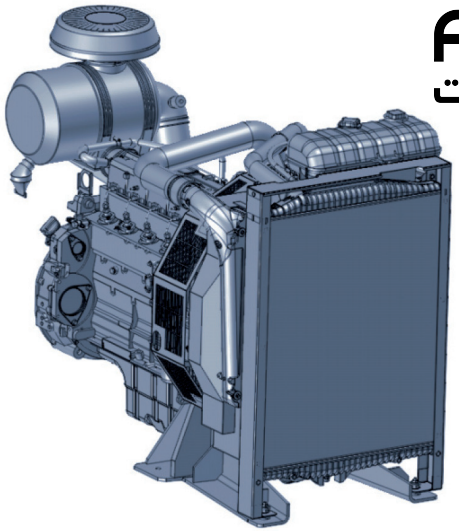
DEUTZ BFM 1013

For generator sets ■ 81 - 225 kW | 109 - 302 hp at 1500/1800 min^{-1}|rpm ■ EU Stage II / US EPA Tier 2

- Water-cooled 4 and 6-cylinder inline engines with turbocharging and charge air cooling.
- The robust engine design allows worldwide operation even with high sulphur fuels.
- Easy, inexpensive installation due to minimum weight and small installation space.
- Best cold starting performance even under extreme conditions.
- Low noise emissions due to acoustically optimized components with very smooth running and high durability.
- Also available with an electronic motor regulator (EMR) to allow easy integration into the electronic device control and monitoring system.
- A very good load response ensures an immediate power supply.



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TECHNICAL DATA

Engine type		BF4M 1013 EC	BF4M 1013 FC	BF6M 1013 EC	BF6M 1013 FC
No. of cylinders		4	4	6	6
Bore/stroke	mm | in	108/130 | 4.25/5.12	108/130 | 4.25/5.12	108/130 | 4.25/5.12	108/130 | 4.25/5.12
Displacement	l | cu in	4.8 | 291	4.8 | 291	7.2 | 436	7.2 | 436
Weight (incl. cooler and fan)	kg | lb	560 | 1235	560 | 1235	770 | 1698	770 | 1698
Governing standard [1]		G2	G2	G2	G2

50 Hz / 1500 min^{-1} | rpm

Power		BF4M 1013 EC	BF4M 1013 FC	BF6M 1013 EC	BF6M 1013 FC
Continuous Power COP [2]	kW | hp	81.0/92.0 | 108.6/123.4	106.0 | 142.1	139.0 | 186.4	166.0 | 222.6
Prime Power PRP [3]	kW | hp	85.0/97.0 | 114.0/130.1	117.0 | 156.9	146.0 | 195.8	183.0 | 245.4
Limited Time Power LTP [4]	kW | hp	89.0/102.0 | 119.4/136.8	129.0 | 173.0	153.0 | 205.2	201.0 | 269.5
Fan power consumption	kW | hp	5.9 | 7.9	5.0 | 6.7	7.2 | 9.7	7.2 | 9.7
Typical Generator Output COP [5]	kVA	85/97	116	152	183
Typical Generator Output PRP [5]	kVA	89/103	129	160	202
Typical Generator Output LTP [5]	kVA	94/108	143	168	223

60 Hz / 1800 min^{-1} | rpm

Power		BF4M 1013 EC	BF4M 1013 FC	BF6M 1013 EC	BF6M 1013 FC
Continuous Power COP [2]	kW | hp	86.0/100.0 | 115.3/134.1	112.0 | 150.2	148.0 | 198.5	186.0 | 249.4
Prime Power PRP [3]	kW | hp	90.0/105.0 | 120.7/140.8	124.0 | 166.3	155.0 | 207.9	204.0 | 273.6
Limited Time Power LTP [4]	kW | hp	95.0/110.0 | 127.4/147.5	136.0 | 182.4	163.0 | 218.6	224.9 | 301.6
Fan power consumption	kW | hp	10.2 | 13.7	8.7 | 11.7	8.7 | 11.7	12.4 | 16.6
Typical Generator Output COP [5]	kWe	68/81	93	128	160
Typical Generator Output PRP [5]	kWe	72/85	104	135	176
Typical Generator Output LTP [5]	kWe	76/90	115	142	196

1) According to ISO 8528-5.
2) Continuous Power: No time limitation, plus 10% additional power for governing purpose only.
3) Prime Power: Average power output ≤ 80%, no time limitation, plus 5% additional power for governing purpose only.
4) Limited Time Running Power: For up to 500 h/year, thereof a maximum of 300 h/year continuous running.
5) In consideration of a generator efficiency level of 90 - 92 % and a power factor of 0.8.

50 Hz / 1500 min^{-1} | rpm

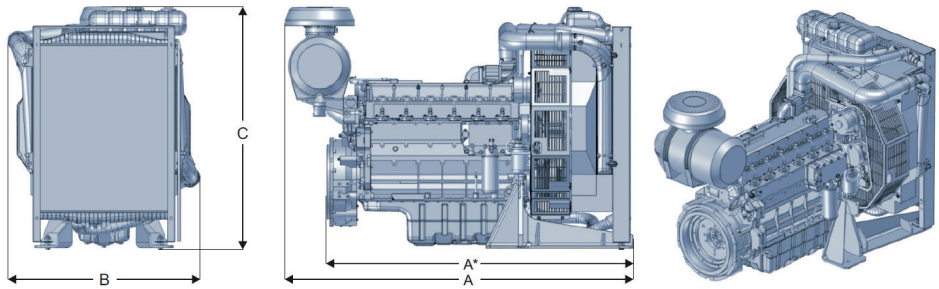
Fuel Consumption PRP [1]		BF4M 1013 EC	BF4M 1013 FC	BF6M 1013 EC	BF6M 1013 FC
Fuel consumption 25% load	g/kWh | lb/hph	246/237 | 0.40/0.39	221 | 0.36	234 | 0.38	222 | 0.36
Fuel consumption 50% load	g/kWh | lb/hph	215/214 | 0.35/0.35	204 | 0.34	213 | 0.35	210 | 0.35
Fuel consumption 75% load	g/kWh | lb/hph	210/211 | 0.35/0.35	203 | 0.33	209 | 0.34	208 | 0.34
Fuel consumption 100% load	g/kWh | lb/hph	209/212 | 0.34/0.35	210 | 0.35	209 | 0.34	212 | 0.35
Heat balance & cooling system		**BF4M 1013 EC**	**BF4M 1013 FC**	**BF6M 1013 EC**	**BF6M 1013 FC**
Heat dissipation (engine radiator) [2]	kW | hp	47.8/52.5 | 64.1/70.4	62.7 | 84.1	68.4 | 91.7	96.1 | 128.9
Heat dissipation CAC [2]	kW | hp	9.9/13.1 | 13.3/17.6	23.7 | 31.8	24.0 | 32.2	42.0 | 56.3
Heat dissipation (convection)	kW | hp	9.0/10.0 | 12.0/13.0	13.0 | 17.0	15.5 | 20.8	20.0 | 26.8
Cooling air flow	m^3/h | cfm	6100 | 3590	9000 | 5297	10800 | 6357	11520 | 6780
Inlet & exhaust data		**BF4M 1013 EC**	**BF4M 1013 FC**	**BF6M 1013 EC**	**BF6M 1013 FC**
max. intake depression	mbar | psi	25 | 0.36	25 | 0.36	25 | 0.36	25 | 0.36
Combustion air volume	m^3/h | cfm	329/365 | 194/215	482 | 284	639 | 376	746 | 439
max. exhaust gas temperature	° C | °F	540/560 | 1004/1040	530 | 986	535 | 995	530 | 986
Exhaust gas flow	m^3/h | cfm	951/1102 | 560/649	1389 | 818	1799 | 1059	2112 | 1243

60 Hz / 1800 min^{-1} | rpm

Fuel Consumption PRP [1]		BF4M 1013 EC	BF4M 1013 FC	BF6M 1013 EC	BF6M 1013 FC
Fuel consumption 25% load	g/kWh | lb/hph	270/251 | 0.44/0.41	235 | 0.39	253 | 0.42	231 | 0.38
Fuel consumption 50% load	g/kWh | lb/hph	228/219 | 0.37/0.36	212 | 0.35	220 | 0.36	215 | 0.35
Fuel consumption 75% load	g/kWh | lb/hph	217/213 | 0.36/0.35	211 | 0.35	214 | 0.35	214 | 0.35
Fuel consumption 100% load	g/kWh | lb/hph	215/212 | 0.35/0.35	219 | 0.36	214 | 0.35	221 | 0.36
Heat balance & cooling system		**BF4M 1013 EC**	**BF4M 1013 FC**	**BF6M 1013 EC**	**BF6M 1013 FC**
Heat dissipation (engine radiator) [2]	kW | hp	51.8/53.3 | 69.5/71.5	68.1 | 91.3	73.5 | 98.6	109.8 | 147.2
Heat dissipation CAC [2]	kW | hp	17.3/21.0 | 23.2/28.2	30.7 | 41.2	33.7 | 45.2	50.9 | 68.3
Heat dissipation (convection)	kW | hp	9.5/11.0 | 12.7/14.8	13.5 | 18.1	16.0 | 21.5	22.5 | 30.2
Cooling air flow	m^3/h | cfm	7600 | 4473	11520 | 6780	11500 | 6769	14760 | 8687
Inlet & exhaust data		**BF4M 1013 EC**	**BF4M 1013 FC**	**BF6M 1013 EC**	**BF6M 1013 FC**
max. intake depression	mbar | psi	25 | 0.36	25 | 0.36	25 | 0.36	25 | 0.36
Combustion air volume	m^3/h | cfm	425/466 | 250/274	576 | 339	801 | 472	946 | 557
max. exhaust gas temperature	°C | °F	490/520 | 914/968	530 | 986	480 | 896	530 | 986
Exhaust gas flow	m^3/h | cfm	1160/1316 | 683/775	1653 | 973	2097 | 1234	2666 | 1569

1) Refers to diesel with a density of 0.835 kg/dm^3 at 15°C | 6.96 lb/US gallon at 60°F.
2) The heat quantities are valid for the dimensioning of the cooling system.

DIMENSIONS



Engine type		A	A*	B	C
BF4M 1013 EC/FC	mm | in	1479 | 58	1250 | 49	728 | 29	1151 | 45
BF6M 1013 EC	mm | in	1870 | 74	1641 | 65	866 | 34	1239 | 49
BF6M 1013 FC	mm | in	1923 | 76	1694 | 67	1003 | 39	1586 | 62

* Note: The engine dimensions and weights vary depending on the scope of delivery.

The data on this data sheet are for information purposes only and are not binding values. For more information please contact your responsible sales partner.

Order no. 0031 1784 / 06 / 2017 / MP-M

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BF4M2011C - 50 Hz

Technical data

General engine data

Engine Type	BF4M2011C
EKZ	11426
Standard KLU	25009526
Power level	-
Engine Code	-
Speed	1500 min^{-1}
Net frequency	50 Hz
Exhaust emission standard	Stage 0

Specific engine data

Aspiration	intercooled turbo
No of cylinders	4
Configuration	in-line
Injection system	single injection pumps
Displacement	3.1 l
Bore	94 mm
Stroke	112 mm
Compression ratio	18.1
Mean effective pressure (PRP)	14.4 bar
Piston speed	5.60 m/s
Rotation (looking at flywheel)	counter clock wise
No of teeth on flywheel ring gear	129
Governor type	mechanical
Frequency setting	single frequency
Governor performance: speed droop (static) mechanical governor	5 %
Governor performance: speed droop (static) electrical governor (EMR or GAC)	0 %
Governing standards[1]	G2

Moment of inertia

Engine without flywheel	0.1 kg m^2
Flywheel (standard genset specification)	1.2 kg m^2
Maximum step load acceptance, 1st step (in progress)	-
Sound power at full load, including cooling system[2]	107 dB(A)
Sound pressure (1 m average distance, full load), including cooling system	93 dB(A)

Weight

Engine dry without cooling system[3]	approx. 350 kg
Engine dry with cooling system	approx. 362 kg

Lubrication system

Oil specification	TR0199-99-1217
Oil consumption (as % of fuel consumption)	0.5 %
Oil capacity (sump)	10 l
Minimum oil pressure (warning)	2.1 bar

Minimum oil pressure (shut down)	1.5 bar
Maximum permissible oil temperature (oil pan)	130 °C

Power output[3]

Gross output (LTP)[4]	59.0 kW
Fan power consumption[7]/reduction (LTP)	2.1 kW
Net flywheel (LTP)	56.9 kW
Gross output (PRP)[5]	56.1 kW
Fan power consumption[7]/reduction (PRP)	2.1 kW
Net flywheel (PRP)	54.0 kW
Alternator efficiency[8]	90 %
Electrical output kVA (LTP)[9]	64 kVA
Electrical output kVA (PRP)[9]	61 kVA
Gross output (COP)[6]	53.2 kW

Fuel consumption (PRP)[10]

25% load	3.8 l/h
50% load	6.9 l/h
75% load	10.4 l/h
100% load	14.0 l/h
25% load	229 g/kWh
50% load	206 g/kWh
75% load	206 g/kWh
100% load	209 g/kWh
Maximum suction head of fuel feed pump	3 m

Engine cooling system

Maximum permitted coolant outlet temperature	128 °C
Maximum permitted flow resistance (cooling system and piping)	1.00 bar
Maximum temperature of coolant (warning)	130 °C
Maximum temperature of coolant (shutdown)	135 °C
Temperature at which thermostat starts to open	95 °C
Temperature at which thermostat is fully open	110 °C
Delivery of coolant pump	1.56 m^3/h
Minimum pressure before coolant pump	-
Temperature at charge air cooler outlet at standard conditions	40 °C
Coolant capacity (engine)	-
Coolant capacity (including cooling unit)	2.9 l
Air to boil (maximum permissible cooling air temperature at fan)	55 °C
Cooling air flow	3200 m^3/h
Air pressure loss	80 mbar

Heat Balance

Heat dissipation (engine radiator)[11]	28.3 kW
Heat dissipation (charge air cooler)[11]	7.4 kW
Heat dissipation (convection)	7.9 kW

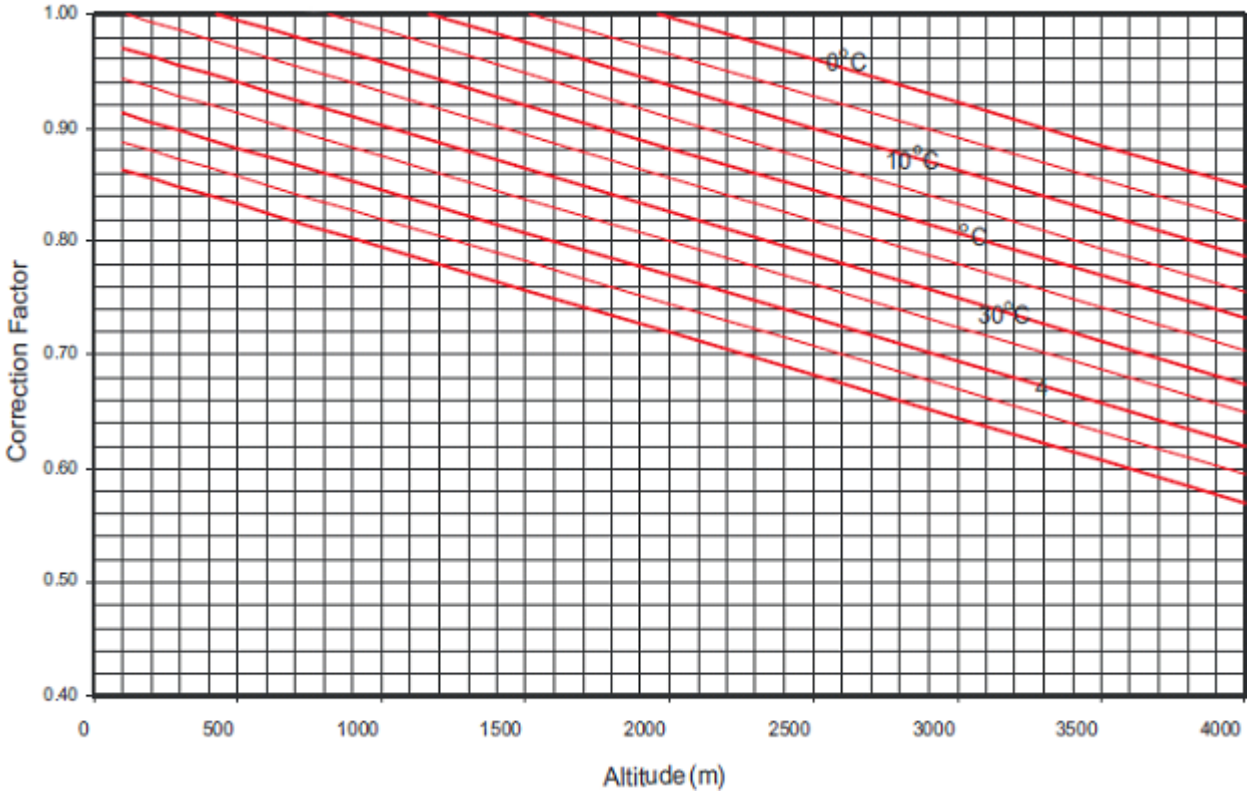
Inlet/Exhaust Data (PRP)

Maximum intake depression (switch setting)	20 mbar
Combustion air volume	241 m^3/h
Maximum exhaust back pressure	30 mbar
Maximum exhaust gas temperature	570 °C
Exhaust gas flow (at above temp)	704 m^3/h
Exhaust flange / pipe diameter	45 mm

Electrical System

Voltage	12 V
Starter	2.6 kW
Alternator output	55 A
Battery: minimum capacity (for cold start limit -5°C)	66 Ah

Automatic power limitation at altitude



Stationary: above 25 °C & 100 m. Derate will apply as per chart.
Non stationary: above 30 °C & 1000 m. Please contact HQ or see ELTAB.

1 According to ISO 8528 Parts 1 and 5

2 Sound power values measured in accordance with ISO 6798.

3 Technical data for BF2012, BF1013, BFM1015 refers to HT cooling system. For NT cooling system please see DEUTZ Technical Information System.

4 Limited time power 100%, which is capable for up to 500 h/year of which maximum of 300 h/year is continuous running, not exceedable, but required power for governing purpose only has to be considered. Necessary supply of engine power usually 10% for governing purpose only.

[5] Prime power 100% , average power output ≤ 80%, no time limitation, plus 5% (at BFM 1015 plus 10%) additional power for governing purpose only (if 1 h overload within 12 h operation time is requested please contact head quarters).

[6] Continuous power 100% , no time limitation, plus 10% additional power for governing purpose only.

[7] Technical data and max. permissible torque for fan drive see data sheet.

[8] Assumed alternator efficiencies: 12 to 29 kVA: 89 %, 30 to 139 kVA: 90 %, 140 to 299 kVA: 92 %, 300 to 550 kVA: 93 %

[9] Ratings in accordance with ISO 8528. Power factor cos φ = 0.8.

[10] At calorific value 42700 kJ/kg + 5 %, density 0.835 kg/dm^3, at temperature 288 K.

[11] The heat quantities are valid for the dimensioning of the cooling system. They are given for the engine with the highest (overload) power output (LTP) at 3% tolerance of fuel consumption and a radiant heat percentage of 3 %.

Power output (kW) in accordance with DIN ISO 14396.

For further information please see DEUTZ Technical Information System.

All data are provided for informational purposes only and are subject to amendment.

Engine Datasheet BF6M1013EC 1500-min^{-1}

Engine			
Type		BF6M1013EC	BF6M1013EC
Speed	[min^{-1}]	1500	1500
Net frequency	[Hz]	50	50
Power standard		LTP	LTP
Power level		G1	G2
Exhaust emission standard		COM II	Fuel optimized
General			
Aspiration		Turbo, CAC	Turbo, CAC
No of cylinders		6	6
Configuration		in-line	in-line
Injection system		single injection pumps	
Displacement	[l]	7.15	7.15
Bore	[mm]	108	108
Stroke	[mm]	130	130
Compression ratio		19	19
Mean effective pressure	[bar]	17.1	19.6
Piston speed	[m/s]	6.5	6.5
Rotation (looking at flywheel)		ccw	ccw
No of teeth on flywheel ring gear		129	129
Governor performance			
Speed droop (static) mech. gov.	[%]	4 - 5	4 - 5
Speed droop (static) electr. gov.(EMR/DDE)	[%]	0 - 3	0 - 3
Governing standards			
to ISO 8528 Parts 1 and 5		G2	G2
Moment of inertia			
Engine without flywheel	[kg m²]	0.23	0.23
Flywheel (standard genset spec.)	[kg m²]	2.6	2.6
Max. step load acceptance, 1st step	[%]	–	–
Sound power at full load,incl. cooling system[5]	[dB(A)]	108.8	110.6
Sound press.(1m average,full load), incl.cool.syst.	[dB(A)]	94.8	96.7
Weight			
Engine dry, w/o cooling system	[kg]	708	708
Engine with cooling system	[kg]	770	770
Lubrication system			
Oil specification		TR0199-99-3002/6	
Oil consumption (as % of fuel consumption)		0.3	0.3
Oil capacity (sump)	[l]	20	20
Min. oil pressure (warning)	[bar]	2.7	2.7
Min. oil pressure (shut down)	[bar]	2	2
Max. permissible oil temperature(oil pan)	[°C]	130	130
Output			
Gross output(LTP or StandBy Power)[1]	[kW]	153	175
Fan reduction	[kW]	7.2	7.2
Net flywheel	[kW]	145.8	167.8
Electrical output[2]	[kVA]	165	200
Gross output(PRP or Prime Power)[1a]	[kW]	146	160
Gross output(Continous Power))[1b]	[kW]	139	150

Engine Datasheet BF6M1013EC 1500-min^{-1}

Engine			
Type		BF6M1013EC	BF6M1013EC
Fuel System			
Fuel consumption			
25% load[3]	[l/h]	10.0	10.9
50% load[3]	[l/h]	18.3	19.9
75% load[3]	[l/h]	26.9	29.5
100% load[3]	[l/h]	35.9	39.2
25% load	[g/kWh]	234	230
50% load	[g/kWh]	213	211
75% load	[g/kWh]	209	209
100% load	[g/kWh]	209	208
Max. suction head of fuel feed pump	[m]	–	–
Cooling System			
General engine cooling data			
Max.perm.coolant outlet temperature	[°C]	105	105
Max. perm. flow resistance (cool. syst. and piping)	[bar]	0.25	0.25
Max.temperature of coolant (warning)	[°C]	108	108
Max. temperature of coolant (shutdown)	[°C]	110	110
Temperature at which thermostat starts to open	[°C]	83	83
Temperature at which thermostat is fully open	[°C]	98	98
Delivery of coolant pump	[m^3/h]	10.2	10.2
Min. pressure before coolant pump	[bar]	0.3	0.3
Temperature at CAC outlet at standard conditions	[°C]	40	40
DEUTZ Cooling System			
Coolant capacity (engine)	[l]	9.8	9.8
Coolant capacity (incl. cooling unit)	[l]	23.1	23.1
Air to boil (max. permissible cool. air temp. at fan)	[°C]	55	55
Fan power consumption[4]	[kW]	7.2	7.2
Cooling air flow	[m^3/h]	10800	10800
Air pressure loss, external	[mbar]	1.5	1.5
Heat Balance			
Heat dissipation (engine radiator)[6]	[kW]	68.4	78.3
Heat dissipation (CAC)	[kW]	24.0	28.8
Heat dissipation (convection)	[kW]	15.5	17.7
Inlet / Exhaust Data			
Max. intake depression (Switch setting)	[mbar]	25	25
Combustion air volume	[m^3/h]	639.3	682
Max. exhaust back pressure	[mbar]	30	30
Max. exhaust gas temperature	[°C]	535	560
Exhaust gas flow (at above temp)	[m^3/h]	1799	1905
Exhaust flange / pipe diameter	[mm]	–	–

Engine Datasheet BF6M1013EC 1500-min^{-1}

Engine			
Type		BF6M1013EC	BF6M1013EC
Electrical System			
Voltage	[V]	24	24
Starter	[kW]	6	6
Alternator output	[A]	35	35
Batteries(minimum capacity, cold start limit -5°C)	[Ah]	2*100	2*100

Powers (kW) in accordance with DIN ISO 14396.

1 Limited time power 100%, which is capable for up to 500 h/year of which maximum of 300 h/year is continuous running, not exceedable, but required power for governing purpose only has to be considered. Necessary supply of engine power usually 10% for governing purpose only.

1a Prime power 100% , average power output ≤ 80%, no time limitation, plus 5% additional power for governing purpose only.

1b Continuous power 100% , no time limitation, plus 10% power for governing purpose only.

2 Ratings in accordance with ISO 8525 LTP. Alternator efficiency please see datasheet. 1500 min-1 = kVA, 1800 min-1 = kWe

3 At calorific value 42700 kJ/kg + 5 %, density 0.835 kg/dm3, temperature 280 K.

4 Technical data and max. permissible torque for fan drive see data sheet.

5 Sound power values measured in accordance with ISO 6798.

6 The heat quantities are valid for the dimensioning of the cooling system.

They are given for the engine with the highest fuel consumption.

For further application guidance see DEUTZ Installation Manual.

All data are provided for informational purposes only and are subject to amendment.

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DEUTZ

Engine Datasheet BF6M1013FC 1500-min^{-1}

Engine			
Type		BF6M1013FC	BF6M1013FC
Speed	[min^{-1}]	1500	1500
Net frequency	[Hz]	50	50
Power standard		LTP	LTP
Power level		G2	G3
Exhaust emission standard		COM II	COM II
General			
Aspiration		Turbo, CAC	Turbo, CAC
No of cylinders		6	6
Configuration		in-line	in-line
Injection system		single injection pumps	
Displacement	[l]	7.15	7.15
Bore	[mm]	108	108
Stroke	[mm]	130	130
Compression ratio		19	19
Mean effective pressure	[bar]	20.5	22.5
Piston speed	[m/s]	6.5	6.5
Rotation (looking at flywheel)		ccw	ccw
No of teeth on flywheel ring gear		129	129
Governor performance			
Speed droop (static) mech. gov.	[%]	4 - 5	4 - 5
Speed droop (static) electr. gov.(EMR/DDE)	[%]	0 - 3	0 - 3
Governing standards			
to ISO 8528 Parts 1 and 5		G2	G2
Moment of inertia			
Engine without flywheel	[kg m²]	0.23	0.23
Flywheel (standard genset spec.)	[kg m²]	2.6	2.6
Max. step load acceptance, 1st step	[%]	–	–
Sound power at full load,incl. cooling system[5]	[dB(A)]	108.8	108.8
Sound press.(1m average,full load), incl.cool.syst.	[dB(A)]	94.8	94.8
Weight			
Engine dry, w/o cooling system	[kg]	708	708
Engine with cooling system	[kg]	785	785
Lubrication system			
Oil specification		TR0199-99-3002/6	
Oil consumption (as % of fuel consumption)		0.3	0.3
Oil capacity (sump)	[l]	31	31
Min. oil pressure (warning)	[bar]	2.7	2.7
Min. oil pressure (shut down)	[bar]	2	2
Max. permissible oil temperature(oil pan)	[°C]	130	130
Output			
Gross output(LTP or StandBy Power)[1]	[kW]	183	201
Fan reduction	[kW]	7.2	7.2
Net flywheel	[kW]	175.8	193.8
Electrical output[2]	[kVA]	210	220
Gross output(PRP or Prime Power)[1a]	[kW]	166	183
Gross output(Continous Power))[1b]	[kW]	151	166

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DEUTZ

Engine Datasheet BF6M1013FC 1500-min^{-1}

Engine			
Type		BF6M1013FC	BF6M1013FC
Fuel System			
Fuel consumption			
25% load[3]	[l/h]	11.1	11.9
50% load[3]	[l/h]	20.3	22.6
75% load[3]	[l/h]	30.2	33.6
100% load[3]	[l/h]	40.6	45.6
25% load	[g/kWh]	227	222
50% load	[g/kWh]	208	210
75% load	[g/kWh]	206	208
100% load	[g/kWh]	208	212
Max. suction head of fuel feed pump	[m]	–	–
Cooling System			
General engine cooling data			
Max.perm.coolant outlet temperature	[°C]	105	105
Max. perm. flow resistance (cool. syst. and piping)	[bar]	0.35	0.35
Max.temperature of coolant (warning)	[°C]	108	108
Max. temperature of coolant (shutdown)	[°C]	110	110
Temperature at which thermostat starts to open	[°C]	83	83
Temperature at which thermostat is fully open	[°C]	98	98
Delivery of coolant pump	[m^3/h]	10.9	10.9
Min. pressure before coolant pump	[bar]	0.3	0.3
Temperature at CAC outlet at standard conditions	[°C]	40	40
DEUTZ Cooling System			
Coolant capacity (engine)	[l]	9.8	9.8
Coolant capacity (incl. cooling unit)	[l]	27.3	27.3
Air to boil (max. permissible cool. air temp. at fan)	[°C]	55	50
Fan power consumption[4]	[kW]	7.2	7.2
Cooling air flow	[m^3/h]	11520	11520
Air pressure loss, external	[mbar]	1.5	1.5
Heat Balance			
Heat dissipation (engine radiator)[6]	[kW]	85.1	86.1
Heat dissipation (CAC)	[kW]	35.9	42.0
Heat dissipation (convection)	[kW]	18.0	20.0
Inlet / Exhaust Data			
Max. intake depression (Switch setting)	[mbar]	25	25
Combustion air volume	[m^3/h]	743.9	746
Max. exhaust back pressure	[mbar]	30	30
Max. exhaust gas temperature	[°C]	540	530
Exhaust gas flow (at above temp)	[m^3/h]	2108	2112
Exhaust flange / pipe diameter	[mm]	–	–

Engine Datasheet BF6M1013FC 1500-min^{-1}

Engine			
Type		BF6M1013FC	BF6M1013FC
Electrical System			
Voltage	[V]	24	24
Starter	[kW]	6	6
Alternator output	[A]	35	35
Batteries(minimum capacity, cold start limit -5°C)	[Ah]	2*100	2*100

Powers (kW) in accordance with DIN ISO 14396.

1 Limited time power 100%, which is capable for up to 500 h/year of which maximum of 300 h/year is continuous running, not exceedable, but required power for governing purpose only has to be considered. Necessary supply of engine power usually 10% for governing purpose only.

1a Prime power 100% , average power output ≤ 80%, no time limitation, plus 5% additional power for governing purpose only.

1b Continuous power 100% , no time limitation, plus 10% power for governing purpose only.

2 Ratings in accordance with ISO 8525 LTP. Alternator efficiency please see datasheet. 1500 min-1 = kVA, 1800 min-1 = kWe

3 At calorific value 42700 kJ/kg + 5 %, density 0.835 kg/dm3, temperature 280 K.

4 Technical data and max. permissible torque for fan drive see data sheet.

5 Sound power values measured in accordance with ISO 6798.

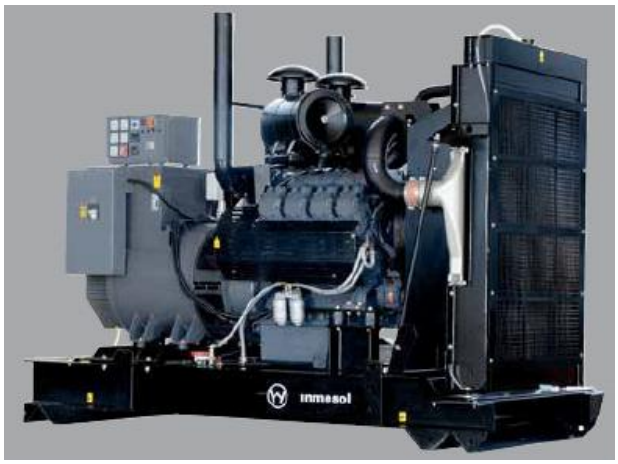
6 The heat quantities are valid for the dimensioning of the cooling system.

They are given for the engine with the highest fuel consumption.

For further application guidance see DEUTZ Installation Manual.

All data are provided for informational purposes only and are subject to amendment.

OPEN GENSETS WITH DEUTZ ENGINE



1500 RPM	400/230 V 50 Hz	Type AD-300	300/240 Kva/KW (PRP)	385/308 Kva/KW (LTP)

Engine: BF6M1015C
Alternator: ECO38-2LN/4

Scope of Supply:

The engine and the alternator are mounted together forming a rigid monoblock, the shafts are connected by a flexible disc connection. The monoblock is mounted on a steel base frame via silent blocks. The base frame is including a fuel tank. Starting is electric and it includes a battery. The genset monitoring system consist of a control module.

GEN SET POWER

Voltage	Hz	Phase	Cos Ø	PRP* Kva/KW	LTP** Kva/KW	Amp.
415/240	50	3	0,8	300/240	330/264	459,6
400/230	50	3	0,8	300/240	330/264	476,9
380/220	50	3	0,8	300/240	330/264	502,0
240/120	50	3	0,8	300/240	330/264	794,8
230/115	50	3	0,8	300/240	330/264	829,4
220/110	50	3	0,8	300/240	330/264	867,1

PRP* Kva/KW:

Available electrical power (at a variable load) with a medium of 80% of the indicated maximum power. A 10% overload capability is available

LTP** Kva/KW:

Available electrical load (at a variable load) during a maximum of 500 hours per year. No overload capability is available.

