General

4-stroke direct injected, turbocharged and aftercooled diesel engine

Number of cylinders		6
No of valves		24
Displacement, total	litres in³	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	2450
Propeller selection range R5	rpm	2450-2500
Dry weight engine BT	kg lb	1145 2524

Performance	**Rating**	**rpm**	**700**	**900**	**1100**	**1300**	**1600**	**1900**	**2100**	**2300**	**2400**	**2450**
Crankshaft power 1), 5)	5	kW	71	120	180	288	375	445	493	493	493	493
		hp	97	163	245	392	510	605	670	670	670	670
Propeller shaft power 1) (At full load)	5	kW	69	116	175	279	364	432	478	478	478	478
With drive Reverse gear		hp	94	158	237	380	495	587	650	650	650	650
Propellershaft power at prop. load $x^{2,5}$	5	kW	21	39	65	98	165	253	325	408	454	478
With drive Reverse gear		hp	28	53	88	133	224	344	442	555	618	650
Propellershaft power at prop. load x^{3}	5	kW	11	24	43	71	133	223	301	396	450	478
With drive Reverse gear		hp	15	32	59	97	181	303	410	538	611	650
Torque at crankshaft 2)	5	Nm	968,6	1273	1563	2116	2238	2237	2242	2047	1962	1922
		lbf ft	714	939	1153	1560	1651	1650	1653	1510	1447	1417
Mean piston speed		m/s	3,5	4,6	5,6	6,6	8,1	9,6	10,6	11,7	12,2	12,4
		ft/s	11,6	15,0	18,3	21,6	26,6	31,6	34,9	38,2	39,9	40,7
Effective mean pressure 2)	5	MPa	1,12	1,48	1,81	2,45	2,60	2,59	2,60	2,37	2,27	2,23
		psi	162,9	214,1	262,8	355,8	376,4	376,2	377,0	344,3	329,9	323,2
Max combustion pressure 2)	5	MPa	11,1	13,2	17	19	18,9	19,5	20,1	19,2	18,8	18,8
		psi	1610	1914	2466	2756	2741	2828	2915	2785	2727	2727

Lubricating system

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

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	700	900	1100	1300	1600	1900	2100	2300	2400	2450
Specific fuel consumption 2)	5	g/kWh	247	239	247	214	198	202	208	214	218	219
		lb/hph	0,40	0,39	0,40	0,35	0,32	0,33	0,34	0,35	0,35	0,35
Fuel consumption, Test cycle E5	5	g/kWh	222									
		lb/hph	0,36									
Fuel consumption at prop. load x [2,5]	5	l/h	6,5	11,4	17,9	26,4	43,3	65,8	84,7	109,0	122,6	129,7
		US gal/h	1,7	3,0	4,7	7,0	11,5	17,4	22,4	28,8	32,4	34,3

Fuel system	Rating	rpm	700	900	1100	1300	1600	1900	2100	2300	2400	2450
Fuel consumption at full load	5	l/h	21,0	34,3	53,2	73,7	88,8	107,6	122,7	126,2	128,6	129,2
		US gal/h	5,5	9,1	14,1	19,5	23,5	28,4	32,4	33,4	34,0	34,1

Intake and exhaust system	Rating	rpm	700	900	1100	1300	1600	1900	2100	2300	2400	2450
Specific exhaust heating effect in percent of crankshaft power	5	%	76	67	66	66	74	79	82	84	83	84
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.	5	°C	526	635	675	608	496	481	507	499	498	498
		°F	979	1175	1247	1126	925	898	945	930	928	928
		°C										
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	1900	2100	2300	2400	2450
Engine air consumption at 25°C / 77°F atmospheric pressure 100kPA and relative humidity 30%.	5	m³/min	4,2	6,6	9,4	14,8	22,2	28,7	32,6	35,1	36,2	36,6
		cu.ft./min	148,3	233,1	332	522,7	784	1014	1151	1240	1278	1293
		m³/min										
		cu.ft./min										
		m³/min										
		cu.ft./min										
Charge air pressure Inlet manifold	5	kPa	22	49	78	136	188	218	228	225	224	224
		psi	3,2	7,1	11,3	19,7	27,3	31,6	33,1	32,6	32,5	32,5
Exhaust gas flow	5	m³/min	12	22	31	49	60	73	83	87	90	90
		cu.ft./min	423,8	776,9	1095	1730	2119	2578	2931	3072	3178	3178

