

General

4-stroke direct injected, turbocharged and aftercooled diesel engine

Number of cylinders		6
No of valves		24
Displacement, total	litres	12,78
	in ³	779,7
Firing order		1-5-3-6-2-4
Rotational direction, viewed from the front		Clockwise
Bore	mm	131
	in	5,16
Stroke	mm	158
	in	6,22
Compression ratio		18,5
Compression pressure at 240 rpm	MPa	3,5
	psi	508
Max. static forward inclination:	°	0
Max. static backward inclination:	°	10
Max. intermittent forward inclination while running:	°	35
Max. intermittent backward inclination while running:	°	35
Max. intermittent side inclination while running:	°	35
Idling speed	rpm	550 - 800
Rated speed R2	rpm	1900
Propeller selection range R2	rpm	1870-1970
Dry weight engine BT	kg	HE=1520, KC=1480
	lb	HE=3351, KC=3263

Performance	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Crankshaft power 1), 5)	2	kW	80,6	164	248,5	298,5	351,7	373,7	398,7	440,5	441,4
		hp	110	223	338	406	478	508	542	599	600
Propeller shaft power 1) (At full load) With drive Twin Disc 5114	2	kW	77	157	239	287	338	359	383	423	424
		hp	105	214	324	390	459	488	521	575	576
Propellershaft power at prop. load x ³ With drive Twin Disc 5114	2	kW	13	32	62	107	170	209	253	360	424
		hp	18	43	84	145	231	284	344	490	576
Torque at crankshaft 2)	2	Nm	1283	1958	2373	2375	2399	2379	2380	2337	2218
		lbf ft	946	1444	1750	1752	1769	1755	1755	1724	1636
Mean piston speed		m/s	3,2	4,2	5,3	6,3	7,4	7,9	8,4	9,5	10,0
		ft/s	10,4	13,8	17,3	20,7	24,2	25,9	27,6	31,1	32,8
Effective mean pressure 2)	2	MPa	1,26	1,93	2,33	2,34	2,36	2,34	2,34	2,30	2,18
		psi	183,0	279,2	338,5	338,8	342,2	339,4	339,4	333,3	316,4
Max combustion pressure 2)	2	MPa	11,7	15,2	16,0	16,5	17,6	18,0	18,3	17,0	16,5
		psi	1697	2205	2321	2393	2553	2611	2654	2466	2393

Lubricating system

Specific lubricating oil consumption.	g/kWh	0,06
Max. oil volume including filters for all allowed installation inclinations:	litres	49
	US gal	12,94
Max. oil volume excluding filters for all allowed installation inclinations:	litres	44
	US gal	11,62
Min. oil volume excluding filters for all allowed installation inclinations:	litres	35
	US gal	9,25

1) ISO 3046, fuel temp 40°C.

ISO 8665 (=SAE J 1228=ICOMIA 28-83)

2) At power according to 1).

3) If reverse gear is used, 4% in heat rejection will be added for its oil cooler.

4) Acc. to ISO 3744

5) At installed back pressure

Fuel system	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Specific fuel consumption US EPA Tier 3	2	g/kWh	234,2	214,9	197,6	195,2	197,2	199,3	201	207	213
		lb/hph	0,379	0,348	0,32	0,316	0,319	0,323	0,326	0,335	0,344
Specific fuel consumption IMO Tier II	2	g/kWh	235,6	215,3	197,1	189	188,8	191,3	194,7	201,7	204,9
		lb/hph	0,382	0,349	0,319	0,306	0,306	0,31	0,315	0,327	0,332
Fuel consumption at prop. load x ³ US EPA Tier 3	2	l/h	5	9	17	28	43	53	64	94	112
		US gal/h	1,3	2,4	4,5	7,4	11,4	14,0	16,9	24,8	29,6
Fuel consumption at prop. load x ³ IMO Tier II		l/h	5	9	17	27	42	50	61	89	108
		US gal/h	1,3	2,4	4,5	7,1	11,1	13,2	16,1	23,5	28,5
Fuel consumption at full load US EPA Tier 3	2	l/h	23	42	59	70	83	89	96	109	112
		US gal/h	6,0	11,1	15,5	18,4	21,9	23,6	25,4	28,8	29,7
Fuel consumption at full load IMO Tier II	2	l/h	23	42	59	68	80	86	93	106	108
		US gal/h	6,0	11,2	15,5	17,8	21,0	22,6	24,6	28,1	28,6

Intake and exhaust system	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900	
Specific exhaust heating effect in percent of crankshaft power	2	%	73	69	63	61	62	62	64	74	76	
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.	2	°C	576	573	494	423	406	409	424	512	519	
		°F	1069	1063	921	793	763	768	795	954	966	
Permitted back pressure in the exhaust line at rated speed. (Installed back pressure)		kPa							Max	12		
		psi								1,7		
		kPa							Min	0		
		psi								0,0		

