

<b>VOLVO PENTA</b>	Document No	Issue Index
	<b>D 16 MG 1800/1500 rpm</b>	<b>23671222</b>

Base on water temp 38°C/100°F

**General**

In-line four stroke diesel engine with direct injection. Rotation direction, anti-clockwise viewed towards flywheel. Turbocharged

Number of cylinders		6	
Displacement, total	litre in <sup>3</sup>	16,12 983,9	
Firing order		1-5-3-6-2-4	
Bore	mm in	144 5,67	
Stroke	mm in	165 6,50	
Compression ratio		17,5:1	
Dry weight	Engine only, excluding cooling system	kg lb	1750 3858

<b>Performance</b>		<b>rpm load</b>	<b>1500</b>				
			<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>100%</b>	<b>110%</b>
Power setting 479 kW		kW hp	120 163	240 326	359 489	479 651	527 717
Torque at:	Power setting 479 kW	Nm lbft	762 562	1525 1124	2287 1687	3049 2249	3354 2474
Mean piston speed		m/s ft/sec	8,3 27,1				
Effective mean pressure at:	Power setting 479 kW	MPa psi	0,6 86	1,2 172	1,8 259	2,4 345	2,6 379
Max combustion pressure at:	Power setting 479 kW	MPa psi	7,8 1131	10,4 1508	13,5 1958	17,1 2480	18,7 2712
Total mass moment of inertia, J (mR <sup>2</sup> ) Engine only		kgm <sup>2</sup> lbft <sup>2</sup>	4,70698 111,7				
Degree of irregularity at:	Power setting 479 kW Power setting		1;353	1;131	1;71	1;48	1;43
Friction Power		kW hp	42 57	42 57	42 57	42 57	42 57

**If applicable Derating are described in Technical Diagrams**

<b>Performance</b>		<b>rpm load</b>	<b>1800</b>				
			<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>100%</b>	<b>110%</b>
Power setting 532 kW		kW hp	133 181	266 362	399 543	532 724	585 796
Torque at:	Power setting 532 kW	Nm lbft	706 520	1411 1041	2117 1561	2822 2081	3105 2290
Mean piston speed		m/s ft/sec	9,9 32,6				
Effective mean pressure at:	Power setting 532 kW	MPa psi	0,5 80	1,1 160	1,6 239	2,2 319	2,4 351
Max combustion pressure at:	Power setting 532 kW	MPa psi	8,3 1204	11,3 1639	14,6 2118	17,7 2567	18,7 2712
Total mass moment of inertia, J (mR <sup>2</sup> ) Engine only		kgm <sup>2</sup> lbft <sup>2</sup>	4,70698 111,7				
Degree of irregularity at:	Power setting 532 kW		1;295	1;264	1;134	1;88	1;79
Friction Power		kW hp	59 80,24	59 80,24	59 80,24	59 80,24	59 80,24

**If applicable Derating are described in Technical Diagrams**

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**Engine noise emission**

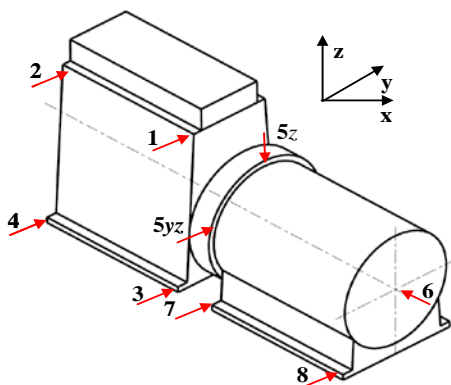
Test Standards: ISO 3744-1981 (E) sound power (without exhaust noise)

Tolerans ± 0.75 dB(A)

Measured sound power Lw		rpm load	1500			
			25%	50%	75%	100%
No load		dB(A)				
	Power setting 479 kW	dB(A)	112	113	114	114,5
		<b>rpm</b>	<b>1800</b>			
No load		dB(A)				
	Power setting 532 kW	dB(A)	114	115	116	116

**Vibrations (vibration velocity)**

Declared vibration levels according to ISO 8528-9



Measuring position	rpm 1500		
	RMS Velocity (10 - 1000Hz)		
	Measurement direction		
	Axial [ x ] mm/s	Transverse [ y ] mm/s	Vertical [ z ] mm/s
1	10,7	10,6	10,9
2	9,5	12,4	15,4
3	8,2	14,7	8
4	8,8	16,8	16,1
5	10,5	10,7	15,8
6	10	16,7	13
7	9,3	18,9	17,4
8	9,7	21,2	17,7
<b>rpm 1800</b>			
1	13	10,4	15,5
2	12	19,5	18
3	11	19,7	11,7
4	12	27,9	20,1
5	9	11,1	18,1
6	12	23,4	17,5
7	9	27,2	19,8
8	10	23,2	23

