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	
Rated speed R4	rpm	
Rated speed Crankshaft power 1), 5) R3	rpm	2250
Propeller selection range Crankshaft power 1), 5)	rpm	2250-2300
Dry weight engine BT	kg lb	1195 2635

Performance	**Rating**	**rpm**	**700**	**900**	**1100**	**1300**	**1600**	**1800**	**1900**	**2000**	**2100**	**2250**
Crankshaft power 1), 5)	3	kW	83	154	210	251	314	347	365	375	375	375
		hp	113	209	286	341	427	472	496	510	510	510
Propeller shaft power 1) (At full load)	3	kW	78	146	198	237	297	328	345	354	354	354
With drive IPS		hp	107	198	270	323	404	446	469	482	482	482
Propellershaft power at prop. load $x^{2,5}$	3	kW	19	36	59	90	151	203	232	264	298	354
With drive IPS		hp	26	49	81	122	206	276	316	359	406	482
Propellershaft power at prop. load x^{3}	3	kW	11	23	41	68	127	181	213	249	288	354
With drive IPS		hp	15	31	56	93	173	247	290	338	392	482
Torque at crankshaft 2)	3	Nm	1132	1634	1823	1844	1874	1841	1834	1790	1705	1592
		lbf ft	835	1205	1345	1360	1382	1358	1353	1321	1258	1174
Mean piston speed		m/s	3,5	4,6	5,6	6,6	8,1	9,1	9,6	10,1	10,6	11,4
		ft/s	11,6	15,0	18,3	21,6	26,6	29,9	31,6	33,2	34,9	37,4
Effective mean pressure 2)	3	MPa	1,31	1,89	2,11	2,14	2,17	2,13	2,13	2,08	1,98	1,85
		psi	190,4	274,8	306,6	310,1	315,2	309,6	308,5	301,1	286,8	267,7
Max combustion pressure 2)	3	MPa	17,00	18,10	18,40	16,40	16,30	16,50	16,70	16,50	16,90	16,80
		psi	2466	2625	2669	2379	2364	2393	2422	2393	2451	2437

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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

Lubricating system

Specific lubricating oil consumption.	g/kWh	0,1
Max. oil volume including filters for all allowed installation inclinations:	litres US gal	38 10,04
Max. oil volume excluding filters for all allowed installation inclinations:	litres US gal	33 8,72
Min. oil volume excluding filters for all allowed installation inclinations:	litres US gal	29 7,66

Fuel system	**Rating**	**rpm**	**700**	**900**	**1100**	**1300**	**1600**	**1800**	**1900**	**2000**	**2100**	**2250**
Specific fuel consumption 2)	3	g/kWh	219,6	209	208	213,7	199,7	200	202	206	207	212
		lb/hph	0,356	0,339	0,337	0,346	0,324	0,324	0,327	0,334	0,335	0,343
Fuel consumption, Test cycle E3	3	g/kWh	219,1									
		lb/hph	0,35									
Fuel consumption at prop. load x [2,5]	3	l/h	6,2	10,6	16,9	24,9	41,3	54,7	62,7	72,4	80,4	95,8
		US gal/h	1,6	2,8	4,5	6,6	10,9	14,5	16,6	19,1	21,2	25,3
Fuel consumption at full load	3	l/h	21,8	38,5	52,3	64,2	75,0	83,0	88,2	92,4	92,9	95,1
		US gal/h	5,8	10,2	13,8	17,0	19,8	21,9	23,3	24,4	24,5	25,1

Intake and exhaust system	**Rating**	**rpm**	**700**	**900**	**1100**	**1300**	**1600**	**1800**	**1900**	**2000**	**2100**	**2250**
Specific exhaust heating effect in percent of crankshaft power	3	%	80	71	70	75	59	56	56	57	58	60
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.	3	°C	353	449	489	596	487	448	438	428	416	407
		°F	667	840	912	1105	909	838	820	802	781	765
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	3	m³/min	6,9	9,6	12,4	13,1	18,7	23	25,4	27,6	28,6	30,9
		cu.ft./min	243,7	339	437,9	462,6	660,4	812,2	897	974,7	1010	1091
Charge air pressure Inlet manifold	3	kPa	106	124	136	110	148	175	188	199	198	203
		psi	15,4	18,0	19,7	16,0	21,5	25,4	27,3	28,9	28,7	29,4
Exhaust gas flow	3	m³/min	16,2	25,6	34,5	41,9	50,3	56,8	60,8	64	64,5	67,1
		cu.ft./min	572,1	904,1	1218	1480	1776	2006	2147	2260	2278	2370