Intake and exhaust system	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Engine air consumption at 25°C / 77°F atmospheric pressure 100kPa and relative humidity 30%.	2	m³/min	4,8	8,9	14,8	20,8	26,0	27,5	29,0	29,7	29,8
		cu.ft./min	169,5	314,3	522,7	734,5	918,2	971,2	1024	1049	1052
Charge air pressure Inlet manifold	2	kPa	40,0	99,0	168,0	220,0	254,0	257,0	259,0	236,0	224,0
		psi	5,8	14,4	24,4	31,9	36,8	37,3	37,6	34,2	32,5
Exhaust gas flow	2	m³/min	14,9	27,4	40	49,5	58,7	61,9	66,1	75,7	76,8
		cu.ft./min	526,2	967,6	1413	1748	2073	2186	2334	2673	2712

Cooling system	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Radiated heat in kW (per engine)	2	kW	4,1	4,4	4,7	5,1	5,6	5,6	5,6	5,7	5,7
Heat rejection to charge air cooler in percent of crankshaft power.	2	%	1,4	5	11,9	19,3	22,9	23,5	22,4	20	20,4
Coolant heat rejection to HE, incl. engine oil cooler and excl. charge air cooler, in percent of crankshaft power.	2	%	82,6	68	56,4	49	48,5	49,5	50,4	53,5	50
Coolant flow with fully open thermostat and std cooling system		l/min	120	192	246	306	360	384	408	450	480
		cu.ft./min	4,2	6,8	8,7	10,8	12,7	13,6	14,4	15,9	17,0
Coolant volume engine, including heat exchanger and charge air cooler		litres	51								
		US gal.	13,47								
Max. additional coolant for cabin heater etc. with std. Expansion tank		litres	16								
		US gal.	4,23								
Maximum coolant flow to cabin heater etc.		l/min	42								
		cu.ft./min	1,48								
Thermostat, start open at		°C	82								
		°F	180								
Thermostat, fully open at		°C	92								
		°F	198								

1) ISO 3046, fuel temp 40°C.

ISO 8665 (=SAE J 1228=ICOMIA 28-83)

2) At power according to 1).

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4) Acc. to ISO 3744

5) At installed back pressure

Raw water circuit		rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Nominal raw water design flow	l/min	161	216	273	320	368	392	414	456	468	
	cu.ft./min	5,7	7,6	9,6	11,3	13,0	13,8	14,6	16,1	16,5	
Nominal raw water pump pressure head at design flow. (measured before and after pump)	kPa	19	30	49	66	84	95	107	131	136	
	psi	2,8	4,4	7,1	9,6	12,2	13,8	15,5	19,0	19,7	
Maximum raw water pump suction head	kPa	-30									
	psi	-4,4									
Maximum raw water temperature entering heat exchanger	°C	32									
	°F	90									

2 circuit keel cooling system, LT		Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Maximum temperature to charge air cooler from external LT-cooling system circuit	2	°C										42
		°F										107,6
Coolant flow through keel cooler, LT-cooling system circuit	2	l/min	33	45	58	70	81	85	90	96	98	
		cu.ft./min	1,2	1,6	2,0	2,5	2,9	3,0	3,2	3,4	3,5	
Pressure drop in external LT-cooling system circuit, including piping		kPa	85									
		psi	12,3									
Coolant volume charge air cooler		litres	5									
		US gal.	1,32									

2 circuit keel cooling system, HT		Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Design point for keel cooler, engine outlet temperature	2	°C										88
		°F										190
Maximum temperature to engine from external HT-cooling system circuit	2	°C										70
		°F										158
Coolant flow through keel cooler, HT-cooling system circuit at design point	2	l/min										182
		cu.ft./min										6,4
Maximum coolant flow through keel cooler, HT-cooling system circuit	2	l/min										295
		cu.ft./min										10,4
Pressure drop in external HT-cooling system circuit, including piping		kPa	85									
		psi	12,3									
Coolant volume engine, excl. heat exchangers		litres	28									
		US gal.	7,40									

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Cooling performance (Radiator cooled)

Cooling air flow and external restriction at different radiator air temperatures based on 107°C TTT and 40% coolant. Valid at 1 atm.

Engine speed rpm	Air on temp °C	441 kW	
		Air flow m ³ /s	External restriction
1500	54,2	6,6	0
	52,3	6,2	100
	50,3	5,9	200
	48,2	5,5	300
	45,7	5,2	400
	42,9	4,9	500
1800	50,3	8,0	0
	48,9	7,7	100
	47,4	7,4	200
	45,8	7,1	300
	44	6,8	400
	42,3	6,5	500

Note! Calculated values >0 Pa

Fan power consumption	rpm		
	1500	1800	
	kW	11	19
	hp	15	26
Fan drive ratio	0,99		

Emissions	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Smoke at prop. load x ³	2	*BSU	0,04	0,08	0,21	0,23	0,15	0,13	0,11	0,24	0,42
Noise at prop. load x ³ . 4)	2	dB(A)	100,5	104,5	107,1	109,8	111,5	#N/A	112,3	114,4	114,9

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

1) ISO 3046, fuel temp 40°C.