**Test conditions for load acceptance data**

Warm engine.	<b>Generator</b>	<b>Modell</b>	<b>Type of AVR</b>
	Stamford	HCM 534F	MX-341
	<b>Voltage droop</b>		

Load acceptance performance can vary due to actual alternator inertia, voltage regulator, type of load and local ambient conditions.

**Single step load performance at 1500 rpm**

Load (%)	Speed diff (%)		Recovery time (s)		Remaining load (%)	Speed diff (%)		Recovery time (s)	
	Nominal	110% power	Nominal	110% power		Nominal	110% power	Nominal	110% power
0-20	3,2	3,4	1,4	1,3	20-100	27,9	26,5	5,7	4,9
0-40	5,3	5,9	1,2	2,2	40-100	12,6	11,1	3,2	3,9
0-50	9,1	9,7	2,4	3,6	50-100	9,4	7,9	2,9	3,3
0-60	13,4	14,3	3,8	3,7	60-100	6,3	6,1	2,4	3,1
0-55,6	10,0	9,7	3,5	3,6	55,6-100	8,0	7,9	3,0	3,9
0-50,5					50,5-100				
100-0					4,2				

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**Single step load performance at 1800 rpm**

Load (%)	Speed diff %		Recovery time (s)		Remaining load (%)	Speed diff (%)		Recovery time (s)	
	Nominal	110% power	Nominal	110% power		Nominal	110% power	Nominal	110% power
0-20	2,4	2,7	1,2	1,3	20-100	18,4	19,7	3,7	7,6
0-40	4,2	4,5	1,6	1,5	40-100	9,4	9,4	2,1	3,8
0-60	8,3	10,7	2,0	2,4	60-100	3,8	3,9	1,5	1,6
0-70	13,1	15,3	2,8	3,1	70-100	3,2	3,2	1,4	1,5
0-67,4	10,4	9,9	1,5	2,2	67,4-100	3,5	4,1	1,5	2,7
0-61,3					61,3-100				
100-0					8,0				

**Cold start performance**

	rpm	1500	1800	
Time from start to no load speed at ambient temperature:	20°C	s	5,8	6,7
	5 °C	s	6,0	7,1
Time from start to stay within 0.5% of no load speed at ambient temperature:	20°C	s	5,8	6,7
	5 °C	s	6,0	7,1
<b>Block heater type</b>	<b>Make</b>	<b>Power kW</b>	<b>Engaged hours</b>	<b>Cooling water temp engine block</b>
Ext./Thermostat-ctrl	Volvo Penta	2	12	32°C 90°F

**Lubrication system**

		rpm	load	25%	50%	1500	75%	100%	110%
Lubricating oil consumption	Power setting 479 kW	liter/h						0,100	0,110
		US gal/h						0,026	0,029
	Power setting 532 kW	<b>rpm 1800</b>							
		liter/h						0,110	0,120
		US gal/h						0,029	0,032
Oil system capacity including filters		liter			55				
		US gal			14,5				
Oil sump capacity:	max	liter			49				
		US gal			12,9				
	min	liter			39				
		US gal			10,3				
Oil change intervals/ specifications: (Fuel quality dependant)	VDS-2. ACEA: E3, E5. API: CG-4, CH4	h			400				
	VDS. ACEA: E2. API: CF, CF-4	h			500				
		h							
		h							
Engine angularity limits, static (ref. classification rules, roll and pitch simultaneously)	front up	°			10				
	front down	°			10				
	side tilt	°			23				
Engine angularity limits, dynamic (ref. classification rules, roll and pitch simultaneously)	front up	°			10				
	front down	°			10				
	side tilt	°			23				

**Lubrication system**

	rpm	1500	1800
Oil pressure at rated speed	kPa	425 - 440	
	psi	62 - 64	
Oil pressure shut down switch setting	kPa	200 - 200	
	psi	29	29
Lubrication oil temperature in oil sump:	max	°C 128	
		°F 262	
Oil filter micron size	μ	40	