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Cooling system	Rating	rpm	700	900	1100	1300	1600	1800	1900	2000	2100	2250
Radiated heat in percent of crankshaft	3		2,4	1,9	1,9	2,5	1,4	1,2	1,1	1,1	1	1
Heat rejection to charge air cooler in percent of crankshaft power.	3	%	21	17	16	15	16	19	21	23	24	26
Coolant heat rejection to HE, incl. engine oil cooler and excl. charge air cooler, in percent of crankshaft power.	3	%	24	45	56	73	47	36	32	31	28	28
Coolant flow with fully open thermostat and std cooling system		l/min	249	342	400	477	591	660	693	717	743	750
		cu.ft./min	8,8	12,1	14,1	16,8	20,9	23,3	24,5	25,3	26,2	26,5
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									

Raw water circuit	rpm	700	900	1100	1300	1600	1800	1900	2000	2100	2250
Nominal raw water design flow	l/min	91	99	121	141	168	187	196	206	216	230
	cu.ft/min	3,2	3,5	4,3	5,0	5,9	6,6	6,9	7,3	7,6	8,1
Maximum raw water pump suction head	kPa	-10									
	psi	-1,5									
Maximum raw water temperature entering heat exchanger	°C	32									
	°F	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

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VOLVO PENTA

D11B4-A (R3-510IPS)

Document No	Issue Index
22678599	**05**

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)	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

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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

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	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

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Technical data - Drive unit

Drive line		IPS650 & IPS800
Transmission type		IPS2-C
Gear ratio (total)		1,70:1
Steering angle, max.		+/- 27º
Total weight of drive unit (1)	kg	586
Oil capacity, approx.	litres	26
Oil volume difference MIN-MAX	litres	0,5
Oil type		Volvo Penta API GL5 75W/90
Propeller range		PS4-PS5, P1-P7

(1) Including oil, exhaust pipe and elbow, clamping ring and various installation components. Propellers are not included in total weight

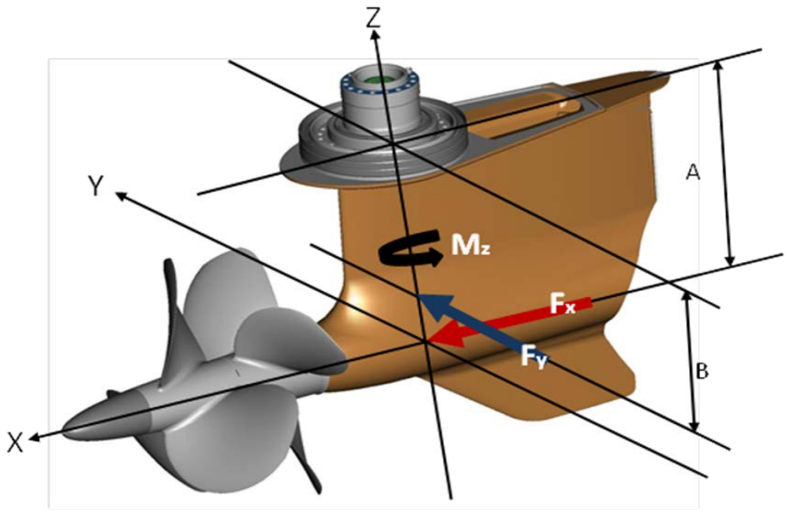
"Generalized maximum load document"for IPS3

Valid products	Drive Unit	Gear Ratio
IPS650	IPS2	1,70:1
IPS800	IPS2	1,70:1

Loads provided in chart are single maximum loads i.e. not to be used for fatigue calculations

Speed range (top speed)	Load vektor	Maximum load
20-28 kn	Fx	37 kN
	Fy (+/-)	24 kN
	Mz (+/-)	12 kNm
28-42 kn	Fx	26 kN
	Fy (+/-)	49 kN
	Mz (+/-)	12 kNm

A	450 mm
B	382 mm



Important Note!
The above forces and torque are to be used as the base for maximum load in normal operations.
Volvo Penta requires however that the detailed guidelines for the structure around
the IPS unit are followed in order to ensure structural strength in case of grounding.