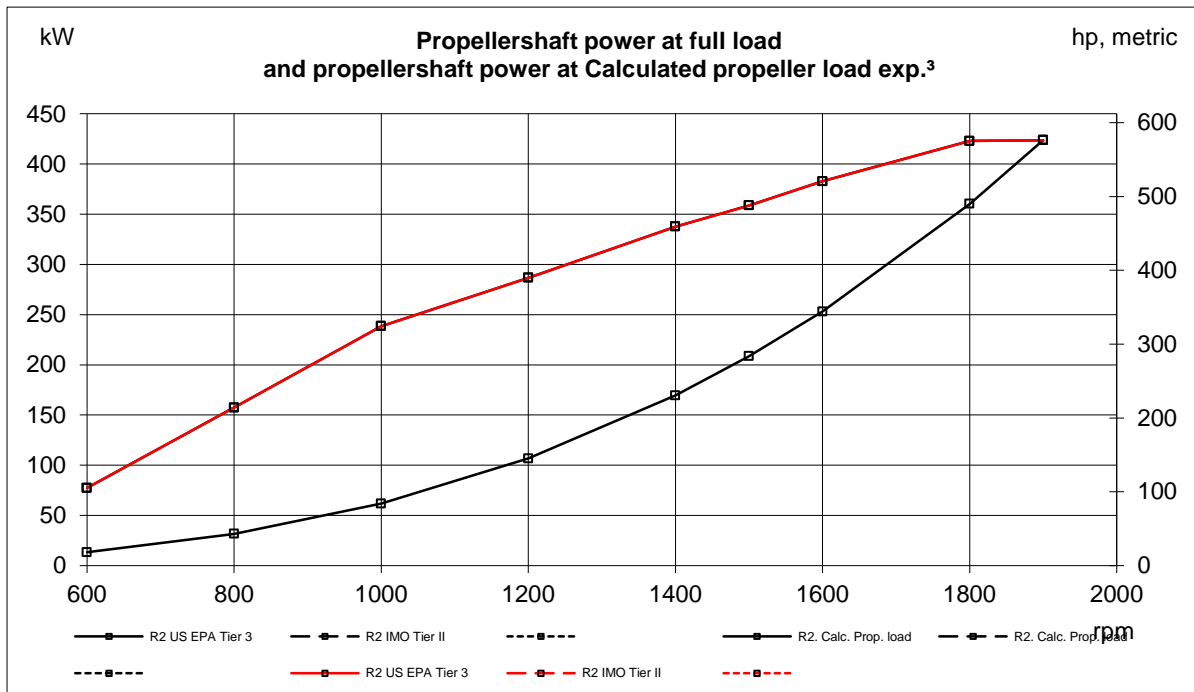
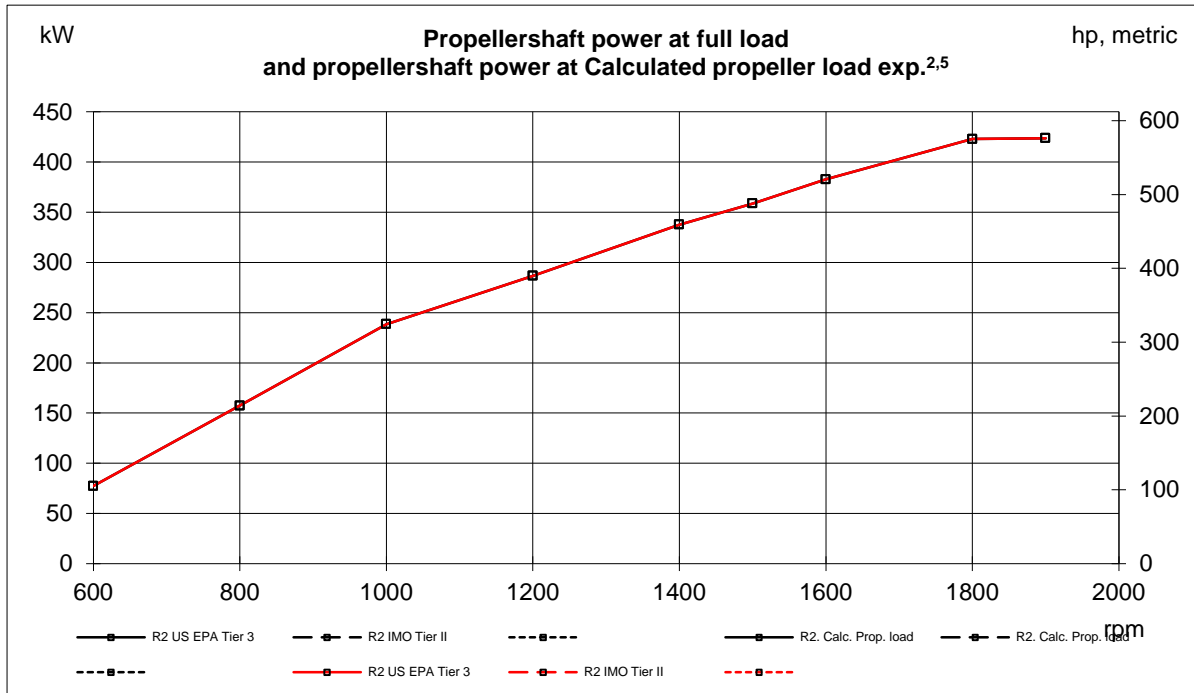
ISO 8665 (=SAE J 1228=ICOMIA 28-83)