\* See also general section in the sales guide

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<b>Fuel system</b>		<b>rpm load</b>	<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>100%</b>	<b>110%</b>	
Specific fuel consumption with:	Power setting 479 kW	g/kWh	225	204	199	200	200	
		lb/hph	0,364	0,330	0,323	0,324	0,325	
			<b>rpm</b>	<b>1800</b>				
	Power setting 532 kW	g/kWh	235	207	205	206	210	
lb/hph		0,381	0,336	0,331	0,334	0,340		
Fuel to conform to		ASTM-D975-No. 1 and 2-D, JIS KK 2204, EN 590 DMX and MDO-DMA (ISO8271)						
		<b>rpm</b>	<b>1500</b>					
System return flow	Power setting 479 kW	liter/h	47	47	47	47	47	
		US gal/h	12,4	12,4	12,4	12,4	12,4	
			<b>rpm</b>	<b>1800</b>				
	Power setting 532 kW	liter/h	51	51	51	51	51	
US gal/h		13,5	13,5	13,5	13,5	13,5		
		<b>rpm</b>	<b>1500</b>					
System supply flow	Power setting 479 kW	liter/h	79	105	132	161	172	
		US gal/h	20,9	27,7	34,9	42,5	45,4	
			<b>rpm</b>	<b>1800</b>				
	Power setting 532 kW	liter/h	88	117	148	181	197	
US gal/h		23,2	30,9	39,1	47,8	52,0		
		<b>rpm</b>	<b>1500</b>					
Normal fuel pressure (after filter)	Power setting 479 kW	kPa	455	449	445	438	437	
		psi	66,0	65,1	64,5	63,5	63,4	
			<b>rpm</b>	<b>1800</b>				
	Power setting 532 kW	kPa	478	475	472	466	466	
psi		69,3	68,9	68,5	67,6	67,6		

**Fuel system**

Fuel supply line max restriction	kPa	10
	psi	1,5
Fuel supply max pressure head (day tank, from CL)	m	2
	feet	6,6
Fuel supply line max suction head (from CL)	kPa	2
	psi	0,3
Fuel return line max restriction	kPa	20
	psi	2,9
Maximum allowable inlet fuel temp	°C	60
	°F	140

<b>Fuel system</b>		<b>rpm load</b>	<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>100%</b>	<b>110%</b>	
Fuel temp rise over engine	Power setting 479 kW	°C	27	27	27	27	27	
		°F	81	81	81	81	81	
			<b>rpm</b>	<b>1800</b>				
	Power setting 532 kW	°C	32	32	32	32	32	
°F		90	90	90	90	90		
Prefilter / Water separator micron size	μ	10						
Fuel filter micron size	μ	2						
		<b>rpm</b>	<b>1500</b>		<b>1800</b>			
Governor type/make, standard	Electronic/Volvo EMSII			Electronic/Volvo EMSII				
Injection pump type/make	Unit injector			Unit injector				
Injection timing std.	°B.T.D.C							
Injection timing	°B.T.D.C							

rpm

1500

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<b>Intake system</b>		<b>load</b>	<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>100%</b>	<b>110%</b>
Air consumption at: (+25°C and 100kPa)	Power setting 479 kW	m <sup>3</sup> /min	14,93	21,43	29,08	35,4	37,28
		cfm	527	757	1027	1250	1317
		<b>rpm</b>	<b>1800</b>				
	Power setting 532 kW	m <sup>3</sup> /min	19,9	28,43	37	41,42	42,28
		cfm	703	1004	1307	1463	1493
Max allowable air intake restriction including piping		kPa	3				
		psi	0,4				
Air filter type		Paper cartridge					
Air filter cleaning efficiency		%	98				

<b>Exhaust system</b>		<b>rpm</b>	<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>100%</b>	<b>110%</b>
Heat rejection to exhaust at:	Power setting 479 kW	kW	94	166	245	327	360
		BTU/min	5329	9440	13922	18590	20490
		<b>rpm</b>	<b>1800</b>				
	Power setting 532 kW	kW	112	192	278	379	432
		BTU/min	6381	10913	15832	21553	24590

<b>Exhaust system</b>		<b>rpm</b>	<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>100%</b>	<b>110%</b>
Exhaust gas temperature after turbine at:	Power setting 479 kW	°C	320	381	408	441	457
		°F	608	718	766	826	855
		<b>rpm</b>	<b>1800</b>				
	Power setting 532 kW	°C	288	335	366	432	474
		°F	550	635	691	810	885
Max allowable back pressure in exhaust line		kPa	15				
		psi	2,2				