Cooling system	Rating	rpm	700	900	1100	1300	1600	1900	2100	2300	2400	2450
Radiated heat in percent of crankshaft power.	5	%	4,2	3,8	3,4	1,8	1,2	1,1	1,1	1,1	1,1	1,1
Heat rejection to charge air cooler in percent of crankshaft power.	5	%	4	7	8	14	18	20	21	22	23	23
Coolant heat rejection to HE, incl. engine oil cooler and excl. charge air cooler, in percent of crankshaft power.	5	%	51	74	74	46	29	32	36	42	54	54
Coolant flow with fully open thermostat and std cooling system		l/min	249	342	400	477	591	693	742	750	738	735
		cu.ft./min	8,8	12,1	14,1	16,8	20,9	24,5	26,2	26,5	26,1	26,0
Max. permissible temperature on coolant in engine outlet		°C	98									
		°F	208									
Coolant volume engine, including heat exchanger and charge air cooler		litres	46									
		US gal.	12,15									
Max. additional coolant for cabin heater etc. with std. Expansion tank		litres	40									
		US gal.	10,57									
Maximum coolant flow to cabin heater etc.		l/min	76									
		cu.ft./min	2,68									
Thermostat, start open at		°C	76									
		°F	169									
Thermostat, fully open at		°C	86									
		°F	187									

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4) Acc. to ISO 3744
5) At installed back pressure

Raw water circuit	rpm	700	900	1100	1300	1600	1900	2100	2300	2400	2450
Nominal raw water design flow	l/min	76	99	121	141	174	204	227	249	255	259
	cu.ft/min	2,7	3,5	4,3	5,0	6,1	7,2	8,0	8,8	9,0	9,1
Maximum raw water pump suction head	kPa	30									
	psi	4,4									
Maximum raw water temperature entering heat exchanger	°C	32									
	°F	90									

Emissions	Rating	rpm	700	900	1100	1300	1600	1900	2100	2300	2400	2450
Smoke at prop. load $x^{2,5}$	5	*BSU	0,0	0,2	0,3	0,6	0,5	0,2	0,2	0,2	0,3	0,4
Noise at prop. load $x^{2,5}$. 4)	5	dBA	103	106	109	110	111	114	115	117	118	118

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

1) ISO 3046, fuel temp 40°C.
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4) Acc. to ISO 3744
5) At installed back pressure

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 temperaure	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)	NA	NA
Engine speed cam	Frequency	rpm		Instant	Lost signal	Lost signal**	NA	NA
Engine speed crank	Frequency	rpm		Instant	Lost signal	Lost signal**	NA	NA
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

NA = Not applicable

* 50% remaining torque from 1500 rpm

** 80% remaining torque

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	
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	NA	kPa	NA	NA	NA	NA	NA	NA	NA	
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

Warning = Yellow Lamp active
Derating = Red Lamp active

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

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

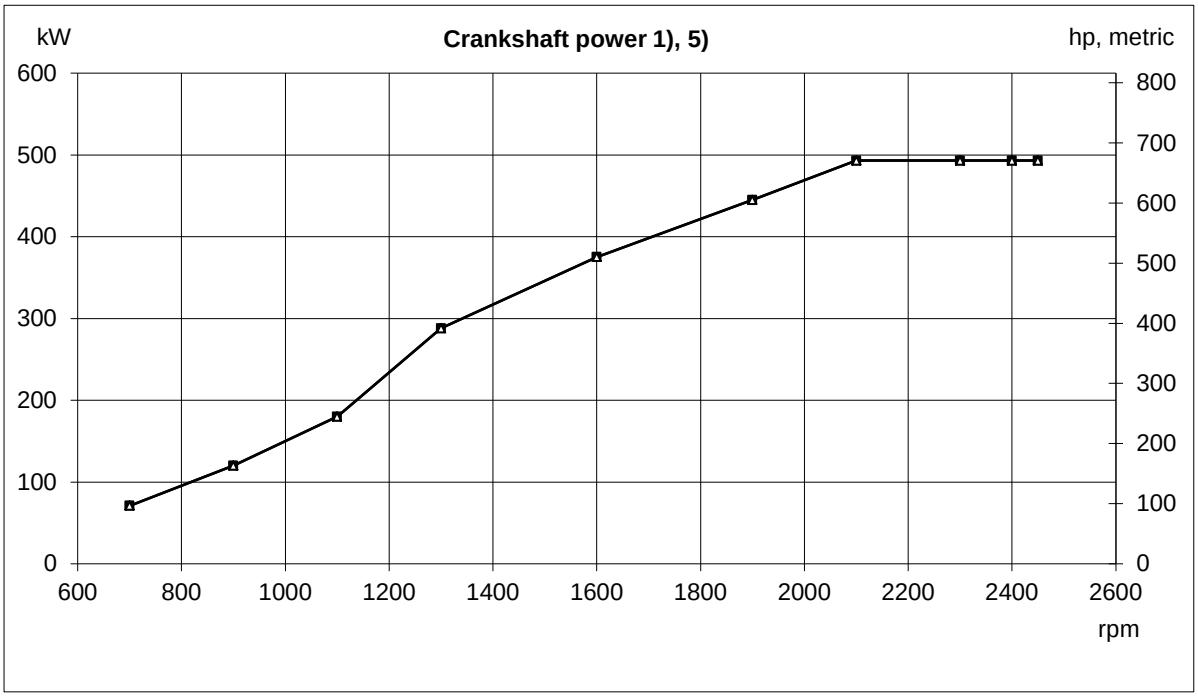
	Speed / °C	80°C	85°C	90°C
Soft 3) Soft derate Charge Air Temp.	**600**	100%*	100%*	100%*
Remaining torque in %	**1000**	100%*	100%*	100%*
	1500 ->	100%*	50%	30%