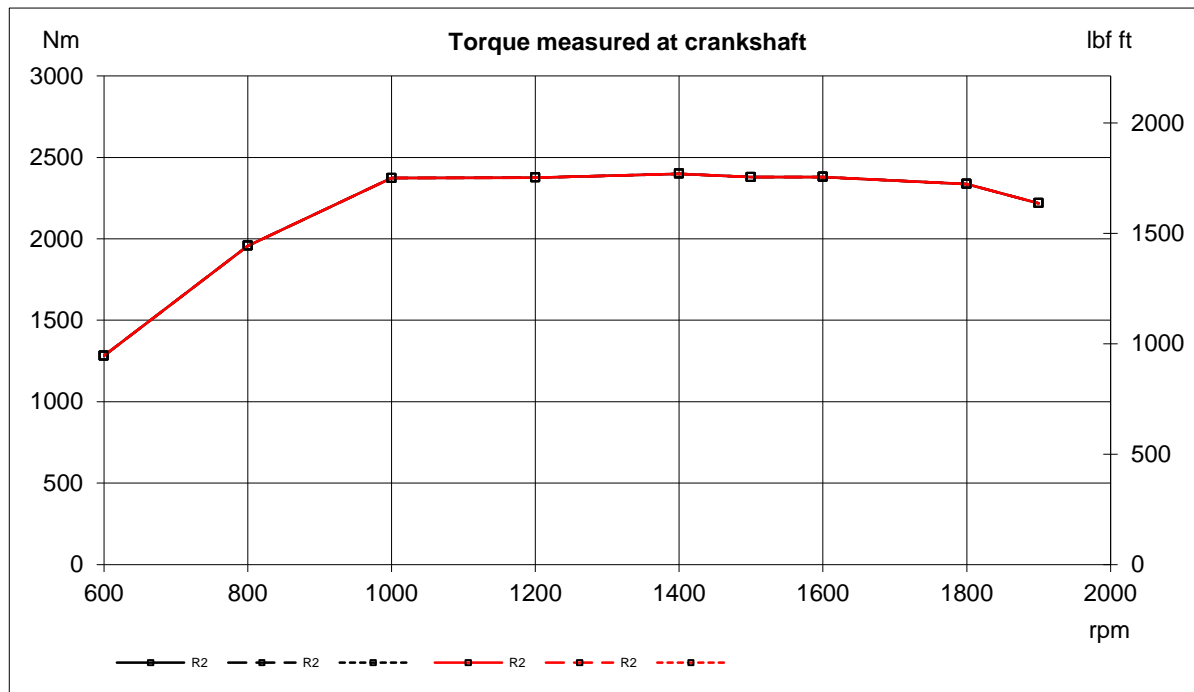
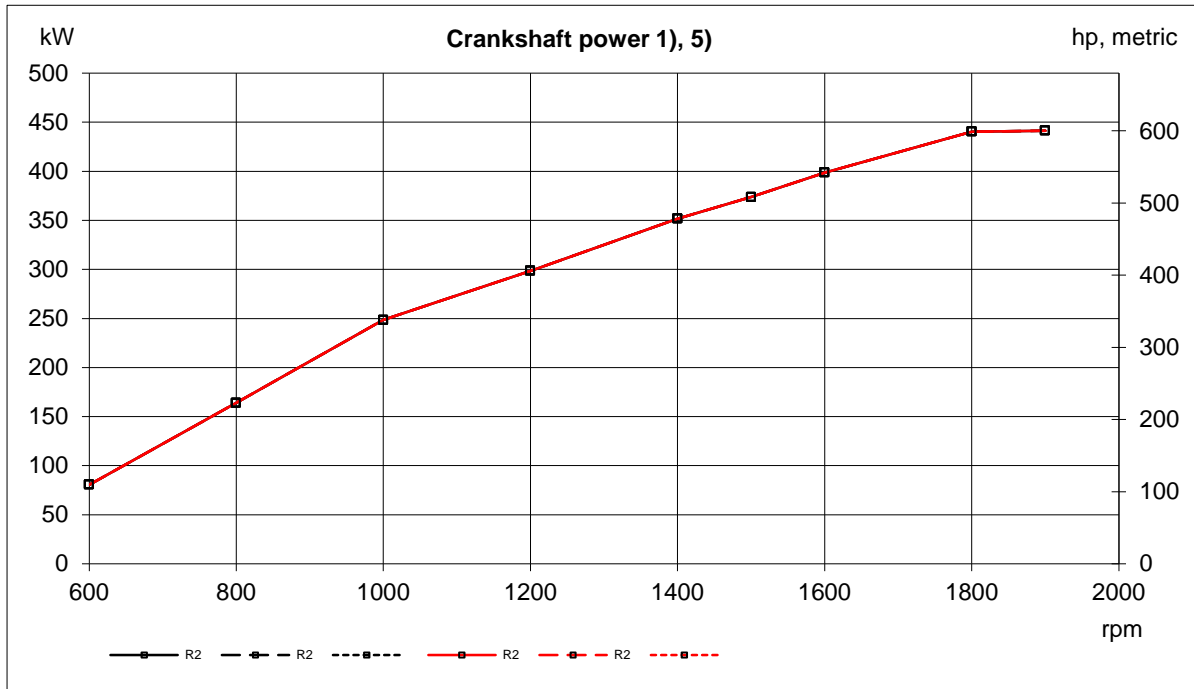
2) At power according to 1).

