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General

4-stroke direct injected, turbocharged and aftercooled diesel engine

Engine Rating		4
Number of cylinders		4
No of valves		16
Displacement, total	litres in³	3.67 223.7
Firing order		1-3-4-2
Rotational direction, viewed from the front		Clockwise
Bore	mm in	103 4.06
Stroke	mm in	110 4.33
Compression ratio		18.0:1
Compression pressure at 240 rpm	MPa psi	
Max. static forward inclination:	°	5
Max. static backward inclination:	°	10
Max. intermittent forward inclination while running:	°	10
Max. intermittent backward inclination while running:	°	20
Max. intermittent side inclination while running:	°	22.5 or 30 for max 30 sec
Idling speed	rpm	700-750
Rated speed R4	rpm	3400
Governed speed R4	rpm	3530
Propeller selection range R4		3350-3530
Dry weight engine BT	kg lb	510 1124
Dry weight with drive DPI	kg lb	655 1444
Dry weight with drive DPH	kg lb	645 1422
	kg lb	
	kg lb	

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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Performance	rpm	1000	1500	2000	2500	2800	3000	3200	3300	3400	3500
Crankshaft power 1), 5)	kW	31	69	121	152	169	169	169	169	169	169
	hp	42	94	165	207	230	230	230	230	230	230
Propeller shaft power 1) (At full load)	kW	30	66	116	146	162	162	162	162	162	162
	hp	40	90	158	198	221	221	221	221	221	221
Propellershaft power at prop. load $x^{2,5}$	kW	8	21	43	75	100	119	139	151	162	162
	hp	10	29	59	102	136	161	190	205	221	221
Propellershaft power at prop. load x^3	kW	4	14	33	64	91	111	135	148	162	162
	hp	6	19	45	88	123	152	184	202	221	221
Torque at crankshaft 2)	Nm	296	439	578	581	576	538	504	489	475	461
	lbf ft	218	324	426	428	425	397	372	361	350	340
Mean piston speed	m/s	3.7	5.5	7.3	9.2	10.3	11.0	11.7	12.1	12.5	12.8
	ft/s	12.0	18.0	24.1	30.1	33.7	36.1	38.5	39.7	40.9	42.1
Effective mean pressure 2)	MPa	1.01	1.51	1.98	1.99	1.98	1.84	1.73	1.68	1.63	1.58
	psi	147.2	218.4	287.2	288.6	286.5	267.4	250.7	243.1	236.0	229.2
Max combustion pressure 2)	MPa	12.6	16.1	20.0	20.0	19.4	17.7	16.5	16.5	16.7	16.8
	psi	1831	2331	2901	2901	2817	2561	2398	2396	2422	2442

Lubricating system

Specific lubricating oil consumption.	g/kWh	< 0.2
Max. oil volume including filters for all allowed installation inclinations:	litres	12
	US gal	3.17
Max. oil volume excluding filters for all allowed installation inclinations:	litres	10.5
	US gal	2.77
Min. oil volume excluding filters for all allowed installation inclinations:	litres	9.3
	US gal	2.46

Fuel system	rpm	1000	1500	2000	2500	2800	3000	3200	3300	3400	3500
Specific fuel consumption 2)	g/kWh	249	235	213	198	202	210	220	225	227	232
	lb/hph	0.403	0.381	0.345	0.321	0.327	0.34	0.356	0.365	0.368	0.376
Fuel consumption, Test cycle E5 EU	g/kWh	226									
	lb/hph	0.37									
Fuel consumption at prop. load $x^{2,5}$	l/h	2.6	5.9	11.7	20.2	26.9	31.9	38.2	42.0	45.9	46.9
	US gal/h	0.7	1.6	3.1	5.3	7.1	8.4	10.1	11.1	12.1	12.4

Fuel system	rpm	1000	1500	2000	2500	2800	3000	3200	3300	3400	3500
Fuel consumption at prop. load x^3	l/h	1.9	4.3	9.3	17.6	24.9	30.1	37.4	41.2	45.9	46.9
	US gal/h	0.5	1.1	2.4	4.7	6.6	8.0	9.9	10.9	12.1	12.4
Fuel consumption at full load	l/h	9.2	19.4	30.8	36.0	40.9	42.5	44.5	45.5	45.9	46.9
	US gal/h	2.4	5.1	8.1	9.5	10.8	11.2	11.8	12.0	12.1	12.4

Full load performance at rated speed

Fuel inlet temperature	°C	40
	°F	104
Fuel return temperature from engine	°C	65
	°F	149
Fuel consumption	l/h	45.9
	US gal/h	12.13
Fuel inlet flow to engine	l/h	72.9
	US gal/h	19.26
Fuel return flow from engine	l/h	27
	US gal/h	7.13

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Intake and exhaust system	rpm	1000	1500	2000	2500	2800	3000	3200	3300	3400	3500
Specific exhaust heating effect in percent of crankshaft power	%	49	51	57	51	53	58	63	65	66	69
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.	°C	387	466	467	369	345	339	335	337	340	352
	°F	729	871	873	696	653	642	635	639	644	666
Permitted exhaust back pressure after turbocharger at rated speed. (Installed back pressure)	kPa							Max		30	
	psi									4.4	
	kPa							Min		10	
	psi									1.5	

Intake and exhaust system	rpm	1000	1500	2000	2500	2800	3000	3200	3300	3400	3500
Engine air consumption at 25°C / 77°F atmospheric pressure 100kPA	m³/min	1.8	3.0	6.4	9.9	12.7	13.9	15.0	15.6	16.1	16.8
	cu.ft./min	63.57	105.9	226	349.6	448.5	490.9	529.7	550.9	568.6	593.3
Charge air pressure Inlet manifold	kPa	12	38	103	154	190	201	205	210	212	220
	psi	1.7	5.5	14.9	22.3	27.6	29.2	29.7	30.5	30.7	31.9
Exhaust gas flow	m³/min	4.3	8.2	16.5	20.8	24.3	25.7	26.8	27.5	28.1	29.2
	cu.ft./min	151.9	289.6	582.7	734.5	858.1	907.6	946.4	971.2	992.3	1031