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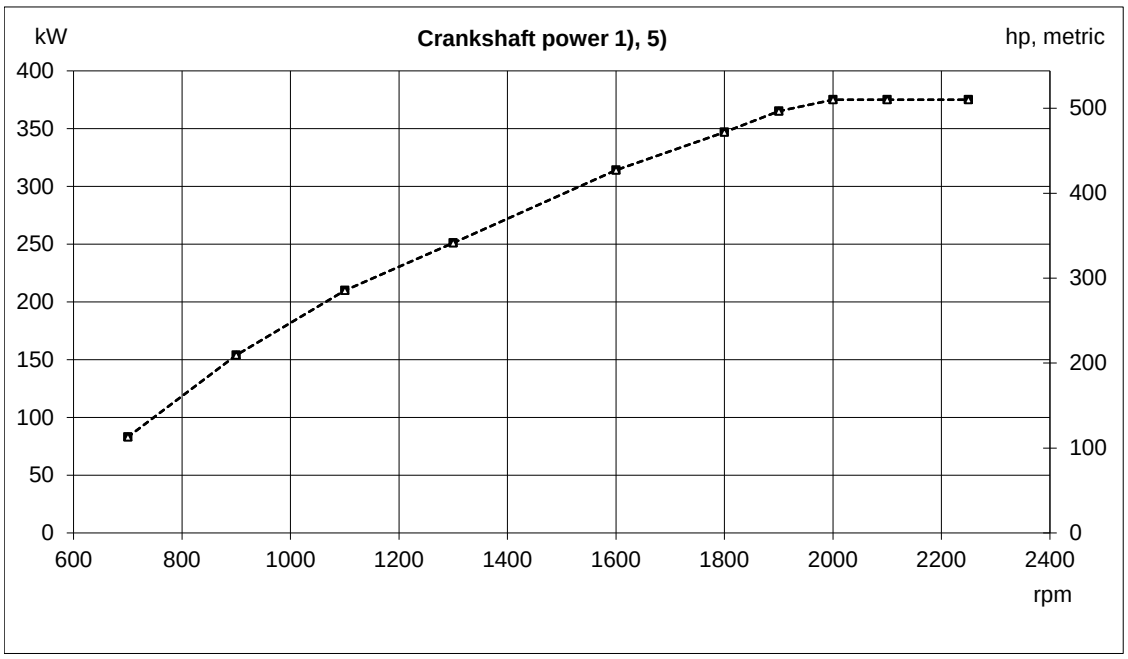