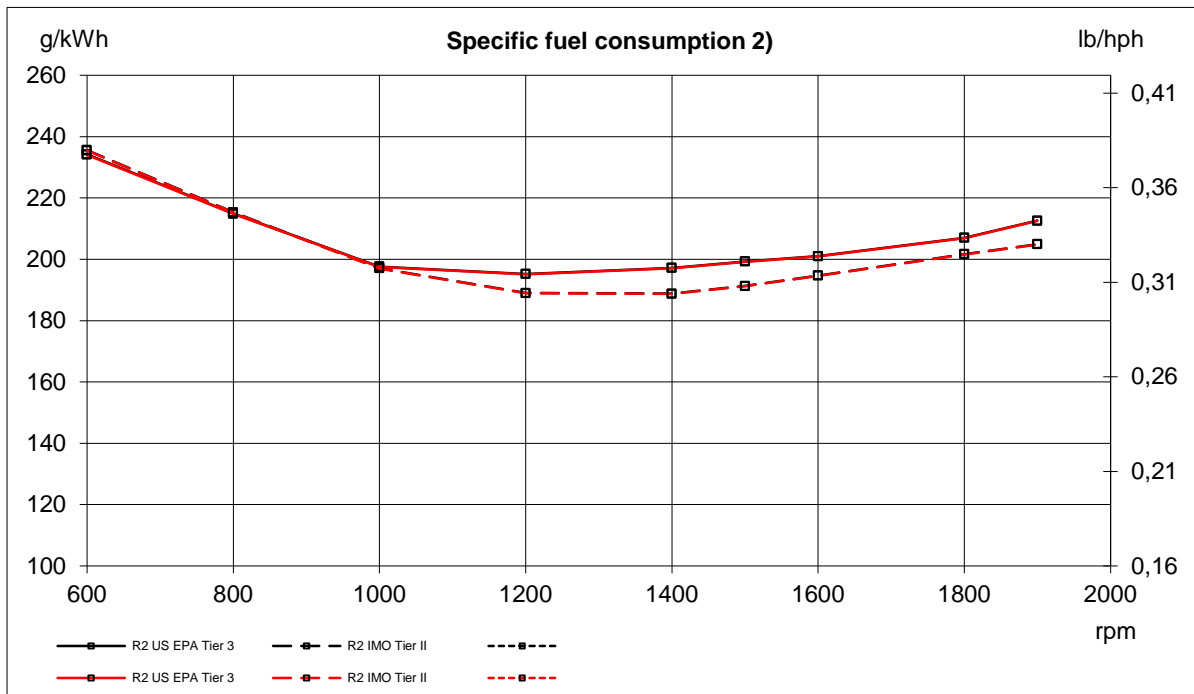
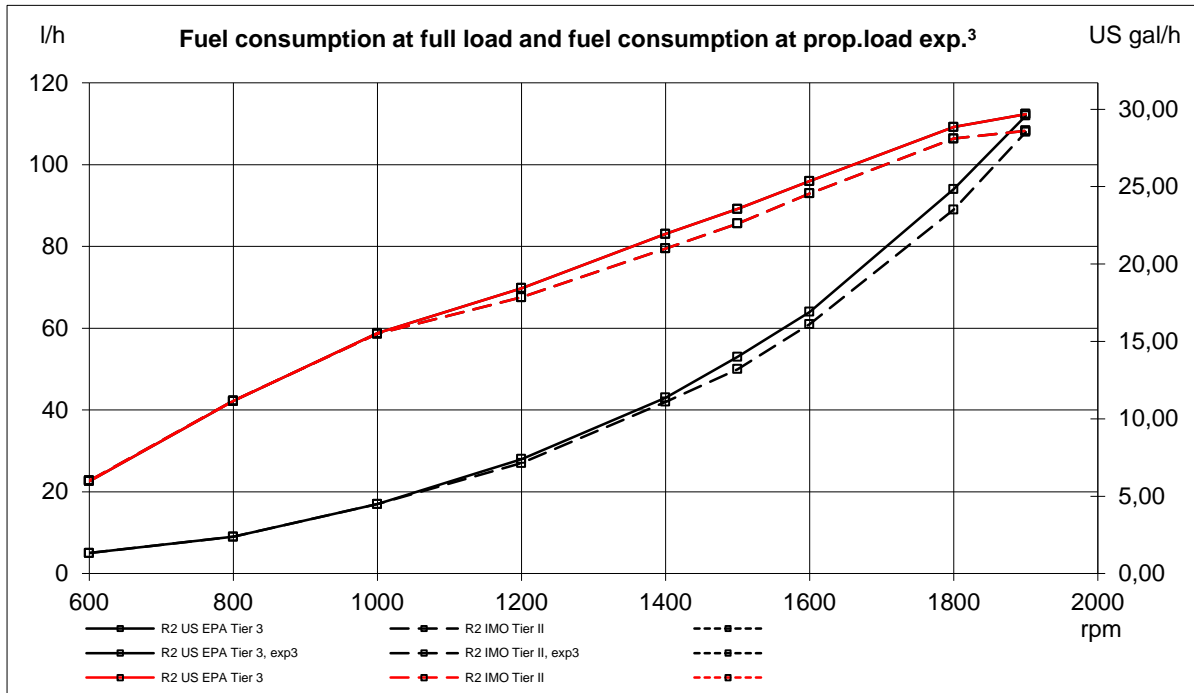
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