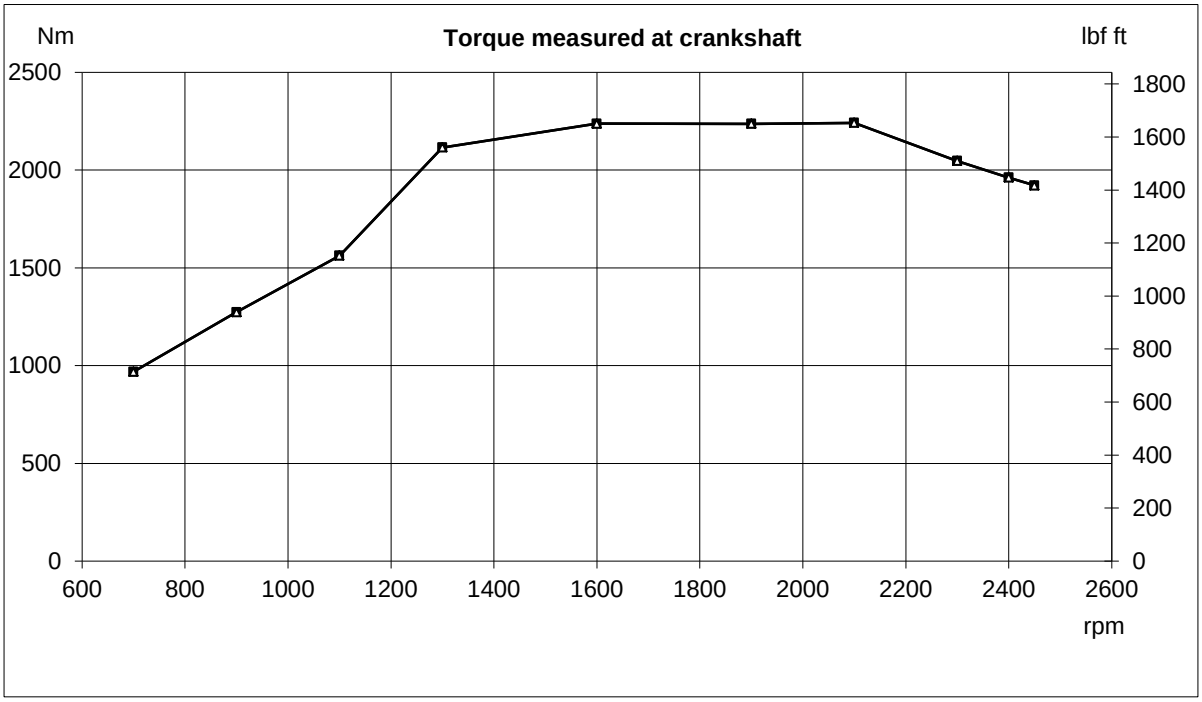
	Speed / °C	655°C	665°C	670°C	675°C
Soft 4) Soft derate Exhaust Temp.	**600**	100%*	100%*	100%*	100%*
Remaining torque in %	**1000**	100%*	100%*	100%*	100%*
	1500 ->	100%*	60%	20%	10%