Cooling system	rpm	1000	1500	2000	2500	2800	3000	3200	3300	3400	3500
Radiated heat of crankshaft power at full load.	kW	0.9	1.9	3.5	4.5	5.1	5.1	5.0	5.0	5.1	5.2
Heat rejection to charge air cooler of crankshaft power at full load.	kW	0.3	2.1	11.6	23.0	33.8	38.4	42.9	45.4	49.2	53.0
Coolant heat rejection to HE, incl. engine oil cooler and excl. charge air cooler, of crankshaft power at full load.	kW	36	57	91	93	100	96	92	93	113	107
Coolant flow with fully open thermostat and std cooling system	l/min	59	91	122	152	170	183	195	201	207	213
	cu.ft./min	2.1	3.2	4.3	5.4	6.0	6.5	6.9	7.1	7.3	7.5
Extra water pump flow through charge air cooler	l/min										
	cu.ft./min										
Max. pump pressure at extra pump pressure side (pressure set system)	kPa										
	psi										
Max. permissible temperature on coolant in engine outlet	°C	55									
	°F	131									
Coolant volume engine, including heat exchanger and charge air cooler	litres	13									
	US gal.	3.43									
Max. additional coolant for cabin heater etc. with std. Expansion tank	litres	5									
	US gal.	1.32									
Maximum coolant flow to cabin heater etc.	l/min	30									
	cu.ft./min	1.06									
Thermostat, start open at	°C	78									
	°F	172									
Thermostat, fully open at	°C	90									
	°F	194									

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Raw water circuit	rpm	1000	1500	2000	2500	2800	3000	3200	3300	3400	3500
Nominal raw water design flow	l/min	50	72	92	108	116	121	126	128	131	134
	cu.ft/min	1.8	2.5	3.2	3.8	4.1	4.3	4.4	4.5	4.6	4.7
Nominal raw water pump pressure head at design flow.	kPa	30	39	66	92	109	121	133	138	142	146
	psi	4.4	5.7	9.6	13.3	15.8	17.5	19.3	20.0	20.6	21.2
Maximum raw water pump suction head	kPa	-30									
	psi	-4.4									
Maximum additional pressure drop excl. reverse gear oil cooler	kPa										
	psi										
Pressure drop over reverse gear oil cooler (optional equipment)	kPa										
	psi										
Maximum raw water temperature entering heat exchanger	°C	32									
	°F	90									

1 circuit keel cooling system	rpm	1000	1500	2000	2500	2800	3000	3200	3300	3400	3500
Design point for keel cooler, engine outlet temperature	°C										
	°F										
Maximum temperature to engine from external cooling system circuit	°C										
	°F										
Maximum temperature to engine inlet from external cooling system circuit	°C										
	°F										
Coolant flow through keel cooler at design point	l/min										
	cu.ft./min										
Maximum coolant flow through keel cooler	l/min										
	cu.ft./min										
Pressure drop in external circuit, including piping	kPa										
	psi										
Coolant volume engine	litres										
	US gal.										

1 1/2 circuit keel cooling system (Two circuit	rpm	1000	1500	2000	2500	2800	3000	3200	3300	3400	3500
Design point for keel cooler, engine outlet temperature	°C										
	°F										
Maximum temperature to charge air cooler from external cooling system circuit	°C										
	°F										
Coolant flow through keel cooler at design point	l/min										
	cu.ft./min										
Maximum coolant flow through keel cooler	l/min										
	cu.ft./min										
Pressure drop in external circuit, including piping	kPa										
	psi										
Coolant volume engine	litres										
	US gal.										

2 circuit keel cooling system, LT	rpm	1000	1500	2000	2500	2800	3000	3200	3300	3400	3500
Maximum temperature to charge air cooler from external LT-cooling system	°C										27
	°F										81
Coolant flow through keel cooler, LT-cooling system circuit	l/min										134
	cu.ft./min										4.7
Pressure drop in external LT-cooling system circuit, including piping	kPa	50									
	psi	7.3									
Coolant volume charge air cooler	litres	2									
	US gal.	0.53									

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2 circuit keel cooling system, HT	rpm	1000	1500	2000	2500	2800	3000	3200	3300	3400	3500
Design point for keel cooler, engine outlet temperature	°C										83
	°F										181
Maximum temperature to engine from external HT-cooling system circuit	°C										62
	°F										144
Coolant flow through keel cooler, HT-cooling system circuit at design point	l/min										95
	cu.ft./min										3.4
Maximun coolant flow through keel cooler, HT-cooling system circuit	l/min										213
	cu.ft./min										7.5
Pressure drop in external HT-cooling system circuit, including piping	kPa	70									
	psi	10.2									
Coolant volume engine	litres	13									
	US gal.	3.43									

Emissions	rpm	1000	1500	2000	2500	2800	3000	3200	3300	3400	3500
Smoke at prop. load $x^{2,5}$	*BSU	0.1	0.1	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.4
Smoke at prop. load x^3	*BSU	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.5	0.4
Noise at prop. load $x^{2,5}$. 4)	dBA	98.8	101.8	103.8	107.7	109.5	110.4	111.1	111.4	112	112.1
Noise at prop. load x^3. 4)	dBA	97.9	101.6	103.3	107.7	109.1	110.2	111	111.2	112	112.1

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

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Sensors : Control and Monitoring System							
Sensors	**Signal**	**Range**	**Unit**	**Warning Initial Delay / Warning Delay**	**Warning Level**	**Derating Level**	**Engine protection action**
Coolant level switch	Digital	ON/OFF		30 sec from start / 5 sec	Low (ON / Closed)	NA	Warning only
Coolant temperature	50-0 kΩ	-40 - 140	°C	30 sec from start / 5 sec	96	99	See derating map
Fuel temperature	50-0 kΩ	-40 - 140	°C		60	NA	Warning only
Engine speed cam	Frequency		rpm	Instant	Lost signal	NA	Warning only
Engine speed crank	Frequency		rpm	Instant	Lost signal	NA	Warning only
Oil level sensor	Digital	ON/OFF		30 sec from start / 5 sec	Low level	NA	Warning only
Oil temperature	PT1000	-40 - 150	°C	30 sec from start / 5 sec	132	135	See derating map
Water In fuel switch	Digital	ON/OFF		All the time	Water in fuel	NA	Warning only
Wet Exhaust temp	PT200	0 - 850	°C	30 sec from start / 5 sec	90	95	See derating map

