X	W1296
QL1	3000	6 a	Crankcase breathers	Fit new oil separators.		W1055
QL1	6000	-	Exhaust gas recirculation	Check operation of exhaust flap actuators.		W1551
				Check coupling bars of EGR flaps for play.		W1817
QL1	6000	6 a	NOx sensor	Fit new sensor.		W1525
QL1	6000	6 a	Oxygen sensor	Fit new sensor.		W1526
QL1	9000	1 a	Engine mounts	Carry out visual inspection of Trunion mounts for general condition.		W1575
QL1	9000	6 a	Combustion chambers	Inspect cylinder chambers using endoscope.		W1011
QL1	9000	9 a	Fuel injectors	Replace fuel injectors.		W1006
QL1	9000	9 a	Engine governor	Reset parameters of drift correction (CDC) and enter injector coding (IIG).		W1636
QL1	9000	9 a	Engine mounts	Check securing screws of trunion mounts for secure seating.		W1610
QL1	9000	9 a	Auxiliary PTO	Replace auxiliary PTO of generator.		W1940
QL3	6000	9 a	Turbochargers	Check turbine housing for cracks (externally by visual inspection and internally by endoscopic examination), replace if necessary..		W1577
QL3	9000	5 a	Engine mounts	Check for cracks. Measure height of rubber element.		W1812
				Check buffer clearance of mounts, check proper seating of securing screws.		W1026
QL3	9000	6 a	Rubber sleeves	Replace all rubber sleeves.		W1250
QL3	9000	9 a	Battery charging alternator	Overhaul battery-charging generator.		W1043
QL3	9000	9 a	Exhaust gas recirculation	Replace EGR actuators and check EGR flaps for wear, replace if necessary.		W1818

w = weeks  
m = months  
a = years

TIM-ID: 0000065939 - 001

Qualification level	Interval [h]	Limit	Item	Maintenance tasks	Option	Task
QL3	9000	9 a	Component maintenance	Inspect rocker arms and valve bridge for wear. Insert an endoscope through the pushrod bore to visually inspect swing followers and camshaft running surfaces.		W2001
				Fit new high-pressure fuel sensor.		W2004
				Check engine coolant thermostat and fit new thermal actuator.		W2006
				Check charge-air coolant thermostat and fit new thermal actuator.		W2007
				Inspect centrifugal oil filter for wear.		W2009
				Overhaul starter.		W2010
				Fit new seals/sealing materials for all disassembled components.		W2062
				Overhaul charge-air coolant pump.		W2070
				Overhaul engine coolant pump.		W2110
				QL3	9000	18 a
QL3	18000	18 a	Fuel delivery pump	Fit new fuel delivery pump.		W1051
QL3	18000	18 a	HP fuel pump	Fit new high-pressure fuel pump.		W1058
QL3	18000	18 a	Cylinder heads	Overhaul cylinder heads.		W1134
QL4	18000	6 a	Hose lines	Replace all hose lines.		W1251
QL4	18000	6 a	Automatic engine oil filter	Remove filter housing and clean. Fit new filter candles.	X	W1035
QL4	18000	18 a	Engine mounts	Fit new Trunnion mount element.		W1124
QL4	18000	18 a	Exhaust gas recirculation	Replace EGR flaps.		W1819
				Replace EGR cooler.		W1901
QL4	18000	18 a	Extended component maintenance	Completely disassemble the engine. Inspect engine components as per assembly instructions and repair or fit new components as required.		W3000
				Replace all elastomeric parts and seals with new ones.		W3001
				Fit new piston rings.		W3002
				Fit new conrod bearings.		W3003
				Fit new crankshaft bearings.		W3004
				Fit new cylinder liners.		W3005
				Fit new camshaft bearings and camshaft thrust bearings.		W3018
				Fit new pressure relief valve in high-pressure fuel system.		W3021
				Gear train: Check tooth flanks for wear (visual inspection), replace bearing bushings.		W3182
				Fit new shaft misalignment coupling.		W3097
				Fit new rubber elements of engine mounts.		W3100
				Fit new turbine wheels for turbochargers.		W3101
				Replace swing followers and swing-follower shafts.		W3103
				Check vibration damper, fit new one if necessary.		W3108
				Replace pulley.		W3143
				Insulated flywheel: Check and repair if required.		W3144
				Overhaul fan clutch.		W3165
Check engine oil pump, replace if necessary.		W3177				