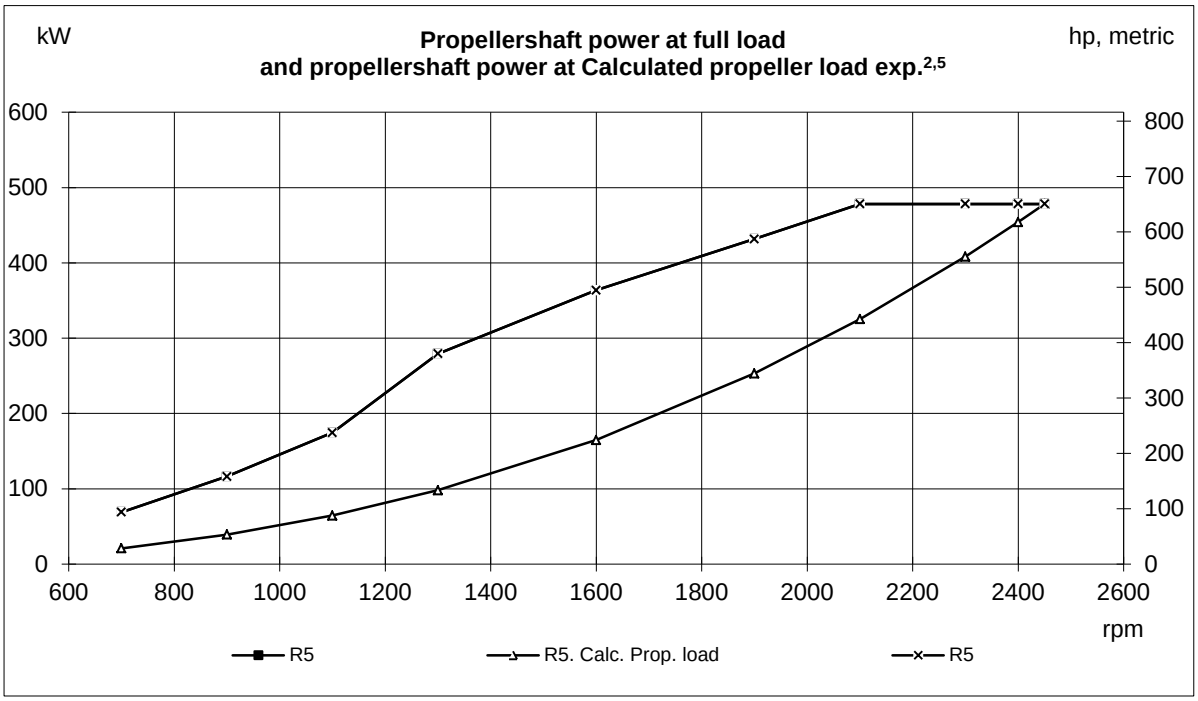
* = Alarm but no derate

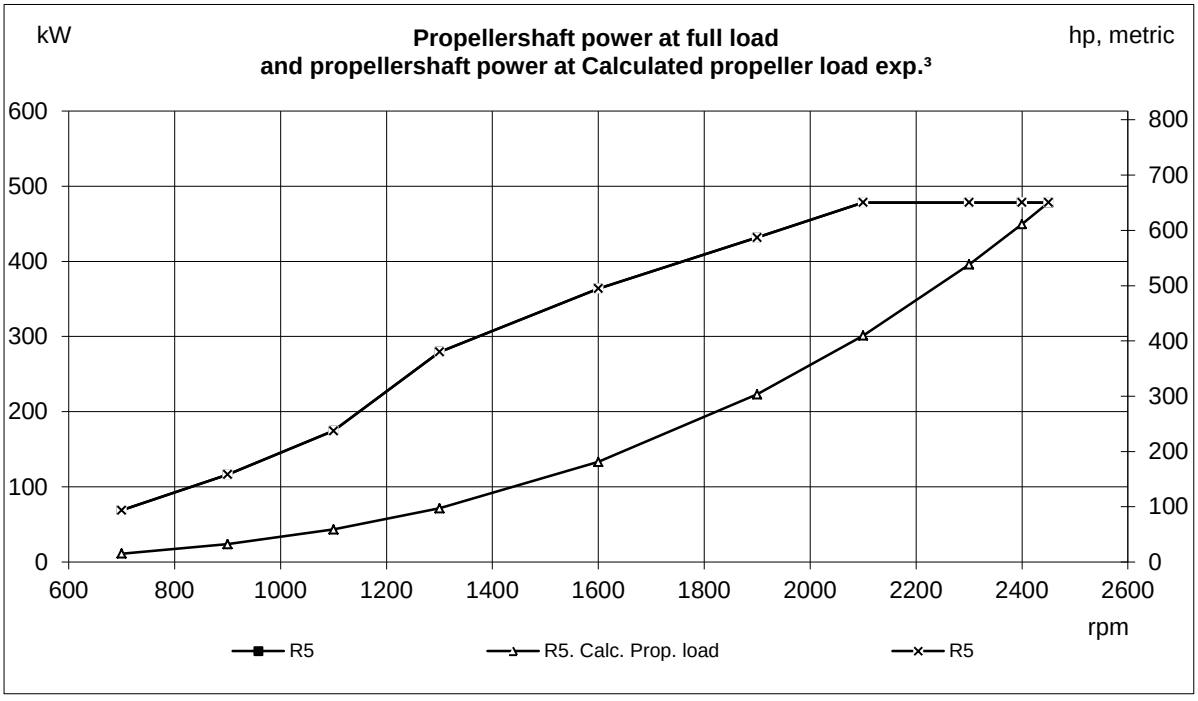
Fault Limit table Exhaust Dry Temp.