Sensors (rpm dependent)	**Signal**	**Range**	**Unit**	**Initial Delay / Delay**	**Warning Level / Derating Level / Shutdown Level rpm Map**					**Comment**
Charge air temperature	50-0 kΩ	-40 - 130	°C		**0 rpm**	**1200 rpm**	**2000 rpm**	**2500 rpm**	**3600 rpm**	
Warning Level			°C	30 sec from start / 5 sec	100	100	70	70	70	
Derating Level			°C							**See derating map**
Fuel pressure	0,5-4,5 V	0-200	kPa		**0 rpm**	**600 rpm**	**1600 rpm**	**2600 rpm**	**3600 rpm**	
Warning Level			kPa	30 sec from start / 5 sec	50	50	50	50	50	
Derating Level			kPa	NA	NA	NA	NA	NA	NA	
Oil pressure	0,5-4,5 V	0-700	kPa		**0 rpm**	**600 rpm**	**1200 rpm**	**2000 rpm**	**3600 rpm**	
Warning Level			kPa	30 sec from start / 5 sec	-50	75	150	200	230	
Derating Level (30% remain trq.)			kPa	10% trq. decr. per sec	-50	70	120	170	200	

Warning = Yellow Lamp active

Derating = Red Lamp active

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Derating map

Charge Air Temp [°C]	rpm	75°C	80°C	85°C
Remaining torque in %	600	100%	100%	100%
	1600	100%	100%	100%
	2200	100%	75%	50%

Coolant temp [°C]	rpm	99°C	104°C	108°C
Remaining torque in %	600	100%	100%	100%
	1600	100%	85%	75%
	2200	100%	75%	50%

Oil temp [°C]	rpm	135°C	137.5°C	140°C
Remaining torque in %	600	100%	100%	100%
	1600	100%	85%	75%
	2200	100%	75%	50%

Oil pressure [kPa]	rpm	
Remaining torque in %	600	85%
	1600	70%
	2200	50%

Wet exhaust temp [°C]	rpm	95°C	105°C	115°C	125°C
Remaining torque in %	600	100%	100%	100%	100%
	1600	100%	85%	80%	75%
	2200	100%	75%	65%	50%

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Transmission: Control and Monitoring System: DPI Drive							Engine protection action
Sensors	**Signal**	**Range**	**Unit**	**Warning Initial Delay / Warning Delay**	**Warning Level**	**Derating Level**	
Gear oil temperature (EVC)	50-0 kΩ	-30 - 130±4%	°C	N/A	95		Warning only
Gear oil pressure (EVC)	Frequency	0-3000±3%	kPa	60 sec from start / 7 sec	700		Warning only

Transmission: Control and Monitoring System: Reverse Gear							Engine protection action
Sensors	**Signal**	**Range**	**Unit**	**Warning Initial Delay / Warning Delay**	**Warning Level**	**Derating Level**	
Gear oil temperature (EVC)	50-0 kΩ	-30 - 130±4%	°C	N/A	95		Warning only

Transmission: Control and Monitoring System: IPS Drive							Engine protection action
Sensors	**Signal**	**Range**	**Unit**	**Warning Initial Delay / Warning Delay**	**Warning Level**	**Derating Level**	
Gear oil temperature (EVC)	50-0 kΩ	-30 - 130±4%	°C	N/A	95		Warning only
Gear oil pressure (EVC)	Frequency	0-3000±3%	kPa	60 sec from start / 7 sec	700		Warning only

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Technical data - Drive unit

Drive line		DPI with D4/D6
Transmission type		DPI-A
Gear ratio (total)		1,69:1 and 1,85:1
Steering angle, max.		+/- 24º
Total weight of drive unit (1)	kg	154
Oil capacity, approx.	litres	5.7
Oil volume difference MIN-MAX	litres	0.3
Oil type drive		Volvo Penta API GL5 75W/90
Propeller range		H2-H10

(1) Drive, Transom shield kit, including oil and various installation components. Propellers are not included in total weight

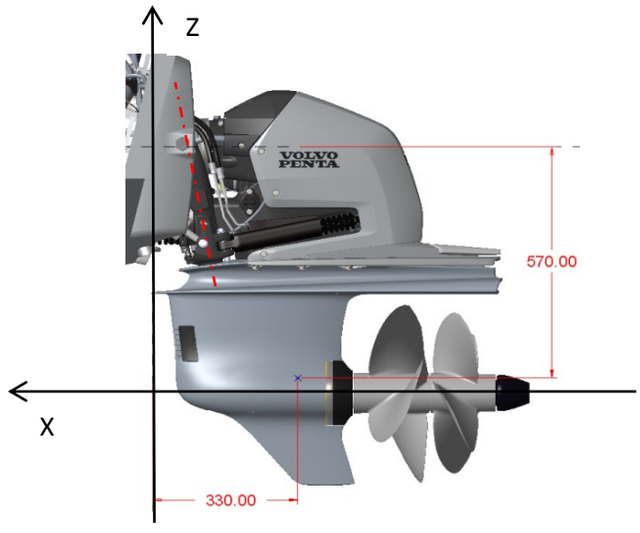
"Generalized maximum load document"for DPI

Valid products	Drive Unit	Gear Ratio
DPI-A with D6	DPI	1,69:1
DPI-A with D4	DPI	1,85:1

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
25-50 kn	Fx	18 kN
	Fy (+/-)	11 kN
	MCL rudder (+/-)	1.6 kNm