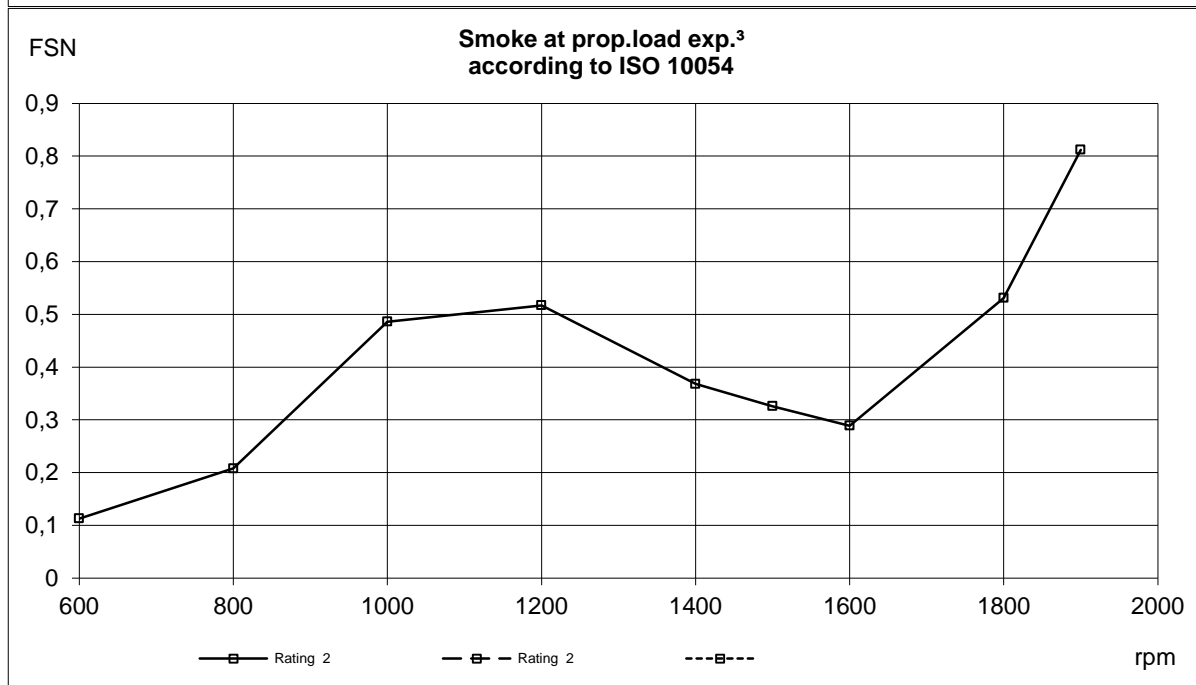
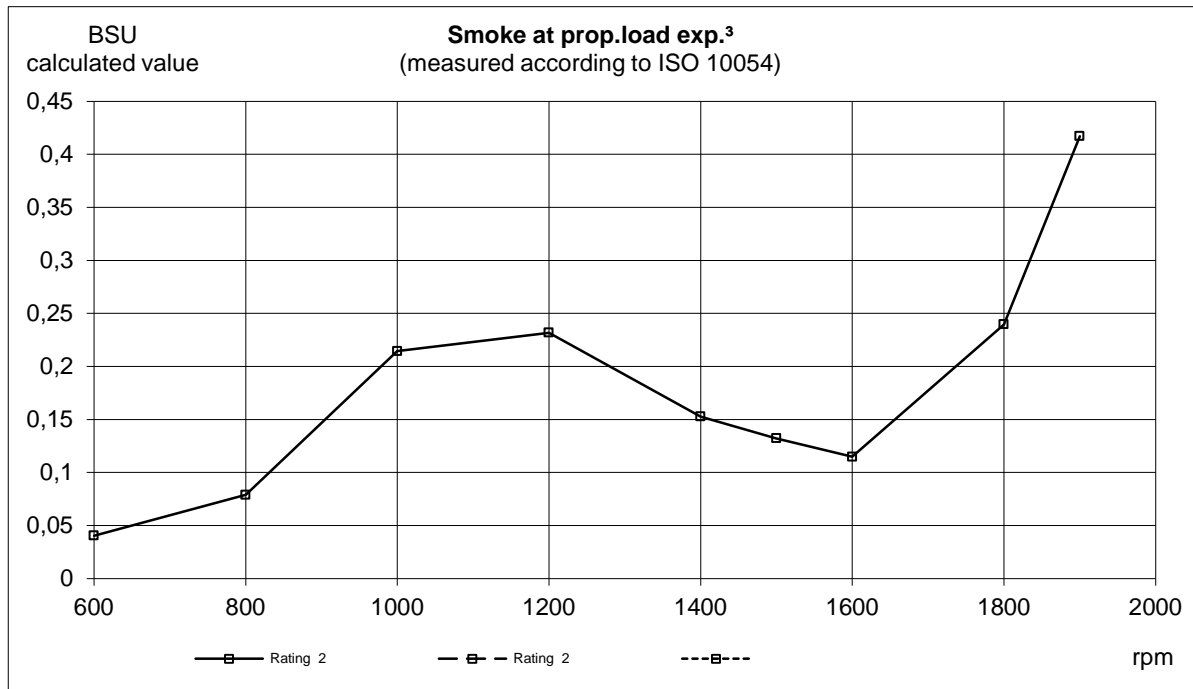
4) Acc. to ISO 3744