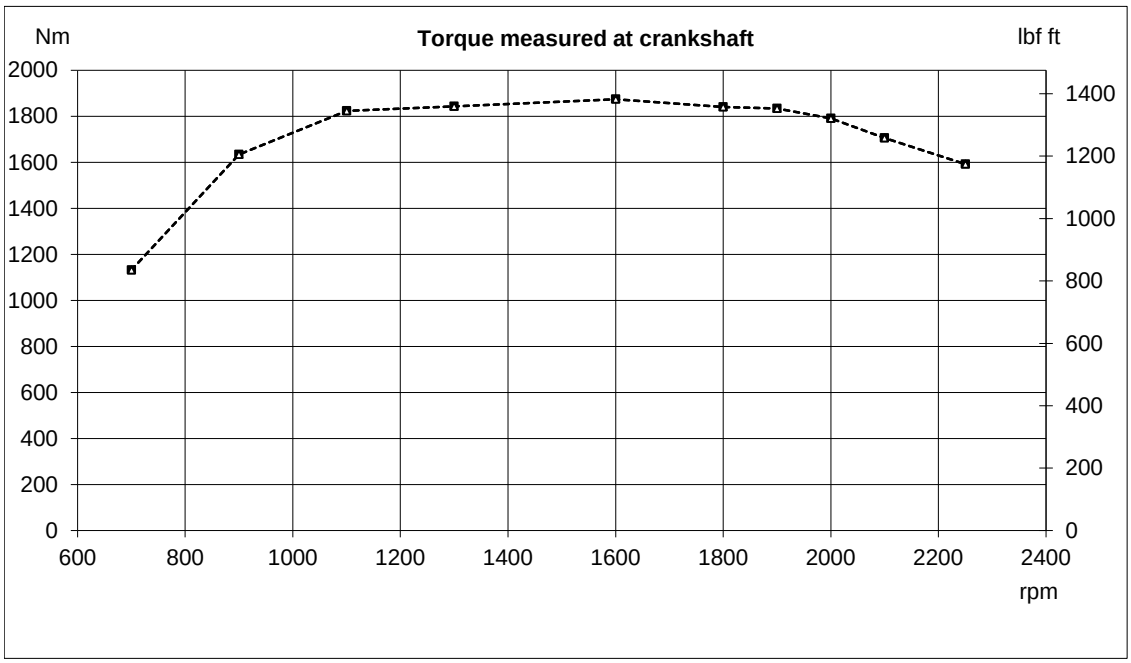

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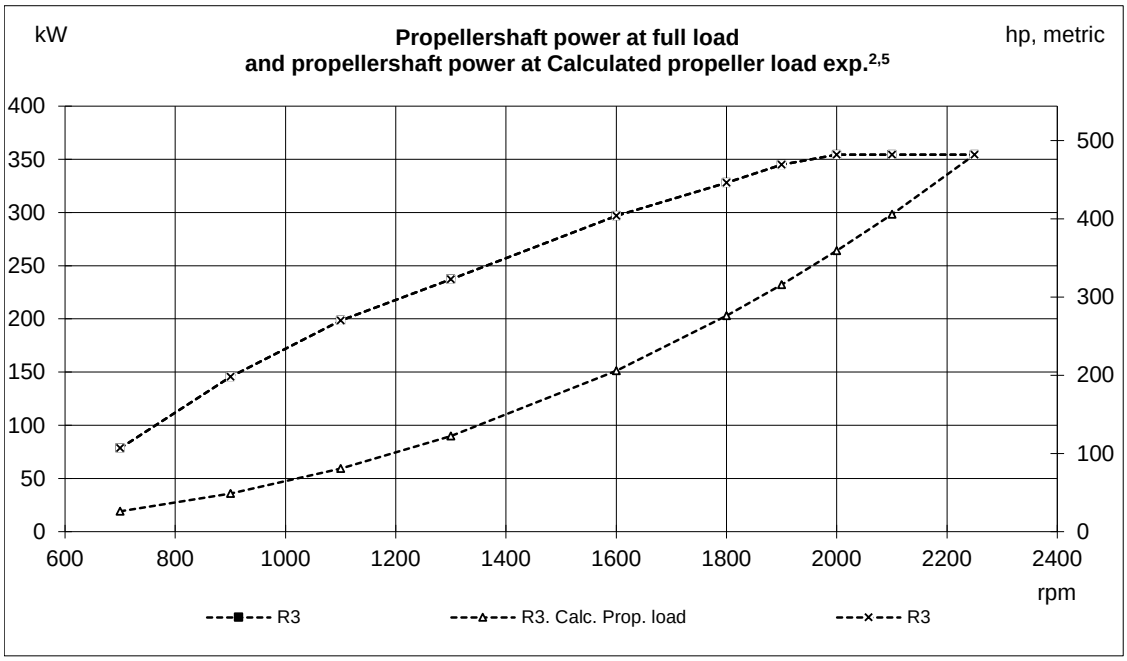

