

General

4-stroke direct injected, turbocharged and aftercooled diesel engine

Number of cylinders		6
No of valves		24
Displacement, total	litres in ³	10,84 661,3
Firing order		1-5-3-6-2-4
Rotational direction, viewed from the front		Clockwise
Bore	mm in	123 4,84
Stroke	mm in	152 5,98
Compression ratio		16,5:1
Compression pressure at 240 rpm	MPa psi	
Max. static forward inclination:	°	0
Max. static backward inclination:	°	7
Max. intermittent forward inclination while running:	°	10
Max. intermittent backward inclination while running:	°	17
Max. intermittent side inclination while running:	°	30
Idling speed	rpm	600 (+50)
Rated speed R5	rpm	
Rated speed R4	rpm	
Rated speed R3	rpm	2250
Propeller selection range R5	rpm	
Propeller selection range R4	rpm	
Propeller selection range R3	rpm	2250-2300
Dry weight engine BT	kg lb	1145 2524

Performance	Rating	rpm	700	900	1100	1300	1600	1800	1900	2000	2100	2250
Crankshaft power 1), 5)												
	3	kW hp	71 97	120 163	180 245	252 343	310 422	345 469	362 492	371 505	375 510	375 510
Propeller shaft power 1) (At full load) With drive Reverse gear												
	3	kW hp	69 94	116 158	175 237	244 332	301 409	335 455	351 478	360 489	364 495	364 495
Propellershaft power at prop. load x ^{2,5} #N/A												
	3	kW hp	20 27	37 50	61 83	92 126	155 211	208 283	238 324	271 369	306 416	364 495
Propellershaft power at prop. load x ³ With drive Reverse gear												
	3	kW hp	11 15	23 32	43 58	70 95	131 178	186 253	219 298	255 347	296 402	364 495
Torque at crankshaft 2)												
	3	Nm lbf ft	968,6 714	1273 939	1563 1153	1851 1365	1850 1365	1830 1350	1819 1342	1771 1307	1705 1258	1592 1174
Mean piston speed		m/s ft/s	3,5 11,6	4,6 15,0	5,6 18,3	6,6 21,6	8,1 26,6	9,1 29,9	9,6 31,6	10,1 33,2	10,6 34,9	11,4 37,4
	3	MPa psi	1,12 162,9	1,48 214,1	1,81 262,8	2,15 311,3	2,15 311,2	2,12 307,8	2,11 306,0	2,05 297,9	1,98 286,8	1,85 267,7
Max combustion pressure 2)												
	3	MPa psi	11,1 1610	13,2 1914	16,8 2437	17,1 2480	16,3 2364	16,5 2393	16,6 2408	16,5 2393	16,7 2422	16,5 2393

Lubricating system

Specific lubricating oil consumption.	g/kWh	0,1
Max. oil volume including filters for all allowed installation inclinations:	litres	30
	US gal	7,93
Max. oil volume excluding filters for all allowed installation inclinations:	litres	25
	US gal	6,60
Min. oil volume excluding filters for all allowed installation inclinations:	litres	21
	US gal	5,55

Fuel system

	Rating	rpm	700	900	1100	1300	1600	1800	1900	2000	2100	2250
Specific fuel consumption 2)												
	3	g/kWh lb/hph	246,4 0,399	239 0,387	248 0,402	214,1 0,347	199,8 0,324	200,1 0,324	202,3 0,328	206,7 0,335	207,3 0,336	212,7 0,345
Fuel consumption, Test cycle E3	3	g/kWh lb/hph						217,5 0,35				
Fuel consumption at prop. load x ^{2,5}												
	3	l/h US gal/h	6,2 1,6	10,6 2,8	16,9 4,5	24,9 6,6	41,3 10,9	54,7 14,5	62,7 16,6	72,4 19,1	80,4 21,2	95,8 25,3

Fuel system

	Rating	rpm	700	900	1100	1300	1600	1800	1900	2000	2100	2250
Fuel consumption at full load												
	3	l/h US gal/h	20,9 5,5	34,3 9,1	53,4 14,1	64,6 17,1	74,1 19,6	82,6 21,8	87,6 23,1	91,8 24,2	93,0 24,6	95,4 25,2

Intake and exhaust system	Rating	rpm	700	900	1100	1300	1600	1800	1900	2000	2100	2250	
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.													
	3	°C	529	637	706	594	490	450	438	428	415	406	
		°F	984	1179	1303	1101	914	842	820	802	779	763	
Permitted back pressure in the exhaust line at rated speed. (Installed back pressure)		kPa							Max	15			
		psi								2,2			
		kPa							Min				
		psi											