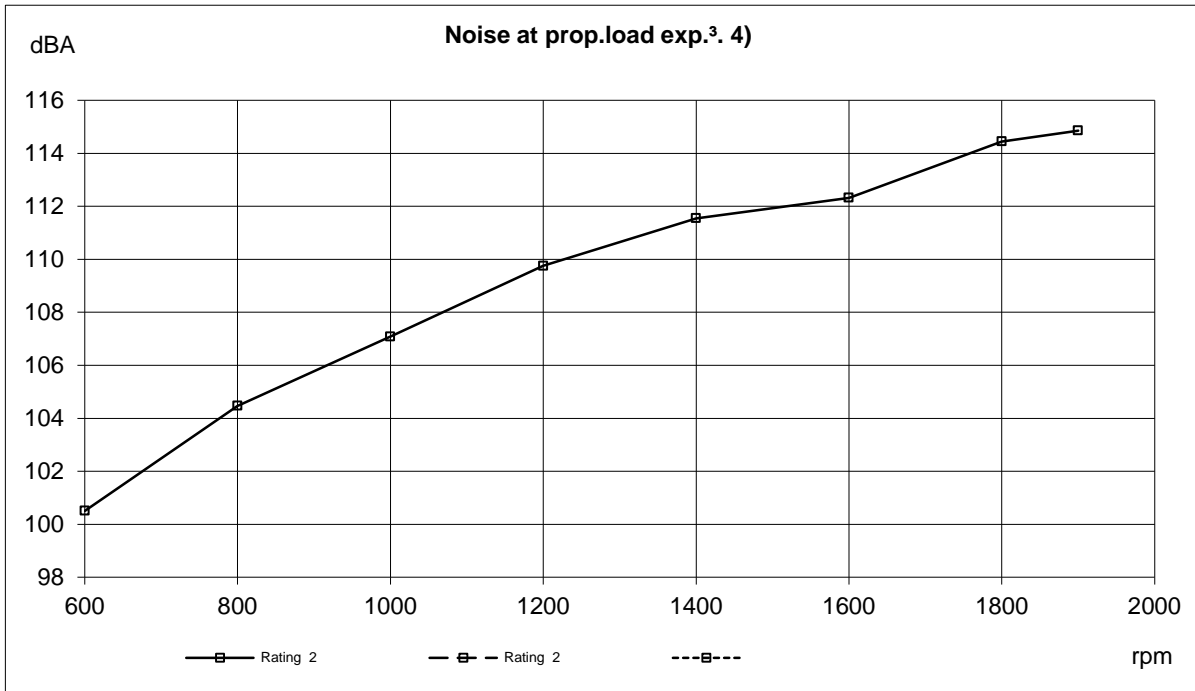
5) At installed back pressure











Rating	Power (Hk)	Rpm
R2	600	1900
R2	441	1900

Sensors Control and Monitoring System							Switches Engine Shutdown System	
Sensors	Signal	Unit	Range	Initial Delay / Warning Delay	Warning Level	Derating Level	Shutdown Initial Delay / Shutdown Delay	Shutdown Level (Tolerance)
Coolant level switch	Digital		ON/OFF	30 sec from start / 75 sec	Low(OFF / Open contact)	NA	NA	NA
Coolant temperature	50-0 kΩ	°C	- 40 - 140 ±1.5°C	30 sec from start / 3 sec	98	101 (Rem 1)	NA	NA
Coolant temperature (SDU)	Digital	°C	ON/OFF	NA	NA	NA	1 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 1900 rpm+15%	Frequency	rpm / Hz	153 puls./rev.	Instant	Lost signal	NA	Instant	2185 rpm / 5572 Hz (-1 to 0%)
Exhaust gas temperature	PT200	°C	- 40 - 750 ± 2.5%	30 sec from start / 22 sec	575	600 (Rem 2)	NA	NA
Crankcase pressure	0,5-4,5 V	kPa	0-15 kPa	20 sec from start / Instant	Rapid Pressure Increase	0-75% @ >1200 rpm	NA	NA
Oil temperature	50-0 kΩ	°C	-40 - 140 °C	30 sec from start / 22 sec	130	135 (Rem 3)	NA	NA
Gear oil temperature (EVC)	50-0 kΩ	°C	-40 - 140 ± 2.5%	NA	NA	NA	NA	NA
Gear oil pressure (EVC)	0,5-4,5V	kPa	0 - 3000 ±3%	60 sec from start / 7 sec	700	NA	NA	NA
Gear oil pressure (SDU)	Digital	kPa	ON/OFF	NA	NA	NA	11 s ±20% from start/ 1 s	400±20 <u>Shutdown Unit Activated</u> S2,S3: 510 rpm ±2% 1300 Hz ±2% 153 pulses / revolution