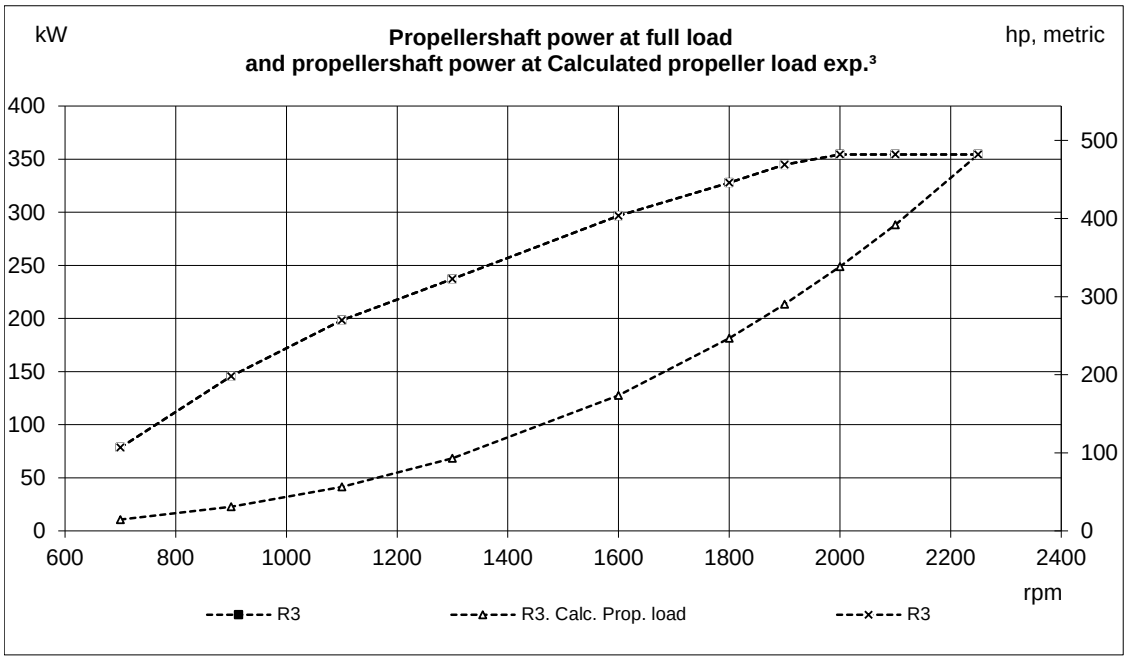

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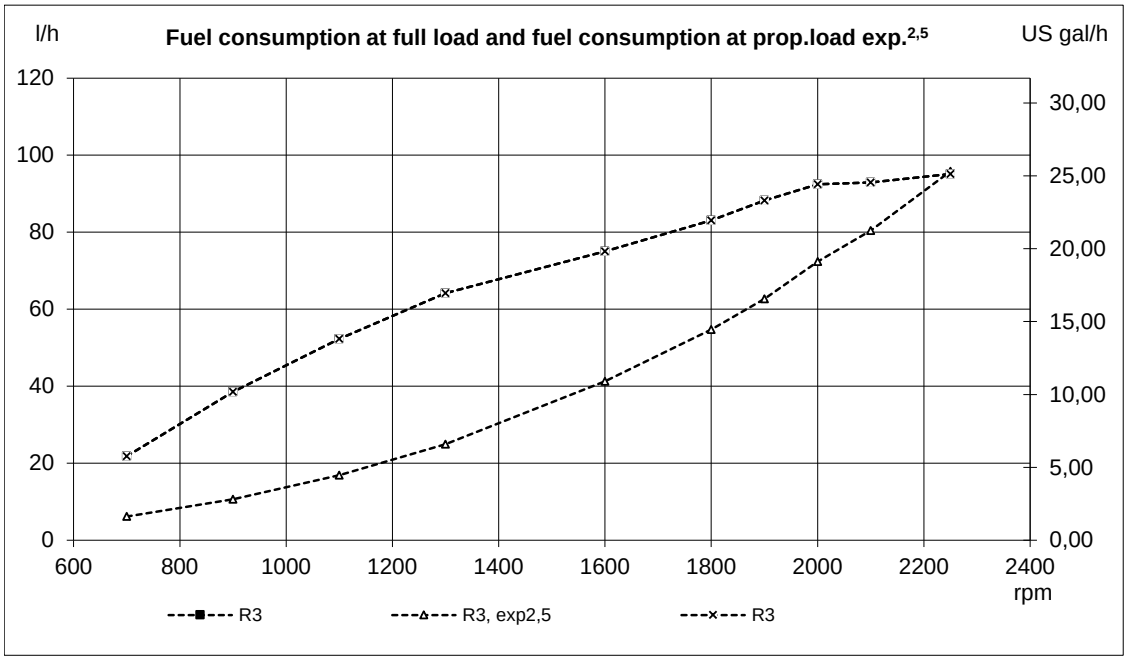