Fy load coordinate	570 mm
Fy load coordinate	330 mm



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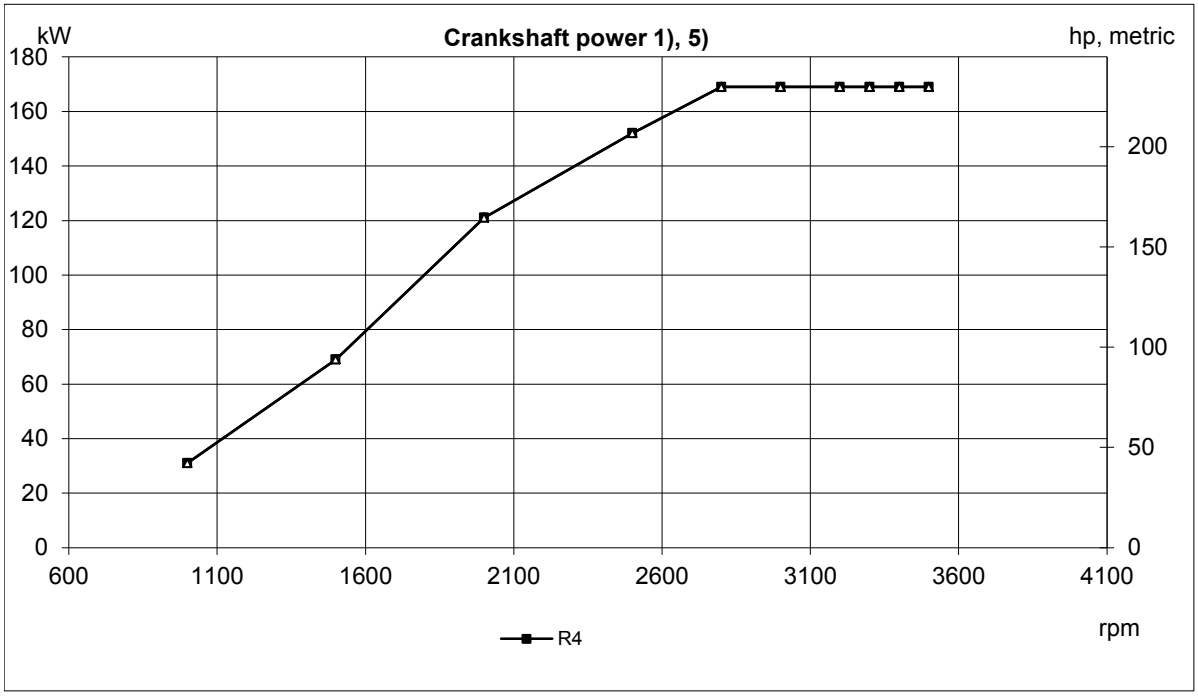

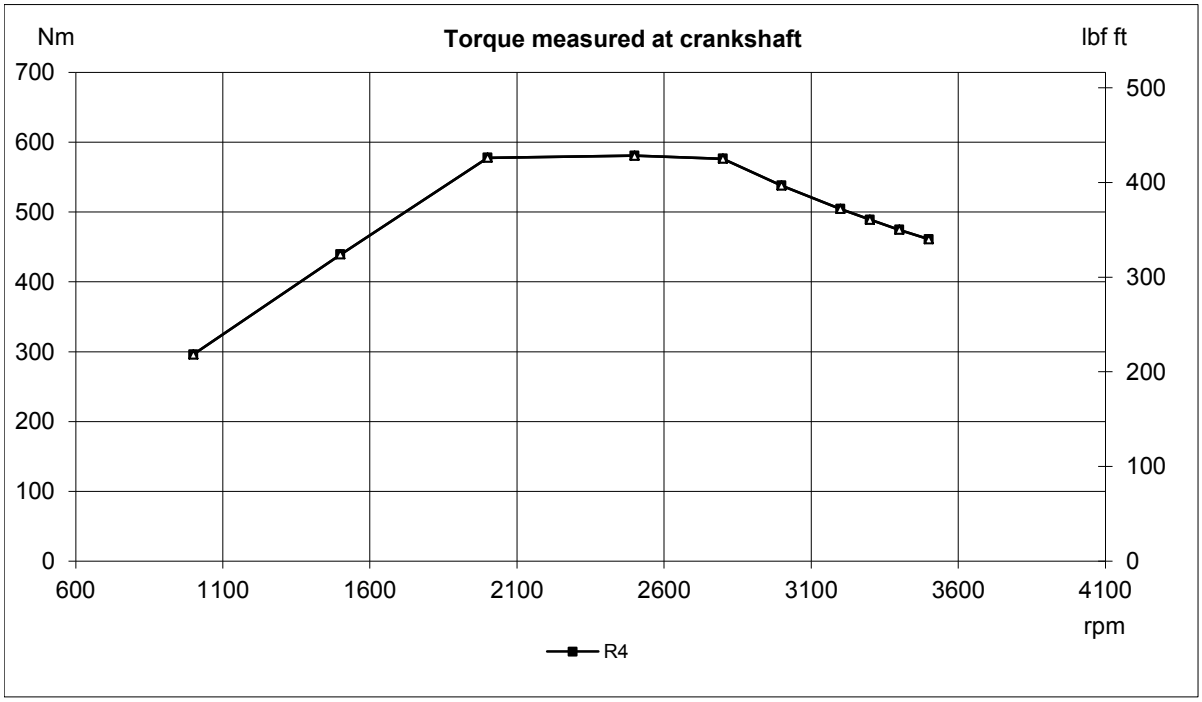

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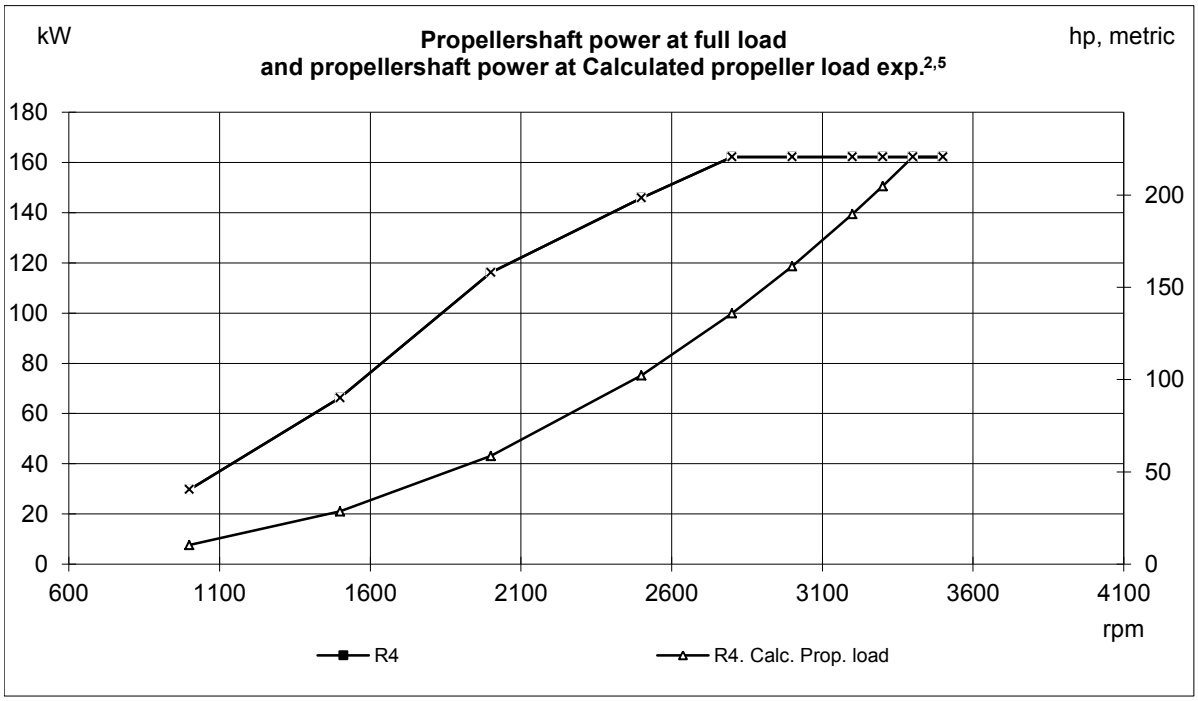