Control Cubicle Alternatives

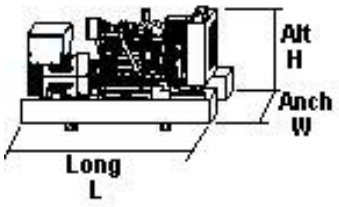
Manual/Remote Control Cubicle:: STANDARD MCP SAM 712 / OPTIONAL MCP DSE 720
Automatic Control Cubicle: STANDARD ACP DSE 720 / OPTIONAL ACP DSE 5320

Options::

Please see the price list

TECHNICAL DATA

Engine		Alternator	
Engine type:	BF6M1015C	**Alternator Type:**	ECO38-2LN/4
Eng. Power kW COP:	236,2	**Nº of poles:**	4
Eng. Power kW PRP:	271	**Eff. At 3/4 %:**	94
Eng. Power kW LTP:	300	**Eff. At 4/4 %:**	93,7
Nº Cylinders:	V6	**Alt. rating PRP kVA III Kw II:**	300
Displacement cm3:	11900	**Alt. rating LTP kVA III kW II:**	330
Bore/stroke (mm/mm):	132/145	**Output Power PRP kVA III kW II:**	300
Compression ratio:	16,5	**Output Power LTP kVA III kW II:**	330
Cooling:	WATER	**Current Amp PRP:**	432
Injection:	DIRECT	**Current Amp LTP:**	475
Aspiration:	TURBO/INTERCOOLER	**Standard Circuit Breaker (Amp):**	630
Standard governor:	ELECTRONIC	**Xd (%):**	208
Governing control quality:	G3	**X'd (%):**	15,3
Speed droop mech gov. (%):	0	**X:**	8,1
Exhaust gases temperature (ºC):	485	**Nº of wires:**	12
Exhaust gases flow (m3/h):	3265	**Insulation:**	H
Max Exh. Back pres. (mbar):	50	**Regulator AVR:**	UVR6
Coolant capcity (lit.):	91-	**Protection:**	IP21
Cooling air flow (m3/h):	20950	**DIMENSIONS**	
Max allow. Intake dep. (mbar):	50	**Height:**	2290 mm
Combustion air flow (m3/h):	1170	**Width:**	1400 mm
Oil cap. (Litres):	34	**Lenght:**	2750 mm
Oil cons. (kg/hr or % of fuel cons):	0,30%	**Weight:**	2940 kgs
Min oil press warning (bar):	2,7	**Tank:**	520 lit
Fuel cons. 25% lit/h:	18		
Fuel cons. 50% lit/h:	34,7		
Fuel cons. 75% lit/h:	49,9		
Fuel cons. 100% lit/h:	67,9		
Electric system VDC:	24		
Type:	Neg to ground.		
Battery (Ah):	2 X 180		
Starting motor (kW):	5,4		
Flywheel Housing:	SAE1/14		



Technical information available in download section.:

Engine technical data	Alternator Technical data	Gen Set Drawing	Instalation drawing	Control cubicle descr.
Engine manual	**Alternator Manual**	**Gen Set Manual**	**Gen Set Condensed Man.**	**Controler manual**

MANUAL -REMOTE START CONTROL MODULE: MCP SAM 712

SAM 712 CONTROLLER

•Manual or Automatic remote start controller, Selector switch for Off, Man and Auto with key. Complete engine protection functions with alarms visualised via LEDs in the front. The controller is set up via 6 DIP switches in the rear of the case.

•Standard circuit breaker.and diferential relay.

MANUAL-REMOTE START: MCP DSE 5320

DSE 5320 CONTROLLER

• The Model 5320 is a Manual or Automatic Start Control Module.

• The module is used to manually or automatically start and monitor a generator set. The module also provides indication of operational status and fault conditions, automatically shutting down the genset and indicating failures by means of clear text on an LCD display on the front panel.

• Comunication via interface and cable via PC.

Operation of the module is via pushbutton controls with STOP/RESET, MANUAL, AUTO and START

• Standard Circuit Breaker

AUTOMATIC CONTROL MODULE: ACP DSE 5320

DSE 5320 CONTROLLER

•The Model 5320 is an Automatic Mains Failure Control Module. The module is used to monitor a mains supply and automatically start a standby generator set..

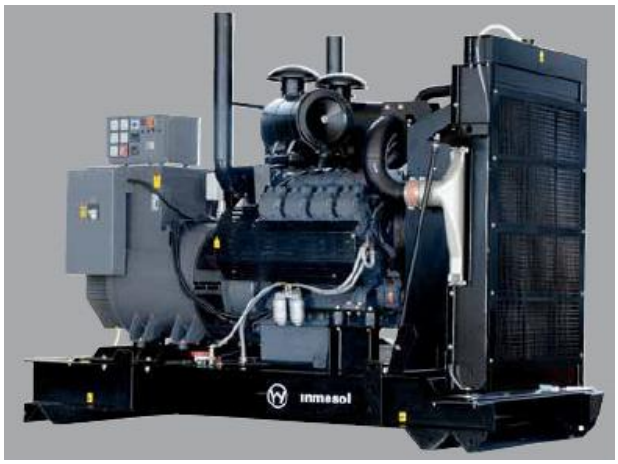
•Operation of the module is via pushbutton controls with STOP/RESET, MANUAL, TEST, AUTO and START

•The controller has a J 1939 CANBus interface for connection to modern engine ECU's. This enables engine protection and instrumentation without requiring additional sensors. Engine diagnostic information removes the need for both service equipment and cryptic diagnostic

•Comprehensive remote communication via RS232 port connecting via modem or PC.It is also possible to monitor and control the system via PC up to 100metres (111 yards) from the controller

•Standard IV poles circuit breaker (until 85 Kva.)

OPEN GENSETS WITH DEUTZ ENGINE



1500 RPM	400/230 V 50 Hz	Type AD-430	430/344 Kva/KW (PRP)	477/382 Kva/KW (LTP)

Engine: BF8M1015C
Alternator: ECO40-2S/4

Scope of Supply:

The engine and the alternator are mounted together forming a rigid monoblock, the shafts are connected by a flexible disc connection. The monoblock is mounted on a steel base frame via silent blocks. The base frame is including a fuel tank. Starting is electric and it includes a battery. The genset monitoring system consist of a control module.

GEN SET POWER

Voltage	Hz	Phase	Cos Ø	PRP* Kva/KW	LTP** Kva/KW	Amp.
415/240	50	3	0,8	430/344	477/381,6	664,4
400/230	50	3	0,8	430/344	477/381,6	689,3
380/220	50	3	0,8	430/344	477/381,6	725,6
240/120	50	3	0,8	430/344	477/381,6	1148,8
230/115	50	3	0,8	430/344	477/381,6	1198,8
220/110	50	3	0,8	430/344	477/381,6	1253,3

PRP* Kva/KW:

Available electrical power (at a variable load) with a medium of 80% of the indicated maximum power. A 10% overload capability is available

LTP** Kva/KW:

Available electrical load (at a variable load) during a maximum of 500 hours per year. No overload capability is available.

Control Cubicle Alternatives

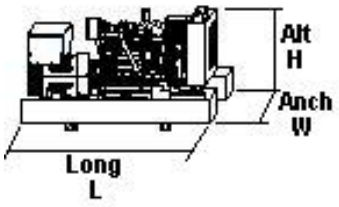
Manual/Remote Control Cubicle:: STANDARD MCP SAM 712 / OPTIONAL MCP DSE 720
Automatic Control Cubicle: STANDARD ACP DSE 720 / OPTIONAL ACP DSE 5320

Options::

Please see the price list

TECHNICAL DATA

Engine		Alternator	
Engine type:	BF8M1015C	**Alternator Type:**	ECO40-2S/4
Eng. Power kW COP:	322,3	**Nº of poles:**	4
Eng. Power kW PRP:	369	**Eff. At 3/4 %:**	94
Eng. Power kW LTP:	407,3	**Eff. At 4/4 %:**	93,7
Nº Cylinders:	V8	**Alt. rating PRP kVA III Kw II:**	450
Displacement cm3:	15900	**Alt. rating LTP kVA III kW II:**	495
Bore/stroke (mm/mm):	132/145	**Output Power PRP kVA III kW II:**	430
Compression ratio:	16,5	**Output Power LTP kVA III kW II:**	477
Cooling:	WATER	**Current Amp PRP:**	619
Injection:	DIRECT	**Current Amp LTP:**	685
Aspiration:	TURBO/INTERCOOLER	**Standard Circuit Breaker (Amp):**	800
Standard governor:	ELECTRONIC	**Xd (%):**	345,6
Governing control quality:	G3	**X'd (%):**	27,2
Speed droop mech gov. (%):	0-3	**X:**	16,9
Exhaust gases temperature (ºC):	485	**Nº of wires:**	12
Exhaust gases flow (m3/h):	4395	**Insulation:**	H
Max Exh. Back pres. (mbar):	50	**Regulator AVR:**	UVR6
Coolant capcity (lit.):	99	**Protection:**	IP21
Cooling air flow (m3/h):	24120	**DIMENSIONS**	
Max allow. Intake dep. (mbar):	50	**Height:**	2480 mm
Combustion air flow (m3/h):	1663	**Width:**	1300 mm
Oil cap. (Litres):	45	**Lenght:**	3000 mm
Oil cons. (kg/hr or % of fuel cons):	0,30%	**Weight:**	3700 kgs
Min oil press warning (bar):	2,7	**Tank:**	535 lit
Fuel cons. 25% lit/h:	25		
Fuel cons. 50% lit/h:	46,7		
Fuel cons. 75% lit/h:	66,5		
Fuel cons. 100% lit/h:	93,2		
Electric system VDC:	24		
Type:	Neg to ground.		
Battery (Ah):	2 X 180		
Starting motor (kW):	5,4		
Flywheel Housing:	SAE1/14		



Technical information available in download section.:

Engine technical data	Alternator Technical data	Gen Set Drawing	Instalation drawing	Control cubicle descr.
Engine manual	**Alternator Manual**	**Gen Set Manual**	**Gen Set Condensed Man.**	**Controler manual**

MANUAL -REMOTE START CONTROL MODULE: MCP SAM 712

SAM 712 CONTROLLER

•Manual or Automatic remote start controller, Selector switch for Off, Man and Auto with key. Complete engine protection functions with alarms visualised via LEDs in the front. The controller is set up via 6 DIP switches in the rear of the case.

•Standard circuit breaker.and diferential relay.

MANUAL-REMOTE START: MCP DSE 5320

DSE 5320 CONTROLLER

• The Model 5320 is a Manual or Automatic Start Control Module.

• The module is used to manually or automatically start and monitor a generator set. The module also provides indication of operational status and fault conditions, automatically shutting down the genset and indicating failures by means of clear text on an LCD display on the front panel.

• Comunication via interface and cable via PC.

Operation of the module is via pushbutton controls with STOP/RESET, MANUAL, AUTO and START

• Standard Circuit Breaker

AUTOMATIC CONTROL MODULE: ACP DSE 5320

DSE 5320 CONTROLLER

•The Model 5320 is an Automatic Mains Failure Control Module. The module is used to monitor a mains supply and automatically start a standby generator set..

•Operation of the module is via pushbutton controls with STOP/RESET, MANUAL, TEST, AUTO and START

•The controller has a J 1939 CANBus interface for connection to modern engine ECU's. This enables engine protection and instrumentation without requiring additional sensors. Engine diagnostic information removes the need for both service equipment and cryptic diagnostic

•Comprehensive remote communication via RS232 port connecting via modem or PC.It is also possible to monitor and control the system via PC up to 100metres (111 yards) from the controller

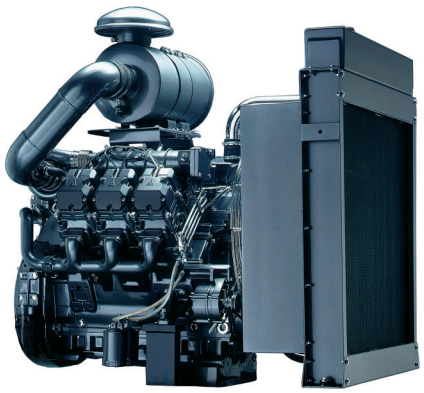
•Standard IV poles circuit breaker (until 85 Kva.)

BFM 1015

for generator sets

250 - 517 kW|335 - 693 hp at 1500/1800 min^{-1}|rpm
EU Stage II / US EPA Tier 2

- Water-cooled V6 and V8 engines with turbocharging, charge air cooling and four-valve technology.
- Also available with an electronic motor regulator (EMR) to allow easy integration into the electronic device control and monitoring system.
- The robust engine design allows worldwide operation even with high sulphur fuels.



- Low noise emissions due to acoustically optimized components with very smooth running and high durability.
- Robust and reliable mechanical injection system.
- Best cold starting performance even under extreme conditions.
- A very good load response ensures an immediate power supply.

Technical data

Engine type		BF6M 1015C	BF6M 1015CP	BF8M 1015C	BF8M 1015CP
No. of cylinders		6	6	8	8
Bore/stroke	mm | in	132/145 |5.2/5.7	132/145 |5.2/5.7	132/145 |5.2/5.7	132/145 |5.2/5.7
Displacement	l | cu in	11.9 |727	11.9 |727	15.9 |969	16 |969
Weight (incl. cooler and fan)	kg | lb	1020 |2249	1055 |2326	1265 |2789	1300 |2866
Governing standard[1)]		G2	G2	G2	G2

50 Hz / 1500 rpm

Power		BF6M 1015C	BF6M 1015CP	BF8M 1015C	BF8M 1015CP
Continuous Power (COP)[2)]	kW | hp	285,0 |382,2	303,0 |406,3	372,0 |498,9	399,0 |535,1
Prime Power (PRP)[3)]	kW | hp	315,0 |422,4	338,0 |453,3	413,0 |553,8	448,0 |600,8
Limited Time Power (LTP)[4)]	kW | hp	345,0 |462,7	365,0 |489,5	459,0 |615,5	490,0 |657,1
Fan power consumption	kW | hp	14,0 |18.8 (LTP 8,7) |(LTP 11.7)	8,7 |11,7	8,7 |11.7 (LTP 15,4) |(LTP 20.7)	15,4 |20,7
Typical Generator Output COP[5)]	kVA	315	339	422	446
Typical Generator Output PRP[5)]	kVA	350	383	470	503
Typical Generator Output LTP[5)]	kVA	391	414	516	552

60 Hz / 1800 rpm

Power		BF6M 1015C	BF6M 1015CP	BF8M 1015C	BF8M 1015CP
Continuous Power (COP)[2)]	kW | hp	271,0 |363,4	320,0 |429,1	362,0 |485,5	426,0 |571,3
Prime Power (PRP)[3)]	kW | hp	310,0 |415,7	351,0 |470,7	413,0 |553,8	473,0 |634,3
Limited Time Power (LTP)[4)]	kW | hp	341,0 |457,3	384,0 |515,0	454,0 |608,8	517,0 |693,3
Fan power consumption	kW | hp	19,0 |25,5	15,6 |20,9	15,6 |20,9	15,6 |20,9 (LTP 19,7) |(LTP 26,4)
Typical Generator Output COP[5)]	kWe	232	283	322	382
Typical Generator Output PRP[5)]	kWe	268	312	370	425
Typical Generator Output LTP[5)]	kWe	296	343	408	463

1) According to ISO 8528-5.
2) Continuous Power: No time limitation, plus 10% additional power for governing purpose only.
3) Prime Power: Average power output ≤ 80%, no time limitation, plus 10% additional power for governing purpose only.
4) Limited Time Running Power: For up to 500 h/year, thereof a maximum of 300 h/year continuous running.
5) In consideration of a generator efficiency level of 92 - 93 % and a power factor of 0.8..

The engine company.

FAMCO هایپرصنعت

DEUTZ®

50 Hz / 1500 rpm

Fuel Consumption (PRP)[1]		BF6M 1015C	BF6M 1015CP	BF8M 1015C	BF8M 1015CP
Fuel comsuption 25% load	g/kWh | lb/hph	215 |0.35	219 |0.36	216 |0.36	220 |0.36
Fuel comsuption 50% load	g/kWh | lb/hph	203 |0.33	208 |0.34	203 |0.33	209 |0.34
Fuel comsuption 75% load	g/kWh | lb/hph	203 |0.33	208 |0.34	203 |0.33	211 |0.35
Fuel comsuption 100% load	g/kWh | lb/hph	207 |0.34	215 |0.35	208 |0.34	220 |0.36

Heat balance & cooling system		BF6M 1015C	BF6M 1015CP	BF8M 1015C	BF8M 1015CP
Heat dissipation (engine radiator)[2]	kW | hp	157 |211	166 |223	216 |290	250 |335
Heat dissipation (CAC)[2]	kW | hp	77 |103	85 |114	105 |141	114 |153
Heat dissipation (convection)	kW | hp	28 |38	30 |40	37 |50	40 |54
Cooling air flow	m^3/h | cfm	21960 |12925	21960 |12925	29520 |17375	29880 |17587

Inlet & exhaust data		BF6M 1015C	BF6M 1015CP	BF8M 1015C	BF8M 1015CP
max. intake depression	mbar | psi	50 |0.73	50 |0.73	50 |0.73	50 |0.73
Combustion air volume	m^3/h | cfm	1339 |788	1386 |816	1777 |1046	1848 |1088
max. exhaust gas temperature	°C | °F	520 |968	555 |1031	540 |1004	560 |1040
Exhaust gas flow	m^3/h | cfm	3644 |2145	4000 |2354	4822 |2838	5357 |3153

60 Hz / 1800 rpm

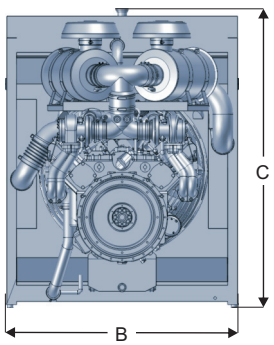
Fuel Consumption (PRP)[1]		BF6M 1015C	BF6M 1015CP	BF8M 1015C	BF8M 1015CP
Fuel comsuption 25% load	g/kWh | lb/hph	237 |0.39	229 |0.38	238 |0.39	214 |0.35
Fuel comsuption 50% load	g/kWh | lb/hph	213 |0.35	213 |0.35	214 |0.35	213 |0.35
Fuel comsuption 75% load	g/kWh | lb/hph	210 |0.35	212 |0.35	211 |0.35	212 |0.35
Fuel comsuption 100% load	g/kWh | lb/hph	213 |0.35	218 |0.36	217 |0.36	219 |0.36

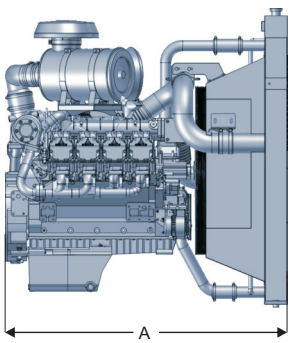
Heat balance & cooling system		BF6M 1015C	BF6M 1015CP	BF8M 1015C	BF8M 1015CP
Heat dissipation (engine radiator)[2]	kW | hp	150 |201	175 |235	216 |290	240 |322
Heat dissipation (CAC)[2]	kW | hp	92 |123	107 |143	113 |152	139 |186
Heat dissipation (convection)	kW | hp	28 |38	31 |42	37 |50	42 |56
Cooling air flow	m^3/h | cfm	24480 |14408	29160 |17163	31320 |18434	37080 |21824

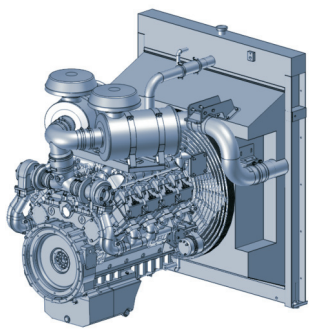
Inlet & exhaust data		BF6M 1015C	BF6M 1015CP	BF8M 1015C	BF8M 1015CP
max. intake depression	mbar | psi	50 |0.73	50 |0.73	50 |0.73	50 |0.73
Combustion air volume	m^3/h | cfm	1694 |997	1709 |1006	2048 |1205	1971 |1160
max. exhaust gas temperature	°C | °F	465 |869	515 |959	510 |950	502 |936
Exhaust gas flow	m^3/h | cfm	4040 |2378	4622 |2720	5297 |3118	6082 |3580

1) Refers to diesel with a density of 0.835 kg/dm^3 at 15°C | 6.96 lb/US gallon at 60°F.
2) The heat quantities are valid for the dimensioning of the cooling system.

Dimensions







		A	B	C
BF6M 1015C	mm | in	1635 |64	1315 |52	1865 |73
BF6M 1015CP	mm | in	1635 |64	1515 |60	1925 |76
BF8M 1015C	mm | in	1750 |69	1515 |60	1740 |69
BF8M 1015CP	mm | in	1750 |69	1815 |71	1850 |73

Note: The engine dimensions and weights vary depending on the scope of delivery.

For more information please contact the DEUTZ AG Köln or the responsible sales partner.

Order No. 0031 1663 / 06 / 2015 / MC-M

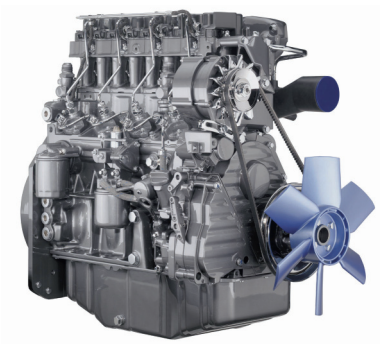
DEUTZ AG • Ottostraße 1 • 51149 Köln • Deutschland • Telefon +49 (0) 221 822-0 • Telefax +49 (0) 221 822-3525 • www.deutz.com • E-Mail: info@deutz.com

BFM 2011

For mobile machinery

24.2 - 65 kW|32.5- 87.2 hp at 2800 min^{-1}|rpm
EU Stage II / US EPA Tier 2

- Oil-cooled 2-, 3- and 4-cylinder naturally aspirated in-line engines. 4-cylinder engines also with turbocharging and optional charge air cooling.
- Direct injection with single injection pumps and optional electronic governor.
- High reliability combined with durability. No corrosion or cavitation due to oil cooling and lubrication.



- Best cold starting performance even under extreme conditions.
- Minimised running costs due to low maintenance need and little wear.
- Low fuel consumption due to optimised combustion.
- Long oil change intervals of up to 1000 hours.
- The robust engine design allows worldwide operation even with high sulphur fuels.

Technical data

Engine type		F2M 2011	F3M 2011	F4M 2011	BF4M 2011	BF4M 2011C
No. of cylinders		2	3	4	4	4
Bore/stroke	mm | in	94/112 | 3.7/4.4	94/112 | 3.7/4.4	94/112 | 3.7/4.4	94/112 | 3.7/4.4	94/112 | 3.7/4.4
Displacement	l | cu in	1.6 | 95	2.3 | 142	3.1 | 190	3.1 | 190	3.1 | 190
Max. nominal speed	min^{-1} | rpm	2800	2800	2800	2800	2300

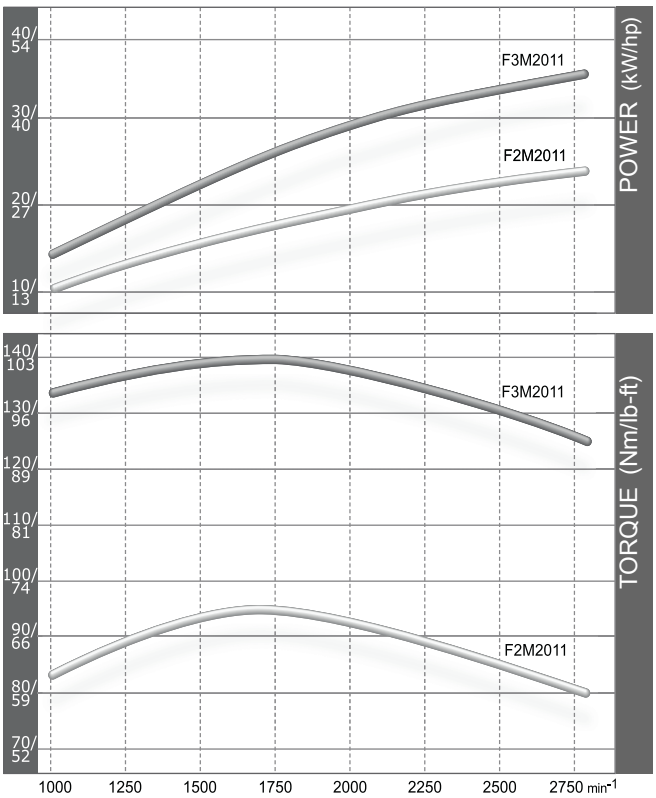
Engine type		F2M 2011	F3M 2011	F4M 2011	BF4M 2011	BF4M 2011C
Power output as per ISO 14396[1)]	kW | hp	24.2 | 32.5	36.5 | 48.9	48.5 | 65.0	65 | 87.2	65 | 87.2
at speed	min^{-1} | rpm	2800	2800	2800	2800	2300
Max. torque	Nm | lb/ft	93 | 68.6	140 | 103.3	195 | 143.8	270 | 199.1	320 | 236.0
at speed	min^{-1} | rpm	1700	1700	1700	1600	1600
Minimum idling speed	min^{-1} | rpm	900	900	900	900	900
Specific fuel consumption[2)]	g/kWh | lb/hph	224 | 0.37	219 | 0.36	213 | 0.35	205 | 0.34	205 |.034
Weight as per DIN 70020 Part 7A[3)]	kg | lb	168 | 370.4	208 | 458.6	245 | 540.1	247 | 544.5	247 |.544.5

1) Power data without deduction of fan power.
2) Best point consumption refers to diesel with a density of 0.835 kg/dm^3 at 15°C.
3) Without starter/alternator, cooler and fluids but with flywheel and flywheel housing.

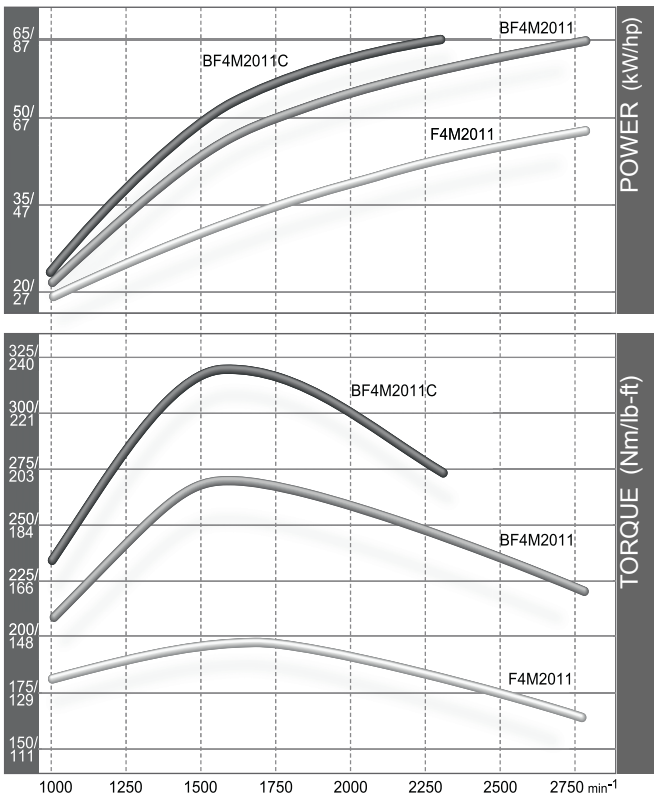
The data on this data sheet are for information purposes only and are not binding values. The data in the quotation is definitive.

Torque curve

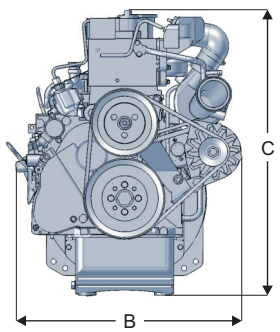
F2M 2011 - 24.2 kW|32.5 hp
F3M 2011 - 36.5 kW|48.9 hp

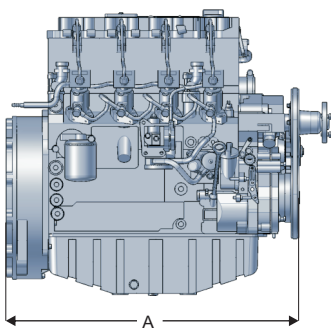


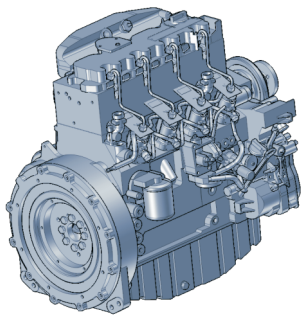
F4M 2011 - 48.5 kW|65.0 hp
BF4M 2011 - 65.0 kW|87.2 hp
BF4M 2011C - 65.0 kW|87.2 hp



Dimensions







		A	B	C
F2M 2011	mm | in	408 | 16.1	451 | 17.8	683 | 26.9
F3M 2011	mm | in	599 | 23.6	451 | 17.8	678 | 26.7
F4M 2011	mm | in	710 | 28.0	451 | 17.8	703 | 27.7
BF4M 2011	mm | in	710 | 28.0	495 | 19.5	703 | 27.7
BF4M 2011C	mm | in	720 | 28.3	528 | 20.8	703 | 27.7

Note: The engine dimensions and weights vary depending on the scope of delivery.

Order No. 0031 1949 / 01 / 2015 / MC-M

For more information please contact the DEUTZ AG Köln or the responsible sales partner.

DEUTZ AG • Ottostraße 1 • 51149 Köln • Deutschland • Telefon +49 (0) 221 822-0 • Telefax +49 (0) 221 822-3525 • www.deutz.com • E-Mail: info@deutz.com

FAMCO
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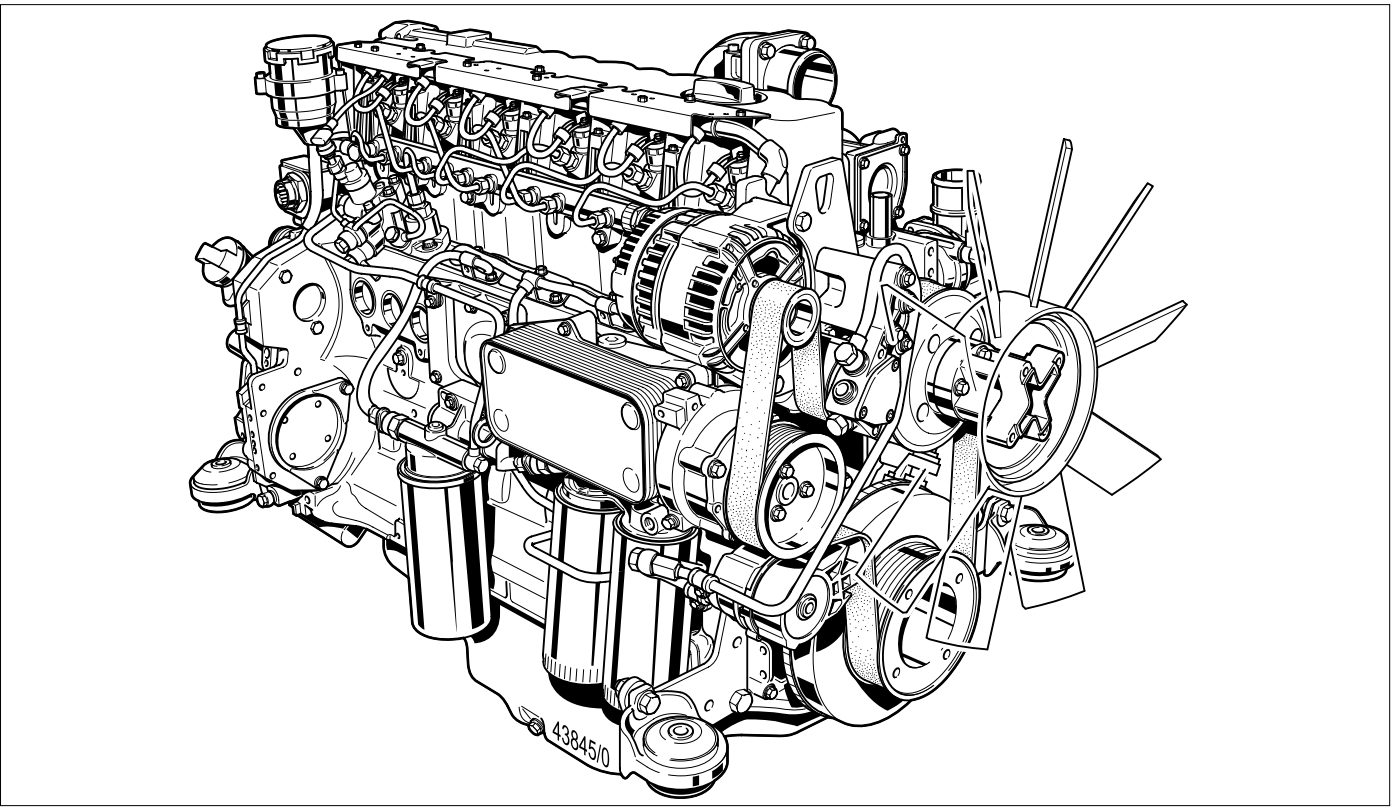

Operation Manual

TCD 2012 L04/06 V2

TCD 2013 L04/06 V2

DEUTZ®

- Read and observe the information in this instruction manual. You will avoid accidents, retain the manufacturer's warranty and have a fully functional, ready to use engine at your disposal.

- This engine is exclusively for the purpose according to the scope of delivery - defined and built by the equipment manufacturer (use for the intended purpose). Any use above and beyond this is considered improper use. The manufacturer will not be liable for damages resulting from this. The user will bear the sole risk in this case.

- Use for the intended purpose also includes observance of the operating, maintenance and repair instructions specified by the manufacturer. The engine may only be used, maintained and repaired by persons who are familiar with it and instructed in the dangers.

- The pertinent rules for the prevention of accidents and other generally recognised safety and industrial medicine rules must be observed.

- When the engine is running there is a danger of injury caused by:
  - rotating / hot components
  - engines with extraneous ignition
  - ignition systems (high electrical voltage)
    Contact must be avoided!

- The manufacturer will not be liable for damages resulting from unauthorised modification to the engine.
  Equally, manipulations to the injection and control system can affect the engine's performance and the exhaust characteristics. Compliance with environmental regulations will no longer be guaranteed in this case.

- Do not alter, obstruct or block the area of the cool air supply to the fan.
  The manufacturer will accept no liability for damages resulting from this.

- Only DEUTZ original parts may be used when carrying out maintenance/repair work on the engine. These have been designed especially for your engine and ensure a trouble-free operation.
  Failure to observe this will lead to voiding of the warranty!

- Maintenance/cleaning work on the engine may only be carried out when the engine is not running and has cooled down.
  When doing this, make sure that the electrical system is switched off (remove ignition key).
  The specifications for accident prevention with electrical systems (e.g. VDE-0100/-0101/-0104/-0105 Electrical protective measures against dangerous touch voltages) must be observed.
  Cover all electrical components tightly when cleaning with liquids.

- Do not work on the fuel system while the engine is running **- Danger to life.**
  Wait (1 minute) for the engine to come to a standstill (pressure release), as system is under high pressure: there is a **- Danger to life.**
  During the first trial run do not stand in the danger area of the engine (danger due to high pressure of leaks) **- Danger to life.**
  - In case of leaks immediately contact the workshop.
  - When working on the fuel system ensure that the engine is not unintentionally started during repairs **- Danger to life.**

Operation Manual

TCD 2012 L04/06 V2

TCD 2013 L04/06 V2

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Engine number: | | | | | | | | |

Please enter the engine number here. This will simplify the handling of customer service, repair and spare parts queries (see Section 2.1).