Intake and exhaust system	Rating	rpm	700	900	1100	1300	1600	1800	1900	2000	2100	2250
Engine air consumption at 25°C / 77°F atmospheric pressure 100kPa and relative humidity 30%.												
	3	m³/min cu.ft./min	4,2 148,3	6,7 236,6	9,6 339	13,3 469,7	18,8 663,9	23,1 815,8	25,6 904,1	27,8 981,7	28,7 1014	30,7 1084
Charge air pressure Inlet manifold												
	3	kPa psi	22 3,2	48 7,0	76 11,0	108 15,7	146 21,2	172 24,9	186 27,0	197 28,6	195 28,3	198 28,7
Exhaust gas flow												
	3	m³/min cu.ft./min	6,9 243,7	9,6 339	12,4 437,9	13,1 462,6	18,7 660,4	23 812,2	25,4 897	27,6 974,7	28,6 1010	30,9 1091

Cooling system	Rating	rpm	700	900	1100	1300	1600	1800	1900	2000	2100	2250	
Radiated heat in percent of crankshaft power.		%											
	3		5,7	4,2	3,5	2,5	1,4	1,2	1,1	1,1	1,1	1,1	
Heat rejection to charge air cooler in percent of crankshaft power.		%											
	3		4	6	8	10	14	17	19	25,1	21	23	
Coolant heat rejection to HE, incl. engine oil cooler and excl. charge air cooler, in percent of crankshaft power.		%											
	3		131	133	100	79	51	39	35	33	31	31	
Coolant flow with fully open thermostat and std cooling system		l/min cu.ft./min	249 8,8	342 12,1	400 14,1	477 16,8	591 20,9	693 24,5	742 26,2	750 26,5	738 26,1	733 25,9	
		°C °F							98 208				
Coolant volume engine, including heat exchanger and charge air cooler		litres US gal.							46 12,15				
		litres US gal.							40 10,57				
Maximum coolant flow to cabin heater etc.		l/min cu.ft./min							76 2,68				
		°C °F							76 169				
Thermostat, start open at		°C °F							86 187				
		°C °F							86 187				

Raw water circuit	rpm	700	900	1100	1300	1600	1800	1900	2000	2100	2250		
Nominal raw water design flow		l/min cu.ft./min	91 3,2	99 3,5	121 4,3	141 5,0	174 6,1	204 7,2	227 8,0	249 8,8	258 9,1	266 9,4	
		kPa psi							-10 -1,5				
Maximum raw water temperature entering heat exchanger		°C °F							32 90				

Emissions	Rating	rpm	700	900	1100	1300	1600	1800	1900	2000	2100	2250
Smoke at prop. load x ^{2.5}												
	3	*BSU	0,0	0,0	0,0	0,7	0,2	0,1	0,1	0,1	0,1	0,1
Noise at prop. load x ^{2.5} . 4)												
	3	dBA	103,1	106,2	108,8	109,3	111,1	112,4	113,3	113,7	115,2	115,9

*NB.! BSU are calculated values. Measured values are acc. to ISO 10054 in FSN units

Sensors Control and Monitoring System							Switches 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 ± 4.2kPa	30 sec from start / 2 sec	270 kPa (relative)	280 kPa*	NA	NA
Charge air temperature	50-0 kΩ	°C	-40 - 130 ± 4%	30 sec from start / 2 sec	75°C	80°C (soft 3)	NA	NA
Coolant level switch	Digital		ON / OFF	30 sec from start / 100 sec	Low level / Lost signal	NA	NA	NA
Coolant temperature	50-0 kΩ	°C	-40 - 140 ± 1.5°C	30 sec from start / 2 sec	98°C	101°C (soft 1)	4 sec from start / 1 sec	105 (± 2°C) SDU Ch. S1
Engine speed cam	Frequency	rpm		Instant	Lost signal	Lost signal**	NA	NA
Engine speed crank	Frequency	rpm		Instant	Lost signal	Lost signal**	NA	NA
Eng. overspeed SDU 2250 +15%	Frequency	rpm / Hz	54 puls./rev.	Instant	Lost signal	NA	Instant	2588 / 2329 Hz (-1 to 0%)
Eng. overspeed SDU 2400+15%	Frequency	rpm / Hz	54 puls./rev.	Instant	Lost signal	NA	Instant	2760 / 2484 Hz (-1 to 0%)
Eng. overspeed SDU 2450+15%	Frequency	rpm / Hz	54 puls./rev.	Instant	Lost signal	NA	Instant	2818 / 2536 Hz (-1 to 0%)
Exhaust gas dry temperature	PT200	°C	-40 - 750 ± 2.5%	30 sec from start / 5 sec	Fault Limit table 1	655°C (soft 4)	NA	NA
Exhaust gas wet temperature	PT200	°C	-40 - 750 ± 2.5%	30 sec from start / 5 sec	200°C	NA	NA	NA
Oil level switch	Digital		ON / OFF	30 sec from start / 5 sec	Low level / Lost signal	NA	NA	NA
Oil temperature	50-0 kΩ	°C	-40 - 140 ± 3.5%	30 sec from start / 2 sec	120°C	122°C (soft 2)	NA	NA
Water in fuel switch	Digital		ON / OFF	All the time	Water in fuel	NA	NA	NA
Gear oil pressure (EVC)	0.5-4.5 V	kPa	0-3000 ± 3%	60 sec from start / 7 sec	700 kPa	NA	NA	NA
Gear oil temperature (EVC)	50-0 kΩ	°C	-40 - 140 ± 2.5%	NA (IB) 2s (IPS)	95°C Lost signal during slip	NA	NA	NA
Gear oil pressure (SDU) (Shutdown Unit Channel S2)	Digital	kPa	ON / OFF	NA	NA	NA	11 sec ± 20% from start / 1 sec	400 ± 20 Shutdown Unit Setting S2.S3: 510 rpm ± 2% 459 Hz ± 2% 54 pulses / revolution