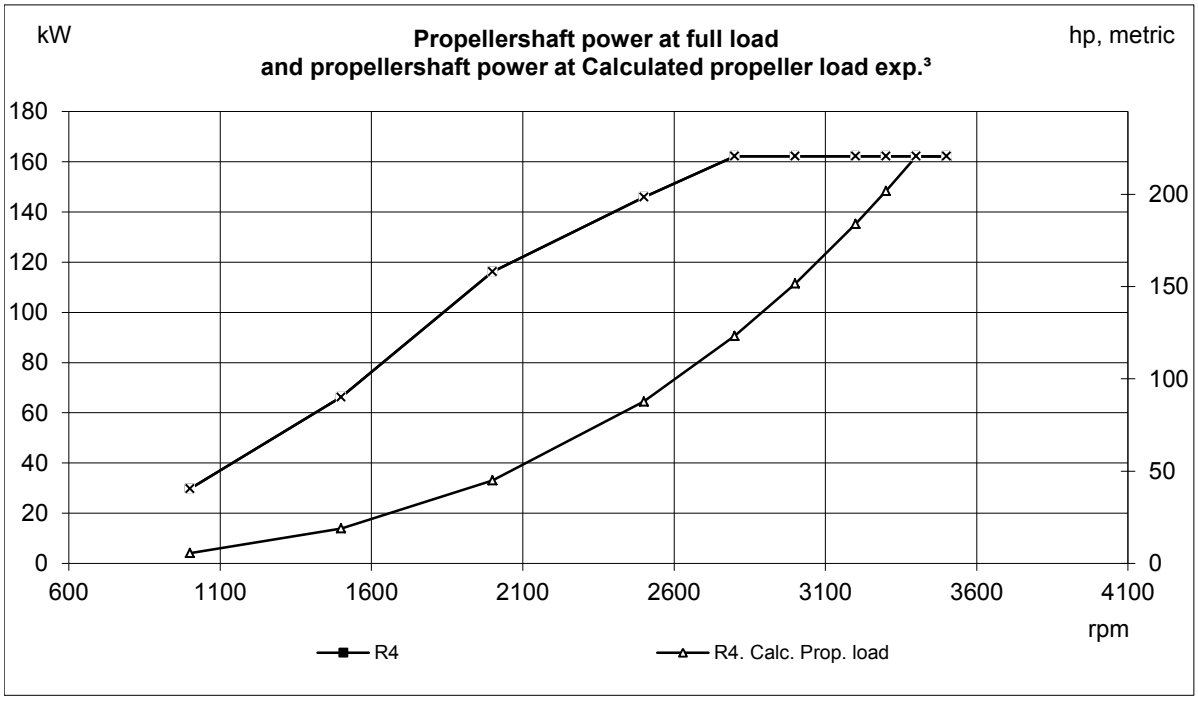

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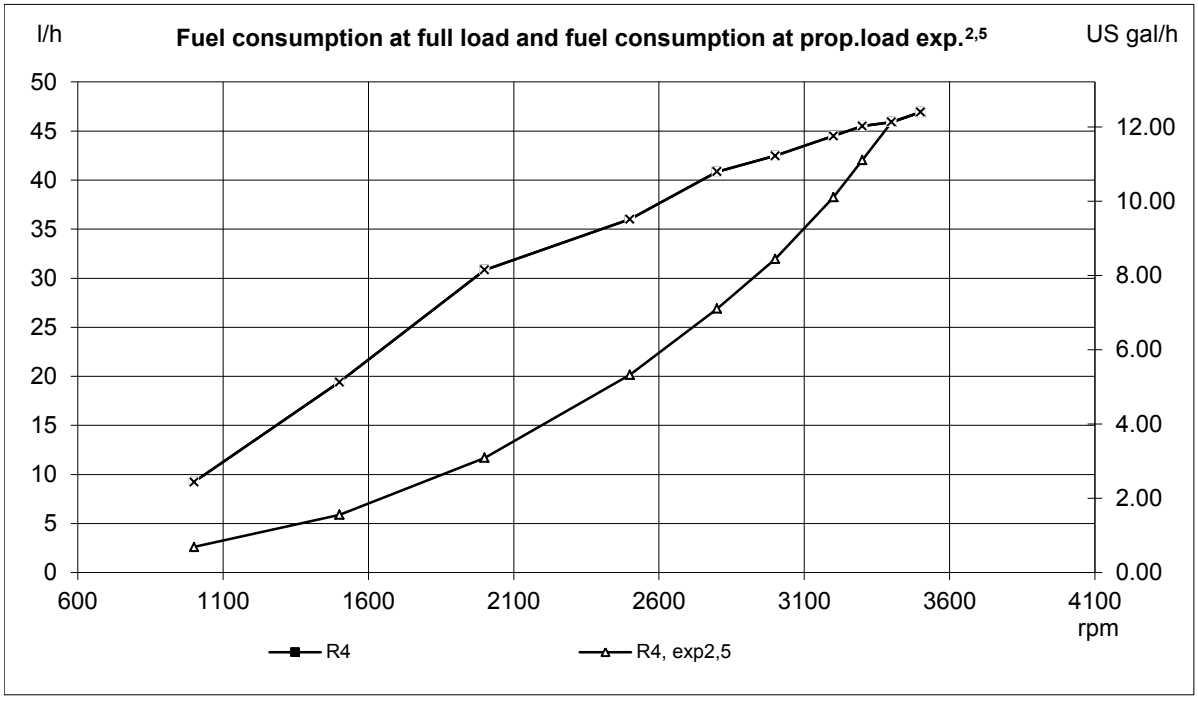