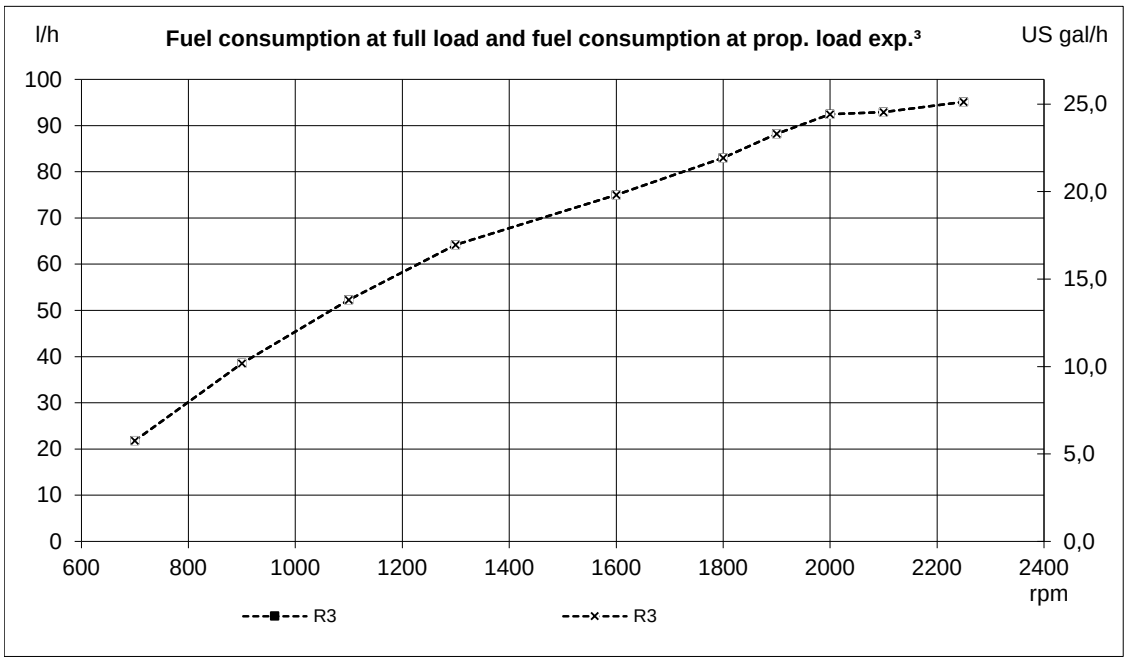

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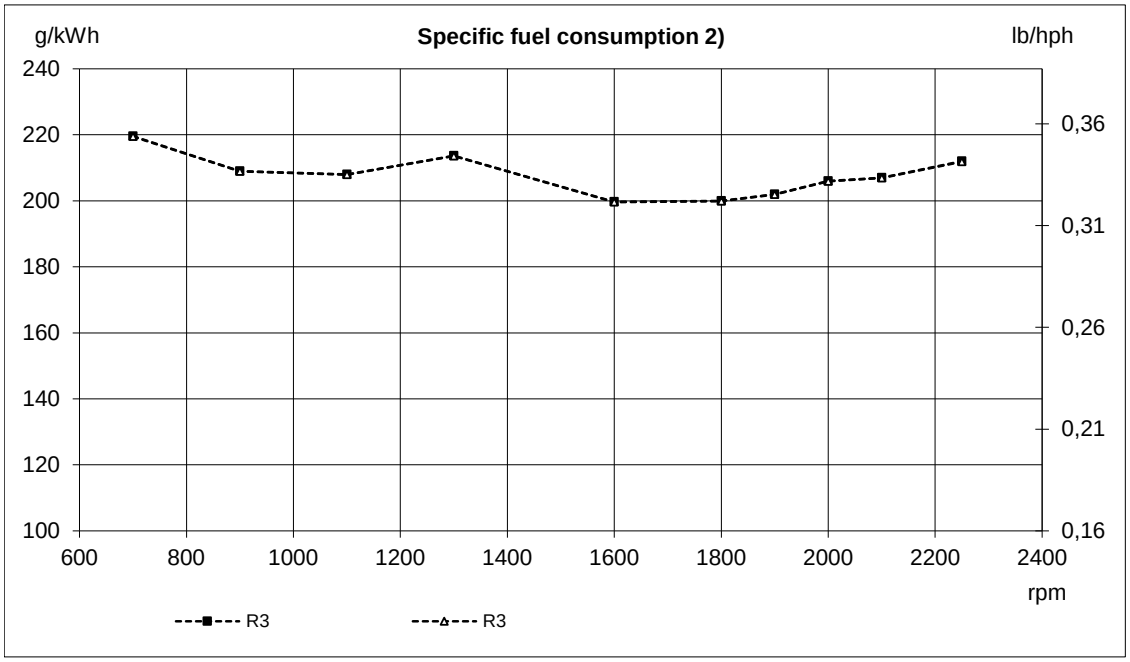