NA = Not applicable

* 50% remaining torque from 1500 rpm

** 80% remaining torque

Run detection S4 should be set to same value as S2, S3

Sensors (rpm dependent)	Signal	Unit	Range	Initial Delay / Delay	Warning Level / Derating Level / Shutdown Level rpm Map					Notes
					0 rpm	600 rpm	1000 rpm	1500 rpm	2250/2400/2450 rpm	
Coolant pressure										
	0.5-4.5 V	kPa	0-300 ± 3%							
Warning Level		kPa		30 sec from start / 2 sec	NA	3	20	50	70	
Derating Level		kPa		Instant after warning	NA	NA	10	40	60	50% remain torque >1500 rpm
Shutdown Level (Shutdown Unit Channel S4)	NA	kPa	NA	NA	NA	NA	NA	NA	NA	Run detection S4 = S2, S3
Fuel pressure										
	0.5-4.5 V	kPa	0-700 ±1.5%							
Warning Level		kPa		30 sec from start / 2 sec	NA	125	200	260	270	
Derating Level		kPa		NA	NA	NA	NA	NA	NA	
Oil pressure										
	0.5-4.5 V	kPa	0-700 ±1.5%							
Warning Level		kPa		30 sec from start / 1 sec	NA	136	280	320	330	
Derating Level		kPa		Instant after warning	NA	80	260	300	310	30% remain torque > 1500 rpm
Shutdown Level (Shutdown Unit Channel S3)	Digital	kPa	ON/OFF	11 sec ±20% from start / 1 sec	NA	120 ± 20	120 ± 20	120 ± 20	120 ± 20	Shutdown Unit Setting S2.S3: 510 rpm ± 2% 459 Hz ± 2% 54 pulses / revolution
Piston cooling pressure										
	0.5-4.5 V	kPa	0-700 ±1.5%							
Warning Level		kPa		30 sec from start / 4 sec	NA	NA	75	230	250	
Derating Level		kPa		Instant after warning	NA	NA	65	220	240	30% remain torque > 1500 rpm
Seawater pressure										
	0.5-4.5 V	kPa	0-300 ± 3%							
Warning Level		kPa		30 sec from start / 5 sec	NA	1	8	17	30	
Derating Level		kPa		Instant after warning	NA	NA	NA	7	20	Derate active >1500 rpm

Warning = Yellow Lamp active

Derating = Red Lamp active

Soft 1) Soft derate Coolant Temp. Remaining torque in %	Speed / °C	101°C	103°C	106°C
	600	100%*	100%*	100%*
	1000	100%*	100%*	100%*
	1500 ->	100%*	75%	50%

Soft 2) Soft derate Oil Temp. Remaining torque in %	Speed / °C	122°C	124°C	126°C
	600	100%*	100%*	100%*
	1000	100%*	100%*	100%*
	1500 ->	100%*	50%	30%

Soft 3) Soft derate Charge Air Temp. Remaining torque in %	Speed / °C	80°C	85°C	90°C
	600	100%*	100%*	100%*
	1000	100%*	100%*	100%*
	1500 ->	100%*	50%	30%

Soft 4) Soft derate Exhaust Temp. Remaining torque in %	Speed / °C	655°C	665°C	670°C	675°C
	600	100%*	100%*	100%*	100%*
	1000	100%*	100%*	100%*	100%*
	1500 ->	100%*	60%	20%	10%

* = Alarm but no derate