<b>Exhaust system</b>		<b>rpm</b>	<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>100%</b>	<b>110%</b>
Exhaust gas flow at: (temp and pressure after turbine at the corresponding power setting)	Power setting 479 kW	m <sup>3</sup> /min	30,47	47,65	65,33	80,4	85,57
		cfm	1076	1683	2307	2839	3022
		<b>rpm</b>	<b>1800</b>				
	Power setting 532 kW	m <sup>3</sup> /min	38,07	57,83	76,68	92,58	99,52
		cfm	1344	2042	2708	3269	3515

<b>Cooling system</b>		<b>rpm</b>	<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>100%</b>	<b>110%</b>
Heat rejection radiation from engine to surrounding at:	Power setting 479 kW	kW	1	5	11	17	22
		BTU/min	57	284	626	967	1251
		<b>rpm</b>	<b>1800</b>				
	Power setting 532 kW	kW	3	7	13	19	24
		BTU/min	171	398	739	1081	1365
		<b>rpm</b>	<b>1500</b>				
Heat rejection to raw water system at:	Power setting 479 kW	kW	86	152	228	324	343
		BTU/min	4891	8644	12966	18426	19506
		<b>rpm</b>	<b>1800</b>				
	Power setting 532 kW	kW	128	199	295	404	434
		BTU/min	7279	11317	16776	22975	24681

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**Cooling system. Fresh water coolant circuit**

Coolant volume engine, including heat exchanger, charge air cooler and std. expansion tank	liter	56	
	US gal	14,79	
Max. additional coolant for cabin heater etc. with std. expansion tank	liter	6	
	US gal	1,59	
Max. coolant flow to cabin heater etc.	l/s		
	US gal/s		
Coolant pump	drive/ratio	1;1,906	
	<b>rpm</b>	<b>1500</b>	<b>1800</b>
Coolant flow with fully open thermostat	l/s	N/A	N/A
	US gal/s		
Nominal coolant pressure with standard system	kPa	75	75
	psi	10,9	10,9
Thermostat	start to open	°C	86
		°F	187
	fully open	°C	96
		°F	205
Maximum static pressure head (expansion tank height + pressure cap setting)	kPa	100	
	psi	14,5	
Standard pressure cap setting	kPa	75	
	psi	10,9	

**Cooling system. Engine mounted raw water pump**

Raw water pump	drive/ratio	1;1,31	
	<b>rpm</b>	<b>1500</b>	<b>1800</b>
Nominal raw water design flow	l/s	378,0	438,0
	US gal/s	99,9	115,7
Nominal raw water pump pressure head at design flow (measured before and after pump)	kPa	80	100
	psi	11,6	14,5
Maximum raw water pump suction head	kPa	30	30
	psi	4,4	4,4
Maximum additional pressure drop (after heat exchanger )	kPa	26	33
	psi	3,8	4,8
Maximum raw water temperature entering heat exchanger	°C	38	
	°F	100	

**Cooling system. Raw water circuit central cooling**

	<b>rpm</b>	<b>1500</b>	<b>1800</b>
Maximum raw water flow	l/s		
	US gal/s		
Minimum raw water flow	l/s	378,0	438,0
	US gal/s	99,9	115,7
Pressure drop engine raw water circuit at maximum flow	kPa		
	psi		
Pressure drop engine raw water circuit at minimum flow	kPa	53	70
	psi	7,7	10,2
Maximum allowed raw water circuit pressure before heat exchanger (external pump system )	kPa	400	
	psi	58,0	
Maximum raw water temperature entering heat exchanger	°C	38	
	°F	100	

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<b>Charge air cooler system</b>		<b>rpm load</b>	<b>25%</b>	<b>50%</b>	<b>1500 rpm 75%</b>	<b>100%</b>	<b>110%</b>
Cooling power	Power setting 479 kW	kW	8,1	28,9	63,1	100,3	113,4
		BTU/min	461	1644	3588	5704	6449
	Power setting 532 kW	<b>rpm 1800</b>					
		kW	15	48	93	132	148
Charge air mass flow	Power setting 479 kW	kg/s	0,289	0,415	0,564	0,686	0,722
		<b>rpm 1800</b>					
	Power setting 532 kW	kg/s	0,392	0,56	0,729	0,816	0,833
		<b>rpm 1500</b>					