w = weeks  
m = months  
a = years

TIM-ID: 0000065939 - 001

# 1.15 Maintenance schedule matrix 15,000 h

## 0 to 15,000 Operating hours

Task	Limit	Operating hours [h]																
		Daily	1,000	2,000	3,000	4,000	5,000	6,000	7,000	7,500	8,000	9,000	10,000	11,000	12,000	13,000	14,000	15,000
Engine																		
W0800	-																	
W1008	2 a																	
W1009	2 a																	
W0500	-	X																
W0501	-	X																
W0505	-	X																
W0506	-	X																
W0507	-	X																
W0508	-	X																
W1864	6 m	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
W1463	1 a	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
W1001	2 a	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
W1481	2 a	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
W1675	2 a	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
W1716	1 a			X			X			X			X				X	
W1003	2 a			X			X			X			X				X	
W1207	2 a	X		X			X			X			X				X	
W1689	2 a			X			X			X			X				X	
W1296	3 a			X			X			X			X				X	
W1055	6 a			X			X			X			X				X	
W1551	-					X						X					X	
W1817	-					X						X					X	
W1525	6 a					X						X					X	
W1526	6 a					X						X					X	
W1575	1 a									X							X	
W1011	6 a									X							X	
W1006	9 a									X							X	
W1636	9 a									X							X	
W1610	9 a									X							X	
W1940	9 a									X							X	
W1577	9 a					X						X					X	
W1812	5 a									X							X	
W1026	5 a									X							X	
W1250	6 a									X							X	
W1043	9 a									X							X	
W1818	9 a									X							X	
W2001	9 a									X							X	
W2004	9 a									X							X	
W2006	9 a									X							X	
W2007	9 a									X							X	
W2009	9 a									X							X	
W2010	9 a									X							X	

w = weeks  
m = months  
a = years

TIM-ID: 000005941 - 001

Task	Limit	Operating hours [h]																
		Daily	1,000	2,000	3,000	4,000	5,000	6,000	7,000	7,500	8,000	9,000	10,000	11,000	12,000	13,000	14,000	15,000
W2062	9 a								X									X
W2070	9 a								X									X
W2110	9 a								X									X
W1038	18 a								X									X
W1051	18 a																	X
W1058	18 a																	X
W1134	18 a																	X
W1251	6 a																	X
W1035	6 a																	X
W1124	18 a																	X
W1819	18 a																	X
W1901	18 a																	X
W3000	18 a																	X
W3001	18 a																	X
W3002	18 a																	X
W3003	18 a																	X
W3004	18 a																	X
W3005	18 a																	X
W3018	18 a																	X
W3021	18 a																	X
W3182	18 a																	X
W3097	18 a																	X
W3100	18 a																	X
W3101	18 a																	X
W3103	18 a																	X
W3108	18 a																	X
W3143	18 a																	X
W3144	18 a																	X
W3165	18 a																	X
W3177	18 a																	X

w = weeks  
m = months  
a = years

## 1.16 Maintenance tasks 15,000 h

Qualification level	Interval [h]	Limit	Item	Maintenance tasks	Option	Task
Engine						
QL1	-	-	EPA label	Check if emission label is fitted and legible, and if it contains the correct information.		W0800
QL1	-	2 a	Engine oil filter	Fit new engine oil filters each time the engine oil is changed or, at the latest, on expiry of the time limit (given in years).	X	W1008
QL1	-	2 a	Centrifugal oil filter	Check thickness of oil residue layer. Clean. Fit new sleeve, at the latest, each time the engine oil is changed.		W1009
QL1	Daily	-	Engine operation	Check engine oil level.		W0500
				Carry out visual inspection of engine for general condition and leaks.		W0501
				Check relief bores of coolant pump(s).		W0505
				Check for abnormal running noises, exhaust gas color and vibration.		W0506
				Drain off water and contamination from fuel prefilter.		W0507
				Check differential pressure gauge of fuel prefilter.		W0508
QL1	1000	6 m	Automatic engine oil filter	Check and clean oil indicator filter.	X	W1864
QL1	1000	1 a	Engine mounts	Carry out visual inspection of engine mounts for general condition.		W1463
QL1	1000	2 a	Fuel filter	Fit new fuel filter or new fuel filter insert.		W1001
QL1	1000	2 a	Intermediate fuel filter	Replace intermediate fuel filter or filter element of intermediate fuel filter.		W1481
QL1	1000	2 a	Fuel prefilter	Fit new fuel prefilter or new fuel prefilter insert.		W1675
QL1	3000	1 a	Battery charging alternator	Clean battery-charging generator.		W1716
QL1	3000	2 a	Belt drive	Check belt condition and tension Fit new belt(s) if necessary.		W1003
QL1	3000	2 a	Valve gear	Check valve clearance, adjust if required. ATTENTION! Initial adjustment after 1,000 operating hours and subsequently 1,000 operating hours after each cylinder-head overhaul..		W1207
QL1	3000	2 a	Cylinder heads	Measure valve stem end to cylinder head top distance.		W1689
QL1	3000	3 a	Coolant expansion tank	Replace valve.	X	W1296
QL1	3000	6 a	Crankcase breathers	Fit new oil separators.		W1055
QL1	5000	-	Exhaust gas recirculation	Check operation of exhaust flap actuators.		W1551
				Check coupling bars of EGR flaps for play.		W1817
QL1	5000	6 a	NOx sensor	Fit new sensor.		W1525
QL1	5000	6 a	Oxygen sensor	Fit new sensor.		W1526
QL1	7500	1 a	Engine mounts	Carry out visual inspection of Trunion mounts for general condition.		W1575
QL1	7500	6 a	Combustion chambers	Inspect cylinder chambers using endoscope.		W1011
QL1	7500	9 a	Fuel injectors	Replace fuel injectors.		W1006
QL1	7500	9 a	Engine governor	Reset parameters of drift correction (CDC) and enter injector coding (IIG).		W1636
QL1	7500	9 a	Engine mounts	Check securing screws of trunion mounts for secure seating.		W1610
QL1	7500	9 a	Auxiliary PTO	Replace auxiliary PTO of generator.		W1940
QL3	5000	9 a	Turbochargers	Check turbine housing for cracks (externally by visual inspection and internally by endoscopic examination), replace if necessary..		W1577
QL3	7500	5 a	Engine mounts	Check for cracks. Measure height of rubber element.		W1812
				Check buffer clearance of mounts, check proper seating of securing screws.		W1026
QL3	7500	6 a	Rubber sleeves	Replace all rubber sleeves.		W1250
QL3	7500	9 a	Battery charging alternator	Overhaul battery-charging generator.		W1043
QL3	7500	9 a	Exhaust gas recirculation	Replace EGR actuators and check EGR flaps for wear, replace if necessary.		W1818