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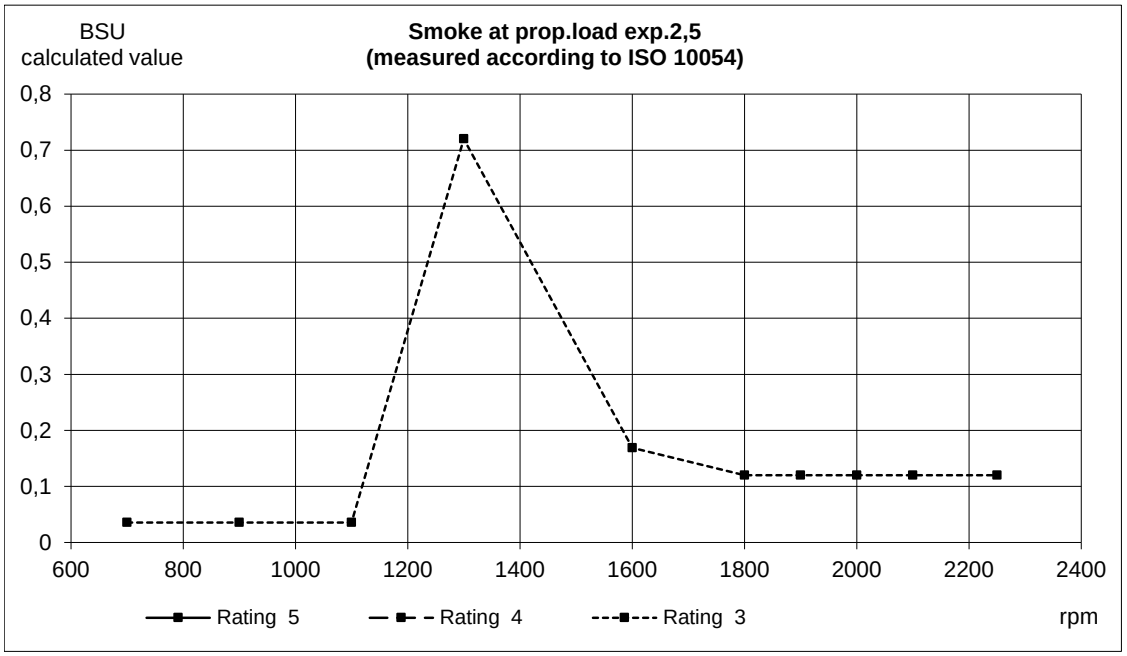