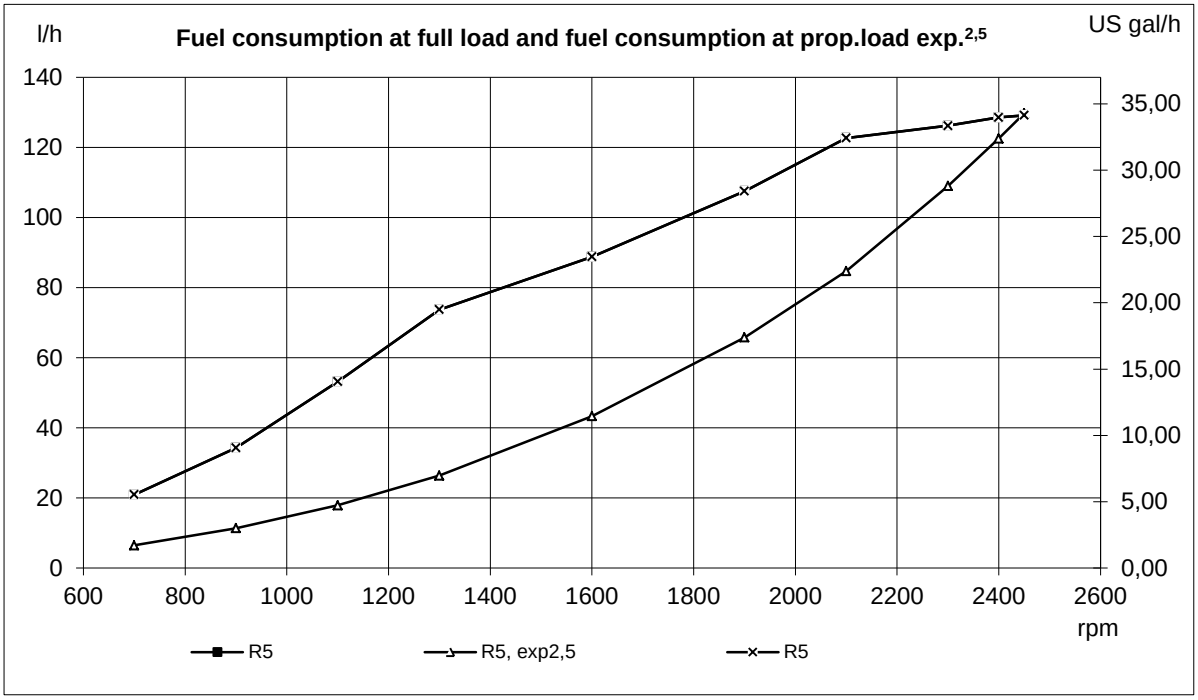
Nm \ rpm	1000 rpm	1200 rpm	1300 rpm	1400 rpm	1500 rpm	1600 rpm	2000 rpm	2500 rpm
600	575	620	650	620	580	560	560	560
1000	575	620	650	620	580	560	560	560
1400	575	620	650	620	580	560	560	560
1600	575	620	650	620	580	560	560	560
2000	575	620	650	620	580	560	560	560
2200	575	620	650	620	580	560	560	560
2400	575	620	650	620	580	560	560	560
2600	575	620	650	620	580	560	560	560