DEUTZ®

Foreword

Dear customer,

The liquid-cooled engines made by DEUTZ are developed for a wide variety of applications. An extensive range of variants ensures that the respective special requirements are met.

Your engine is equipped according to the installation, i.e. not all the parts and components described in this instruction manual are installed on your engine.

We have done our best to clearly identify the differences, so that you can easily find the operating, maintenance and repair instructions relevant to your engine.

Please read these instructions before you start your engine and observe the operating and maintenance instructions.

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

Your

DEUTZ AG

FAMCO
هایپرصنعت

Contents

Contents

DEUTZ Diesel Engines

are the product of many years of research and development. The resulting know-how, coupled with stringent quality standards, guarantee their long service life, high reliability and low fuel consumption.
It goes without saying that DEUTZ Diesel Engines meet the highest standards for environmental protection.

Care and Maintenance

Sound care and maintenance practices will ensure that the engine continues to meet the requirements placed on it. Recommended service intervals must be observed and service and maintenance work carried out conscientiously. Special care should be taken under abnormally demanding operating conditions.

Service

Please contact one of our authorized service representatives in the event of breakdowns or for spare parts inquiries. Our trained specialists will carry out repairs quickly and professionally, using only genuine spare parts. Original parts from DEUTZ AG are always produced in accordance with state-of-the-art technology.
The Technical Circulars listed in the instruction manual are obtainable from your DEUTZ partner.
Please turn to the end of this manual for further service information.

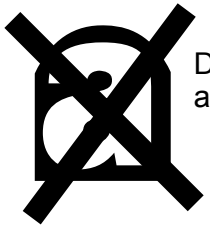
Beware of Running Engine

Shut the engine down before carrying out maintenance or repair work. Ensure that the engine cannot be accidentally started. Risk of accidents!
When working on the running engine, work clothing must be close fitting.
Observe industrial safety regulations when running the engine in an enclosed space or underground.
When the work is complete, be sure to refit any panels and guards that may have been removed.Never fill the fuel tank while the engine is running.

Safety

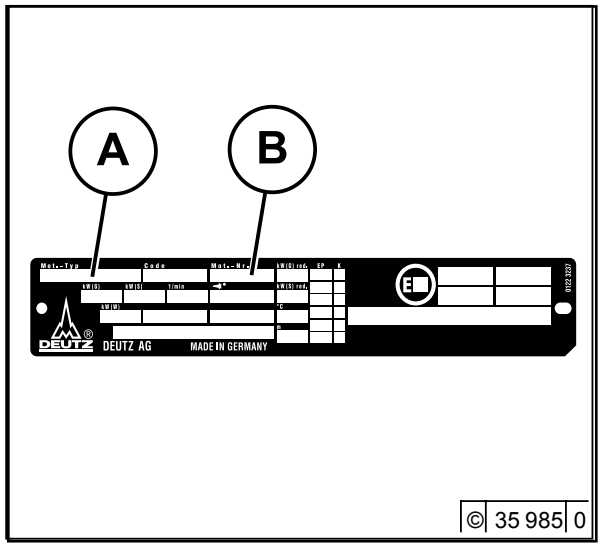
This symbol is used for all safety warnings which, if not observed, present a direct danger to life and limb for the person involved. Please follow them carefully. The attention of operating personnel should be drawn to these safety instructions. General safety and accident prevention regulations laid down by law must also be observed.

Asbestos



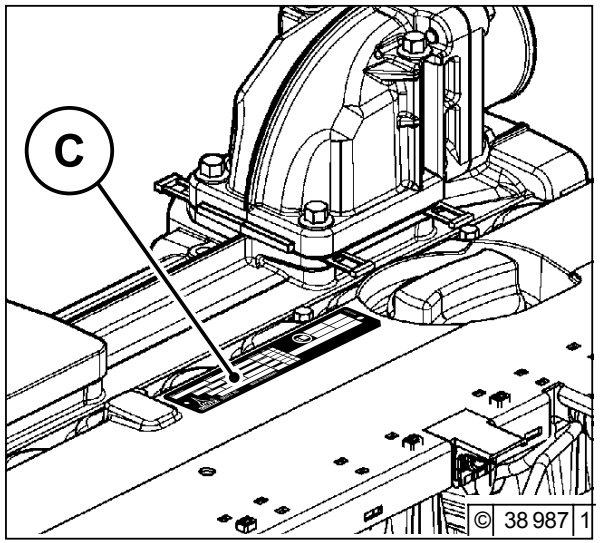
DEUTZ original parts are asbestos-free.

2.1.1 Company plate

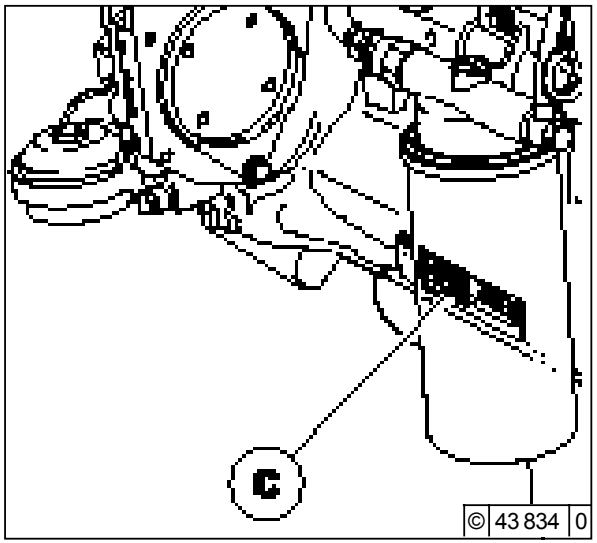


The engine type **A,** engine number **B** and the power data are stamped on the company plate. The engine type and number must be stated when purchasing spare parts.

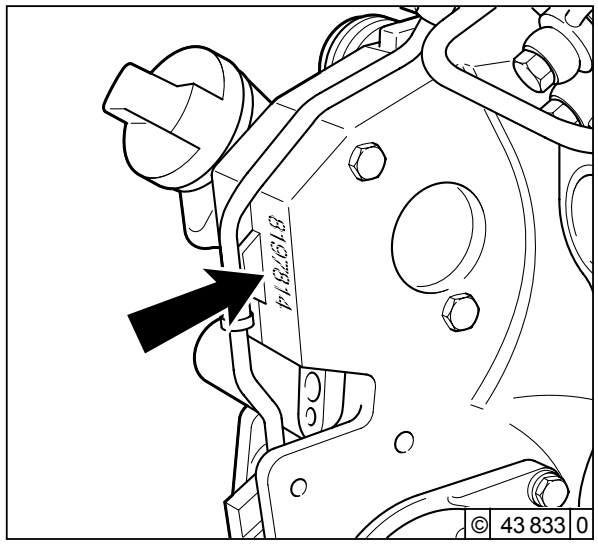
2.1.2 Location of company plate



The company plate **C** is fixed to the cylinder head cover or the crankcase.

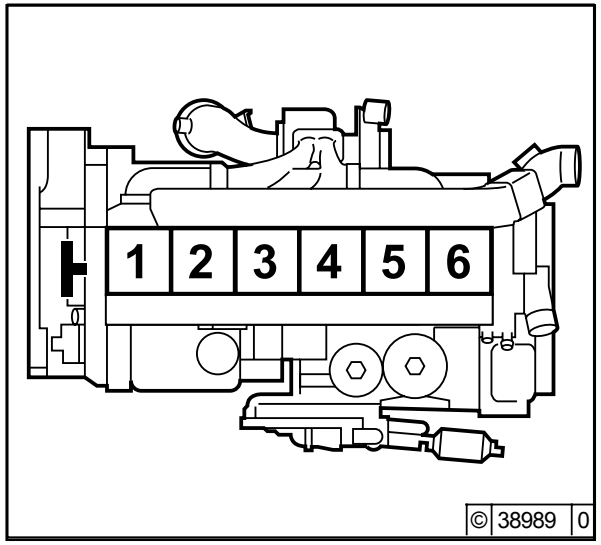


2.1.3 Engine number



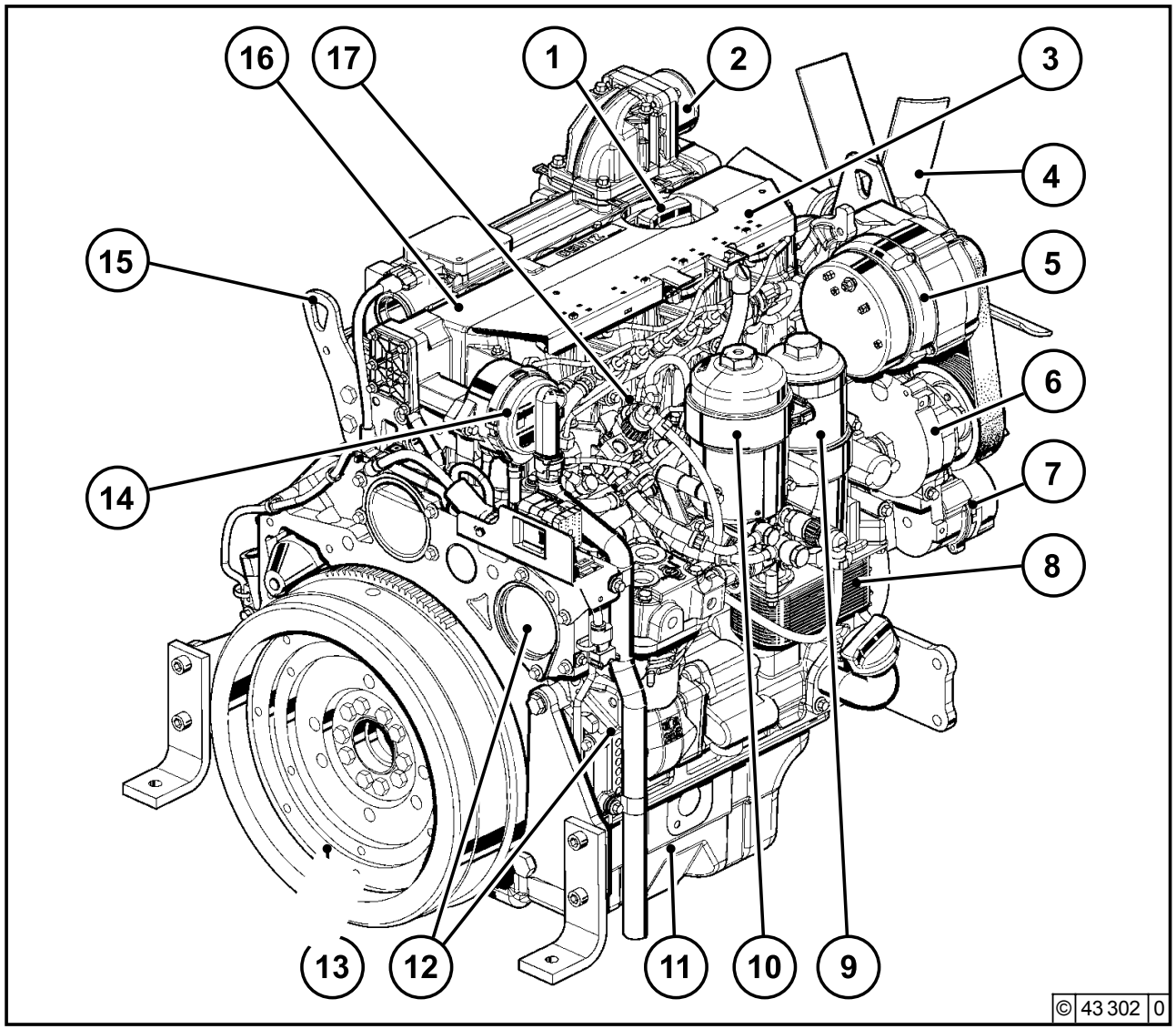
The engine number is stamped on the crankcase (arrow) and on the company plate.

2.1.4 Cylinder numbering



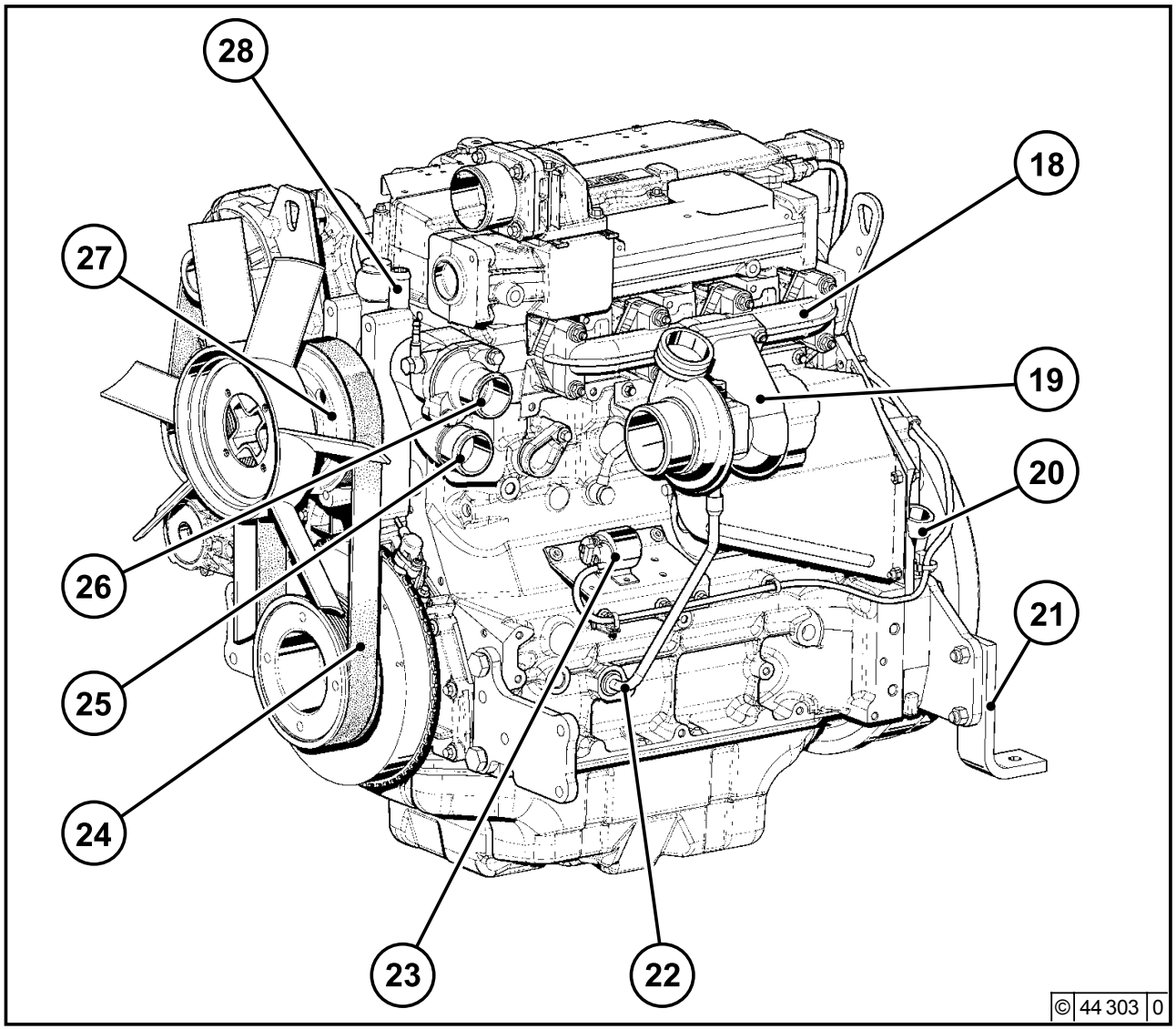
The cylinders are counted consecutively, starting from the flywheel.

2.2.1 Operation side TCD 2012 L04 2V



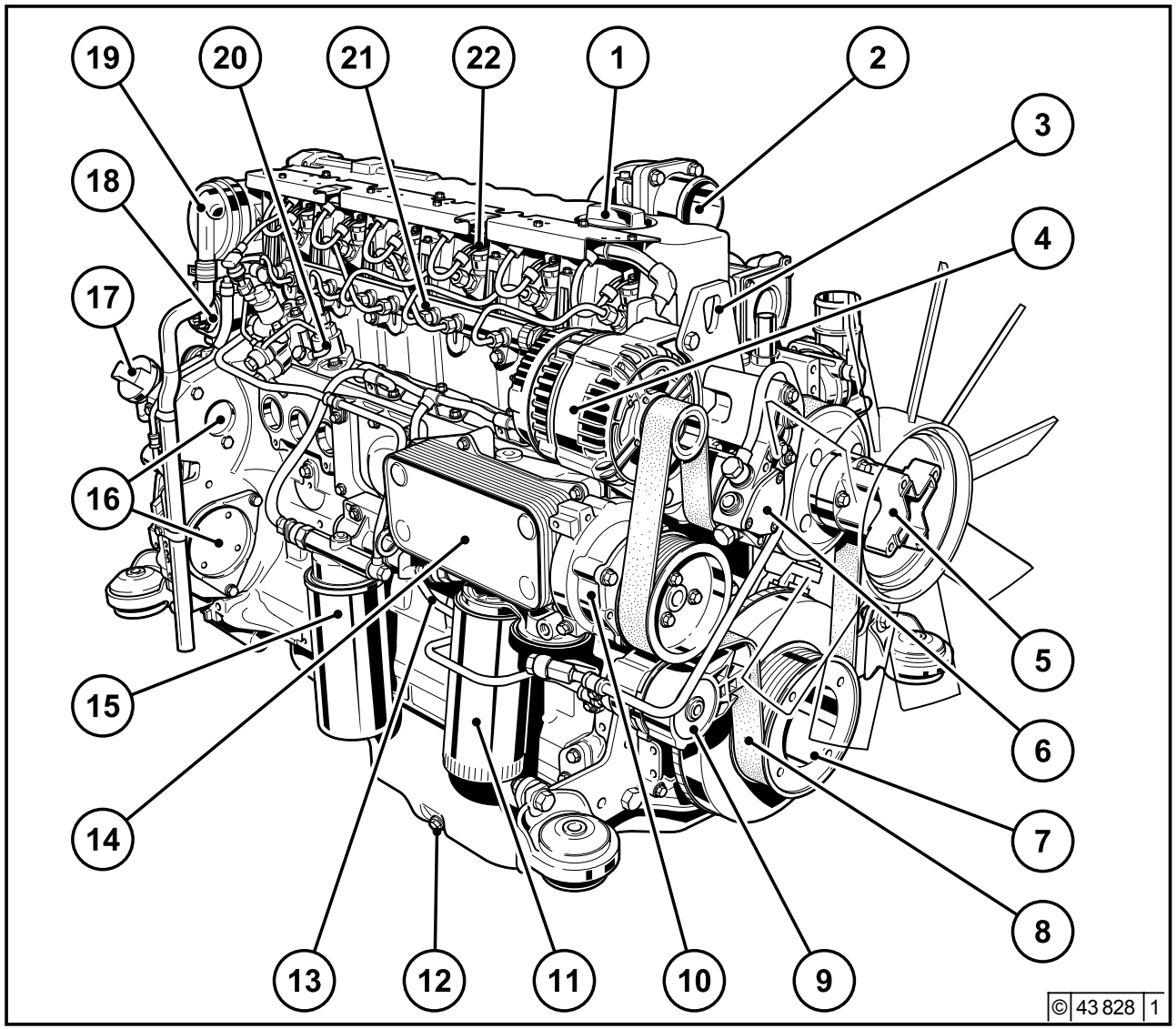
1 Oil filler
2 Combustion air inlet
3 Cover
4 Fan
5 Generator
6 Fuel pump
7 Tension pulley with torsion spring
8 Oil cooler
9 Exchangeable fuel filter
10 Exchangeable lube oil filter
11 Oil tray
12 Hydraulic pump or compressor mounting possibility
13 Flywheel
14 Crankcase bleeding valve
15 Transport eyes
16 Charge air pipe
17 Fuel control unit

2.2.2 Starter side
TCD 2012 L04 2V



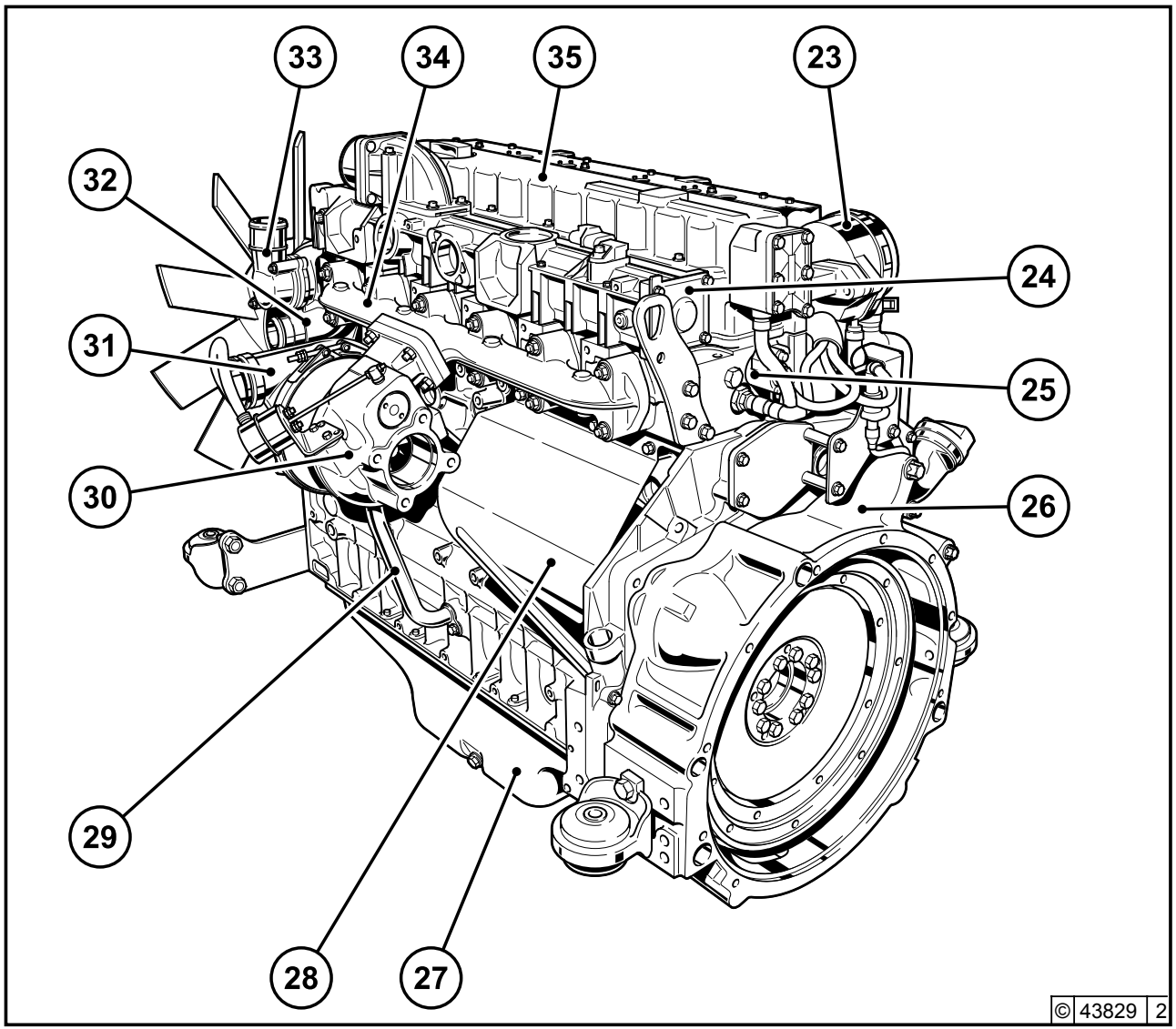
18 Exhaust manifold
19 Turbocharger
20 Oil filler (optional)
21 Engine mounting
22 Oil return line from turbocharger
23 Relay (starter)
24 V-rib belt
25 Coolant inlet
26 Coolant outlet
27 Coolant pump
28 Connection cabin heater or compensation line

2.2.3 Operation side
TCD 2012 L06 2V



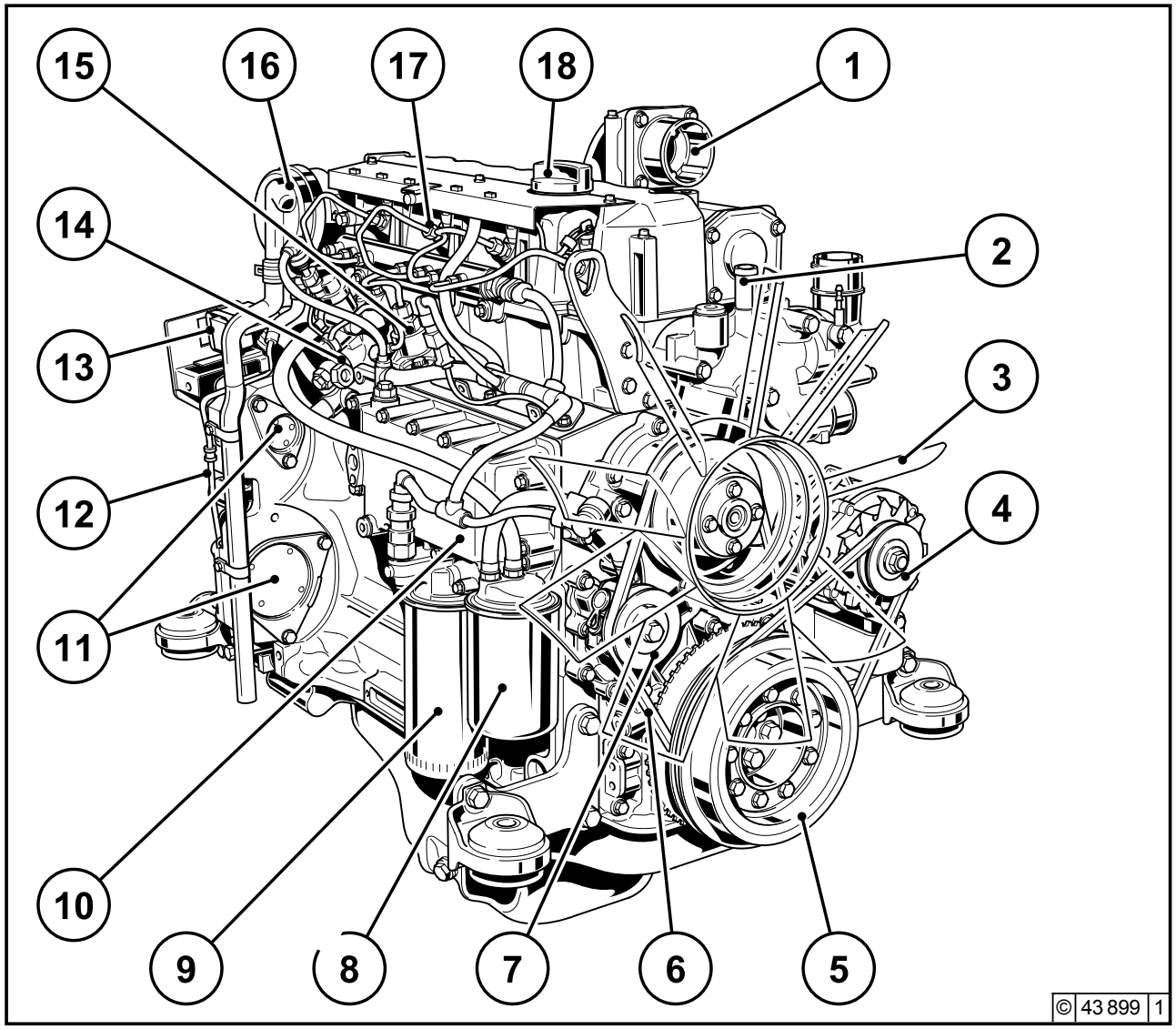
1 Oil filler
2 Combustion air inlet
3 Transport eyes
4 Generator
5 Fan hub
6 Fuel pump
7 V-rib belt drive on crankshaft
8 V-rib belt
9 Tension pulley with torsion spring
10 Coolant pump
11 Exchangeable lube oil filter (1x optional)
12 Oil drain screw
13 Oil dipstick
14 Lube oil cooler
15 Exchangeable fuel filter
16 Hydraulic pump or compressor installation (optional)
17 Oil filler (optional)
18 Plug to control unit
19 Crankcase bleeding valve
20 High-pressure pump (2)
21 Rail
22 Injector

2.2.4 Starter side
TCD 2012 L06 2V



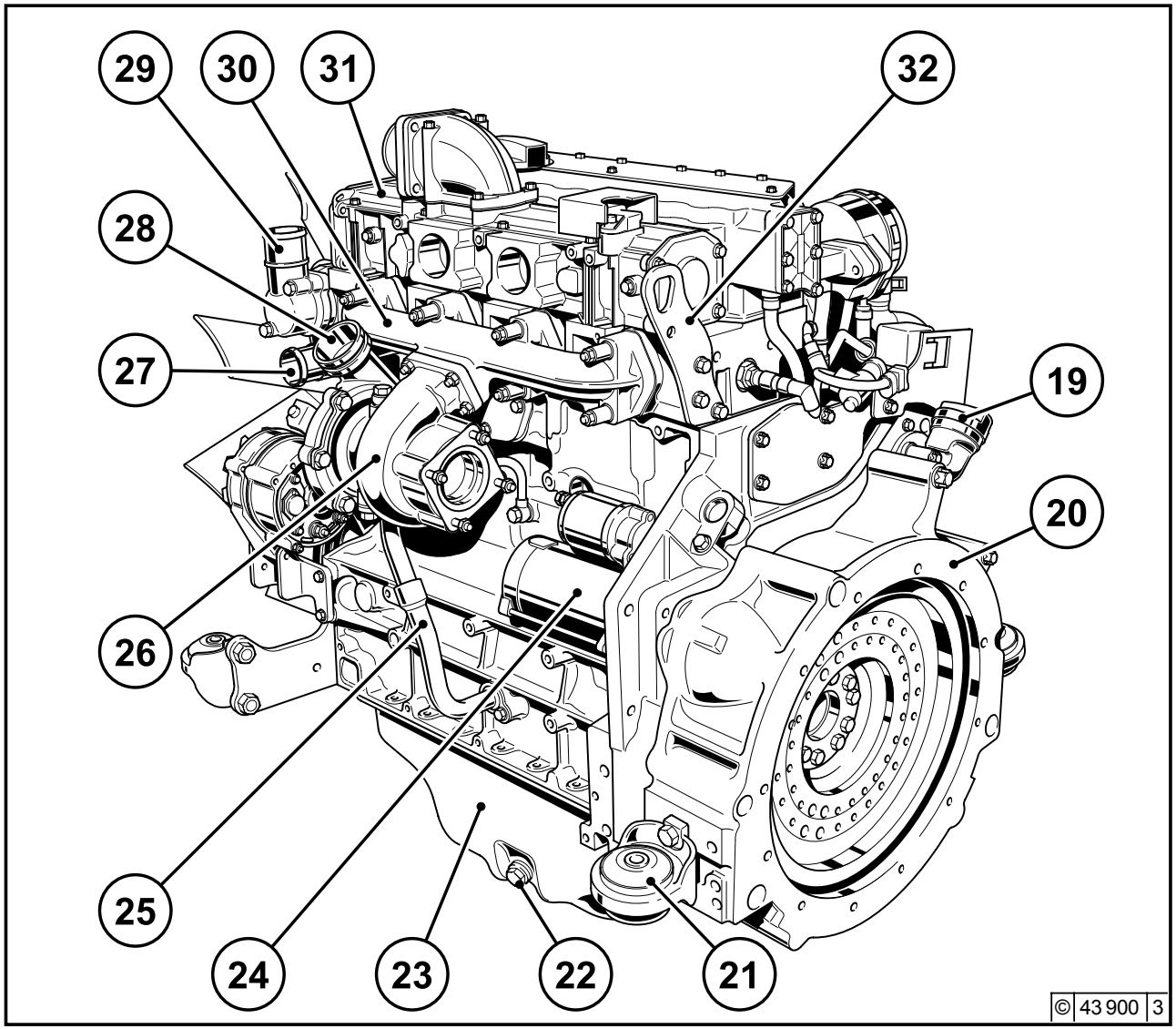
23 Crankcase bleeding valve
24 Charge air pipe
25 Solenoid valve for exhaust gas recirculation
26 SAE housing
27 Oil tray
28 Starter cover
29 Oil return line from turbocharger
30 Exhaust turbocharger
31 Charge air connection to charge air cooler
32 Coolant inlet
33 Coolant outlet
34 Exhaust manifold
35 Cylinder head cover

2.2.5 Operation side
TCD 2013 L04 2V



1 Combustion air inlet (heating flange installation facility, optional)
2 Connection cabin heater or compensation line
3 Fan (drive coolant pump)
4 Generator
5 Belt pulley on crankshaft
6 V-belt
7 Fuel pump drive
8 Exchangeable fuel filter
9 Exchangeable lube oil filter
10 Oil cooler
11 Drive facility (e.g. hydraulic pump, optional)
12 Oil return line crankcase bleeding
13 Plug to control unit
14 Fuel control unit (**E**lectronic **C**ontrol **U**nit)
15 High-pressure pump
16 Crankcase bleeding valve
17 Injector
18 Oil filler