w = weeks  
m = months  
a = years

TIM-ID: 000005942 - 001

Qualification level	Interval [h]	Limit	Item	Maintenance tasks	Option	Task
QL3	7500	9 a	Component maintenance	Inspect rocker arms and valve bridge for wear. Insert an endoscope through the pushrod bore to visually inspect swing followers and camshaft running surfaces.		W2001
				Fit new high-pressure fuel sensor.		W2004
				Check engine coolant thermostat and fit new thermal actuator.		W2006
				Check charge-air coolant thermostat and fit new thermal actuator.		W2007
				Inspect centrifugal oil filter for wear.		W2009
				Overhaul starter.		W2010
				Fit new seals/sealing materials for all disassembled components.		W2062
				Overhaul charge-air coolant pump.		W2070
				Overhaul engine coolant pump.		W2110
				QL3	7500	18 a
QL3	15000	18 a	Fuel delivery pump	Fit new fuel delivery pump.		W1051
QL3	15000	18 a	HP fuel pump	Fit new high-pressure fuel pump.		W1058
QL3	15000	18 a	Cylinder heads	Overhaul cylinder heads.		W1134
QL4	15000	6 a	Hose lines	Replace all hose lines.		W1251
QL4	15000	6 a	Automatic engine oil filter	Remove filter housing and clean. Fit new filter candles.	X	W1035
QL4	15000	18 a	Engine mounts	Fit new Trunnion mount element.		W1124
QL4	15000	18 a	Exhaust gas recirculation	Replace EGR flaps.		W1819
				Replace EGR cooler.		W1901
QL4	15000	18 a	Extended component maintenance	Completely disassemble the engine. Inspect engine components as per assembly instructions and repair or fit new components as required.		W3000
				Replace all elastomeric parts and seals with new ones.		W3001
				Fit new piston rings.		W3002
				Fit new conrod bearings.		W3003
				Fit new crankshaft bearings.		W3004
				Fit new cylinder liners.		W3005
				Fit new camshaft bearings and camshaft thrust bearings.		W3018
				Fit new pressure relief valve in high-pressure fuel system.		W3021
				Gear train: Check tooth flanks for wear (visual inspection), replace bearing bushings.		W3182
				Fit new shaft misalignment coupling.		W3097
				Fit new rubber elements of engine mounts.		W3100
				Fit new turbine wheels for turbochargers.		W3101
				Replace swing followers and swing-follower shafts.		W3103
				Check vibration damper, fit new one if necessary.		W3108
				Replace pulley.		W3143
				Insulated flywheel: Check and repair if required.		W3144
				Overhaul fan clutch.		W3165
				Check engine oil pump, replace if necessary.		W3177

w = weeks  
m = months  
a = years

TIM-ID: 0000065942 - 001