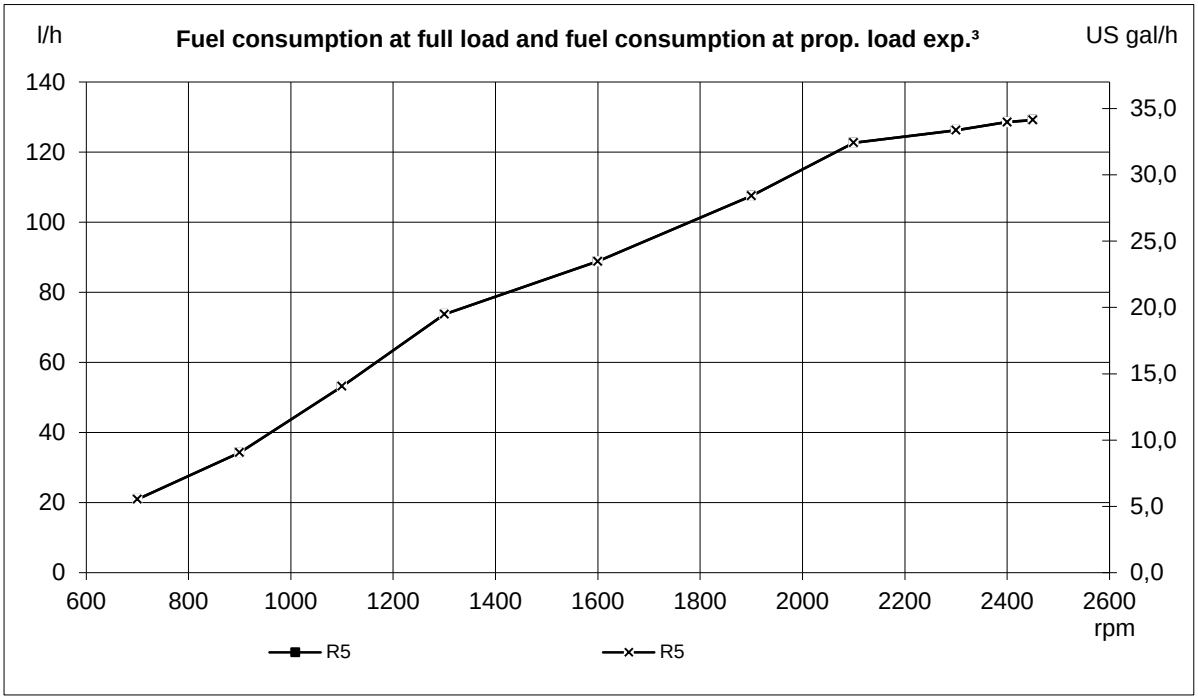

kW
Crankshaft power 1), 5)
hp, metric
600
500
400
300
200
100
0
800
700
600
500
400
300
200
100
0
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
rpm

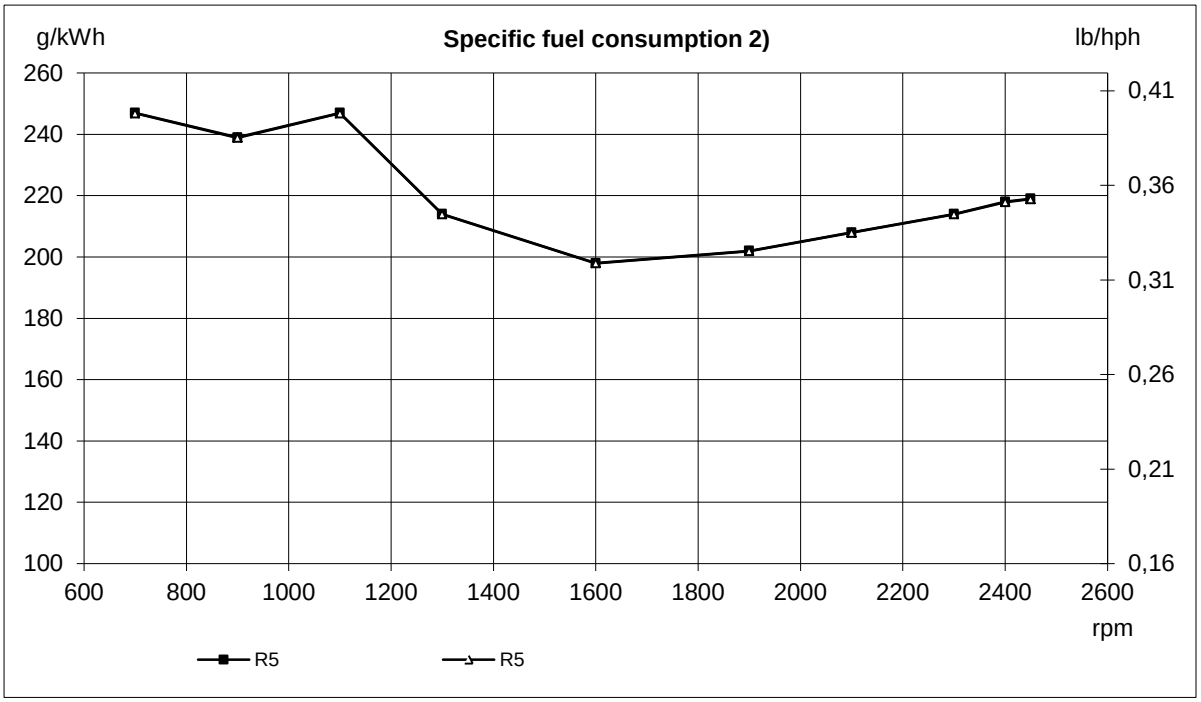

Nm
Torque measured at crankshaft
lbf ft
2500
2000
1500
1000
500
0
1800
1600
1400
1200
1000
800
600
400
200
0
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
rpm