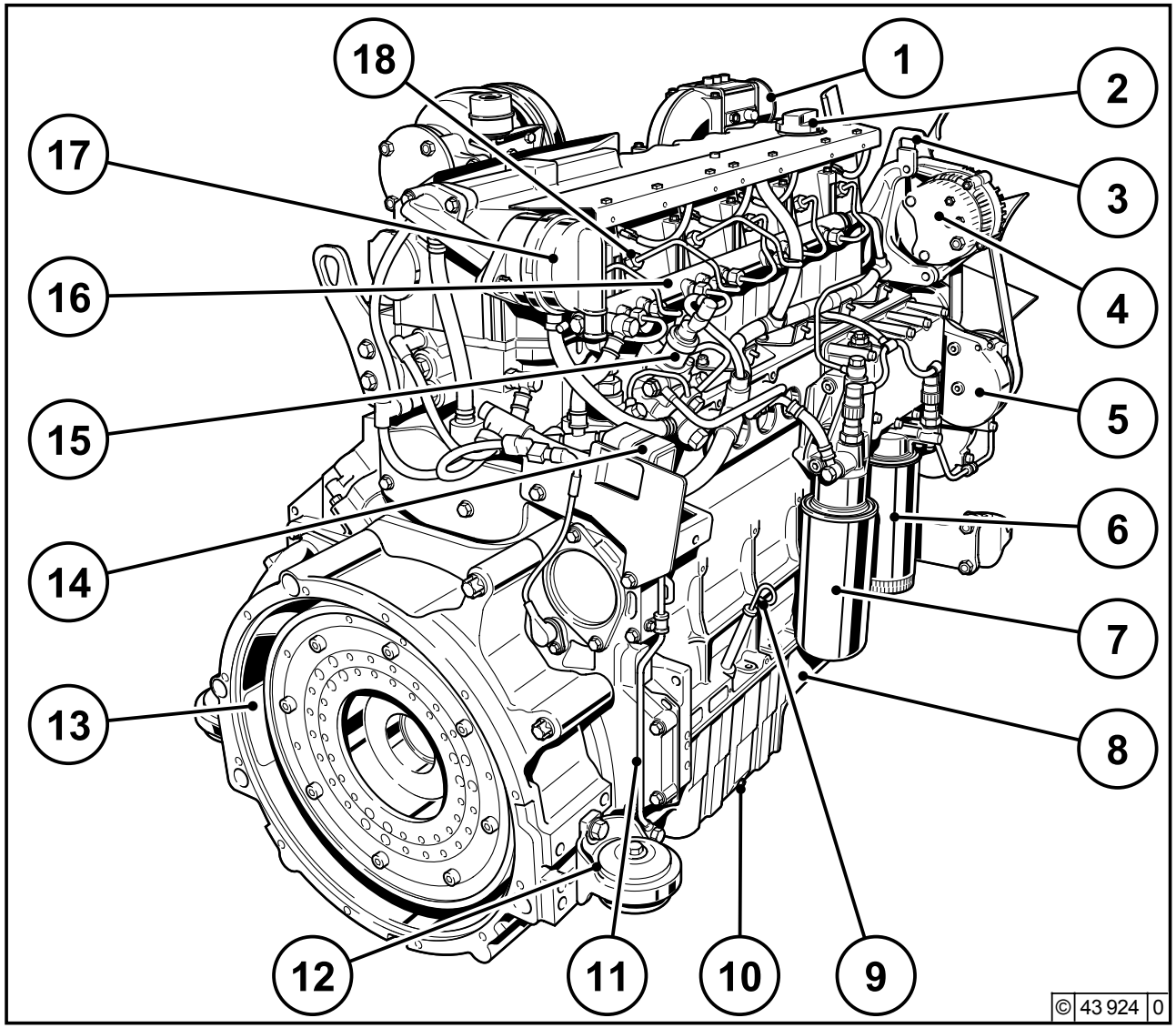
2.2.6 Starter side
TCD 2013 L04 2V



19 Oil filler (optional)
20 SAE housing
21 Engine mounting
22 Oil drain screw
23 Oil tray
24 Starter
25 Lube oil return from turbocharger
26 Turbocharger
27 Coolant inlet
28 Charge air connection to cooler
29 Coolant outlet
30 Exhaust manifold
31 Charge air pipe
32 Transport eyes

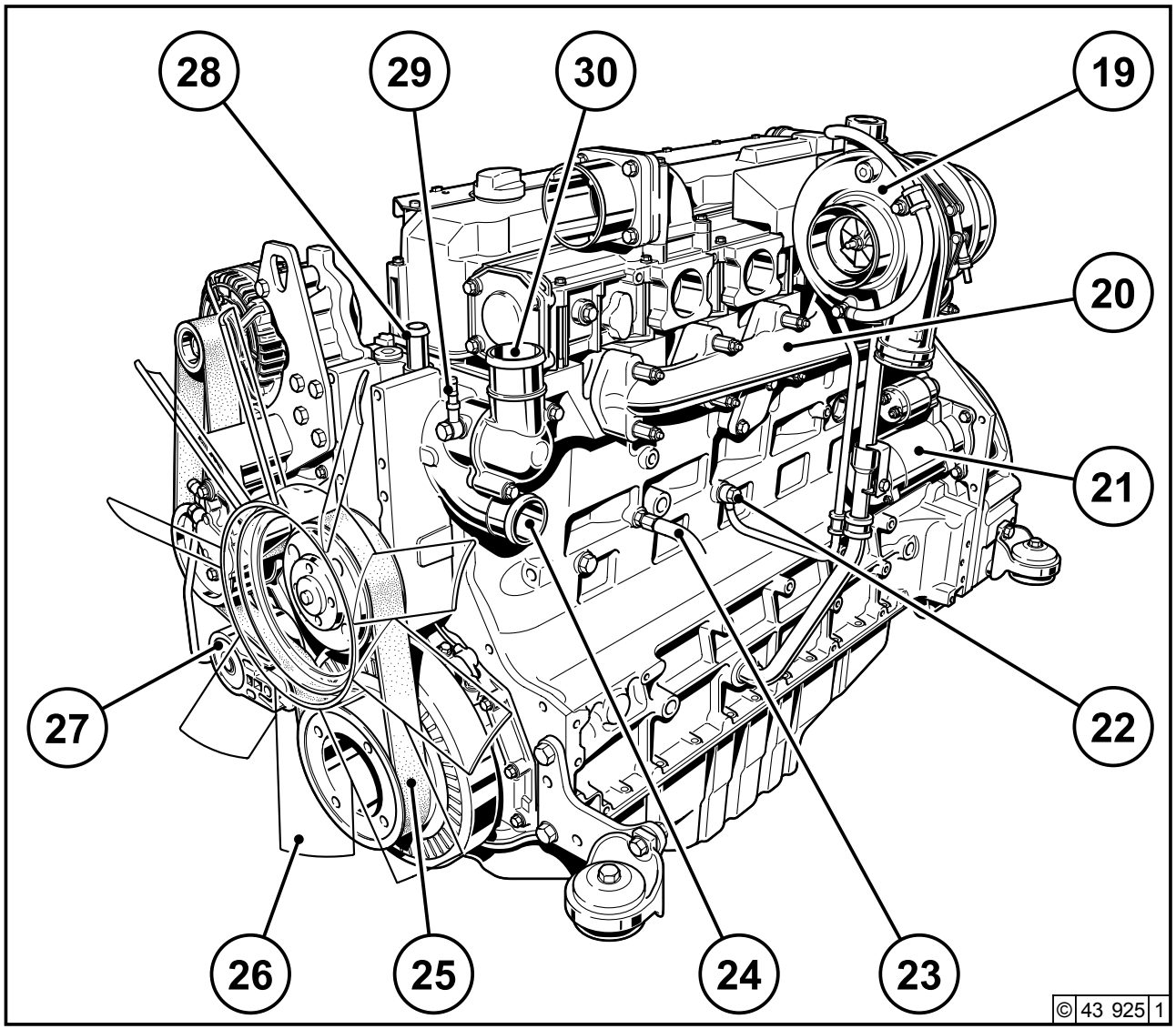
2

2.2.7 Operation side
TCD 2013 L06 2V



1 Combustion air inlet
2 Oil filler
3 Transport eyes
4 Generator
5 Coolant pump
6 Exchangeable lube oil filter
7 Exchangeable fuel filter
8 Oil tray
9 Oil dipstick
10 Oil drain screw
11 Oil return line crankcase bleeding
12 Engine mounting
13 SAE housing
14 Plug to control unit
15 High-pressure pump
16 Rail
17 Crankcase bleeding valve
18 Injector

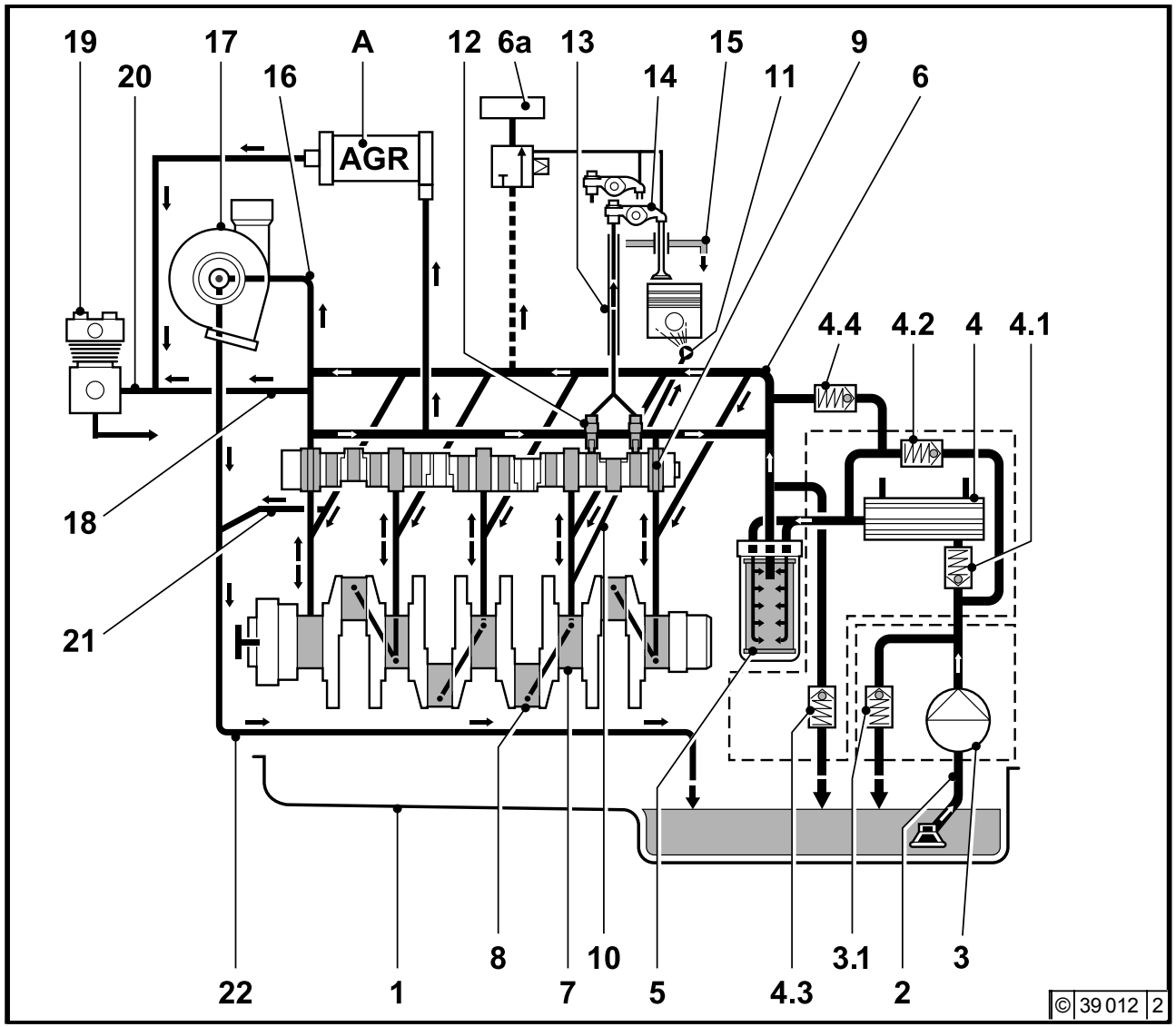
2.2.8 Starter side
TCD 2013 L06 2V



19 Turbocharger
20 Exhaust manifold
21 Starter
22 Lube oil line to turbocharger
23 Coolant drain screw
24 Coolant inlet
25 V-rib belt
26 Fan
27 Tension pulley with torsion spring
28 Connection compensation line
29 Ventilation line to compensation tank
30 Coolant outlet from engine to cooler

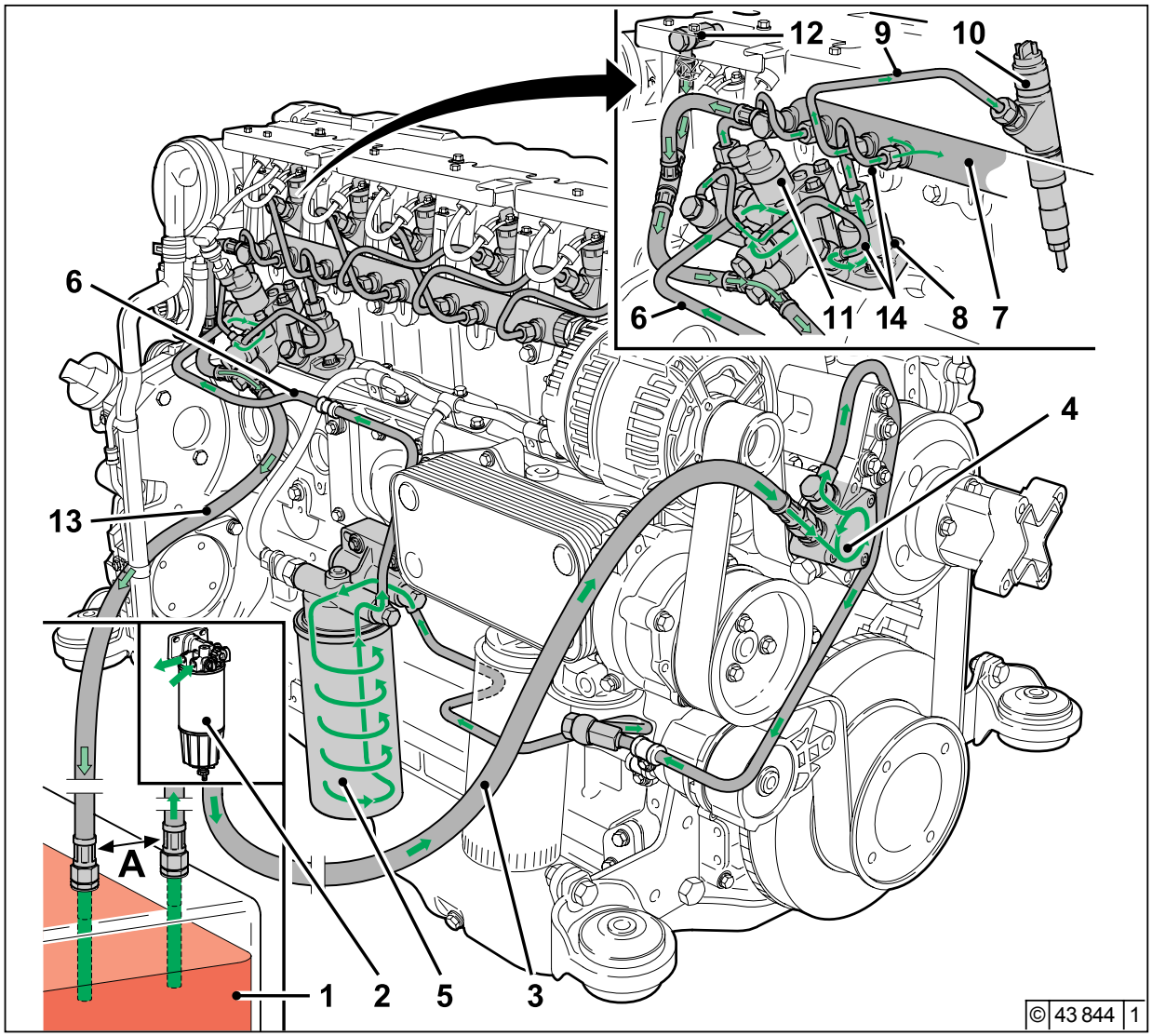
2

2.3.1 Lube oil diagram (example)



1 Oil tray
2 Intake pipe
3 Lube oil pump
3.1 Safety valve
4 Lube oil cooler
4.1 Return shutoff valve (only in 2012)
4.2 By-pass valve
4.3 By-pass valve oil filter
4.4 Pressure control valve
5 Exchangeable lube oil filter
6 Main oil pipe
6a Internal exhaust gas recirculation
7 Crankshaft bearing
8 Con rod bearing
9 Camshaft bearing
10 Line to injection nozzle
11 Injection nozzle for piston cooling
12 Tappet with rocker arm pulse lubrication
13 Stop rod, oil supply for rocker arm lubrication
14 Rocker arm
15 Return line to oil tray
16 Lube oil line toexhaust turbocharger
17 Exhaust turbocharger
18 Return line from compressor 2x
19 Compressor or hydraulic pump
20 Oil line to compressor or hydraulic pump
21 Return line from exhaust turbocharger

2.4.1 Fuel diagram

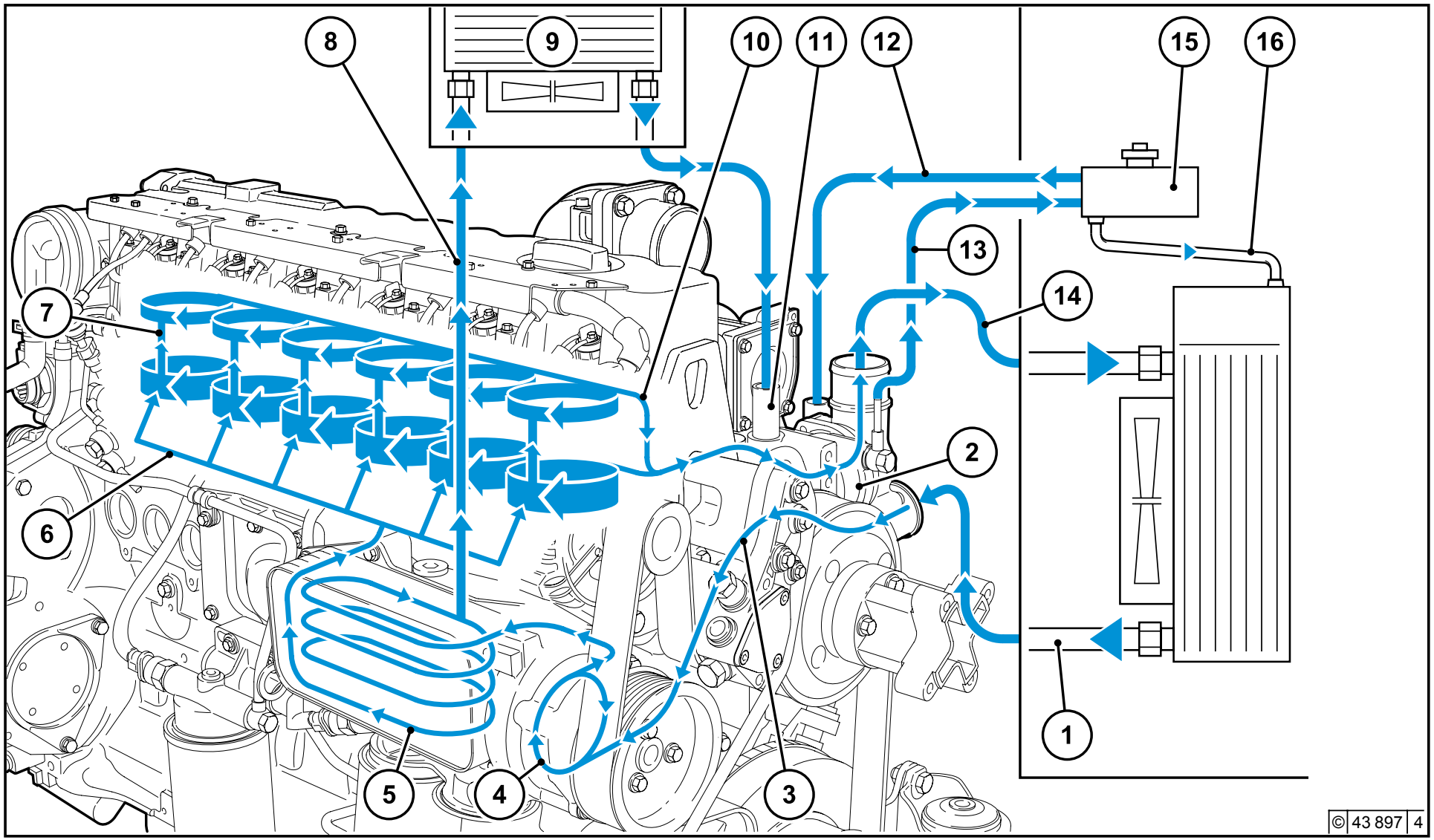


1 Fuel container
2 Fuel pre-filter with pre-pressure pump possibility for filling the low pressure area (to be provided by the customer)
3 Line to fuel pump
4 Fuel pump
5 Fuel filter
6 Fuel supply line to fuel control unit
7 Rail
8 High-pressure pump
9 Fuel line to injector
10 Injectors
11 Control block FCU (**F**uel **C**ontrol **U**nit)
12 Fuel return at the cylinder head
13 Fuel return line to the tank
14 Fuel lines from the control block to the high - pressure pumps and to the rail

A min. distance 500 mm

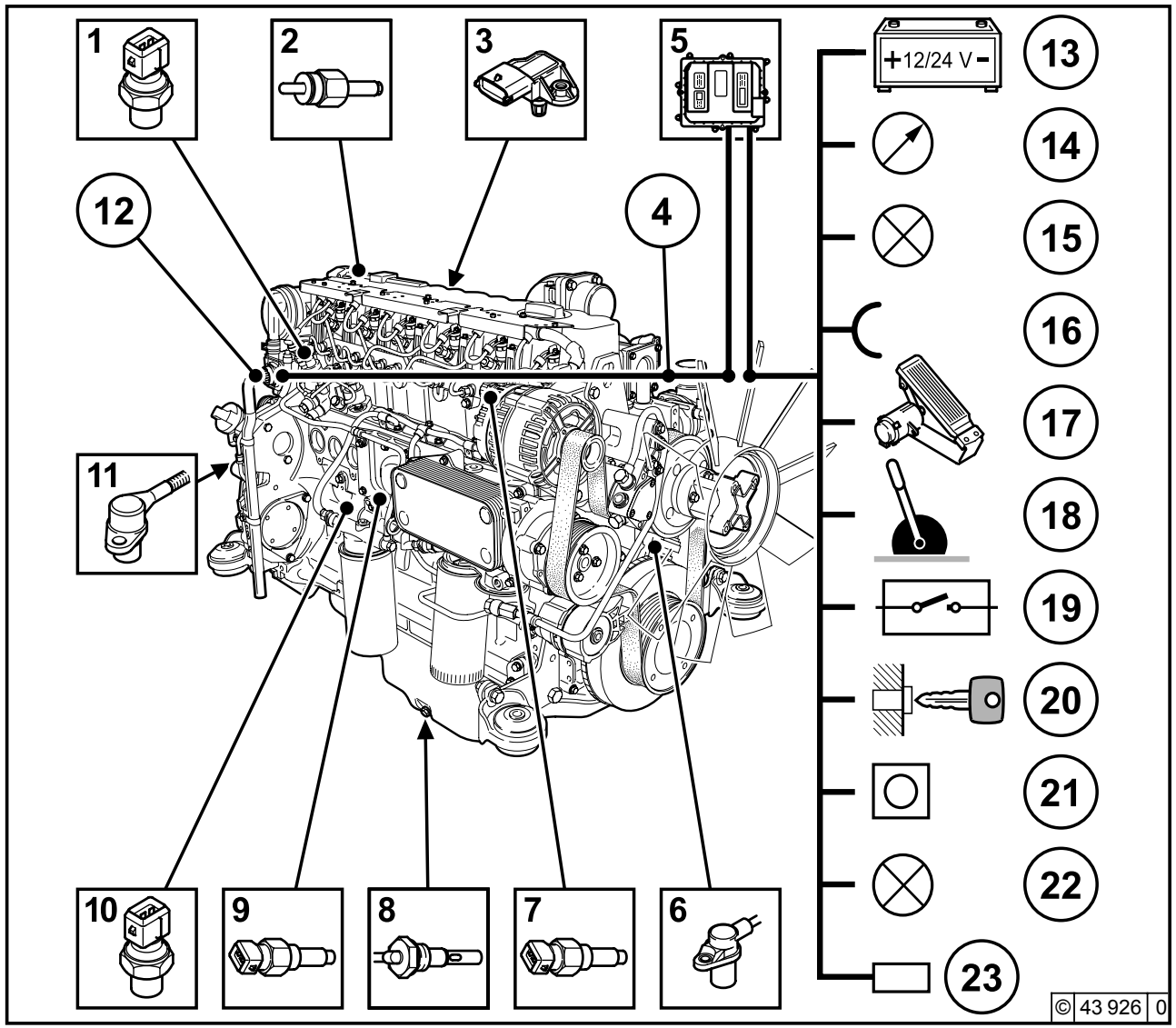
2

2.5.1 Coolant diagram (example)



1 Coolant outlet at the cooler
2 Thermostat
3 Coolant feed line to pump
4 Coolant pump
5 Lube oil cooler
6 Cylinder cooling
7 Cylinder head cooling
8 Coolant inlet to heating
9 Heating
10 Coolant to thermostat
11 Heating connection
12 Compensation line
13 Ventilation line to compensation tank
14 Coolant outlet to cooler
15 Compensation tank
16 Compensation line to heat exchanger

2.6.1 Electrical cable connections for monitoring

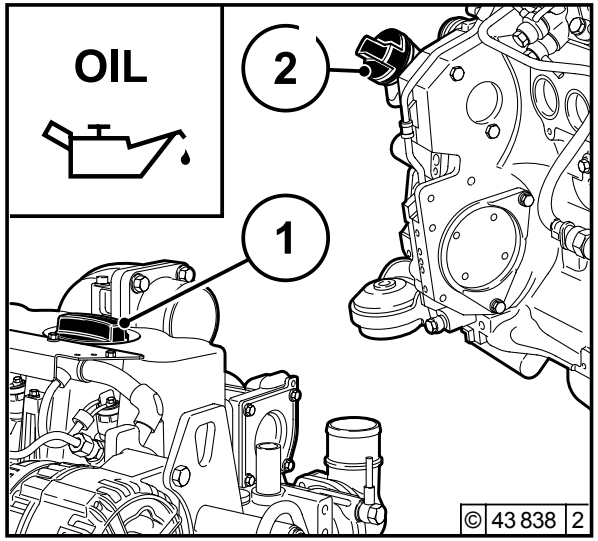


1 Solenoid valve EGR (optional)
2 Coolant temperature
3 Charge air pressure/temperature transmitter
4 Connection facility example: Control unit not mounted on the engine
5 Engine control unit
6 Speed governor via crankshaft
7 Rail pressure, on side of rail
8 Oil level transmitter (optional)
9 Oil pressure transmitter
10 Fuel pressure
11 Speed governor via camshaft
12 Central plug (for engine control)
13 Power supply (battery)
14 Multifunction displays
15 Outputs (configurable, e.g. for lamps, torque (PWM), speed, engine running signal, etc.)
16 Inputs (configurable) (PWM/digital/analogue)
17 Accelerator pedal
18 Hand throttle (optional)
19 Switch functions (optional, e.g. for P factor, controller type, roof curves, fixed speeds, (etc. also multistage switches))
20 Key switch Start/stop
21 Diagnosis button
22 Fault light with blink code
23 Diagnosis interface / CAN-Bus

Other application-side components (depending on the application)

- Water trap fuel filter, see chap. 6.2.3
- Override key, see chap. 3.3.1 (for temporary bypassing of the engine protection functions)
- Coolant level transmitter
- Separate engine stop switch
- Fan control
- Switch for brake contact, engine brake, clutch
- Drive speed sensor, drive speed control unit
  (+ - keys, for speed increase reduction)
- Cold start aid control lamp, see chap. 3.2.1
  If there is a serious fault, e.g. the heating flange draws current although the control unit does not control it, this lamp flashes. The power supply to the heating flange **must** then be disconnected separately (overheating protection heating flange).

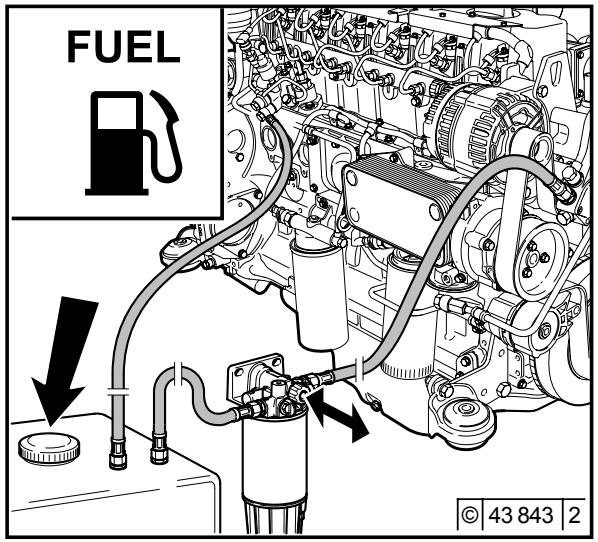
3.1.1 Filling engine oil



The engines are generally supplied without oil filling.
Fill engine with lube oil through the oil filler (1) on the cylinder head cover. Alternatively, you can fill on the wheel box (2) or on the side of the crankcase.
For oil filling amount see 9.1.
For quality and viscosity of oil see 4.1.

Oil may not be filled into the dust collecting tank of the pre-separator, if this is present.

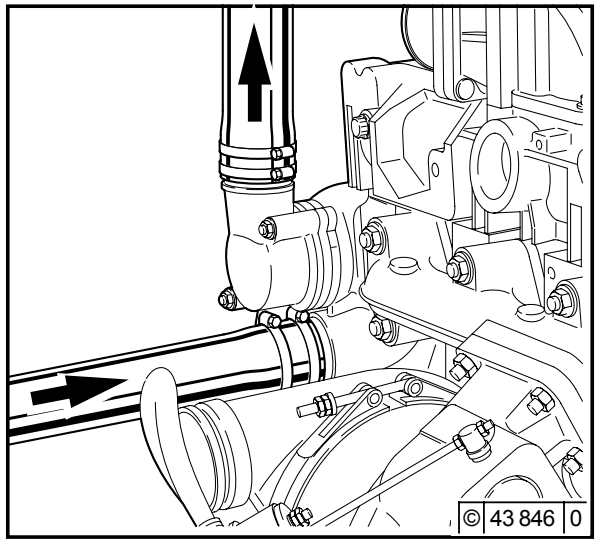
3.1.2 Filling fuel



Only use clean, standard, branded diesel fuel. For fuel quality see 4.2.
Depending on the outdoor temperature, use either summer or winter diesel fuel.
Bled the fuel low pressure system after filling, see 6.2.3.
Additional venting of the fuel system by a 5 minute trial run in idle or low load is absolutely essential.

Only re-fuel when the engine is not running!
Pay attention to cleanliness!
Do not spill any fuel!

3.1.3 Filling / bleeding cooling system



- Connect connection coolant outlet 1 and coolant inlet 2 to the cooling system. Connect the lead line from the compensation tank to the water pump or to the coolant inlet pipe 2.
- Connect the bleed lines from the engine and poss. from the cooler to the compensation tank.
- Fill the cooling system through the compensation tank.
- Close the compensation tank with the valve.
- Start the engine and run warm until the thermostat opens (line 1 heats up).
- Engine run with open thermostat 2 - 3 minutes.
- Check the coolant level in the compensation tank and top up the coolant if necessary.
- Repeat the process with engine start if necessary.

Never operate the engine without coolant (not even briefly).

3.1.4 Other preparations

- Check battery and cable connections, see 6.7.1.

- **Trial run**
  - After preparations carry out a short trial run of approx. 10 min.
    Do not fully load the engine.

  During and after the trial run
  - Check engine for tightness.

  With engine not running
  - Check oil level, re-fill oil if necessary, see 6.1.2
  - Check V-belt, re-tighten if necessary, see 6.5.

- **Running-in**
  Check the oil level twice a day during the running-in phase.
  After the running-in phase, checking once a day is sufficient.

3.2.1 Electrical starting

without cold start aid

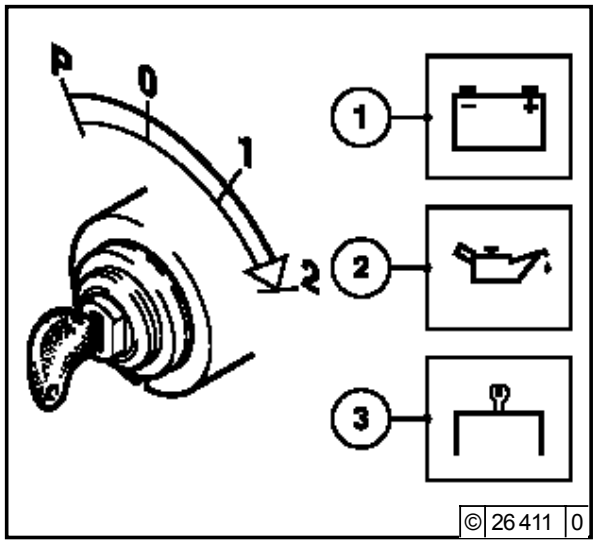
Before starting make sure that there is nobody in the engine/ work machine danger area. After repairs: Check that all protective equipment is mounted and all tools have been removed from the engine.

When starting with heating plugs/heating flange, do not use additional start aids (e.g. injection with start pilot)! Danger of accidents!

- Engine is electronically controlled by
  Example: EMR3 (electronic engine control)
  - engine is programmed and supplied with the necessary function configurations.
- As far as possible separate engine from driven devices by disconnecting.
- Engine connector plug must be connected by the customer (e.g in driver's cab/ device) to at least:
  - Supply voltage
  - Torque output
  - Speed output.
- Warm up the engine for approx. 30 seconds at a low idling speed.
- Do not run up the engine immediately to high idling speed / full load operation from cold.

If the starter is connected by a relay on the EMR3,

- the maximum starting time is limited by the EMR3.
- the pause between two start attempts is given by the EMR3.



- If the touch start function is programmed, a short start command with the ignition key suffices in position 2 or, if available, by a start button.
  The start is then continued automatically by the EMR3.
- For special applications, the EMR3 can be programmed by data record so that the control unit performs other automatic start attempts if the engine fails to start.

- Insert key
  - Step 0 = no operating voltage.
- Turn key to the right
  - Step 1 = operating voltage,
  - Warning lights light up.
- Turn the key further to the right against the spring load.
  - Step 2 = start
- Release key as soon as the engine starts up.
  - Warning lights go out.