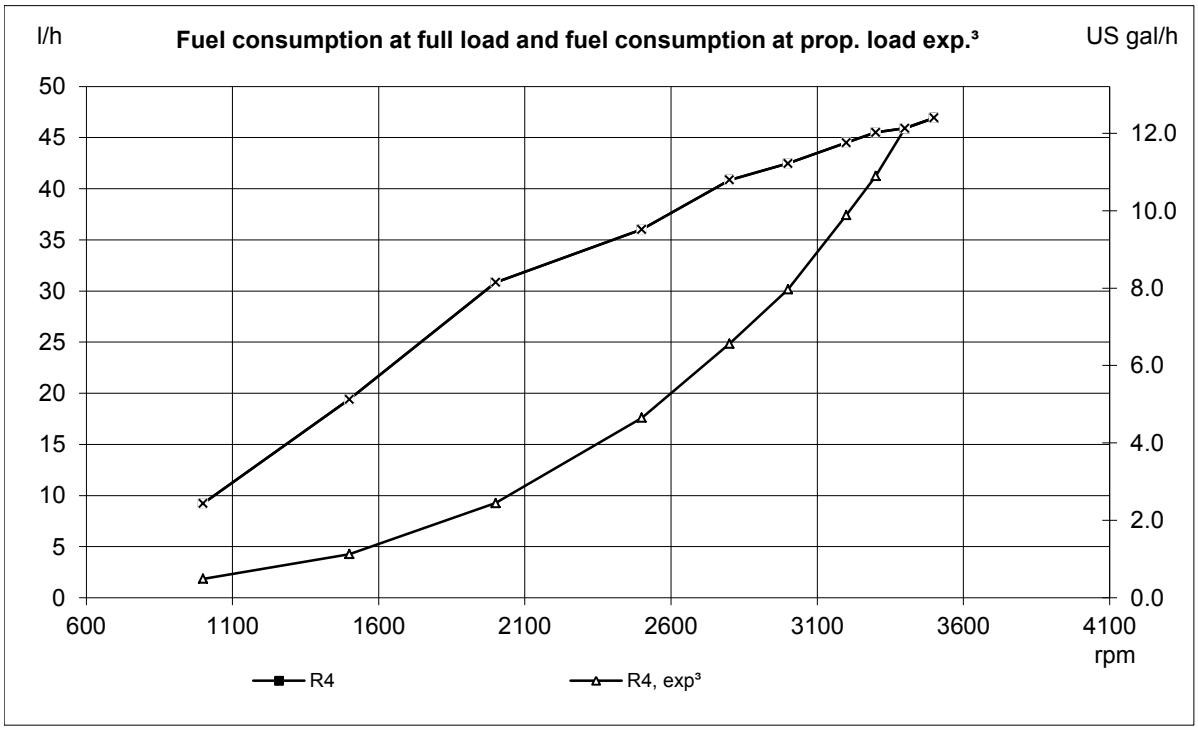

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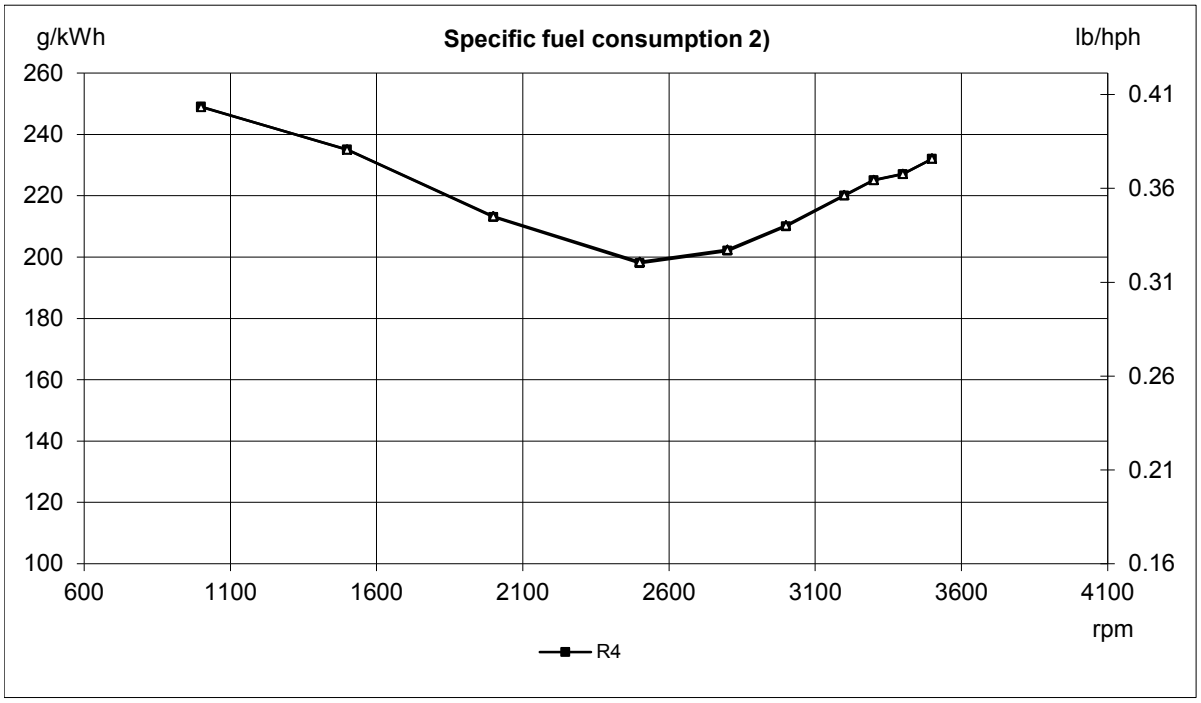