<b>Charge air cooler system</b>		<b>rpm load</b>	<b>25%</b>	<b>50%</b>	<b>1500 rpm 75%</b>	<b>100%</b>	<b>110%</b>
Charge air inlet temp. (Charge air temp after turbo compressor)	Power setting 479 kW	°C	67	113	159	197	210
		°F	153	235	318	387	410
	<b>rpm 1800</b>						
	Power setting 532 kW	°C	80	129	176	216	233
		°F	176	264	349	421	451
			<b>rpm 1500</b>				
		<b>rpm 1800</b>					

<b>Charge air cooler system</b>		<b>rpm load</b>	<b>25%</b>	<b>50%</b>	<b>1500 rpm 75%</b>	<b>100%</b>	<b>110%</b>
Charge air outlet temp. (Charge air temp after charge air cooler)	Power setting 479 kW	°C	40	44	48	52	55
		°F	104	111	118	126	131
	<b>rpm 1800</b>						
	Power setting 532 kW	°C	41	45	50	55	57
		°F	106	113	122	131	135
			<b>rpm 1500</b>				
Maximum pressure drop over charge air cooler, incl. piping		kPa psi					
Charge air pressure	Power setting 479 kW	kPa	239				
		psi	34,66				
	<b>rpm 1800</b>						
	Power setting 532 kW	kPa	239				
psi		34,66					
Standard charge air cooler core area		m <sup>2</sup> foot <sup>2</sup>	0,04 0,43				

**Engine management system**

<b>Functionality</b>	<b>Alternatives</b>	<b>Default setting</b>
Governor mode	Isochronus/Droop Switchable during operation	Droop
Governor droop	0-5%	0,0
Governor response	P, I and D via VODIA	
Idle speed	600-1200rpm	900rpm
Fine speed adjustment	N/A	±120rpm
Stop function	Energized to run / stop	Energized to stop

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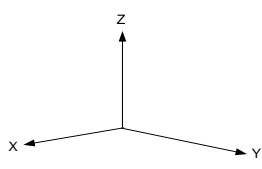
Engine protection		Alarm level	
Parameter	Unit	Setting range	Default setting
Oil temp	°C	N/A	125
Oil pressure	Low idle	kPa	N/A
	1500 rpm	kPa	N/A
	1800 rpm	kPa	N/A
Oil level		N/A	Low level
Piston cooling pressure >1000 rpm	kPa	N/A	150±20
Coolant temp	°C	95-103	98
Coolant level		N/A	Low level
Fuel feed pressure	Low idle	kPa	N/A
	>1400 rpm		N/A
Water in fuel		N/A	Water in fuel
Crank case pressure	kPa	N/A	Inc pressure
Charge air temp	°C	N/A	80
Charge air pressure	kPa	N/A	400
Engine speed	rpm	100-120% of rated speed	120%

**Note!** Complete sensor list available

**Electrical system**

**rpm 1500 and 1800**

Voltage and type		24V / insulated from earth	
Alternator:	make/output	A	Bosch 20849349/35-80A
	tacho output	Hz/alt. Rev	6
	drive ratio		4
Starter motor	make	Melco	
	type	24V/7kW	
	kW	7kW	
Starter motor solenoid,	pull current	A	2
	hold current	A	N/A
Number of teeth on:	flywheel		153
	starter motor		12
Inrush current at +20°C \ +5°C	A	2000	\ 2100
Cranking current at +20°C \ +5°C	A	375	\ 390
Crank engine speed at 20°C \ +5°C	rpm	165	\ 140
Starter motor battery capacity:	max	Ah	2x220 700A DIN
	min at +5°C	Ah	2x180 600A DIN
Max. g-force	x	m/s <sup>2</sup>	
	y	m/s <sup>2</sup>	
	z	m/s <sup>2</sup>	