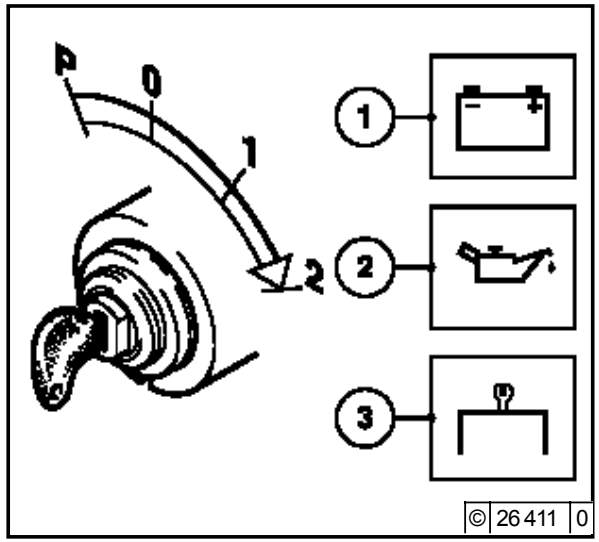
Start the engine for a maximum of 20 seconds uninterrupted. If the engine does not start up, wait for one minute and then repeat the starting process. If the engine does not start up after two starting processes, determine the cause as per fault table (see 7.1).

If the engine does not start and the diagnostic lamp flashes, the EMR3 system has activated the start lock to protect the engine.

The start lock is released by switching off the system with the ignition key for about 30 seconds.

with cold start aid

Heating plug/heating flange



- Insert key.
  - Step 0 = no operating voltage.
- Turn key to the right.
  - Step 1 = operating voltage,
  - Warning lights 1+2+3 light up.
  - Pre-heat until heating indicator goes out. If the pre-heating indicator flashes, there is an error, e.g. pre-heating relay sticking which can fully discharge the battery at standstill.
  - Engine is ready for operation.
- Turn the key further to the right against the spring load to
  - Step 2 = start
- Release key as soon as the engine starts up.
  - Warning lights go out.

Caution: Engine must start within 30 seconds, if not, repeat the starting process.

The EMR3 system monitors the engine condition and itself.
The states are indicated by the diagnostic lamp.
Lamp test:

- The diagnostic lamp lights for about 2s after ignition (ignition lock stage 1).

Steady light:

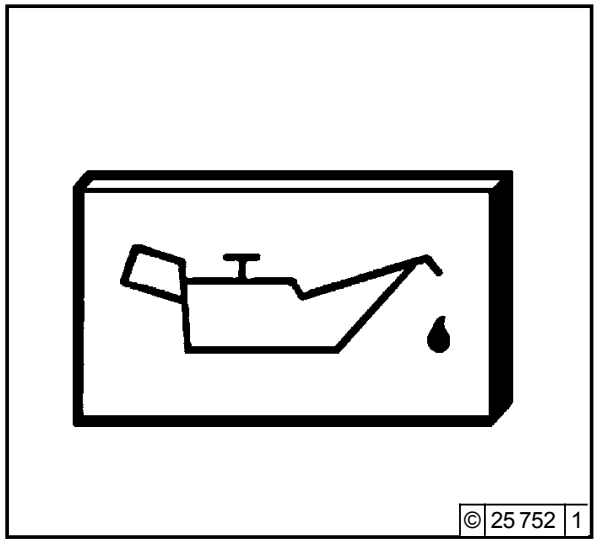
- There is an error in the system or a variable of the engine (temperature, pressure, etc.) is in the warning area. Depending on the error, the performance of the engine may be reduced by the EMR3 to protect the engine so that it is not in danger.

Fast flashing:

- **Attention, the engine is in danger and must be switched off**.
- **Depending on the application, the control unit switches the engine off automatically**.
- The control unit may also specify an idle speed to cool the engine before shutting down.
- There may be a start lock after stopping the engine.
- Additional control lamps e.g. for oil pressure or oil temperature may be on.
- The override key can bypass the reduction in performance to avoid critical situations, as well as delay the automatic shutdown or bypass a start lock. This overwriting of the engine protection functions is logged in the control unit.
- The start lock is released by switching off the system with the ignition key for about 30 seconds.

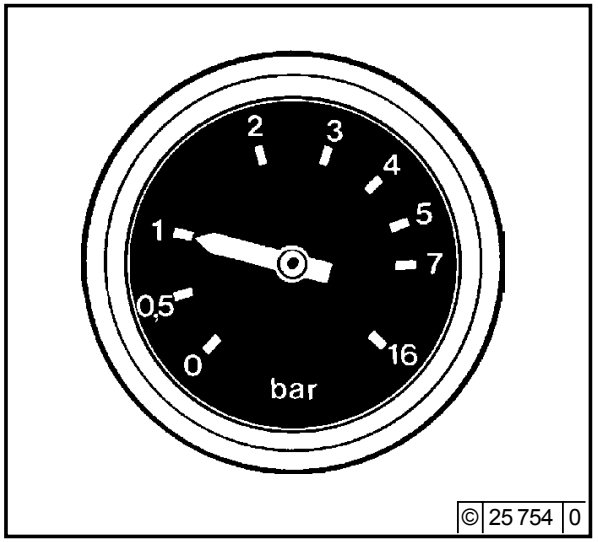
3.3.1 Engine oil pressure

Oil pressure light



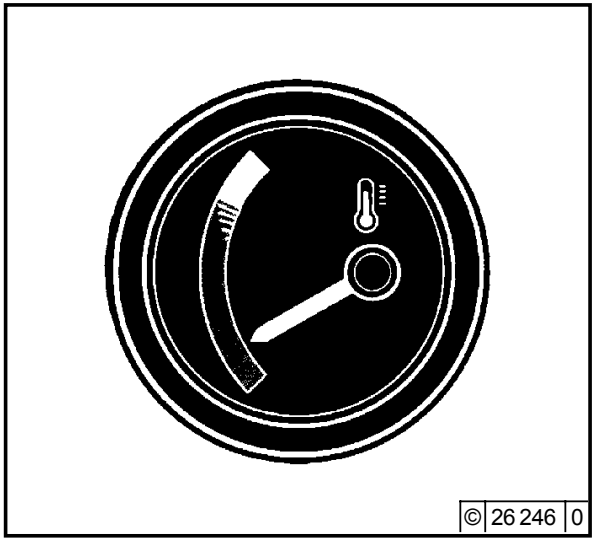
- The oil pressure light comes on for about 2s after switching on the system.
- The oil pressure light must be off when the engine is running.

Oil pressure gauge



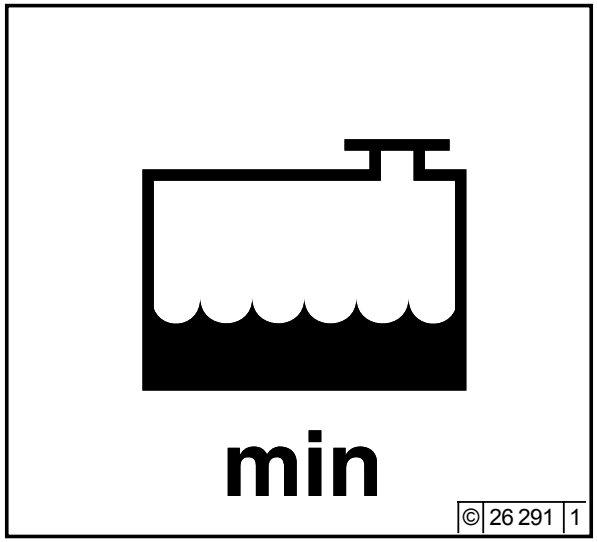
- Oil pressure gauge shows the lube oil pressure (minimum lube oil pressure, see chap. 9.1).

3.3.2 Coolant temperature



- The needle of the temperature display should always be in the green area, and only as an exception in the yellow/green area. If the needle rises into the orange area the engine is getting too hot. Switch off the engine and determine the cause as per fault table (see 7.1).

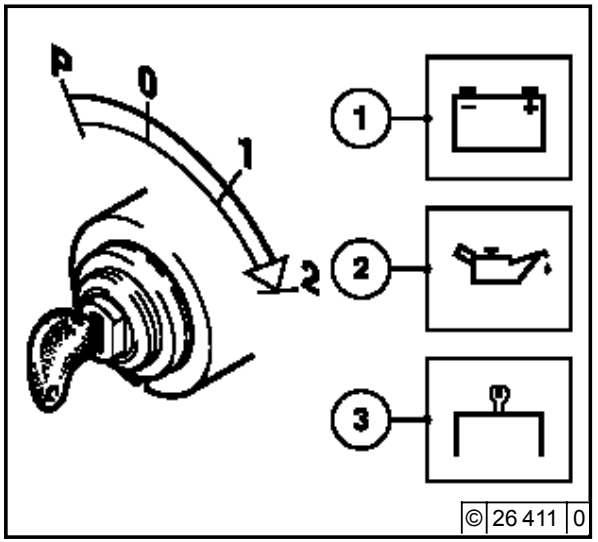
3.3.3 Coolant level



- Light on coolant level display comes on (contact is via float switch/ level probe if coolant level is below minimum):
  Switch off the engine and determine the cause as per fault table (see 7.1).
- Function check of coolant level:
  - Coolant level OK: Light goes out

3

3.4.1 Electrical shutdown



- Turn the key to the left (to step 0) and remove. Warning lights go out.

Note:
The control unit remains active for about another 40 seconds to save the system data (lag) and then switches itself off.

Avoid shutting down from full load operation if possible (coking/ blockage of the remaining oil in the turbocharger bearing housing).
Lube oil is no longer supplied to the turbocharger! Run the engine after relieving the load for about one minute at low idling speed.

3.5.1 Winter operation

- Lube oil viscosity
  - Select the viscosity (SAE class) according to the ambient temperature before starting the engine, see 4.1.2.
  - Observe shorter oil change times when operating below -10 °C, see 6.1.1.

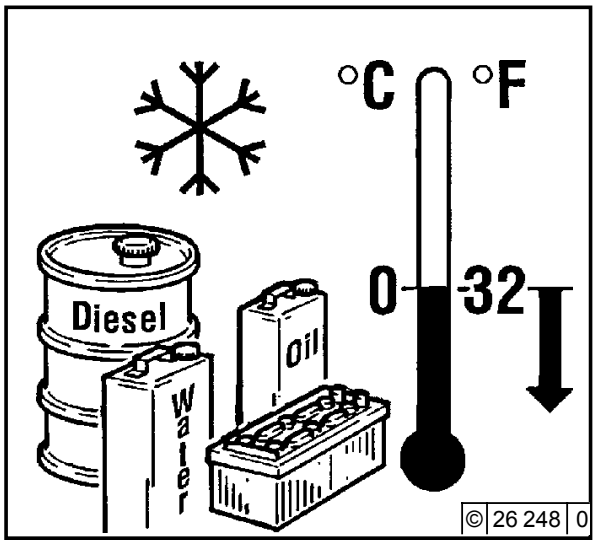
- Diesel fuel
  - Below 0 °C use winter fuel, see 4.2.2.

- Coolant
  - Mixing ratio anti-freeze / water for lowest temperature (max. - 35 °C), see 4.3.1.

- Additional maintenance work
  - Check the fuel container weekly for contaminations, clean if necessary.
  - If necessary, adjust the oil filling of the oil bath air filter (as engine oil) according to the outside temperature.

- Cold start aids
  - When there is a frost, start with heating plugs if necessary (see 3.2.1). This does not only lower the starting limit temperature, but also simplifies starting at temperatures which do not actually require a starting aid.

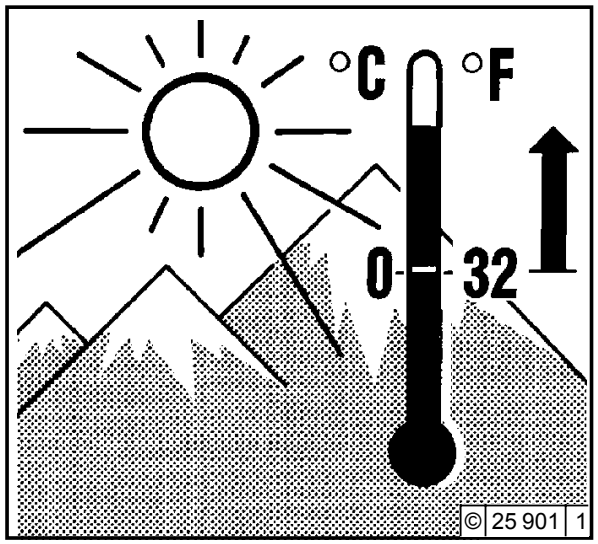
- Battery
  - A well-charged battery is a prerequisite for a good cold start, see 6.7.1.
  - Heating the battery to approx. 20 °C (dismantle and store in a warm room) lowers the starting limit temperature by 4-5 °C.



3.5.2 High ambient temperature, high altitude

- When the altitude or ambient temperature increases, the air density decreases. This impairs the maximum engine performance, exhaust quality, temperature level and, in extreme cases, the starting performance.
  For transient operation, usage up to 1500 m altitude and a temperature of 30 °C is permissible, for stationary operation 1000 m altitude and a temperature of 40 °C is permissible.
  When using the engine under adverse conditions (high altitude or high temperature) the amount of fuel power injected is reduced and the amount of fuel injected and with it the engine power.

- In case of doubt regarding engine usage, please ask your engine or device supplier whether necessary fuel stop reduction has been carried out in the interest of operational safety, service life and exhaust quality (smoke!), or contact your service representative.



Operating substances

General

Modern diesel engines place very high demands on the lube oil to be used. The specific engine performances which have increased constantly over the last few years lead to an increased thermal load on the oil and also the oil is more exposed to contamination due to reduced oil comsumption and longer oil change intervals. For this reason it is necessary to observe the requirements and recommendations described in this instruction manual in order not to shorten the life of the engine.

Lube oils always consist of a basic oil and an additive package. The most important tasks of a lube oil (e.g. wear protection, corrosion protection, neutralization of acids from combustion products, prevention of coke and soot deposits on engine parts) are assumed by the additives. The properties of the basic oil are also decisive for the quality of the product, e.g. with regard to thermal load.

Mixing of engine oils should be avoided because the worst properties of the mixture are always dominant. Basically all engine oils are mixable so that a complete lube oil change from one oil type to another is unproblematical under the aspect of mixability.

The **lube oil quality** has a considerable influence on the life, performance and thus also on the cost-effectiveness of the engine.
It basically applies that: the better the lube oil quality, the better these properties.

The **lube oil viscosity** describes the flow behavior of the lube oil dependent on the temperature. The lube oil viscosity has no influence and effect on the lube oil quality.

Synthetic lube oils are used increasingly and have advantages. These oils have a better temperature and oxidation stability as well as a relatively low cold viscosity. Since some processes relevant to the definition of the lube oil change intervals are not essentially dependent on the lube oil quality (such as the entry of soot and other contaminations), the lube oil change interval when using synthetic lube oils may not be increased in relation to the specifications of the lube oil change intervals section 6.1.1.

Biodegradable lube oils may be used in DEUTZ engines if they meet the requirements of this operating manual.

4.1.1 Quality

Lube oils are classified by DEUTZ according to their performance and quality class (**DQC** : **D**eutz **Q**uality **C**lass). It basically applies that the lube oils are more efficient or higher quality with ascending quality class (DQC I, II, III, IV).
The annex (- 02, - 05) specifies in what year the classification was created.
Lube oils according to other, comparable specifications can be used as long as they meet the DEUTZ requirements. In regions in which none of these qualities is available, please contact the DEUTZ Service responsible.

DEUTZ lube oil quality classes	DQC I - 02	DQC II - 05	DQC III - 05	DQC IV - 05
ACEA classification (**A**ssociation des **C**onstructeurs **E**uropéen d'**A**utomobiles)	E2 - 96	E3 -96 / E5 - 02 E7 - 04	E4 - 99 / E6 - 04 or according to table T 4-1-3	Table T 4-1-4
or API classification (**A**merican **P**etroleum **I**nstitute)	CF / CF - 4	CG - 4 / CH-4 / CI-4	-	-
or worldwide classification	-	DHD - 1	-	-

The following lube oils are prescribed for the engines of this operating manual:

TCD 2012 / 2013 2V
with open crankcase bleeding:
DQC II - 05
DQC III - 05
DQC IV - 05

The best results are achieved with DEUTZ lube oils. These can be ordered from DEUTZ Service with the order number.

DEUTZ lube oil quality classes	DQC II - 05		DQC III - 05	
Lube oil type	DEUTZ ÖI TLS - 15W-40 D		DEUTZ ÖI TLX - 10W-40 FE	
	Container	Order no.	Container	Order no.
	5 liter	0101 6331	5 liter	0101 6335
	20 liter	0101 6332	20 liter	0101 6336
	209 liter	0101 6333	209 liter	0101 6337
	Tank store	0101 6334	Tank store	0101 6338

DEUTZ lube oil quality level		DQC III-05	
Manufacturer	**Lube oil type**	**SAE class**	**Availability**
DEUTZ	**DEUTZ oil TLX-10W40FE**	**10W-40**	**Europe**
ADDINOL	ADDINOL Super Truck MD 1048	10W-40	Europe, Asia
	ADDINOL Ultra Truck MD 0538	5W-30	Europe, Asia
AGIP	Agip Sigma Ultra TFE	10W-40	worldwide
	Autol Valve Ultra FE	10W-40	Germany
ARAL	Aral MegaTurboral	10W-40	worldwide
	Aral SuperTurboral	5W-30	worldwide
AVIA	TURBOSYNTH HT-E	10W-40	Germany
BAYWA	BayWa Super Truck 1040 MC	10W-40	Southern Germany
	BayWa Turbo 4000	10W-40	Southern Germany
BP OIL International	BP Vanellus E7 Plus	10W-40	Europe
	BP Vanellus E7 Supreme	10W-40	Europe
	BP Vanellus C8 Ultima	5W-30	Europe
Bucher AG	MOTOREXFARMER	10W-40	Europe
Castrol	Castrol Enduron Plus	5W-40	Europe, America, Australia, South Africa
	Castrol Enduron	10W-40	Europe, America, Australia, South Africa
	Castrol Elexion	5W-30	USA
CEPSA	EUROTRANS SHPD	10W-40	Spain, Portugal
CHEVRON	Chevron Delo 400 Synthetic	5W-40	North Amerika
ESSO	Essolube XTS 501	10W-40	Europe
FUCHS EUROPE	Fuchs Titan Cargo MC	10W-40	worldwide
	Fuchs Titan Unic Plus MC	10W-40	worldwide
MOBIL OIL	Mobil Delvac 1 SHC	5W-40	Europe, SE Asia, Africa
	Mobil Delvac 1	5W-40	worldwide
	Mobil Delvac XHP Extra	10W-40	Europe, SE Asia
OMV AG	OMV super Truck	5W-30	Europe
	OMC truck FE plus	10W-40	Europe
Ravensberger Lube oil refinery	Ravenol Performance Truck	10W-40	Germany
Salzbergen	Wintershall TFG	10W-40	Europe varies
Texaco	Ursa Super TDX	10W-40	Europe
	Ursa Premium FE	5W-30	Europe
TOTAL	TOTAL RUBIA TIR 8600	10W-40	worldwide
	EXPERTY	10W-40	worldwide

T 4-1-3 Release list for DEUTZ lube oil quality class DQC III - 05

DEUTZ lube oil quality level DQC IV-05			
Manufacturer	**Lube oil type**	**SAE class**	**Availability**
FUCHS EUROPE	Fuchs Titan Cargo SL	5W-30	worldwide
SHELL International	Shell Rimula Ultra Shell Rimula Ultra	5W-30 10W-40	Europe, code country-specific, varies Europe, code country-specific, varies

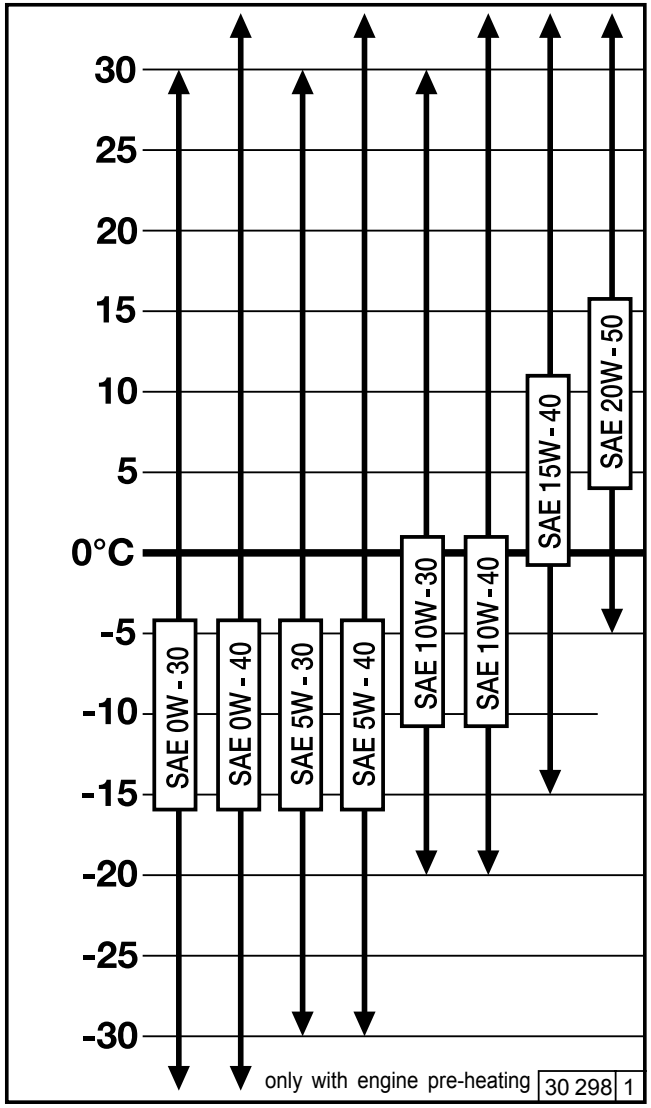
T 4-1-4 Release list for DEUTZ lube oil quality class DQC IV - 05

4

4.1.2 Quality

The ambient temperature at the installation site or area of application of the engine is decisive for the choice of the right viscosity class. Too high a viscosity can lead to starting difficulties, too low a viscosity can endanger the lubrication effect and cause high lube oil consumption. At ambient temperatures below 40°C the lube oil must be pre-heated (e.g. by storing the vehicle or machine in a shed). The viscosity is classified according to SAE. Multipurpose oils should be used basically. Single purpose oils can also be used in closed, heated rooms at temperatures >5 °C. The specified lube oil qualities must also be single purpose oils of course.

Depending on the ambient temperature we recommend the following common viscosity classes:



4.2.1 Quality

The following fuel specifications are permitted:

- **Diesel fuels according to DIN EN 590**
- **US diesel fuel according to ASTM D 975 Grade-No 1-D and 2-D**
- **Japanese diesel fuel JIS K 2204 Grade 1 Fuel and Grade 2 Fuel with lubricating properties according to diesel fuel EN 590 (HFFR max. 460 micrometer according to EN ISO 12156)**

Use commercially available diesel fuels with a sulfur content below 0.5%. If the sulfur content is higher, the lube oil change intervals must be reduced (see 6.1.1).

If other fuels are used which do not meet the requirements of this instruction manual, the warranty will be voided.

The certification measurements to satisfy the legal emission limits are performed with the test fuels defined by law. These correspond to the diesel fuels according to EN 590 and ASTM D 975 described in this operating manual. No emission values are guaranteed with the other fuels described in this instruction manual.

4.2.2 Winter fuel

For the engines TCD 2012/2013 2V and TCD 2012/2013 4V which are operated with fuel according to ASTM D 975 1-D/ 2-D, adding paraffin is not permissible.

At low ambient temperatures paraffin discharges can lead to blockages in the fuel system and cause operating faults. Use winter fuel at outside temperatures below 0 °C (to -20 °C) (generally offered by petrol stations in good time before the cold season begins).

- Paraffin should be added at temperatures below -20 °C. The mixing ratios required are as per the diagram on the right.
- Special diesel fuels can be used for arctic climates to -44 °C.

If it is necessary to use summer diesel fuel under 0 °C, paraffin can also be added up to 30 % as per the diagram on the right.

Generally, sufficient resistance to cold can also be achieved by adding a flow ameliorant. For questions regarding this please contact your **DEUTZ partner.**

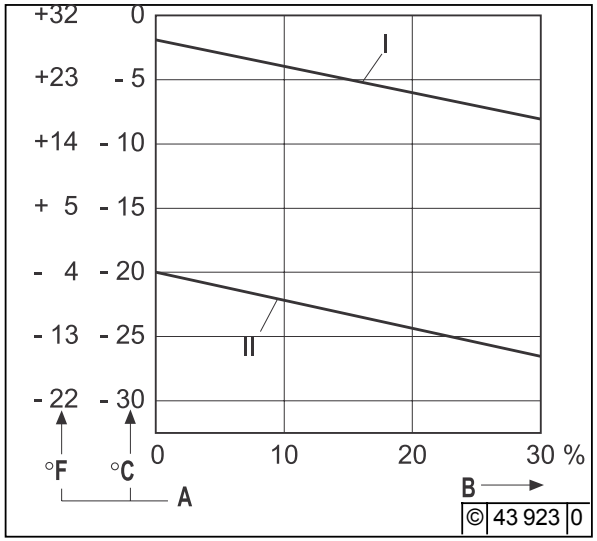


	Diagram key:
I	Summer diesel fuel
II	Winter diesel fuel
A	Outside temperature
B	Paraffin mixing proportion

Only carry out mixing in the tank! First pour in the necessary amount of paraffin, then the diesel fuel. Addition of normal and super petrol is not permitted.

4

4.3.1 General

In liquid-cooled engines, the coolant must be conditioned and monitored otherwise the engine may incur damage due to:

- corrosion,
- cavitation,
- freezing.

The correct water quality is important for conditioning the coolant. Basically, clear, clean water within the following analysis values must be used:

Analysis values	min.	max.
ph value at 20 °C	6.5	8.5
Chloride ion content[mg/dm3]	-	100
Sulfate ion content[mg/dm3]	-	100
Total hardness *1 [°dGH]	3	12

*1 carbonate hardness proportion of total hardness min 3 dGH.

Water quality data are obtainable from the local waterworks.

A test case can be requested from DEUTZ Service (order no. 1213 0382) for checking your water quality.

The water must be treated if it deviates from the analysis values.

- pH value too low:

  Addition of diluted caustic soda or caustic potash solution. Small sample mixtures are advisable.

- Total hardness too high:

  Mix with softened water *2

- Total hardness or carbon hardness too low:

  Mix with harder water *3

- Chloride and / or sulfate too high:

  Mix with softened water *2

*2 Softened water is a distilled water, pH neutral condensate or water treated with ion exchangers.

*3 Harder water is available in most cases in the form of drinking water (city water).

4.3.2 Coolant preparation

The coolant for liquid-cooled DEUTZ compact engines is conditioned by mixing an antifreeze with ethylene-glycol-based corrosion protection inhibitors into the water.

The best results are achieved with DEUTZ cooling system preservatives:

Container	Order no.
5 liter container	0101 1490
20 liter container	0101 6416
210 liter container	1221 1500

This cooling system is free from nitrite, amine, phosphate and adapted to the materials in our engines. Order from your DEUTZ Service

f the DEUTZ cooling system preservative is not available, a coolant according to T 4-1-5 can be used.
Coolants of product group A or B respectively can be mixed.
Coolants of product group A may not be mixed with coolants of product group B.

The cooling system must be monitored regularly, see 5.1. This includes checking the concentration of the cooling system preservative, as well as inspecting the coolant level.
The inspection of the concentration of cooling system preservative can be carried out with standard testing devices (e.g. refractometer).

Cooling system preservative percentage	Water percentage	Cold protection up to
min. 35 %	65%	-22 °C
40 %	60%	-28 °C
max. 45 %	55%	-35 °C

At temperatures below -35°C, please consult your responsible DEUTZ Service.

It is possible to use other cooling system preservatives (e.g. chemical corrosion preservatives) in exceptional cases. Consult DEUTZ Service.

The mixing of nitrite based cooling system preservatives with amine-based agents forms nitrosamines which are hazardous to the health!

Cooling system preservatives must be disposed of in an environmentally friendly manner.

FAMCO هایپرصنعت

5.1 Maintenance schedule

check= ● set=❍ clean=▲ renew= ■

⇓ check 2x daily before or during the 1st trial run, during the running-in phase or when commissioning new and overhauled engines

⇓ every 10 oh or daily

E10	E20	E30	E40	E45	E50	E60	E70	every year(s) 1	every year(s) 2	Activity	Section
		in operating hours (oh) 500	in operating hours (oh) 1,000	in operating hours (oh) 1,500	in operating hours (oh) 3,000	in operating hours (oh) 6,000	in operating hours (oh) 12,000				
●	●									Lube oil level, if necessary re-fill	6.1.2
		■								Lube oil (oil change intervals depending on engine application and oil quality), see TR 0199-99-3002	6.1.1/ 6.1.2
		■								Oil filter cartridge	6.1.3
			■[1)]							Fuel filter cartridge	6.2.1
						■				Electronic injector check via EMR3	#
●			■[1)]							Fuel filter insert[1)] (fuel pre-filter)	4.2
●		●							■	Coolant (additive concentration)	4.3.1/2/3
●	●	●								Coolant level	–
●	●		■							Intake air filter (if available, maintenance as per maintenance display)	6.4.3 /6.4.4
●			●					▲		Charge air cooler (drain lube oil/condensation)	
			●							Check function of heating plug / heating flange	
			●							Battery and cable connections	6.7.1
●			●							Engine monitoring, warning system [2)]	3.3 #
				❍						Valve clearance / contol piston clearance (exhaust gas return)	6.6.1
●		●			■				■	V-belt (re-tighten if necessary)	6.5.1
●			●		●	■				V-rib belt/tension pulley (renew when wear limit reached)	6.5.1
			●		■					Crankcase pressure bleed valve	#
●	●									Engine tightness (visual inspection for leaks)	–
●			●							Engine mounting (renew in case of damage)	9.2
●			●							Fastenings, hose connections / clamps	–
							■			General overhaul	#, 5.1.1

Industrial engines

The engine maintenance times given are maximum permissible job times. Depending on the usage circumstances, shorter maintenance times may be necessary. Observe the instruction manual of the equipment manufacturer.

Maintenance only to be carried out by authorised service personnel

[1)] The maintenance interval must be halved for contaminated fuel or poor quality fuel.

[2)] If the warning system (light/siren) is activated, the fuel pre-filter must be emptied immediately.

check= ● set= ❍ clean= ▲ renew= ■								
max. permissible job times **in operating hours (oh) every**							**Enhancements or modifications for engines with EPA acceptance** The engine maintenance times given are maximum permissible job times. Depending on the usage circumstances, shorter maintenance times may be necessary. Observe the instruction manual of the equipment manufacturer.	
⇓ check 2x daily before or during the 1st trial run, during the running-in phase or when commissioning new and overhauled engines								
	⇓ every 10 oh or daily							
		in operating hours (oh)			every year(s)			
E10		E30 500	E40 5,000	E70 12,000	1	2	**Activity**	**Section**
●		■					Lube oil (oil change intervals depending on engine application and oil quality), see TR 0199-99-3002	6.1.1/ 6.1.2
			■				Injector	#
		●	▲				Charge air cooler (drain lube oil/condensation)	#
		●	▲				Charge air cooler inlet surface (clean if necessary)	#
						■	Crankcase bleeding valve	#
			■				Exhaust turbocharger compressor outlet	-

 # Maintenance only to be carried out by authorised service personnel

5.1.1 Standard maintenance schedule

Intervals at/ after	Deutz maintenance and service schedules	Activity	Execution by:
50 oh	E 10	after commissioning and E 50-E 70	authorised specialists
10 oh or daily	E 20	daily inspection round	the user / authorised specialists
500 oh	E 30	inspection	authorised specialists
1000 oh	E 40	intermediate overhaul	authorised specialists
1500 oh	E 45	extended intermediate overhaul	authorised specialists
3 000 oh	E 50	partial overhaul	authorised specialists
5 000 oh (EPA)	E 60	extended partial overhaul	authorised specialists
6 000 oh	E 60	extended partial overhaul	authorised specialists
12 000 oh *)	E 70	general overhaul	authorised specialists

***) approximate value, depends on the type of engine application and/or regular engine maintenance. Please contact your responsible DEUTZ Service partner.**

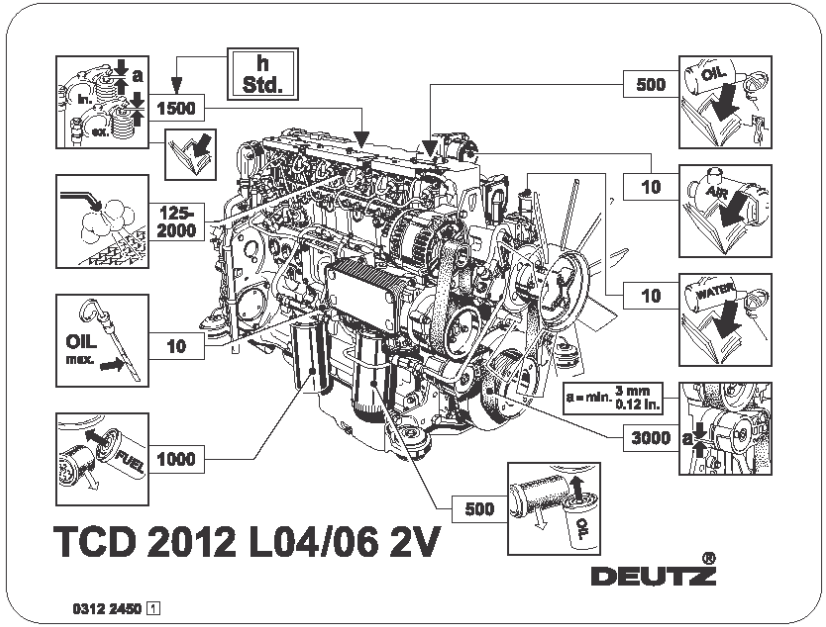
5

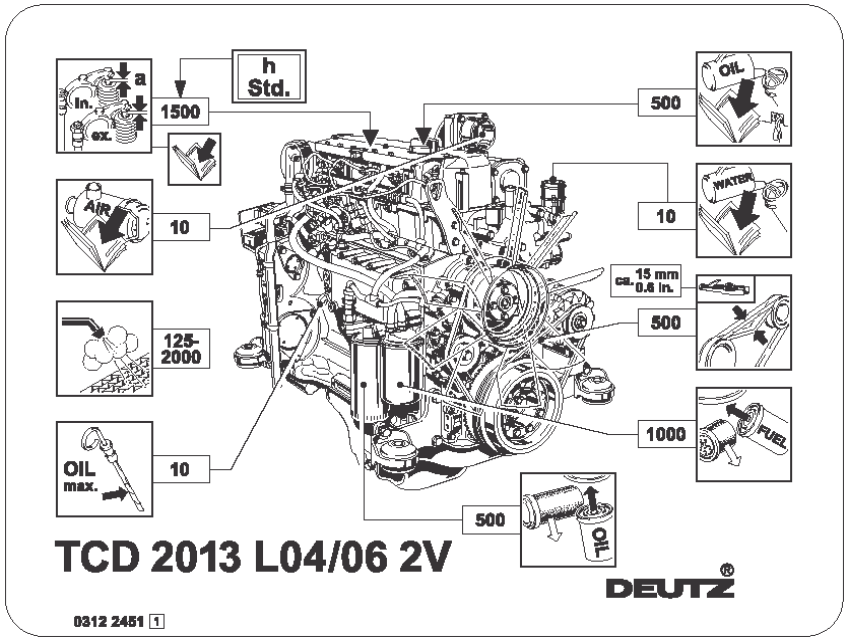
The maintenance diagram shown on this page is supplied with every engine in self-adhesive form. It should be stuck onto a well visible location on the engine or equipment.