NA = Not applicable

Sensors Alarm	Signal	Unit	Range	Initial Delay / Delay	Warning Level / Derating Level / Shutdown Level rpm Map (relative pressure)					Derating / Notes
					600 rpm	1000 rpm	1500 rpm	1700 rpm	1900 rpm	
Charge air pressure	0,5-4,5 V	kPa	50 - 600 ± 4 kPa		600 rpm	1000 rpm	1500 rpm	1700 rpm	1900 rpm	
Warning Level (Relative / Absolute pressure)		kPa		30 sec from start / 2 sec	310 / 410	310 / 410	299 / 399	282 / 382	256 / 356	
Derating Level (Relative / Absolute pressure)		kPa		Instant	320 / 420	320 / 420	309 / 409	292 / 392	266 / 366	0-50% @ 1200-1900rpm
Shutdown Level	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Charge air Temperature	50 - 0 kΩ	°C	-40 - 130°C ±4%		600 rpm	1000 rpm	1500 rpm	1700 rpm	1900 rpm	
Warning Level		°C		90 sec from start / 22 sec	80	80	80	78	75	
Derating Level		°C		Instant	85	85	85	83	80	Rem 4
Shutdown Level	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Coolant pressure	0,5-4,5 V	kPa	0-300 kPa ±3%		600 rpm	1000 rpm	1500 rpm	1700 rpm	1900 rpm	
Warning Level		kPa		30 sec from start / 4 sec	5	30	55	72	90	
Derating Level		kPa		Instant	-5	20	45	62	80	0-50% @ 1200-1900rpm /
Shutdown Level	NA	NA	NA	NA	NA	NA	NA	NA	NA	Run detection S4=S2,S3
Seawater pressure	0,5-4,5 V	kPa	0-300 kPa ±3%		600 rpm	1000 rpm	1500 rpm	1700 rpm	1900 rpm	Only HE
Warning Level		kPa		30 sec from start / 7.5 sec	5	15	40	40	40	
Derating Level		kPa		Instant	-5	5	30	30	30	0-35% @ 1200-1900rpm
Shutdown Level	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Fuel pressure	0,5-4,5 V	kPa	0-700 kPa ±1,5%		600 rpm	1000 rpm	1500 rpm	1700 rpm	1900 rpm	
Warning Level		kPa		30 sec from start / Instant	180	240	270	270	270	
Derating Level		kPa		NA	NA	NA	NA	NA	NA	
Shutdown Level	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Oil pressure	0,5-4,5 V	kPa	0-700 kPa ±1,5%		600 rpm	1000 rpm	1500 rpm	1700 rpm	1900 rpm	
Warning Level		kPa		30 sec from start / 3 sec	136	200	265	265	265	
Derating Level		kPa		Instant	106	170	235	235	235	0-70% @ 1200-1900rpm
Shutdown Level (Shutdown Unit Channel S3)	Digital	kPa	ON/OFF	11 s ±20% from start / 1 s	120 ±20	120 ±20	120 ±20	120 ±20	120 ±20	<u>Shutdown Unit Activated</u> S2,S3: 510 rpm ±2% 1300 Hz ±2% 153 pulses / revolution

Remarks

1) Soft derate Coolant temp	Speed / °C	101°C	103°C	106°C
Remaining torque in %	1200 rpm	100%*	100%*	100%*
	1500 rpm	100%*	77%	54%
	1900 rpm	100%*	75%	50%

2) Soft derate Exhaust temp	Speed / °C	600°C	605°C	610°C	615°C
Remaining torque in %	1200 rpm	100%*	100%*	100%*	100%*
	1500 rpm	100%*	72%	63%	54%
	1900 rpm	100%*	70%	60%	50%

3) Soft derate Oil temp	Speed / °C	135°C	137°C	139°C
Remaining torque in %	1200 rpm	100%*	100%*	100%*
	1500 rpm	100%*	54%	35%
	1900 rpm	100%*	50%	30%

4) Soft derate Charge air Temp	Speed / °C	80°C	85°C	90°C
Remaining torque in %	1200 rpm	100%*	100%*	100%*
	1500 rpm	100%*	54%	35%
	1900 rpm	100%*	50%	30%

* Derate alarm indication but no actual torque decrease