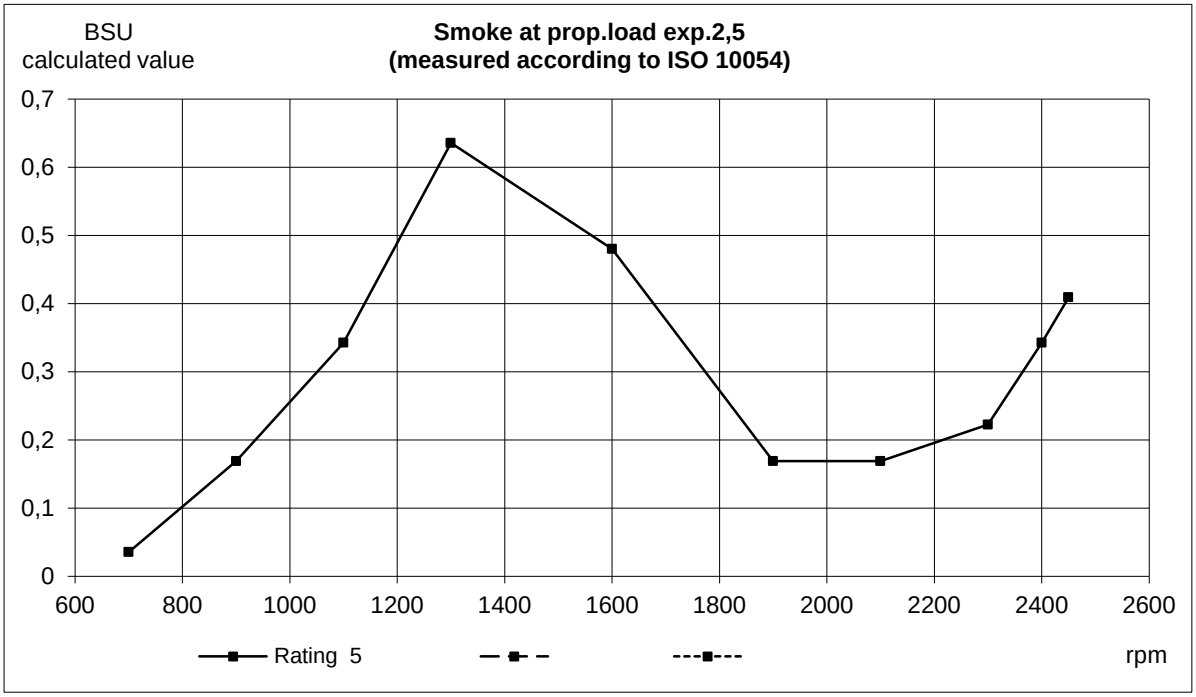

kW
Propellershaft power at full load
and propellershaft power at Calculated propeller load exp.2,5
hp, metric
600
500
400
300
200
100
0
800
700
600
500
400
300
200
100
0
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
rpm
R5
R5. Calc. Prop. load
R5