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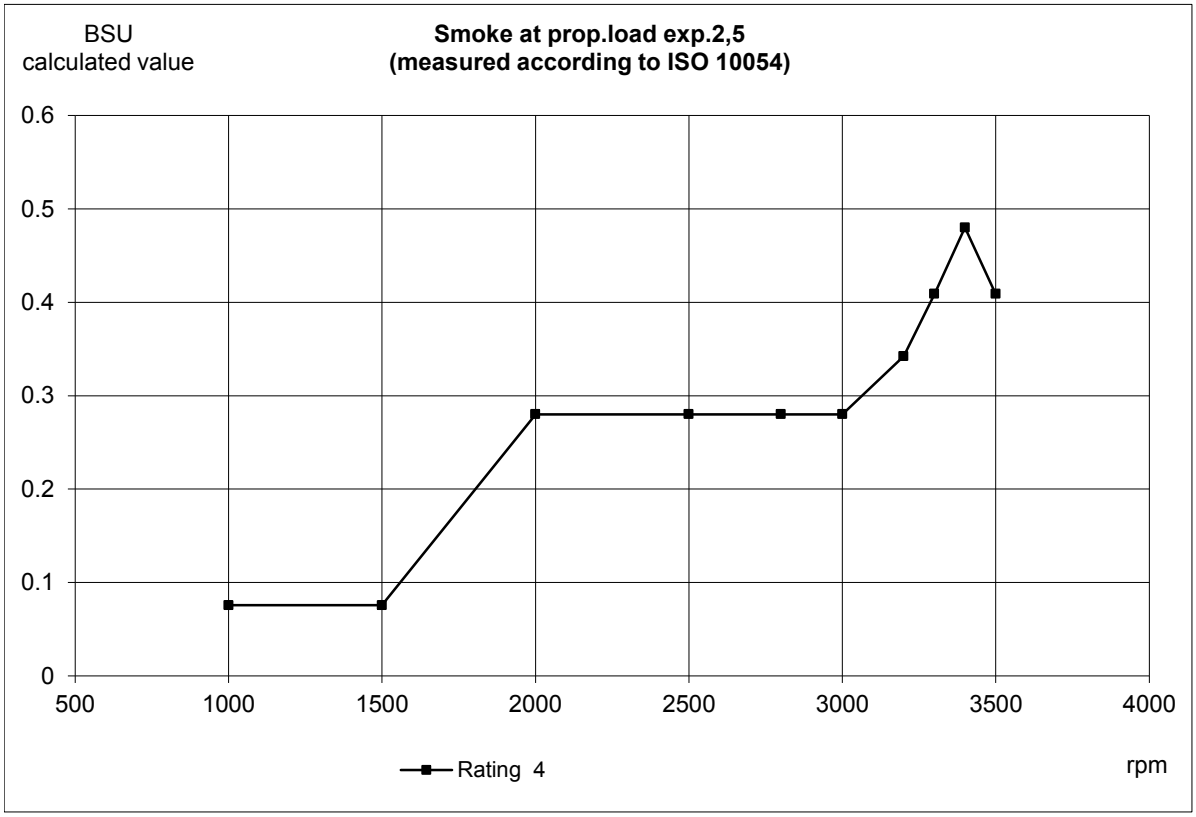

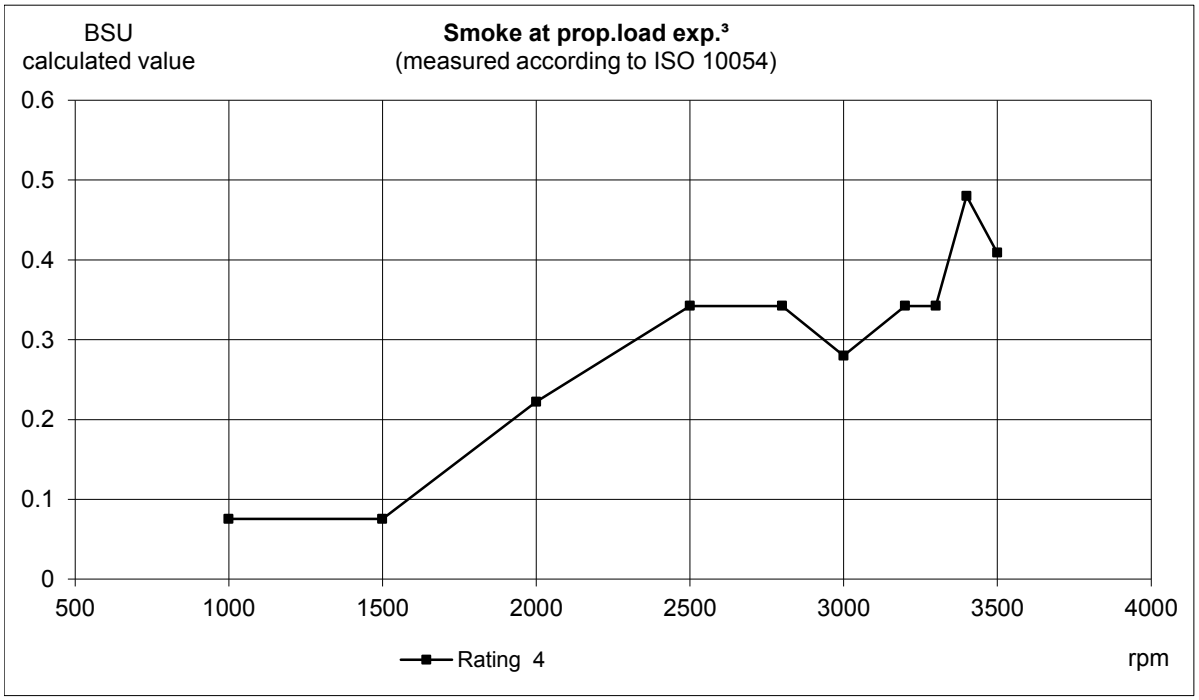

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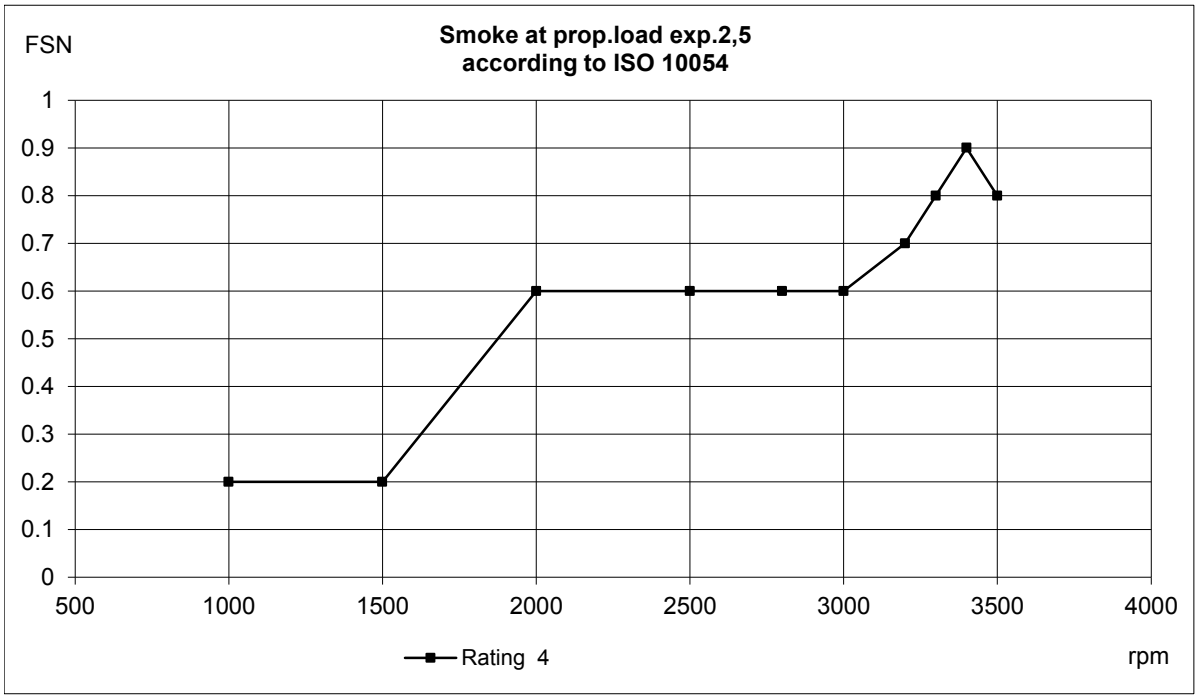