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Sensors							Switches	
Control and Monitoring System							Engine Shutdown System	
Sensors	Signal	Unit	Range	Warning Initial Delay / Warning Delay	Warning Level	Derating Level	Shutdown Initial Delay / Shutdown Delay	Shutdown Level (Tolerance)
Charge air pressure	0,5-4,5 V	kPa	50 - 400 (150-500 abs).	30 sec from start / 5 sec	300 (400 absolute)	NA	NA	NA
Charge air temperaure	50-0 kΩ	°C	-40 - 130	30 sec from start / 5 sec	80	NA	NA	NA
Coolant level switch	Digital		ON/OFF	30 sec from start / 5 sec	Low (ON / Closed)	NA	NA	NA
Coolant temperature	50-0 kΩ	°C	-40 - 140	30 sec from start / 5 sec	98	NA	4 sec from start/ 1 sec	105 (± 2°C) SDU Ch. S1
Engine speed cam	Frequency	rpm		Instant	Lost signal	NA	NA	NA
Engine speed crank	Frequency	rpm		Instant	Lost signal	NA	NA	NA
Eng. overspeed SDU 1500 +15%	Frequency	rpm / Hz	153 puls./rev.	Instant	Lost signal	NA	Instant	1725 / 4399 Hz (-1 to 0%)
Eng. overspeed SDU 1800	Frequency	rpm / Hz	153 puls./rev.	Instant	Lost signal	NA	Instant	2070 / 5279 Hz (-1 to 0%)
Exhaust gas temperature	PT200	°C	0 - 850	30 sec from start / 5 sec	650	NA	NA	NA
Oil level sensor	Digital		ON/OFF	30 sec from start / 5 sec	Low level	NA	NA	NA
Oil temperature	50-0 kΩ	°C	-40 - 140	30 sec from start / 5 sec	125	NA	NA	NA
Piston cooling switch	Digital	kPa	ON/OFF	Above 1000 rpm instant	120 ±20	NA	NA	NA
Water In fuel switch	Digital		ON/OFF	All the time	Water in fuel	NA	NA	NA

NA = Not applicable

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Sensors (rpm dependent)	Signal	Unit	Range	Initial Delay /	Warning Level / Derating Level / Shutdown Level					Switches
<b>Coolant pressure</b>	0,5-4,5 V	kPa	0-300		<b>0 rpm</b>	<b>600 rpm</b>	<b>1000 rpm</b>	<b>1500 rpm</b>	<b>1900 rpm</b>	
Warning Level		kPa		30 sec from start / 5 sec	0	5	55	100	130	
Derating Level		kPa		NA	NA	NA	NA	NA	NA	
Shutdown Level (Shutdown Unit Channel S4)	Digital	kPa	ON/OFF	4 sec from start / 1 sec	NA	NA	NA	25 (-10/+20)	25 (-10/+20)	<u>Shutdown Unit Setting</u> S4:1150 rpm ±2% 2933 Hz ±2% 153 pulses / revolution
<b>Differential oil pressure</b>	NA	kPa	NA		<b>0 rpm</b>	<b>500 rpm</b>	<b>1000 rpm</b>	<b>1500 rpm</b>	<b>1800 rpm</b>	
Warning Level		kPa		NA	NA	NA	NA	NA	NA	
Derating Limit		kPa		NA	NA	NA	NA	NA	NA	
<b>Fuel pressure</b>	0,5-4,5 V	kPa	0-700		<b>0 rpm</b>	<b>600 rpm</b>	<b>1000 rpm</b>	<b>1500 rpm</b>	<b>1800 rpm</b>	
Warning Level		kPa		30 sec from start / 5 sec	-50	50	75	175	200	
Derating Level		kPa		NA	NA	NA	NA	NA	NA	
<b>Oil pressure</b>	0,5-4,5 V	kPa	0-700		<b>0 rpm</b>	<b>500 rpm</b>	<b>1000 rpm</b>	<b>1500 rpm</b>	<b>1900 rpm</b>	
Warning Level		kPa		30 sec from start / 5 sec	-100	150	200	250	250	
Derating Level		kPa		NA	NA	NA	NA	NA	NA	
Shutdown Level (Shutdown Unit Channel S3)	Digital	kPa	ON/OFF	4 sec from start / 1 sec	NA	NA	200 ±20	200 ±20	200 ±20	<u>Shutdown Unit Setting</u> S2,S3:850 rpm ±2% 2168 Hz ±2% 153 pulses / revolution
<b>Seawater pressure</b>	0,5-4,5 V	kPa	0-300		<b>0 rpm</b>	<b>600 rpm</b>	<b>1400 rpm</b>	<b>1700 rpm</b>	<b>1900 rpm</b>	Only HE and KC
Warning Level		kPa		30 sec from start / 5 sec	-20	5	25	35	40	Only HE and KC
Derating Level		kPa		NA	NA	NA	NA	NA	NA	

Warning = Yellow Lamp active

Derating = Red Lamp active

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