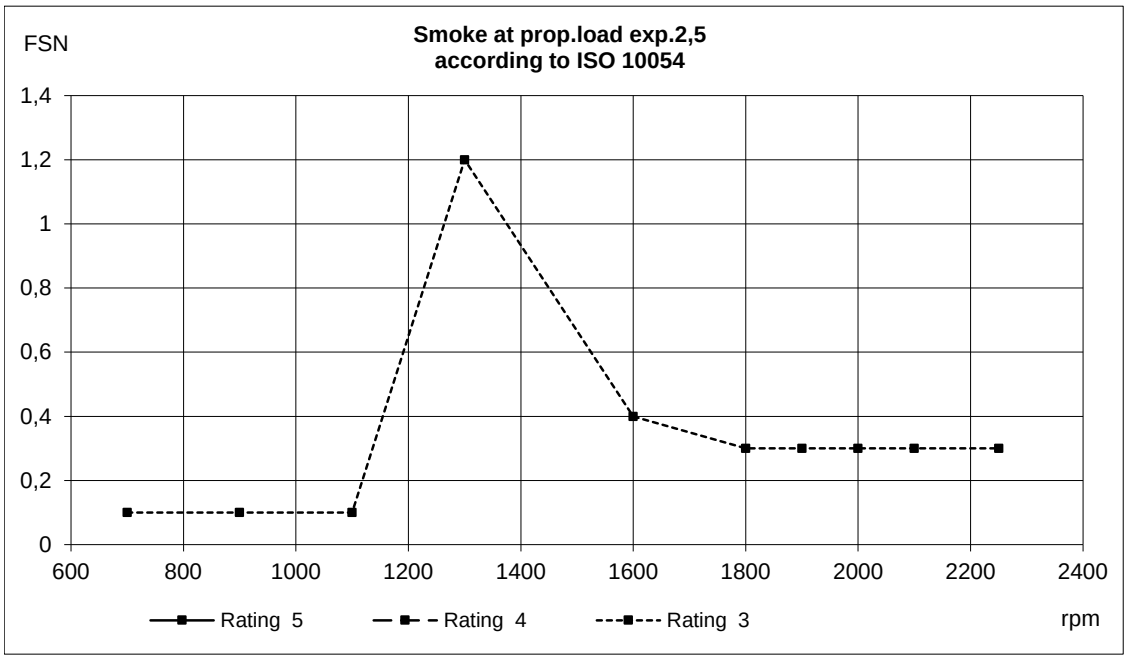

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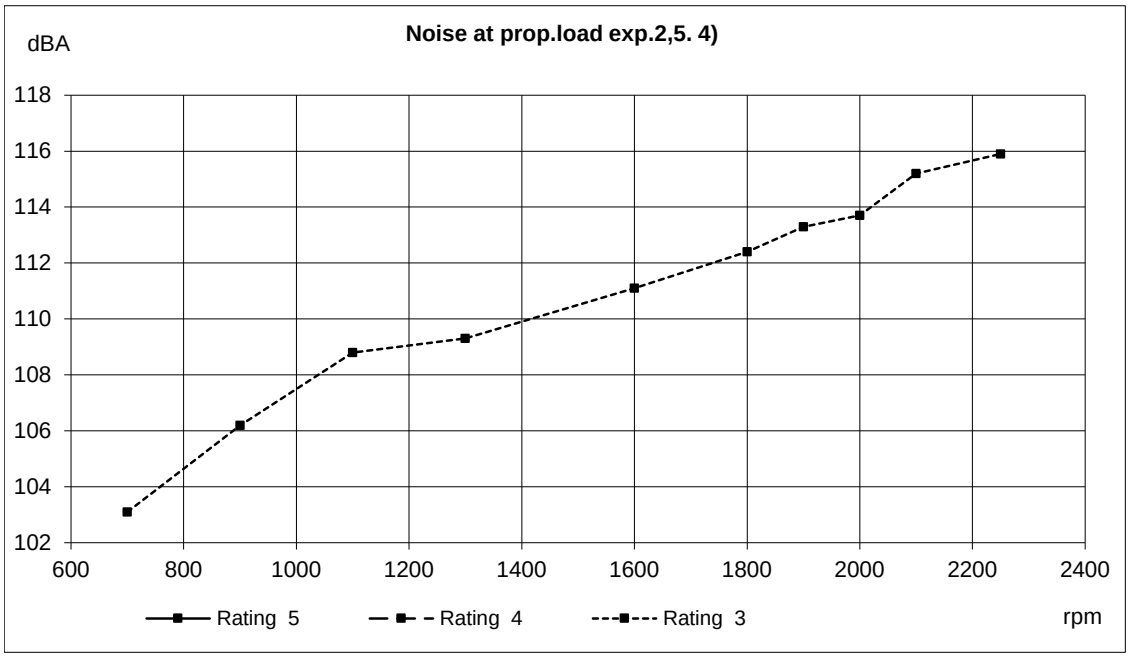

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