Check that this is the case!

If not, request a replacement from your engine or equipment supplier!

The maintenance schedule is decisive for standard maintenance, see 5.1.





All maintenance work should only be carried out when the engine is not running.

Op. hrs.	Date	Signature / stamp	Op. hrs.	Date	Signature / stamp
50-150*			-		
125			250		
375			500		
625			750		
875			1000		
1125			1250		
1375			1500		
1625			1750		
1875			2000		
2115			2250		
2375			2500		
			2750		

* after commissioning new and overhauled engines
The maintenance work carried out methodically can be recorded in the table and confirmed.

Op. hrs.	Date	Signature / stamp	Op. hrs.	Date	Signature / stamp
2875			3000		
3125			3250		
3375			3500		
3625			3750		
3875			4000		
4125			4250		
4375			4500		
4625			4750		
4875			5000		
5125			5250		
5375			5500		
5625			5750		

The maintenance work carried out methodically can be recorded in the table and confirmed.

Op. hrs.	Date	Signature / stamp	Op. hrs.	Date	Signature / stamp
5875			6000		
6125			6250		
6375			6500		
6625			6750		
6875			7000		
7125			7250		
7375			7500		
7625			7750		
7825			8000		
8125			8250		
8375			8500		
8625			8750		

The maintenance work carried out methodically can be recorded in the table and confirmed.

Op. hrs.	Date	Signature / stamp	Op. hrs.	Date	Signature / stamp
8875			9000		
9125			9250		
9375			9500		
9625			9750		
9875			10000		
10125			10250		
10375			10500		
10625			10750		
10875			11000		
11125			11250		
11375			11500		
11625			11750		

The maintenance work carried out methodically can be recorded in the table and confirmed.

6.1.1 Oil change intervals

- The oil change times depend on the engine application and the quality of the lube oil.
- If the oil change times are not reached within a year, the oil change should be carried out at least **1x yearly.**
- The following conditions apply for the table
  – Sulphur content max. 0.5 % of weight for diesel fuel.
  – Constant ambient temperature -10 °C (+14 °F)
- For fuels
  – with sulphur content > 0.5 to 1%

or

  – Constant ambient temperatures **<** -10 °C (+14 °F)

- For fuels with a sulphur content higher than 1% ask your responsible **service representative**.
- If the lube oil change intervals are planned in terms of operating hours, the lube oil change intervals for installed engines 6.1.1.1 apply.

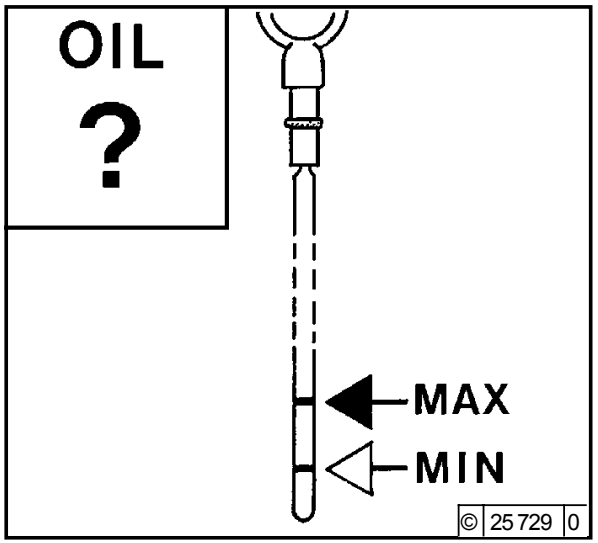
Carry out oil changes on warm engine when the engine is not running (lube oil temperature < 80 °C).

6.1.1.1 Lube oil change intervals for installed engines

		Lube oil quality			
Deutz lube oil quality class		**DQC I-02**	**DQC II-05**	**DQC III-05**	**DQC iV-05**
ACEA specification		E2-96	E3-96/E5-02/E07-04	E4-99/E6-04 see chap 6.1.1.3	E4-99/E6-04 only fully synthetic
API specification		CF/CF-4	CG-4/CH-4/ CI-4	-	-
worldwide specification		-	DHD-1	-	-
special DEUTZ release list		-	-	see chap 4.1.2.1	-
Standard lubricant code designation for building machines and building vehicles		EO... EO...A, EO...B	EO...C	-	-
Engine series	**Engine version**		**Lube oil change intervals in oh**		
TCD 2012 L04/06 2V	**Crankcase ventilation:** open	-	500	500	500
TCD 2013 L04/06 2V	**Crankcase ventilation**: open	-	500	500	500

6.1.2 Checking oil level, changing engine oil

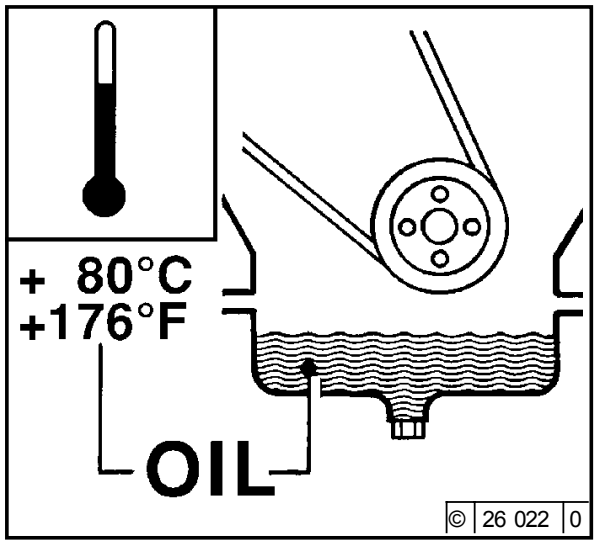
6.1.2.1 Checking oil level



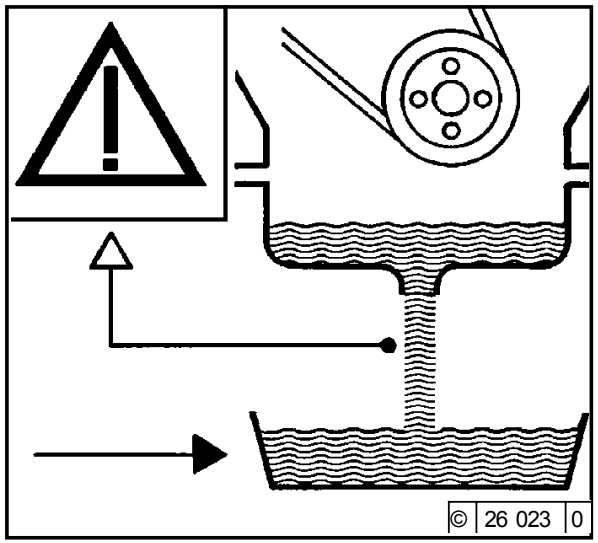
- Position the engine or vehicle so as to be level.
  - **Engine warm:**
    Switch off the engine, wait for 5 minutes and check the oil level.
  - **Engine cold:**
    Check oil level.
- Extract oil dipstick.
- Wipe with a fibre-free, clean cloth.
- Insert until it stops and extract again.
- Check oil level and re-fill to "MAX" if necessary.
  - If the oil level lies just above the "MIN" line marking, re-filling is necessary.

The oil level may not fall short of the "MIN" line marking.

6.1.2.2 Changing engine oil



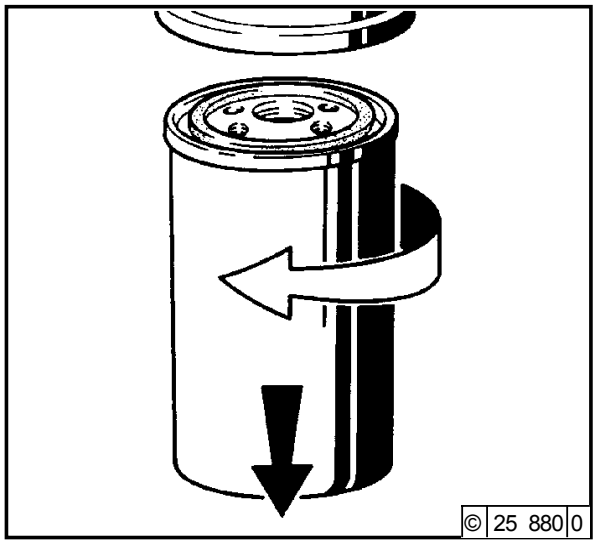
- Warm up the engine.
- Position the engine or vehicle so as to be level.
  - Lube oil temperature approx. 80 °C.
- Switch off engine.
- Position oil drip cup under the engine.
- Unscrew oil drain screw.



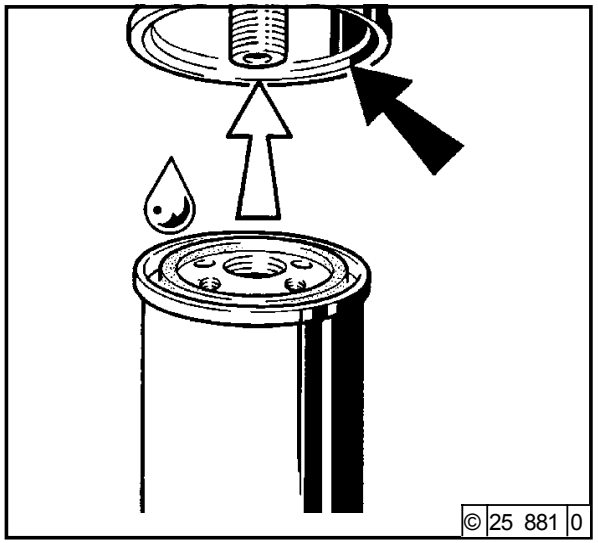
- Drain off oil.
- Screw in oil drain screw with new sealing ring and tighten. (For tightening torque see 9.2).
- Fill lube oil
  - For quality / viscosity data see 4.1.
  - For filling quantities, see 9.1
- Check oil level, see 6.1.2.1

Caution when draining hot oil: danger of scalding!
Collect the used oil, do not allow to seep into floor! Dispose of according to instructions!

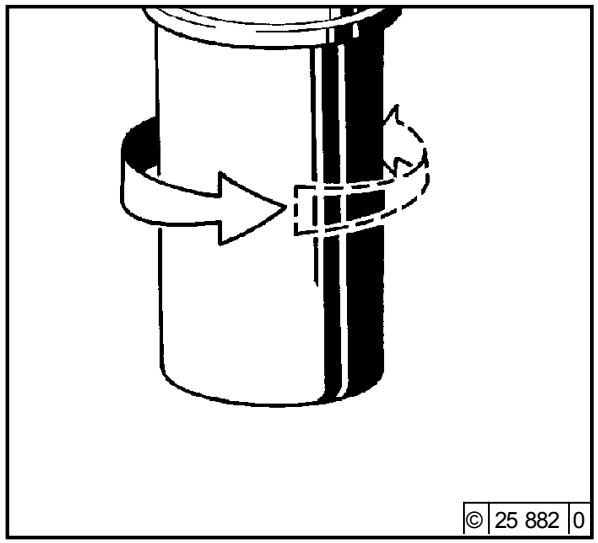
6.1.3 Changing oil filter



- When anti-rotation lock is installed:
  Loosen clamping screws and remove tightening clamps from below.
- Loosen lube oil filter cartridge with standard tool and unscrew.
- Collect any oil which may run out.



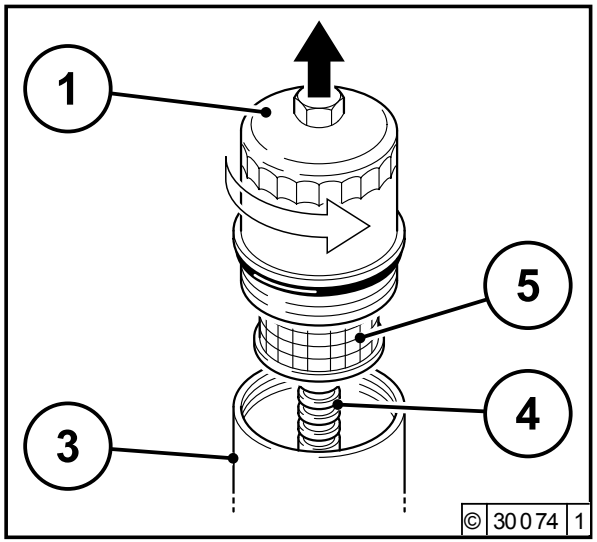
- Clean the sealing surface of the filter support for any dirt there may be.
- Lightly oil the rubber seal of the new lube oil cartridge.
- Screw on the cartridge by hand until the seal makes contact.



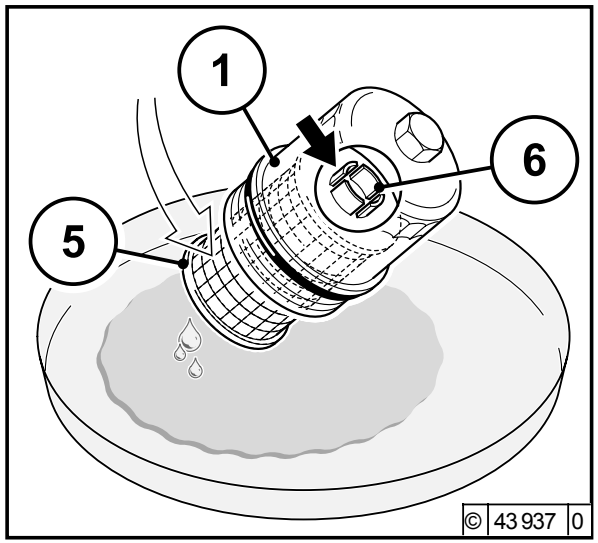
- Tighten the lube oil filter cartridge with a three-quarter turn (about 10 Nm).
- Check the seal of the lube oil cartridge for tightness.
- Check oil level, see 6.1.2.

Careful with hot oil:
danger of scalding!

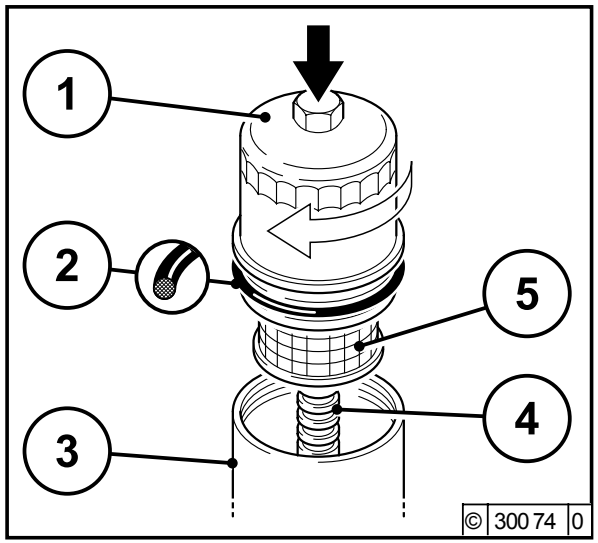
6.1.4 Cleaning / changing oil filter (cup)



- Switch off engine.
- Loosen lube oil filter cover 1 with two or three turns and wait for 30 seconds.
- Unscrew lube oil filter cover 1 with paper filter cartridge 5 in anti-clockwise direction.
- Carefully loosen paper filter cartridge 5 from the guide 4, which is inserted in the housing 3, from above.



- Collect any lube oil which may run out.
- Crease the paper filter cartridge 5 in the collection vessel slightly at the side until the cartridge is released from the clip 6.
- Clean the sealing surface of the filter support and the lube oil filter cover 1 as well as the guide 4 of any dirt there may be



- Change the round sealing ring 2 and lightly oil.
- Press new paper filter cartridge 5 into the clip 6 and insert carefully in the guide 4 together.
- Screw the lube oil filter cover 1 tight in clockwise direction (25 Nm).
- Start the engine.
- Check lube oil filter assembly for leaks.
- Check engine oil level and top up if necessary.

Careful with hot oil:
Danger of scalding
Dispose of used oil in an environmentally friendly way.

Regulations for working on the fuel system

Engine must be switched off! Smoking and naked lights prohibited!
No injection/high pressure pipes may ever be disconnected when the engine is running.
Caution when handling hot fuel!

Pay attention to absolute cleanliness when refueling and working on the fuel system!
Clean the vicinity of the components concerned carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national regulations for handling fuels.
Dispose of leaked fuel and filter elements according to regulations. Do not allow fuel to seep into the ground.
After working on the fuel system, bleed it, conduct a test run and check for leaks.
Additional venting of the fuel system by a 5 minute trial run in idle or low load is absolutely essential.

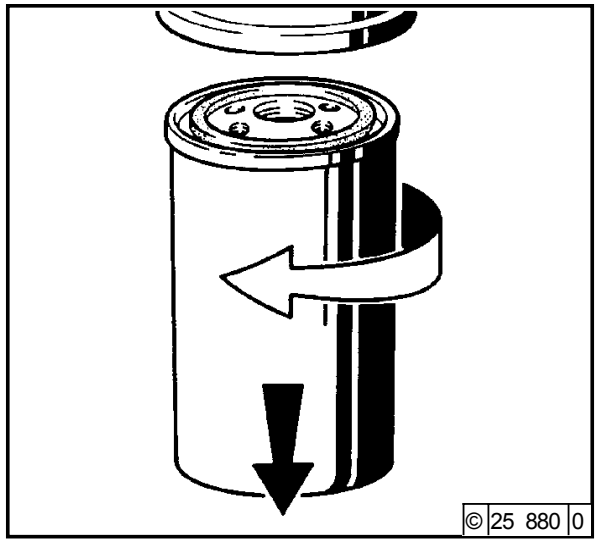
Additional regulations for DEUTZ Common Rail Systems

Danger to life! Never work on the fuel system with the engine running. The system is under high pressure!
Do not stand near to a leak in the high pressure system because fuel jet can cause severe injury! After switching off the engine, wait 30 seconds before working on the fuel system. In the event of leaks in the fuel system contact your DEUTZ Service immediately!

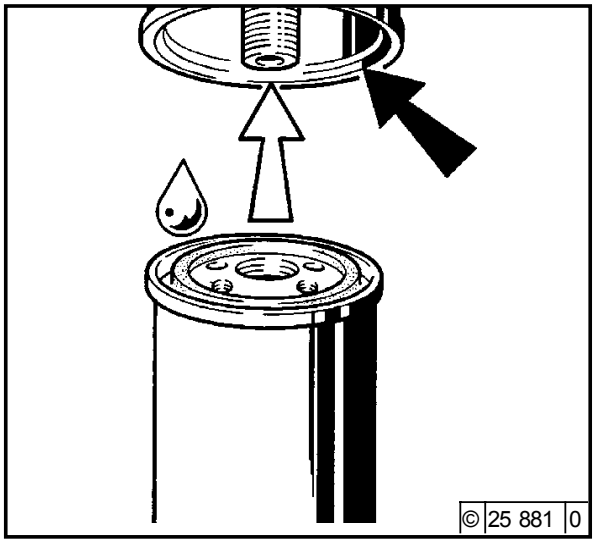
Cleanliness hints and measures for handling DEUTZ Common Rail Systems

Pay attention to extreme cleanliness due to the high-precision technology!
The fuel system must be tight and closed. Inspect visually for leaks/damage in the system.
Clean the engine and engine compartment thoroughly and dry before starting work. Cover engine compartment areas from which dirt could be loosened with fresh, clean foil.
Work on the fuel system may only be carried out in an absolutely clean environment. Air contamination such as dirt, dust, moisture etc. must be avoided.

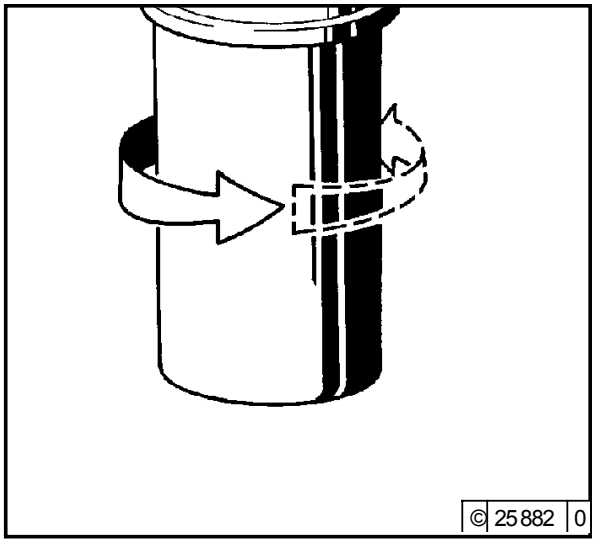
6.2.1 Changing fuel filter



- Close fuel stopcock.
- Loosen fuel filter cartridge with standard tool and unscrew.
- Collect any fuel which may run out.
- Clean the sealing surface of the filter support for any dirt there may be.
- Lightly oil the rubber seal of the filter support.



- Lightly oil the fuel filter cartridge or wet with diesel fuel.
- Screw on the cartridge by hand until the seal makes contact.



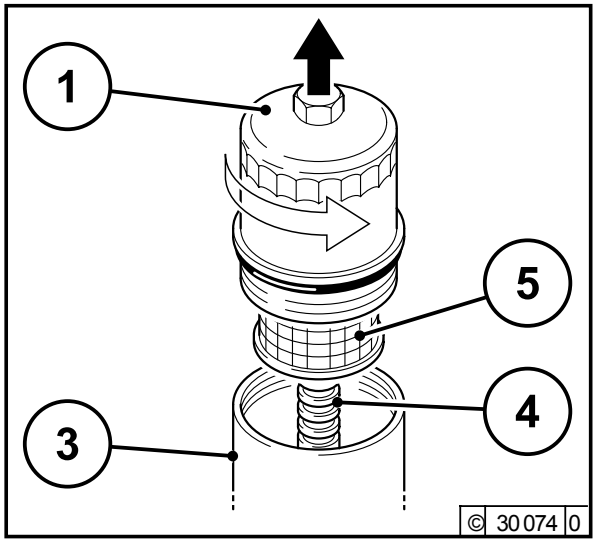
- Tighten the fuel filter cartridge with a three-quarter turn (10 Nm).
- Open fuel stopcock.
- Check for tightness.

No open fire when working on the fuel system! Do not smoke! Pay attention to cleanliness as the fuel system (rail) is very sensitive!!!

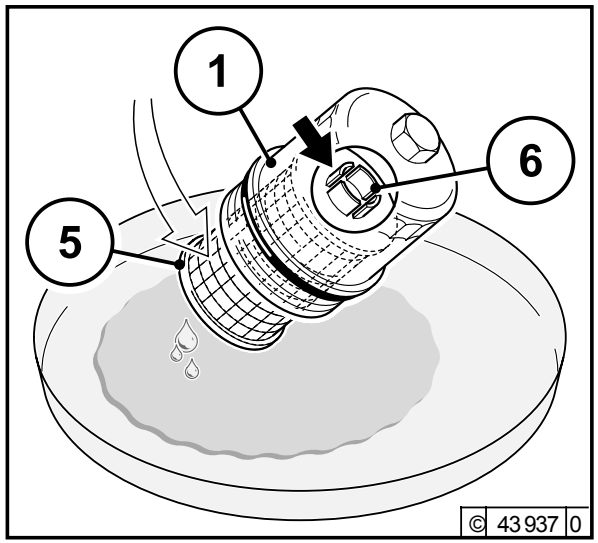
Venting of the fuel system is necessary, see chapter 6.2.3.

6

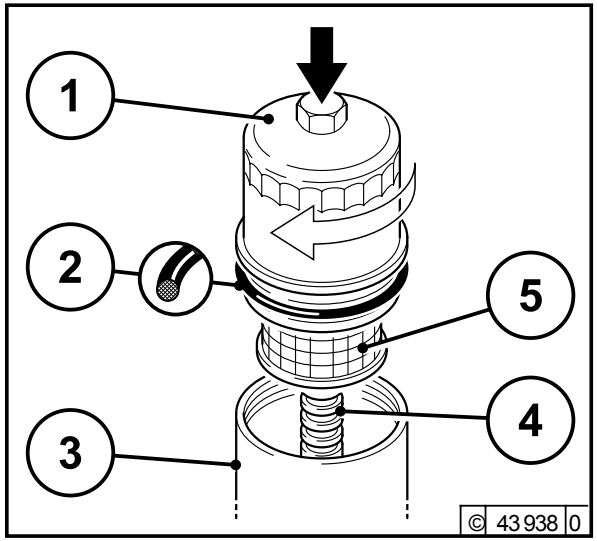
6.2.2 Cleaning / changing fuel filter (cup)



- Switch off engine.
- Loosen fuel filter cover 1 with two or three turns and wait for 30 seconds.
- Unscrew fuel filter cover 1 with paper filter cartridge 5 in anti-clockwise direction.
- Carefully loosen paper filter cartridge 5 from the guide 4, which is inserted in the housing 3, from above.



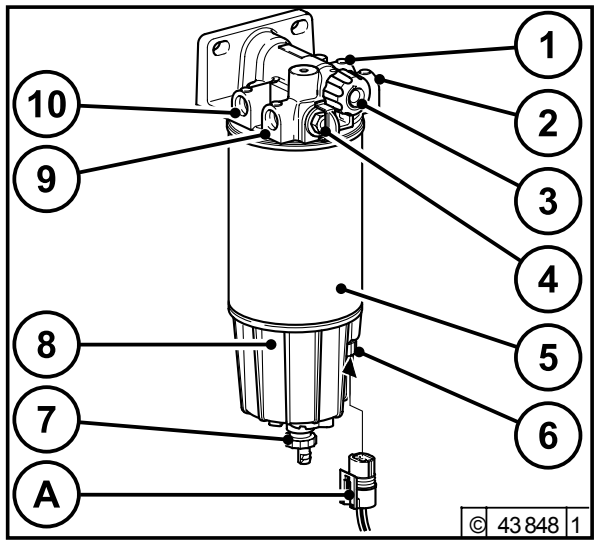
- Collect any fuel which may run out.
- Slightly bend paper filter cartridge 5 sideways in the collecting vessel until the cartridge is loosened from clamp 6.
- Clean the sealing surface of the filter support and the fuel filter cover 1 as well as the guide 4 of any dirt there may be.



- Change the round sealing ring 2 and lightly oil.
- Press new paper filter cartridge 5 into the clip 6 and insert carefully in the guide 4 together.
- Tighten the fuel filter cover 1 in clockwise direction (25 Nm).
- Start the engine.
- Check fuel filter attachment for tightness.

Only work on the fuel system when the engine is switched off.
Wait at least 30 seconds.
No open fire! Do not smoke!
Dispose of used fuel in an environmentally friendly manner.
Venting of the fuel system is necessary, see chapter 6.2.3.

6.2.3 Fuel pre-filter, changing / bleeding filter insert



Filter change:

- Close fuel stopcock (for high tanks).
- Position fuel collecting vessel beneath fuel pre-filter.
- Loosen drain cock (7) and drain water + fuel completely.
- Unscrew filter cartridge (5) together with water collecting vessel (8) in anti-clockwise direction and remove.
- Loosen water collecting vessel (8) from old filter cartridge (5) in anti-clockwise direction and remove.
- Empty remaining fuel into the fuel collecting vessel and clean water collecting vessel (8).
- Screw water collecting vessel (8) onto the new filter cartridge (5) in clockwise direction.
- Clean any dirt from the sealing surface of the new filter cartridge (5) and the reverse side of the filter head
- Wet the sealing surfaces of the filter cartridge (5) slightly with fuel and screw back onto the filter head in clockwise direction (17-18 Nm).
- Open the fuel stopcock and bleed the system (see "Bleeding fuel system").
- Dispose of collected fuel and old filter cartridge (5) properly.

Bleeding fuel system:

- Unlock the bayonet plug of the fuel hand pump (3) by pressing and turning anti-clockwise at the same time. The pump plunger is now pushed out through the spring.

☞ **Turn the shutdown lever of the thermostat valve (4) by approx. 45° in clockwise direction until it is felt to engage**.

- Pump until a very strong resistance is felt and pumping becomes very slow.
- Now carry on pumping a few more times (the return pipe must be filled).
- Start the engine and run for about 5 minutes in idle or low load. Check the pre-filter for leaks.
- Perform some more pumping movements. (The return line must be filled).
- Turn the shutdown lever of the thermostat valve (4) by approx. 45° in anti-clockwise direction until it is felt to engage.
- Lock the bayonet plug of the fuel hand pump (3) by pressing and turning clockwise at the same time.

1 Fuel supply to pump
2 Fuel return from control block FCU (Fuel Control Unit)
3 Fuel hand pump with bayonet plug for locking and unlocking
4 Thermostat valve with shutdown lever
5 Filter cartridge
6 Connection facility for electrical water level sensor
7 Drain cock
8 Water collecting vessel (bowl)
9 Fuel inlet from fuel tank
10 Fuel return to fuel tank

A Connection for electr. warning lamp / siren

Only work on the fuel system when the engine is switched off. No open fire! Do not smoke! Dispose of used fuel in an environmentally friendly manner.

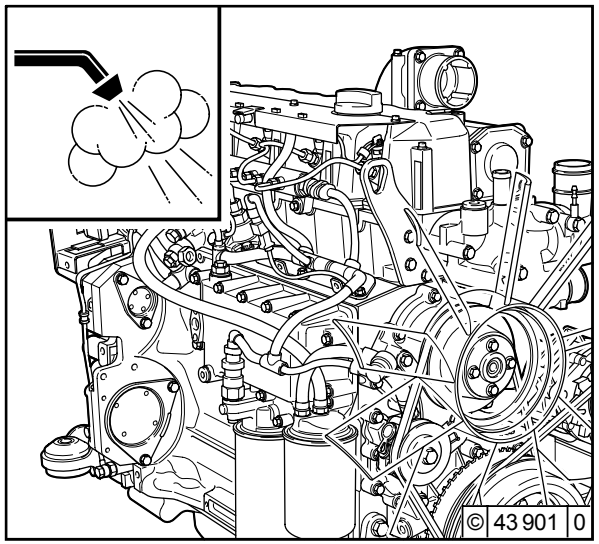
6

6.3.1 Cleaning intervals

- The cooling system soiling depends on the type of engine application.
- The risk of soiling is increased by oil and fuel residues on the engine. Therefore pay particular attention to tightness when operating under high dust exposure.
- Increased soiling occurs, for example, during:
  - Building site application from high dust content of air.
  - Harvesting application from high proportion of chaff and chopped straw, for example, in the area of the work machine.
- Due to the various application conditions, the cleaning intervals must be defined according to each case. Therefore, the cleaning intervals given in the table below can be used as guidelines.

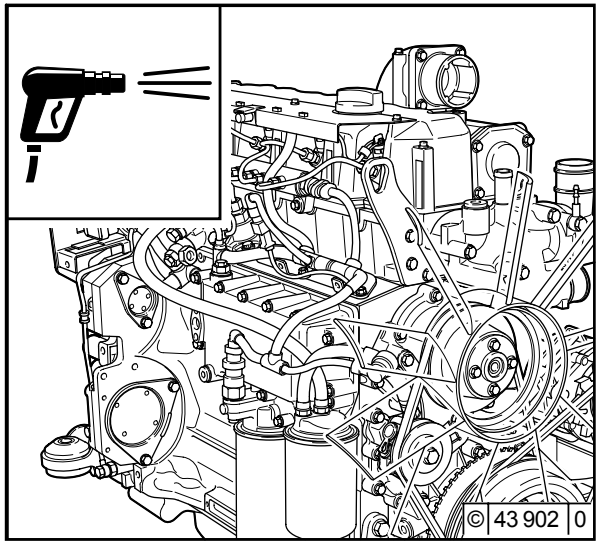
Checking or cleaning intervals Guideline oh	Engine application
2000	Ships, electronic units in enclosed spaces, pumps
1000	Vehicles on paved roads
500	Tractors, fork lift trucks, drivable electronic units
250	Vehicles on building sites and unpaved roads, building machines, compressors, mining equipment.
125	Agricultural machinery, tractors with harvesting application.

6.3.2 Cleaning cooling system



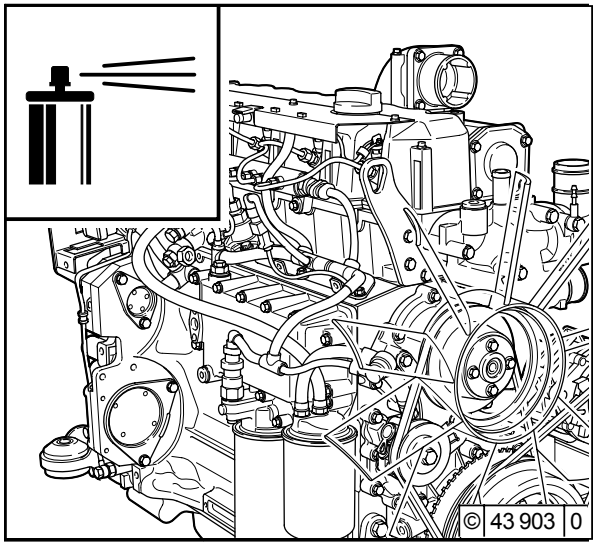
Cleaning with compressed air

- Blast out the engine with compressed air. Do not damage any components.
- Rinse out the loosened dirt with a water jet.



Cleaning with cold cleaner

- Spray the engine with standard cold cleaner and leave to work for approx. 10 minutes.
- Spray the engine clean with an acute water jet (do not spray the water jet directly at sensitive engine parts, e.g. generator, cabling, electronic components, fan drive).