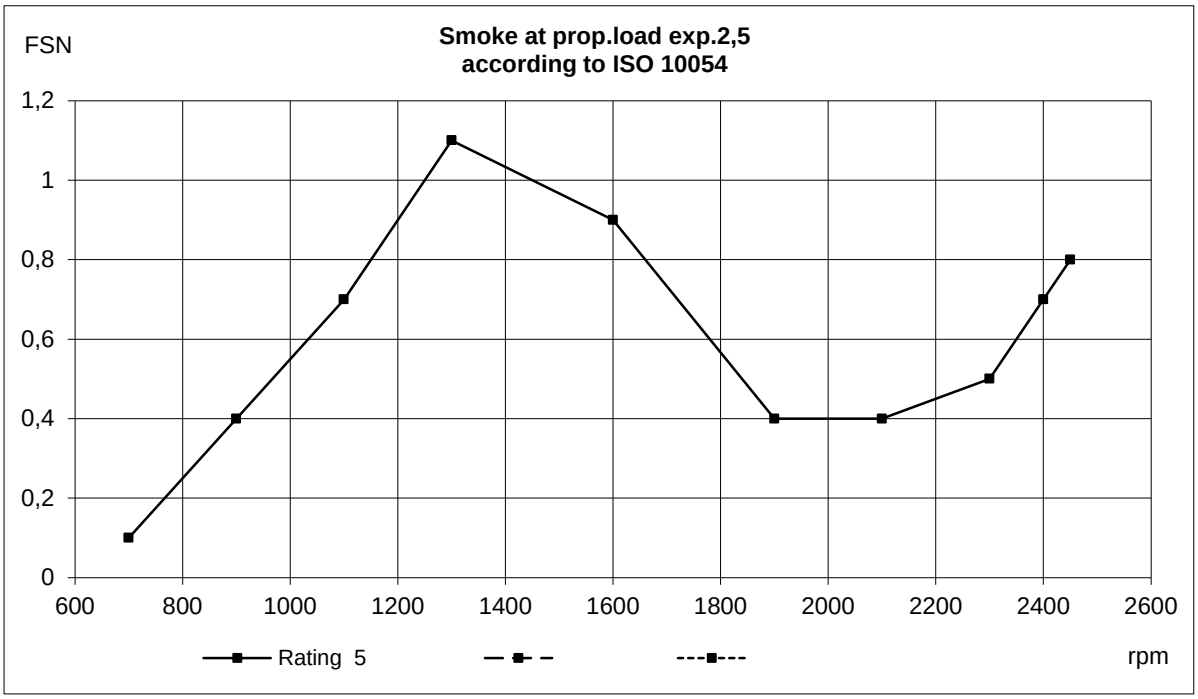

kW
Propellershaft power at full load
and propellershaft power at Calculated propeller load exp.3
hp, metric
600
500
400
300
200
100
0
800
700
600
500
400
300
200
100
0
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
rpm
R5
R5. Calc. Prop. load
R5


l/h
Fuel consumption at full load and fuel consumption at prop.load exp.2,5
US gal/h
140
120
100
80
60
40
20
0
35,00
30,00
25,00
20,00
15,00
10,00
5,00
0,00
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
rpm
R5
R5, exp2,5
R5


l/h
Fuel consumption at full load and fuel consumption at prop. load exp.3
US gal/h
140
120
100
80
60
40
20
0
35,0
30,0
25,0
20,0
15,0
10,0
5,0
0,0
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
rpm
R5
R5

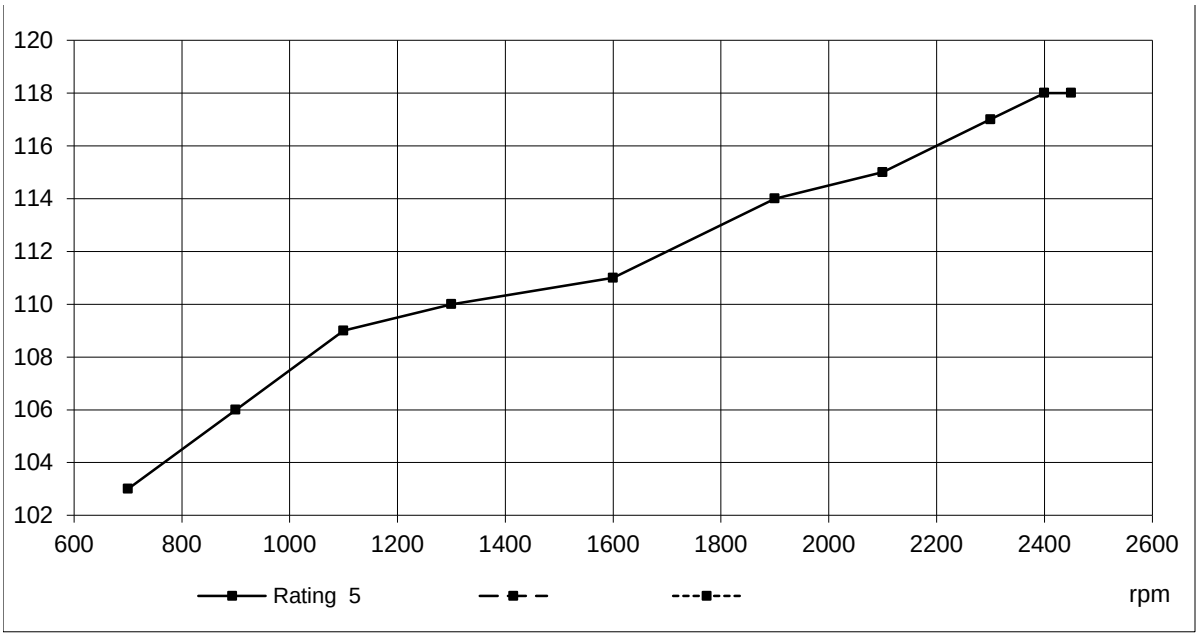

g/kWh
Specific fuel consumption 2)
lb/hph
260
240
220
200
180
160
140
120
100
0,41
0,36
0,31
0,26
0,21
0,16
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
rpm
R5
R5





dBA

Noise at prop.load exp.2,5. 4)


120
118
116
114
112
110
108
106
104
102
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
Rating 5
rpm