Cleaning with steam or hot water

- Remove oil and greasy residues with a gentle jet setting (do not spray directly on sensitive engine parts, e.g. generator, wiring, electrical-components, fan drive).

- Warm up the engine so that the water residues evaporate.

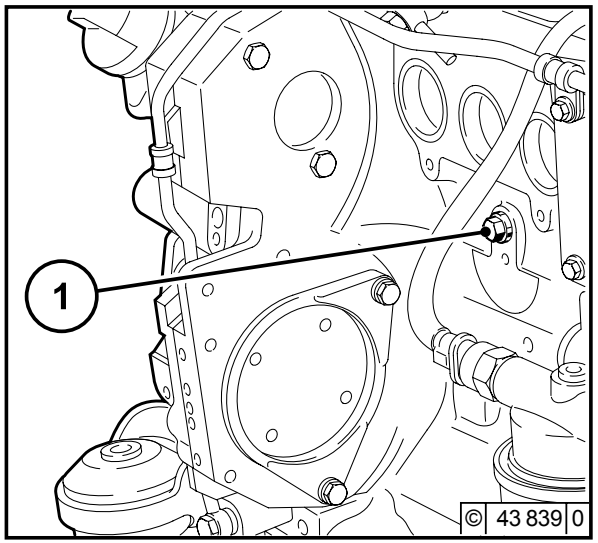
External cooling

- For external coolers: Cleaning as per specifications of the cooling system manufacturer.

Injection pressure: maximum 100 bar and at a distance of 1 meter!

6

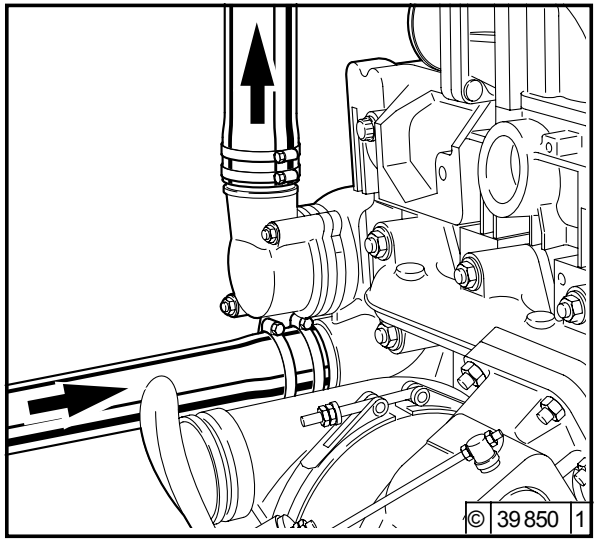
6.3.3 Emptying cooling system



- Open cooler cover.
- Position collecting dish underneath locking screw 1.
- Remove locking screw 1 on the crankcase.
- Drain off coolant.
- Re-tighten locking screw 1.
- If locking screw 1 is not accessible, the cooling system can be emptied on the engine oil cooler (coolant channel).

Caution when draining hot coolant: danger of scalding! Collect coolant when draining off. Dispose of according to instructions!

6.3.4 Filling / bleeding cooling system



- Open cooler cover.
- Loosen locking screw item 1 (chap.6.3.3).
- Pour in coolant until the maximum mark or the filling limit (system heating valve must be open, if present).
- Tighten locking screw item 1(chap.6.3.3).
- Close cooler cover.
- Start engine and warm up until the thermostat opens.
- Switch off engine.
- Check the coolant level with the engine cold and re-fill if necessary.
- Close cooler cover.

- The cooling system (if constructed under consideration of our installation guidelines) is bled automatically after filling.

Never operate the engine without coolant (not even briefly).

6.4.1 Cleaning intervals

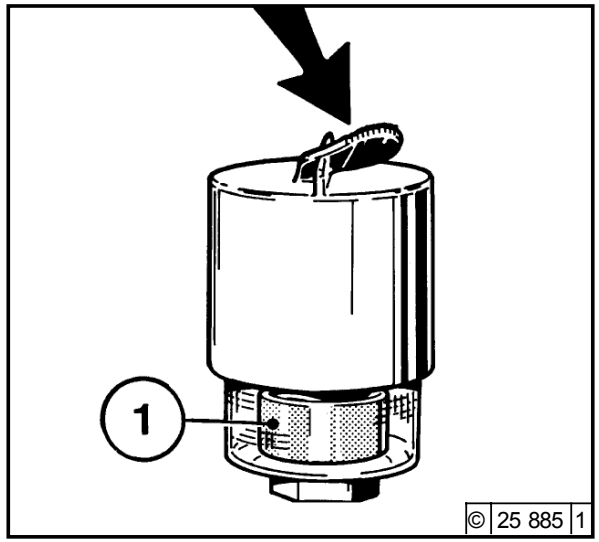
- The soiling of the combustion air filter depends on the dust content of the air and the selected filter size. If a high dust exposure is to be expected, a cyclone separator can be connected to the combustion air filter.

- The cleaning intervals cannot be generally defined. They must be defined depending on each case.

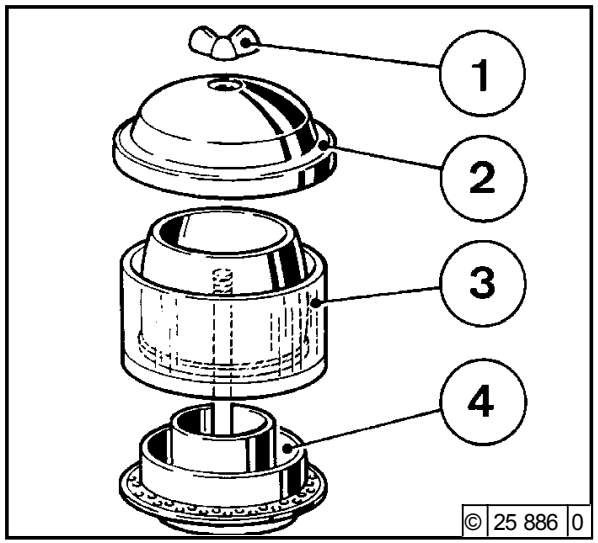
- If dry air filters are used, cleaning should only be carried out according to the maintenance display or maintenance switch.

- Filter maintenance is required when on the:
  - **Maintenance display**
    the red service field 1 is fully visible when the engine is not running.
  - **Maintenance switch**
    the yellow warning light lights up when the engine is running.

- After completion of the maintenance work push the reset button on the maintenance display. The maintenance display is ready for operation again.



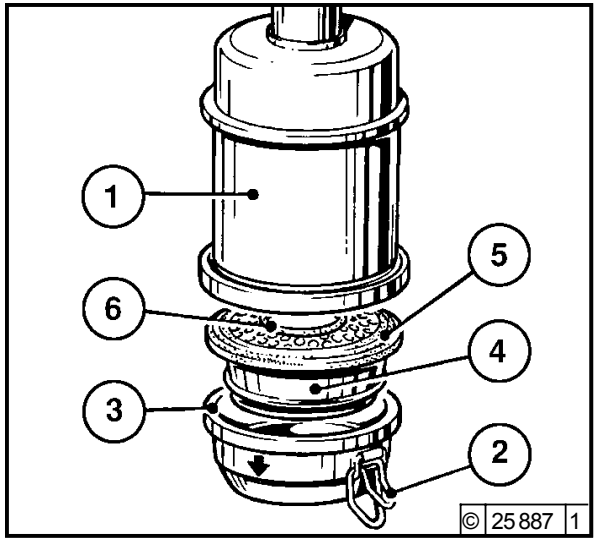
6.4.2 Emptying cyclone pre-separator



- Loosen wing nut 1 and lift housing cover 2.
- Remove the dust container 3 from the base of the cyclone 4 and empty. Clean foliage, straw and the like from the cylone base.
- Place the dust container 3 on the base 4 and tighten the housing cover 2 with wing nut 1.

Never fill the dust container with oil, replace damaged containers!

6.4.3 Cleaning oil bath air filter

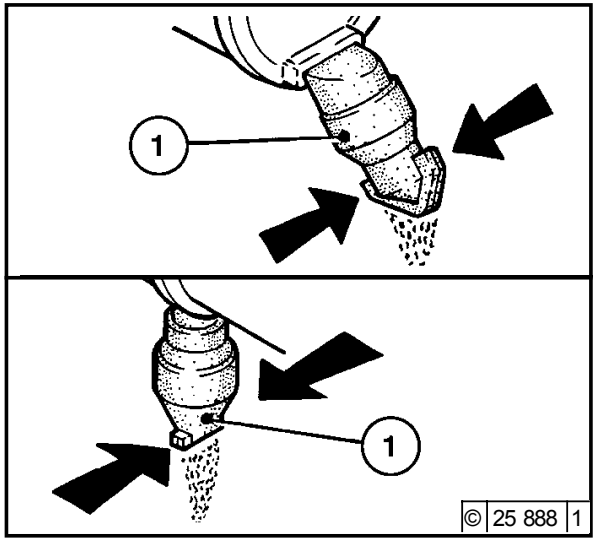


- Turn off the engine and wait approx. 10 min until the oil has run out of the filter housing 1.
- Loosen quick fasteners 2 and remove oil pan 3 with filter insert 4, if possible loosen filter insert on the dividing point with the aid of a screwdriver. Do not damage rubber seal 5!
- Remove soiled oil and sludge, clean oil pan.
- Clean filter insert 4 in diesel fuel and allow to drip dry thoroughly.
- In the event of heavy soiling, clean filter housing 1.
- Visually inspect rubber seals 5 and 6 and renew if necessary.
- Fill up the oil pan with engine oil up to the oil level mark (arrow) (for viscosity see 4.1.2).
- Place the oil pan with the filter insert on the filter housing and close the plugs.

Never clean the filter in petrol!
Dispose of used oil according to instructions!

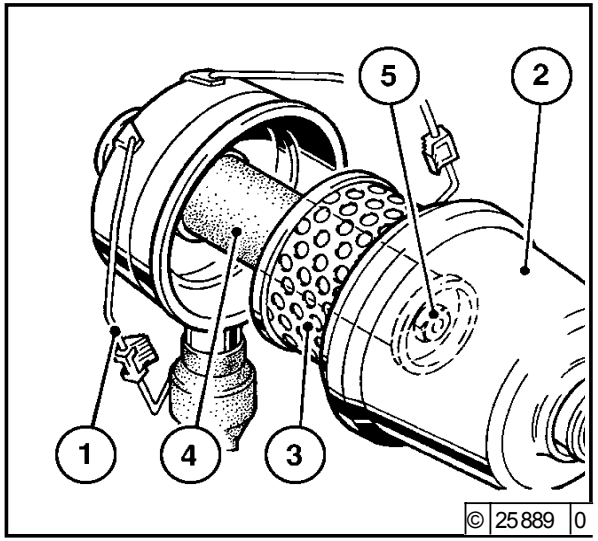
6.4.4 Dry air filter

Dust discharge valve



- Empty the dust discharge valve 1 by squeezing the discharge slot in the direction of the arrow.
- Clean the discharge slot occasionally.
- Remove any stuck on dust residues by squeezing the upper area of the valve.

Filter cartridge

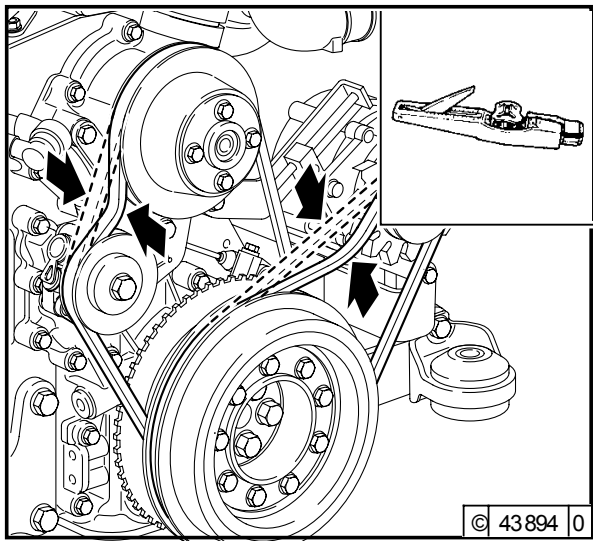


- Open clamping bracket 1.
- Remove filter hood 2 and pull out filter cartridge 3.
- Clean filter cartridge, renew after a year at the latest.
- Clean filter cartridge 3.
  - Blast out from the inside out with dry compressed air (max. 5 bar), or
  - beat out (only in extreme cases). Do not damage the cartridge, or
  - wash according to manufacturer's specifications.
- Check filter cartridge for damage to the filter paper (shine light through) and damage to the seal. Exchange if necessary.
- Renew the safety cartridge 4 after 5 filter maintenances, after 2 years at the latest (never clean!).
  To do this:
  - Loosen the hexagonal nut 5 and pull out the cartridge 4.
  - Insert new cartridge, re-mount hexagonal nut and tighten.
- Insert filter cartridge 3, close hood 2 and secure clamping bracket 1.

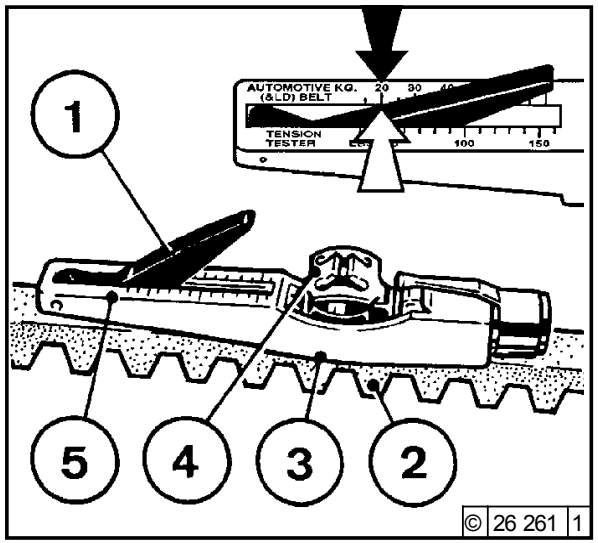
Never clean filter cartridge with petrol or hot liquids!

6

6.5.1 Checking V-belt 2013 example



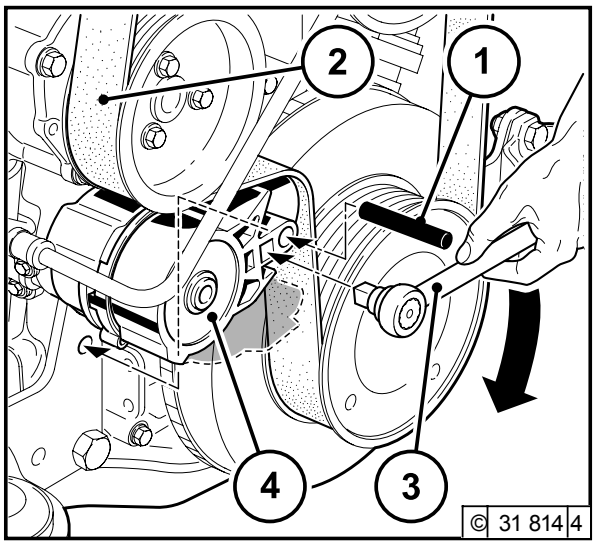
- Visual inspection of entire length of V-belt for damages.
- Renew damaged V-belts.
- Check the belt tension of new V-belts after 15 minutes running time.



- To check the V-belt tension
  - Use a tension measuring device (see 9.3).
  - Lower indicator arm 1 into the measuring device.
  - Lay the guide 3 between two belt pulleys on the V-belt 2. The stop should lie sideways.
  - Press the button 4 at right angles to the V-belt 2 steadily, until the spring is heard or felt to unlock.
  - Carefully lift the measuring device, without altering the position of the indicator arm 1.
  - Read off the measured values on the in tersection (arrow), scale 5 and the indicator arm 1. For setting values see 9.1.
  - If necessary, re-tighten and repeat measurement.

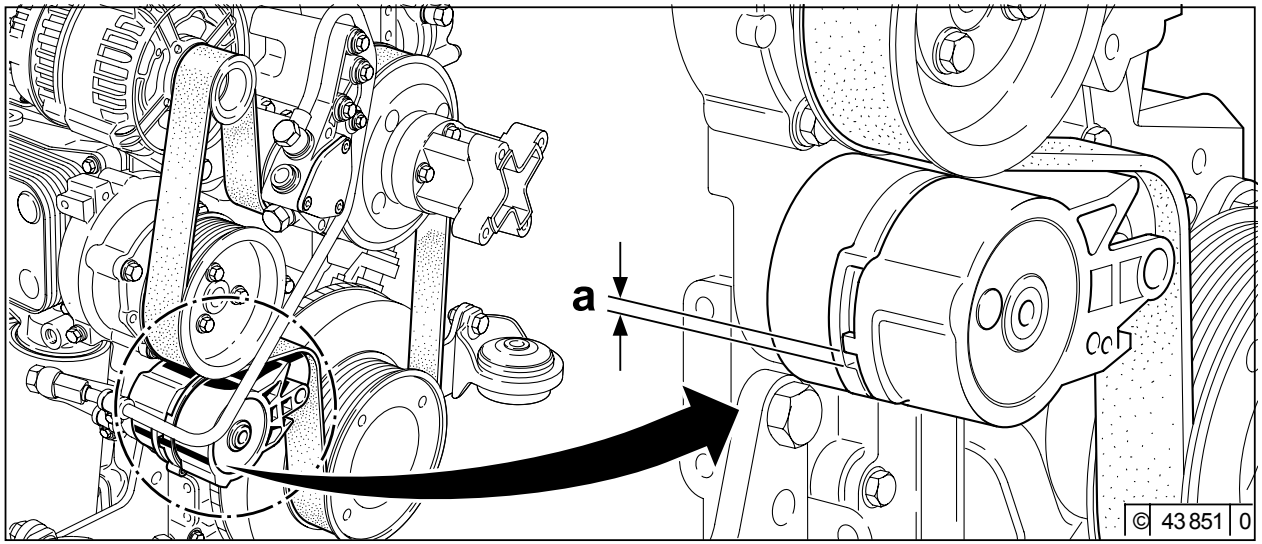
Only test / tighten / change V-belts when the engine is not running. If necessary, re-mount V-rib belt guard.

6.5.2 Changing V-rib belt



- Push tension roller 1 with ratchet 3 in direction of arrow until locking pin 4 can be fixed in the mounting hole. V-rib belt 2 is now tension-free.
- First pull the V-rib belt 2 from the smallest roller or from the tension roller.
- Fit new V-rib belt 2.
- Hold ratchet 3 in the opposite direction to the arrow and remove pin 4.
- Loosen the tension pulley in the opposite direction to the arrow until the V-rib belt is tight, at the same time checking that the V-rib belt is positioned correctly in its guides.

6.5.3 Checking wear limit of V-rib belt

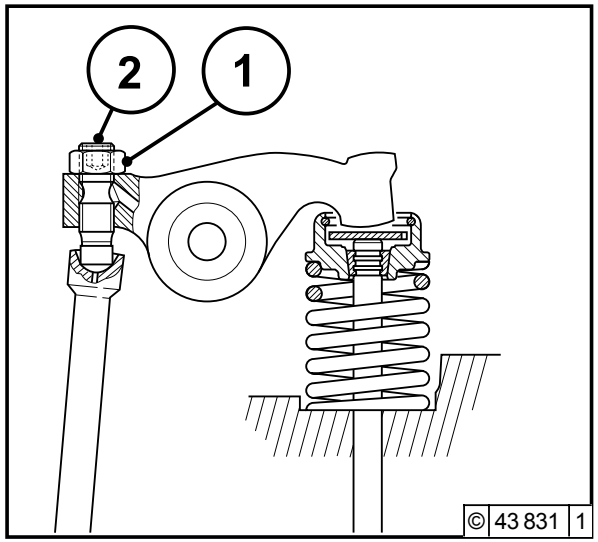


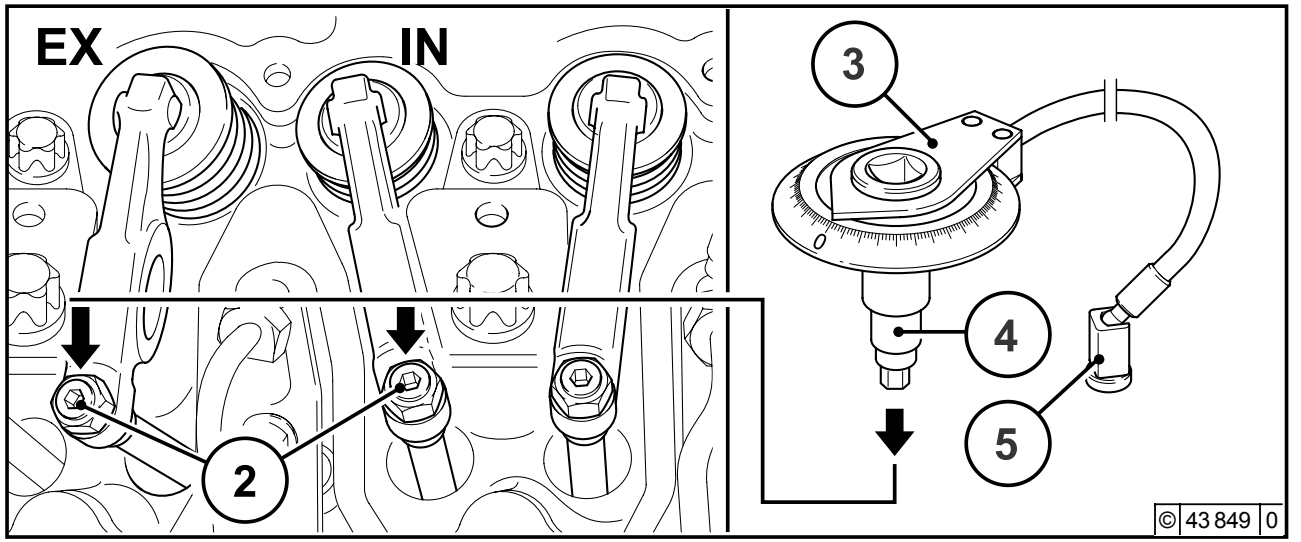
- The wear limit of the V-rib belt is checked as follows:
- Check the distance between the projection of the moving tension arm and the contact with the fixed tensioner housing.
- If the distance "a" is less than **3 mm,** the V-rib belt should be changed.

Only test / tighten / change when the engine is not running.If necessary, re-mount V-belt guard.

6

6.6.1 Checking valve clearance, setting if necessary





- Before setting the valve clearance allow the engine to cool down for at least 30 minutes: Oil temperature below 80 °C.
- Place the turning gear (see chap. 9.3) over the fastening screws of the belt pulleys.
- Turn over engine until the valve overlap is achieved, cylinder no. 1.
  The cylinders to be set are specified in the setting schematic, see chap. 6.6.3.

Special tools for valve setting see chap. 9.3

- Loosen lock nut 1
- Place rotation angle disc and socket wrench insert 4 on the valve clearance setting screw 2.
- Fix magnet 5 to the rotation angle disc 3.
- Turn the rotation angle disc 3 clockwise to the stop (rocker arm without clearance) and set scale to zero.
- Turn the rotation angle disc anti-clockwise until you reach the specified rotation angle size:

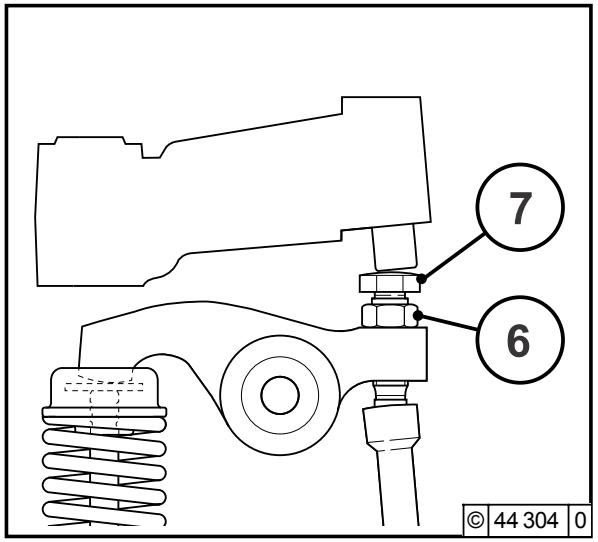
Engine 2012

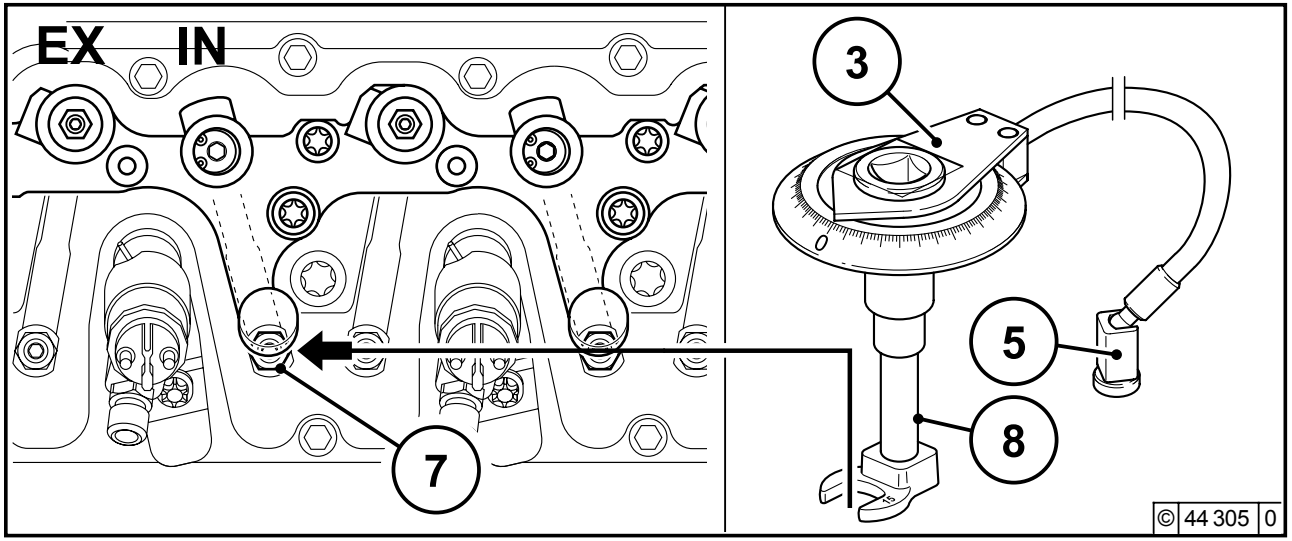
IN = inlet valve	75°
EX = outlet valve	120°

Engine 2013

IN = inlet valve	90°
EX = outlet valve	150°

- Hold rotation angle disc 3 tight against twisting.
- Tighten the lock nut 1.
- Perform the setting on every cylinder (see chap. 6.6.3).





Valve clearance setting inlet valve in exhaust gas return line (EGR):

- Loosen lock nut 6.
- Place rotation angle disc 3 with crow's foot wrench 8 on valve clearance setting screw 7 on the inlet valve.
- Fix magnet 5 to the rotation angle disc 3.
- Turn the rotation angle disc 3 clockwise to the stop (rocker arm without clearance) and set scale to zero.
- Turn the rotation angle disc anti-clockwise until you reach the specified rotation angle size.

Engine 2012

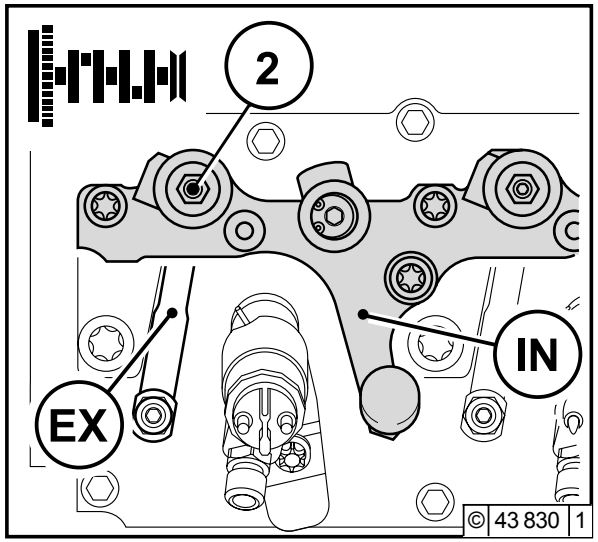
IN = inlet valve 75°

Engine 2013

IN = inlet valve 90°

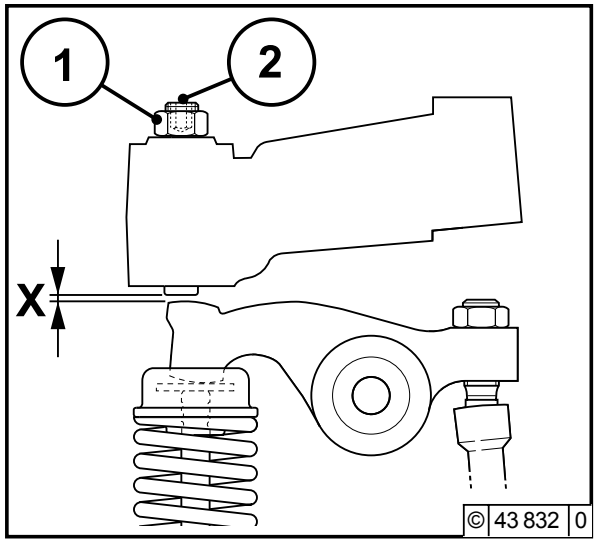
- Hold rotation angle disc 3 tight against twisting.
- Tighten the lock nut 6.
- Perform the setting on every inlet valve (see chap. 6.6.3)

6.6.2 Setting control piston clearance in exhaust gas recirculation (EGR)



- After setting the valve clearance, the control piston clearance should be set as follows:
- Place the turning device over the fastening screws of the belt pulley.
- Turn engine until reaching the valve overlap, cylinder no. 1 The cylinders to be set are specified in the setting diagram, see chap. 6.6.3

Special tools for valve setting see chap. 9.3



- Loosen lock nut 1.
- Place the rotation angle disc and socket wrench insert on the setting screw 2
- Fix the magnet of the rotation angle disc.
- Turn the rotation angle disc clockwise to the stop (control piston without clearance) and set scale to zero.
- Turn the rotation angle disc counter-clockwise until you reach the specified rotation angle.
  Control piston x : 144°
- Tighten the lock nut 1.
- Perform the setting on every control piston (see chap. 6.6.3)

6.6.3 Diagram for setting valve / control piston clearance

Engine TCD 2012/2013 L04 2V

Ignition sequence: 1–3–4–2

Valves	Cylinder			
overlap	1	3	4	2
set to	4	2	1	3

Valve operlap: Outlet valve not yet closed, inlet valve starts opening.

At fully open outlet valve, the inlet valve opens briefly by about 2 mm. This is not the valve overlap.

Engine TCD 2012/2013 L06 2V

Ignition sequence: 1–5–3–6–2–4

Valves	Cylinder					
overlap	1	5	3	6	2	4
set to	6	2	4	1	5	3

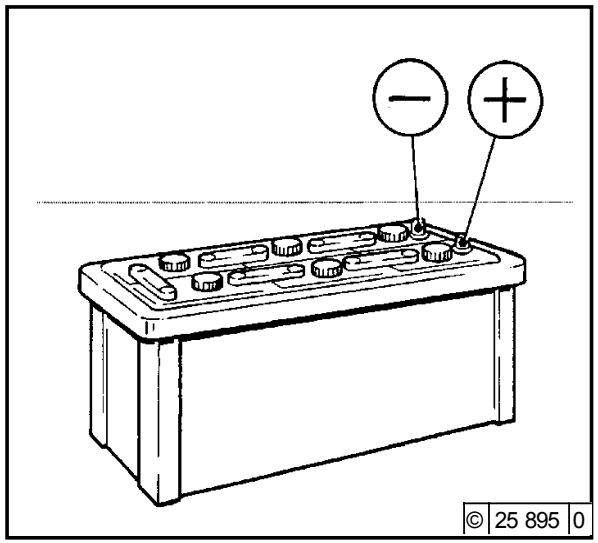
Valve operlap: Outlet valve not yet closed, inlet valve starts opening.

At fully open outlet valve, the inlet valve opens briefly by about 2 mm. This is not the valve overlap.

6

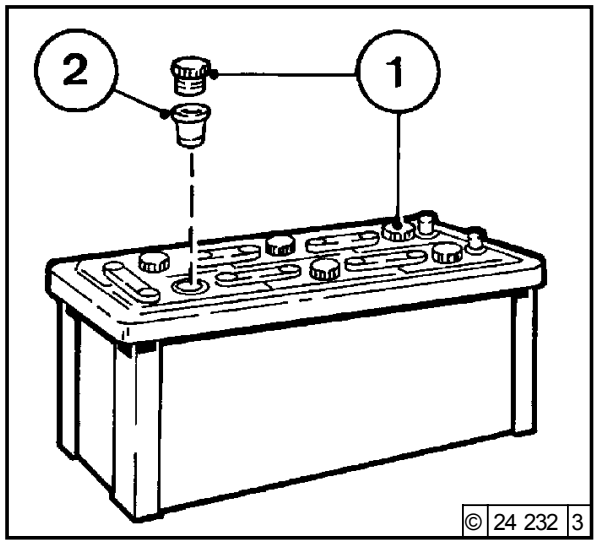
6.7.1 Battery

6.7.1.1 Checking battery and cable connections



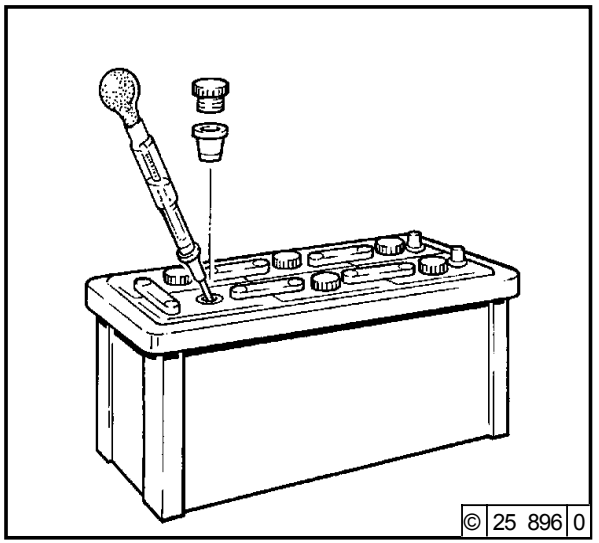
- Keep the battery clean and dry.
- Loosen soiled connection terminals.
- Clean the battery poles (+ and -) and terminals, and grease with an acid-free and acid-resistant grease.
- Ensure that the terminal connections contact well when assembling. Tighten the clamping screws by hand.

6.7.1.2 Checking the acid level



- Remove sealing caps 1.
- If checking inserts 2 are available:
  The liquid level should reach to their bottom.
- Without checking inserts:
  The liquid level should reach 10-15 mm above the upper edge of the plate.
- If necessary, re-fill with distilled water.
- Screw sealing caps back on.

6.7.1.3 Checking acid density



- Measure the acid density of individual cells with a standard acid testing device.

The measured values (see table overleaf) indicate the charge status of the battery. The acid temperature when measuring should be 20 °C if possible.

Acid density in [kg/ l]		Charge level
Normal	Tropics	
1.28	1.23	well charged
1.20	1.12	half charged, re-charge
1.12	1.08	discharged, charge immediately

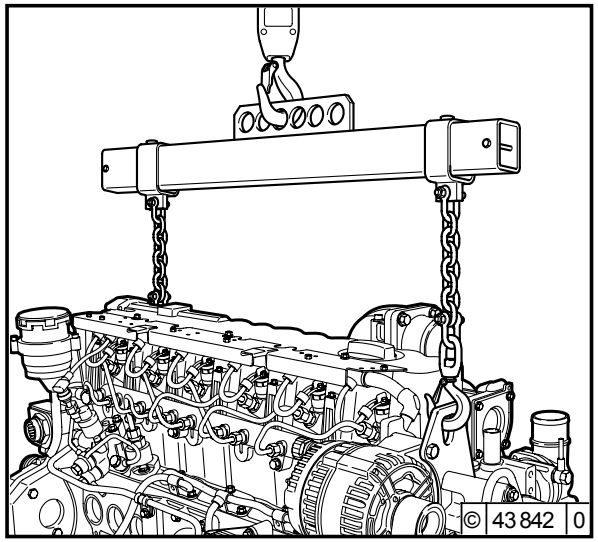
The gases released by the battery are explosive! Avoid sparks and open fire in the vicinity of the battery! Do not allow acid to get on skin or clothes!
Wear protective glasses!
Do not place any tools on the battery!

6.7.2 Three-phase current generator

Notes on three-phase current system:

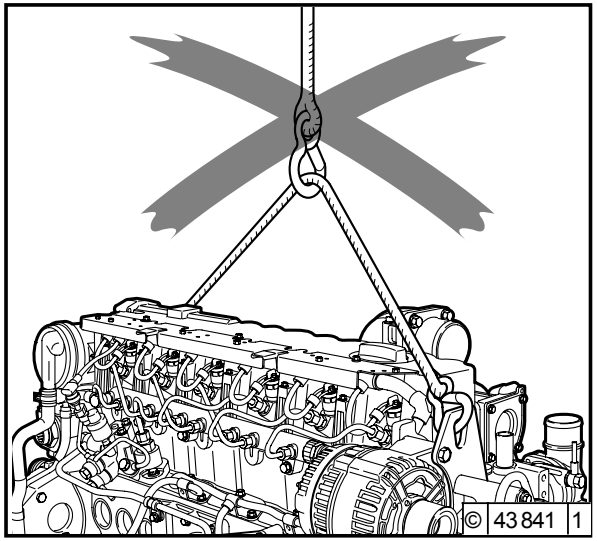
- Do not interrupt the connections between the battery, generator and governor when the engine is **running**.
- If, however, an engine must be started and operated without battery, the connection governor / generator is to be separated before starting.
- Do not swap battery connections.
- Replace defective charging warning light immediately.
- When cleaning engine: Do not spray water/ steam jet directly at generator!
  Warm up the engine so that the water residues evaporate.
- Under no circumstances may the voltage of a three-phase current system be tested by tapping against the earth cable.
- When carrying out electrical welding work, clamp the earth terminal of the welding device directly to the part to be clamped.
- Disconnect battery and three-phase current generator.
- Remove the control unit.

6.7.3 Transportation suspension



- Only use the correct suspension equipment for engine transportation. Suspension equipment must be adjustable for the engine centre of gravity.

Only use correct suspension equipment!



- Fastening devices cannot be fixed safely over the centre of gravity.
- Fastening devices can slip, engine capsizes.
- Short fastening devices cause bending moments in the suspension. This can damage the suspension.

Engine can fall.
Danger to life!

Faults, causes and remedies

7

- Faults are often caused by incorrect operation or maintenance of the engine.
- For every fault, check whether or not all operating and maintenance specifications have been observed.
- A corresponding fault table can be found overleaf.
- If you cannot recognise the cause of a fault or cannot remedy a fault yourself, please contact your **DEUTZ Service.**

Before starting make sure that there is nobody in the engine/ work machine danger area.
For repairs:
Caution: Separate battery connection!

Faults												Action	
Engine doesn't start up, or starts up with difficulty													
	Engine doesn't start up and diagnosis light is blinking											Check	C
		Engines starts up, but runs irregularly or misfires										Set	S
			Engine gets too hot. Temperature warning system is activated									Change	Ch
				Engine lacks power									
					Engine lacks power and diagnosis light is lit up							Clean	Cl
						Engine doesn't work on all cylinders						Fill up	F
							Engine has no, or too little, oil pressure					Lower	L
								Engine has too high oil consumption				Engine electronics	E*
									Engine smoulders - blue			* Identify fault by monitoring the blink code or fault memory	
										- white			
											- black		
												Cause	Section
●												Not disconnected (if possible)	Operation C
●										●		Starting limit temperature not reached	C
●				●								Engine shutdown lever is still in stop position (shutdown magnet defective)	C
			●				●					Oil level too low	F
			●	●				●	●			Oil level too high	L
							●	●	●			Engine is tilted too far	C / S
●												Set throttle to halfway (only with mech. regulators)	C / S
			●	●							●	Air filter soiled / exhaust turbocharger defective	Combustion air C / Ch
			●	●							●	Air filter maintenance switch / display defective	C
			●	●							●	Charge air line leaking	C / Ch
			●									Cool water pump defective (V-rib belt torn or loose)	C
				●							●	Charge air cooler soiled	Cooling system C / Cl
			●									Coolant heat exchanger soiled	C / Cl
●		●	●	●		●						V-belt/V-rib belt torn or loose	C / W
												(fuel pump in belt drive)	
			●	●								Cool air heating / heat short circuit	C
●												Battery defective or not charged	Electrics C

Faults, causes and remedies

7.1 Fault table

Faults	Action
Engine doesn't start up, or starts up with difficulty	Check **C**
Engine doesn't start up and diagnosis light is blinking	Set **S**
Engines starts up, but runs irregularly or misfires	Change **Ch**
Engine gets too hot. Temperature warning system is activated	Clean **Cl**
Engine lacks power	Fill up **F**
Engine lacks power and diagnosis light is lit up	Lower **L**
Speed changes are possible + diagnostic light is lit up	Engine electronics **E***
Engine has no, or too little, oil pressure	* Identify fault by monitoring the blink code or fault memory
Engine has too high oil consumption	
Engine has too high oil consumption	
Engine smoulders - blue	
- white	
- black	

Engine doesn't start up, or starts up with difficulty	Engine doesn't start up and diagnosis light is blinking	Engines starts up, but runs irregularly or misfires	Engine gets too hot. Temperature warning system is activated	Engine lacks power	Engine lacks power and diagnosis light is lit up	Speed changes are possible + diagnostic light is lit up	Engine has no, or too little, oil pressure	Engine has too high oil consumption	Engine has too high oil consumption	Engine smoulders - blue	- white / - black	Cause	Section	
●												Starter, circuit cable connections loose or oxidised	Electrics	**C**
●												Starter defective or pinion doesn't mesh		**C**
●		●		●						●	●	Valve clearance incorrect	Engine	**S**
●		●		●			●					Injection line leaking		**C**
			●									Ventilation line blocked (coolant heat exchanger)		**C / Cl**
●										●		Heating plug defective		**C**
●		●	●	●			●				●	Injector defective		**C / Ch**
●		●		●			●					Air in fuel system		**C / Ch**
●		●		●			●					Fuel filter / fuel pre-cleaner soiled		**C/ Cl/ Ch**
			●									Oil filter defective		
●								●	●			Incorrect SAE class or quality of engine lube oil	Operating substance	**Ch**
●		●		●							●	Fuel quality does not comply with instruction manual		**Ch**
			●									Lack of cooling water		**C / Ch**
	●											Engine electronics prevent start	Electronics	**C / Cl**
					●							Engine electronics reduce power		**C / E**
						●						Engine electronics has detected a system error and activates an equivalent speed		**C / E**

7.2.1 Engine protection function of the electronic engine controller EMR3

Depending on the design of the monitoring functions, the EMR3 can protect the engine against damage in certain fault situations by monitoring compliance with the important limit values during operation and checking the correct functioning of the system components. Depending on the severity of a detected fault, the engine may continue running with restrictions, whereby the fault lamp lights steadily or the fault lamp indicates a serious system fault by flashing. **In this case, the engine must be switched off as soon as it is safe to do so.**
Depending on the engine configuration, the flashing fault lamp can have the following meaning:

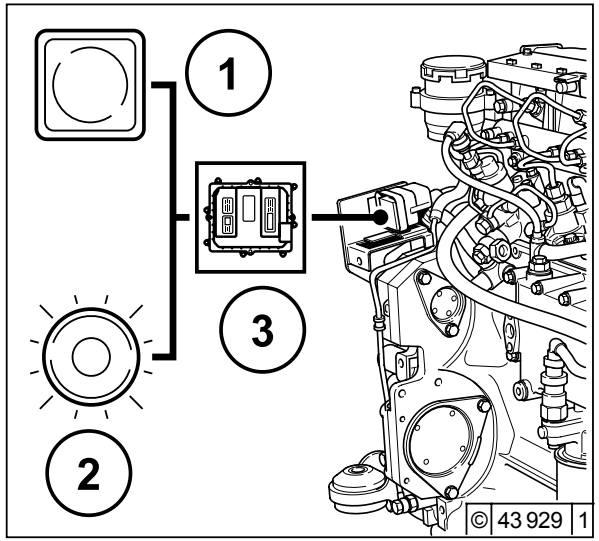
- Request to the operator to shut down
  Caution: Failure to heed this will lead to loss of warranty!
- Autom. shutdown of the engine after a brief warning time, poss. connected with a start prevention.
- To cool the engine, forced operation at low idling speed, poss. with automatic shutdown.
- Start prevention. (see also chap. 3.3)

When the fault is corrected the light goes out. For some faults it is necessary to switch off the ignition, wait for 30 s and then switch the ignition back on.

7.2.2 Using the diagnosis button

With the diagnosis button (1) the fault at hand can be read out as a blink code. The diagnosis button (1) and the fault light (2) can be found on the vehicle driving stand.
Faults are indicated by a blinking or continuous illumination of the fault light (2). More precise information regarding all existing faults can be read out in the form of a blink code, only when the engine is not running, in the following manner: After actuating the diagnosis button (1) for at least one second, the fault light (2) goes out and the first fault is, after releasing the key displayed as a blink code. Analyse the blink code as per the table on the following page. After the fault blink code has been displayed the fault light (2) goes out for five seconds.
Then the next existing fault (i.e. the following one in the fault memory) can be shown by actuating the diagnosis button (1) again. If the last existing fault has been shown, by actuating the diagnosis button (1) once more the first fault will be shown again.

7.2.3 Table of fault blink codes



The possible blink codes, their meaning and measures for correcting faults can be found in the table on the following page. The blink code values in the first column indicate the number of preliminary short blink signals (illuminated duration approx. 0.4 s), the number of subsequent long blink signals (illuminated duration approx. 0.8 s) as well as the number of concluding short blink signals. The code 2-1-4 for the fault "overspeed" is made up of two short, one long and four short blink signals, for example. If a fault cannot be corrected by the measures given in the table please contact your service representative responsible.

Blinkcode Short 0.4s	Long 0.8s	Short 0.4s	Function / Component	Error
1	2	3	Output to coolant temperature light	Signal faulty, Overtemperature control unit
1	2	6	Hand accelerator	Signal faulty / implausible
1	2	8	Suction air temperature sensor	Signal faulty
1	3	3	Gear oil temperature sensor	Signal faulty
1	3	4	Monitoring rail pressure	Signal implausible, pressure / pressure deviation outside the permissible range
1	3	5	Output to oil pressure warning lamp	Signal faulty, overtemperature control unit
			Output to valve of the fuel measuring unit	Signal faulty, overtemperature control unit
1	3	6	Monitoring air filter	Air pressure behind filter too low
1	3	7	Output to actuators	Short circuit to battery
1	3	8	Output to actuators	Short circuit to ground
1	4	2	Output to engine operating lamp	Signal faulty, overtemperature control unit
1	4	3	Multi-step switch 1 / 2 / 3	Signal faulty / implausible
1	4	4	Oil temperature sensor	Signal faulty / implausible
			Monitoring the oil temperature	Temperature outside the nominal range
1	4	5	Monitoring override switch	Signal implausible
1	4	6	Rail pressure limiting valve	Valve open / pressure surge necessary / do not open after pressure surge
1	4	7	Rail pressure sensor	Signal faulty, pressure deviation outside the permissible range

Blinkcode			Function / Component	Error
Short 0.4s	Long 0.8s	Short 0.4s		
2	1	2	Monitoring camshaft/crankshaft	No camshaft signal, no crankshaft signal
2	1	3	Monitoring camshaft/crankshaft	Deviation between the camshaft and crankshaft signal
2	1	4	Engine protection:	Overspeed/override status implausible
2	1	6	Fuel low pressure sensor	Signal faulty
			Monitoring fuel low pressure	Fuel low pressure outside the nominal range
2	1	9	Output to adjuster exhaust valve engine brake	Signal faulty, overtemperature control unit
2	2	2	Input accelerator 1 (PWM)	PWM signal faulty
2	2	3	Charge air pressure sensor	Signal faulty
			Monitoring charge air pressure	Charge air pressure outside the nominal range
2	2	4	Oil pressure sensor	Signal faulty / implausible
2	2	5	Coolant temperature sensor	Signal faulty / implausible in comparison with the oil temperature, CAN signal invalid
2	2	6	Input accelerator 1 (analog)	Signal faulty / implausible
2	2	7	Fuel temperature sensor	Signal faulty
2	2	8	Water level sensor in the fuel filter	Signal faulty
			Monitoring fuel filter water level	Max. water level exceeded

Blinkcode Short 0.4s	Long 0.8s	Short 0.4s	Function / Component	Error
2	3	1	Monitoring oil pressure	Pressure outside the nominal range
2	3	2	Monitoring coolant temperature	Temperature above the nominal range
2	3	3	Monitoring suction intake air temperature	Temperature above the nominal range
2	3	5	Monitoring coolant state	Level below the nominal range
2	3	7	Monitoring fuel temperature	Temperature outside the nominal range
2	3	8	Output to the fan adjuster 1 / 2	Signal faulty, overtemperature control unit
			Monitoring fan speed	Speed outside the nominal range
2	4	1	Monitoring combustion	Misfiring detected in one or more cylinders
2	6	1	Monitoring output to actuators	Relay does not open or opens too late, short-circuit to ground
2	6	3	Output to cold start aid	Signal faulty, relay defective, jammed or connected incorrectly, short-circuit
2	7	1	CAN-Bus	Timeout of one or more send messages, bus inactive
2	8	2	Sensor supply voltage 1 / 2 / 3	Voltage outside the nominal range
2	9	2	Atmospheric pressure sensor	Signal faulty / implausible

Blinkcode			Function / Component	Error
Short 0.4s	Long 0.8s	Short 0.4s		
3	1	4	Hydraulic oil temperature sensor	Signal faulty
			Monitoring hydraulic oil temperature	Temperature outside the nominal range
3	1	8	Monitoring battery	Voltage outside the nominal range
3	2	8	Output to cold start aid indicator lamp	Signal faulty, overtemperature control unit
4	1	4	Output to external EGR actuator	Signal faulty
4	1	5	Output to external EGR actuator	Signal faulty, overtemperature control unit
4	1	6	Output to external EGR actuator	Signal faulty
4	1	7	Oil wear meter	Critical time reached

Blink code			Function / Component	Error
Short	Long	Short		
0,4s	0,8s	0,4s		
5	1	2	Output to start relay	Signal faulty, overtemperature control unit
5	1	3	Output to error lamp	Signal faulty, overtemperature control unit
5	1	4	Monitoring terminal 15	No signal detected
5	1	5	Monitoring terminal 50	Permanent signal detected
5	2	1	Speed measurement	Implausible drive speed
5	2	8	Output to internal engine brake	Signal faulty

All other blink codes: Please contact your service partner

Behavior in case of error signal faulty / implausible: Perform function test on the parts concerned; check wiring and plugs for short-circuits, breaks, corrosion.

8.1 Corrosion protection

8

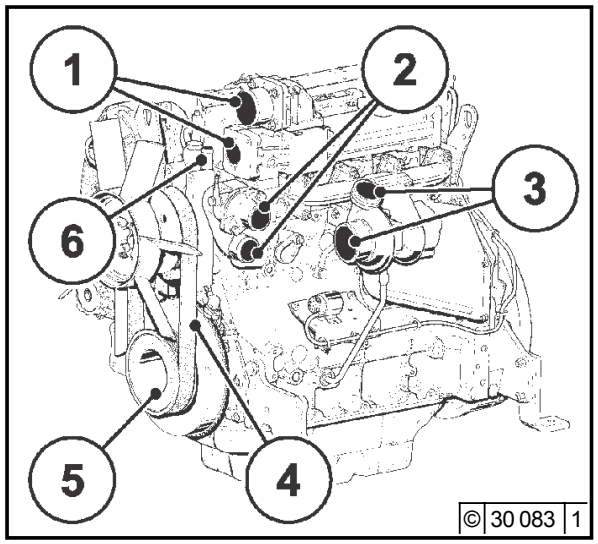
8.1 Corrosion protection

If the engine should be shut down for a long period of time, corrosion protection will be necessary in order to prevent rust formation. The measures described here apply for a shutdown period of up to approx. 6 months. Before the engine is commissioned again the corrosion protection should be removed.

- Corrosion protection oils according to specification:
  - MIL-L 21260B
  - TL 9150-037/2
  - Nato Code C 640 / 642
- Recommended cleaning agent for removal of corrosion protection:
  - Petroleum benzine (hazard class A3)

Protecting engine from corrosion:

- Clean engine (possibly with cold cleaner).
- Warm up the engine and switch off.
- Drain off engine oil, see chapter 6.1.2 and pour in corrosion protection oil.
- Drain off coolant, see 6.3.3.
- Pour in corrosion protection agent, see above.
- Drain fuel from container (tank).
- Make fuel mixture from 90 % diesel fuel and 10 % corrosion protection oil and fill up tank.
- Leave the engine running for approx. 10 minutes.
- Switch off engine
- Turn over the engine manually several times. When turning over with a starter position the shutdown lever in the Stop position.
- Remove V-belt 4, pack up and store.



- Spray the V-belt pulley 5 with corrosion protection agent.
- Seal intake openings 1 and exhaust openings 3.
- Lightly apply corrosion protection agent to the coolant nozzle 2 and seal.
- Drain off corrosion protection agent.

Note:

Fuel tank/supply line to the engine should also be sealed, so that the sensitive rail system is protected against dirt and dust. Protect the electronics from moisture/ corrosion.

Removing engine corrosion protection:

- Remove corrosion protection agent from grooves of V-belt pulley 5.
- Assemble V-rib belt 4 or V-belt, see 6.5.2.
- Remove plugs from intake opening 1, exhaust opening 3 and coolant inlet/outlet 2.
- Pour in coolant see 6.3.3
- Connect fuel tank / supply line to the engine. Pay attention to cleanliness here.
- Start up the engine.

Engine type		TDC 2012 L04 2V	TDC 2012 L06 2V
Number of cylinders		4	6
Cyl. arrangement		In-line	
Bore	[mm]	101	
Stroke	[mm]	126	
Total displacement	[cm^3]	4038	6067
Compression ratio	[ε]	18	
Working principle / combustion procedure		Four stroke diesel with charging and direct injection	
Charge air cooler		without/with	with
Charge air cooler temperature outlet at rated power	[°C]	50	
Direction of rotation		rotation to left	
Injection system **D**eutz **C**ommon **R**ail **(DCR)** **P**ump **L**ine **N**ozzle **(PLD)**		**DCR + PLD**	**DCR**
Weight TDC 2012 without cooling system according to DIN 70020-A	[approx.kg]	410	530
Engine performance according to ISO 3046	[kW]	[1]).	
Max. nominal speed	[1/min]	2400	
Valve clearance inlet/ exhaust, see 6.6.1	[mm]	$0.3/0.5^{+0.1/}$ angle degree 75/120	
Setting with special tool			
Ignition pressure	[bar]	160	
Start of pumping	[°KW before TDC]	[1]).	
Engine ignition sequence		1-3-4-2	1-5-3-6-2-4
V-belt tension		pre-tighten/re-tighten	
Generator	[N]	650 / 400 $^{\pm 50}$.	
Fuel pump - coolant pump	[N]	650 / 400 $^{\pm 50}$.	
V-rib belt tension:		Spring-loaded tension pulley	

[1)] Engine power, speed and start of pumping, among other things, are stamped on the engine company plate, see also 2.1.

[2)] The V-rib belt has a spring-loaded tension pulley which tightens automatically and is not re-tightened: see ch. 6.5.2

Engine type		TDC 2012 L04 2V	TDC 2012 L06 2V
Cooling		Liquid-cooled / cooling system protection	
Coolant quantity (only engine content without cooler)	[approx.ltr.]	5.6	7.3
Permissible continuous coolant temperature engine outlet	[°C]	max.110	
Temperature difference between Coolant inlet/outlet	[°C]	4 to 8	
Start of thermostat opening at	[°C]	86	
Thermostat fully open at	[°C]	102	
Coolant pre-heating		[4].	
Lubrication		Forced feed lubrication	
Oil SAE		see chap. 4	
Maximum oil temperature in oil tray	[°C]	125	
Minimum oil pressure in warm state (114 °C) and low idling	[bar]	0,8	
Initial oil filling quantity without filter max.	[approx.ltr.]	15 [3].	26 [3].
min.	[approx.ltr.]	12.5 [3].	23.5 [3].
Initial oil filling quantity with filter max.	[approx.ltr.]	15.5 [3].	26.5 [3].
min.	[approx.ltr.]	13 [3].	24 [3].

[3] Approximate values can vary depending on version. The upper oil measurement marking is always decisive.
[4] Only necessary for winter operation, see 3.5.1.

Engine type		TDC 2013 L04 2V	TDC 2013 L06 2V
Number of cylinders		4	6
Cyl. arrangement		In-line	
Bore	[mm]	108	
Stroke	[mm]	130	
Total displacement	[cm^3]	4761	7142
Compression ratio	[ε]	18	
Working principle / combustion procedure		Four stroke diesel with charging and direct injection	
Charge air cooler		without/with	without/with
Charge air cooler temperature outlet at rated power	[°C]	50	
Direction of rotation		rotation to left	
Injection system **D**eutz **C**ommon **R**ail **(DCR)** **P**ump **L**ine **N**ozzle **(PLD)**	[bar]	**DCR+PLD**	**DCR**
Weight TDC 2013 without cooling system according to DIN 70020-A	[approx.kg]	450	590
Engine performance according to ISO 3046	[kW]	[1]).	
Max. nominal speed	[1/min]	2300	
Valve clearance inlet / exhaust, see 6.6.1	[mm]	$0.4/0.6^{+0.1/}$ / angle degree 90/150	
Setting with special tool			
Ignition pressure	[bar]	160	
Start of pumping	[°KW before TDC]	[1]).	
Engine ignition sequence		1-3-4-2	1-5-3-6-2-4
V-belt tension:			
Generator	[N]	550 / 300 $^{\pm 50}$.	
Fuel pump - coolant pump	[N]	550 / 300 $^{\pm 50}$.	
Compressor	[N]	650 / 400 $^{\pm 50}$.	
V-rib belt tension:		Spring-loaded tension pulley	

[1)] Engine power, speed and start of pumping, among other things, are stamped on the engine company plate, see also 2.1.

[2)] The V-rib belt has a spring-loaded tension pulley which tightens automatically and is not re-tightened: see ch. 6.5.2

Engine type		TDC 2013 L04 2V	TDC 2013 L06 2V
Cooling		Liquid-cooled / cooling system protection	
Coolant quantity (only engine content without cooler)	[approx.ltr.]	7.2	9.8
Permissible continuous coolant temperature engine outlet	[°C]	max.105	
Temperature difference between Coolant inlet/outlet	[°C]	4 to 8	
Start of thermostat opening at	[°C]	86	
Thermostat fully open at	[°C]	102	
Coolant pre-heating		[4].	
Lubrication		Forced feed lubrication	
Oil SAE		see chap. 4	
Maximum oil temperature in oil tray	[°C]	125	
Minimum oil pressure in warm state (114 °C) and low idling	[bar]	0.8	
Initial oil filling quantity without filter max.	[approx.ltr.]	15 [3].	26 [3].
min.	[approx.ltr.]	12.5 [3].	23.5 [3].
Initial oil filling quantity with filter max.	[approx.ltr.]	15.5 [3].	26.5 [3].
min.	[approx.ltr.]	13 [3].	24 [3].

[3] Approximate values can vary depending on version. The upper oil measurement marking is always decisive.
[4] Only necessary for winter operation, see 3.5.1.

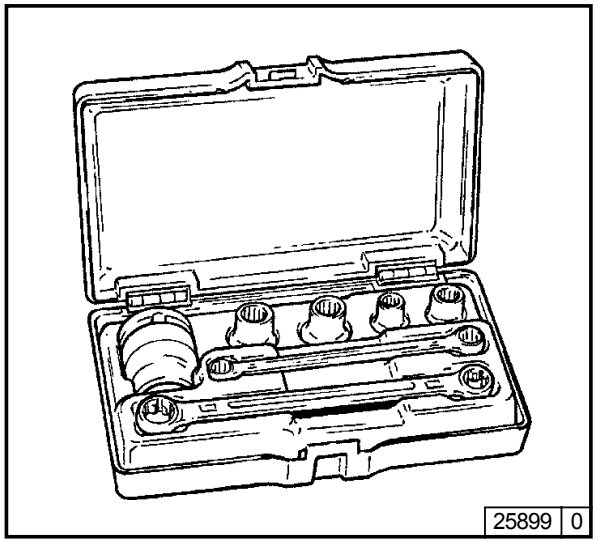
Installation	Pre-tightening [Nm]	Re-tightening 1st step	2nd step	3rd step	4th step	Total	Comments
Cylinder head cover	–	–	–	–	–	9 ± 1 Nm	M6
Lock nut Valves	–	–	–	–	–	20 ± 2 Nm	Nut with inner square
Front face mounting foot	–	–	–	–	–	280 Nm	M16 x 85 –10.9
	–	–	–	–	–	280 Nm	M16 x 40 –10.9
Oil drain screw aluminium tray	–	–	–	–	–	55 Nm	M 18x 1.5 with Cu ring
Oil drain screw sheet metal oil tray	–	–	–	–	–	55Nm	M 18x 1.5 with Cu ring

Ordering tools

The special tools listed in this chapter must be ordered from:

FA.WILBÄR
Postfach 14 05 80
D-42826 Remscheid
http://www.deutz-tools.com

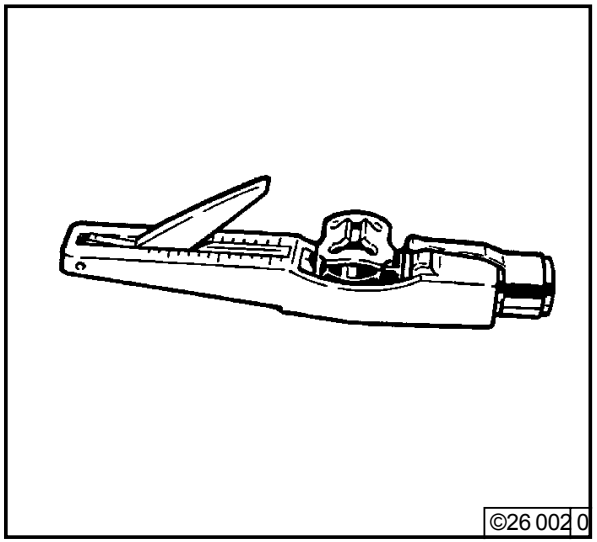
TORX



Order No. 8189
For engines of series 2012/2013, the TORX screw system BN. 8189, amongst others, is used.
This system was introduced due to its many advantages:

- Excellent screw accessibility.
- High transfer of force when loosening and tightening.
- Slipping or broken wrenches and the risk of injury associated with this is practically impossible.

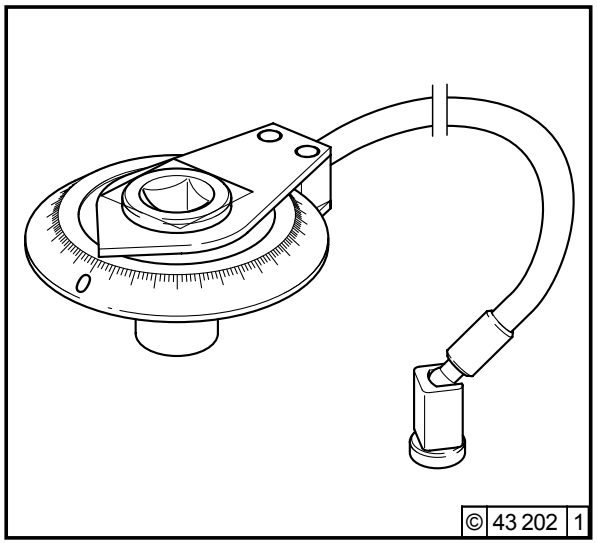
V-belt tension measuring device



Order No. 8115
Measuring device for checking the prescribed V-belt tensions

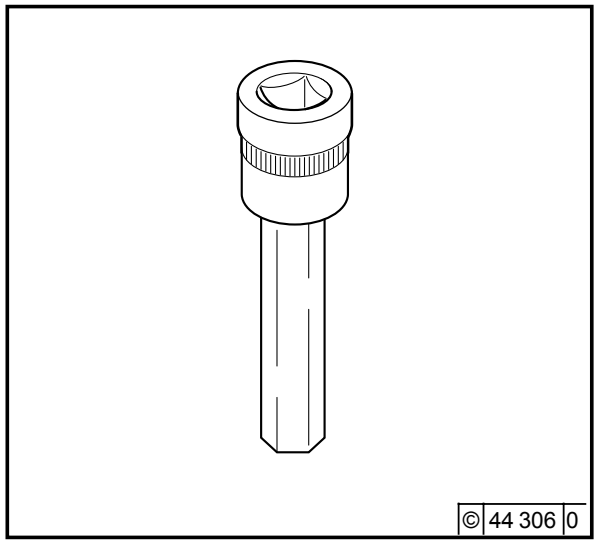
9

Rotation angle disc



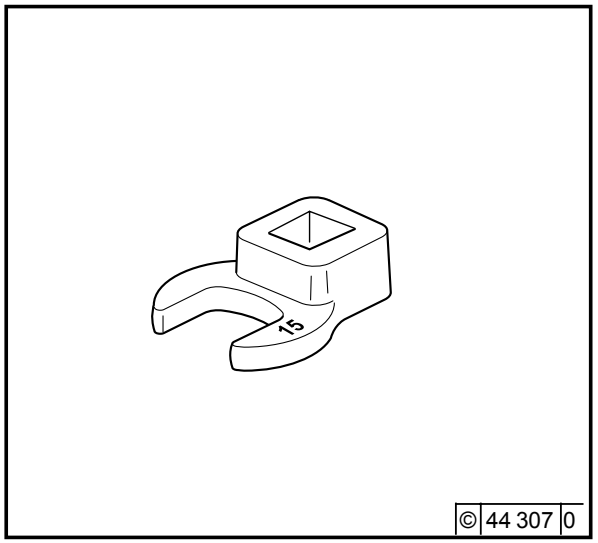
Order No. 8190
Rotation angle disc for setting the valve/ control piston clearance.

Socket wrench insert



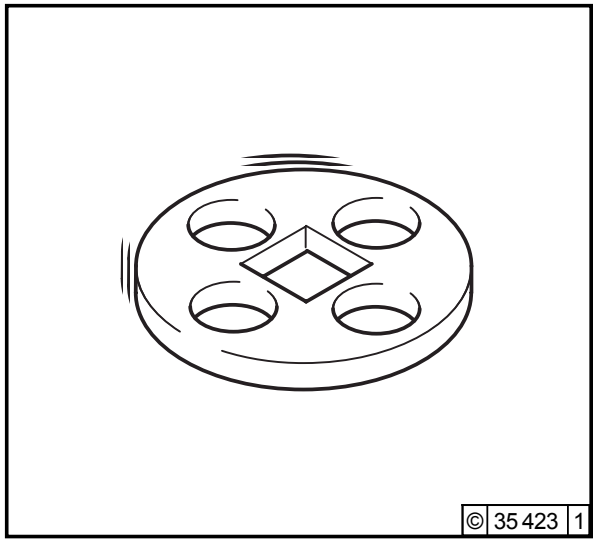
Order No. 8193 (5 mm) valve clearance
Order No. 8194 (4 mm) control piston clearance. Wrench inserts for rotation angle disc.

Crow's foot wrench



Order No. 8199
Crow's foot wrench for rotation angle disc 8190 in connection with commercially available square bar extension.

Turning gear



Order No. 100 330
For turning over the engine (as add-on on the torsional vibration damper).

Service

For many years DEUTZ has stood for pioneering development in engine construction. As an independent manufacturer we offer a complete palette of diesel and gas engines worldwide. Our products are perfectly tailored to meet the requirements of our customers.

More than 1.4 million DEUTZ engines reliably perform their service all over the world. We want to preserve the operational readiness of our engines and with it the satisfaction of our customers. Therefore we are represented worldwide by a network of competent partners, the concentration of whom corresponds to the regional distribution of our engines.

Thus, DEUTZ is not just a name for innovative engines. But also for a complete service package for every aspect of engines, and a service that you can rely on.

You can find an overview of DEUTZ partners in your area, their product competencies and their services on the DEUTZ website (see following address).
Also if there is no direct product competency specified, your DEUTZ partner will be able to help you further with professional advice.
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