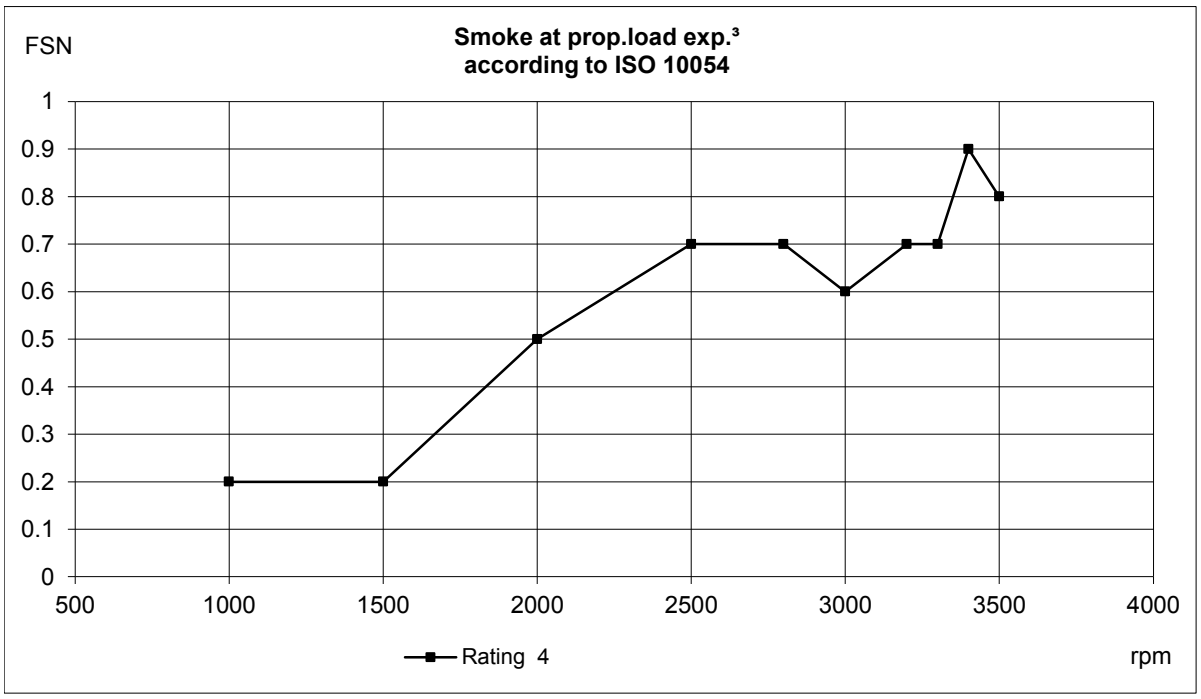

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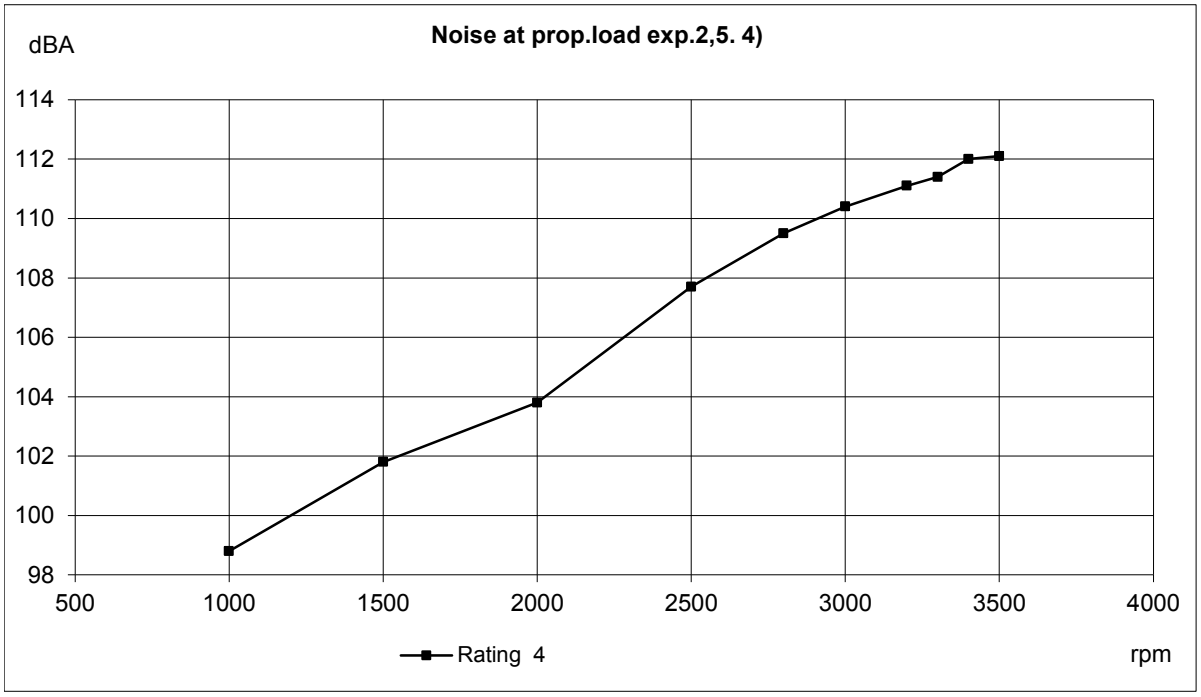

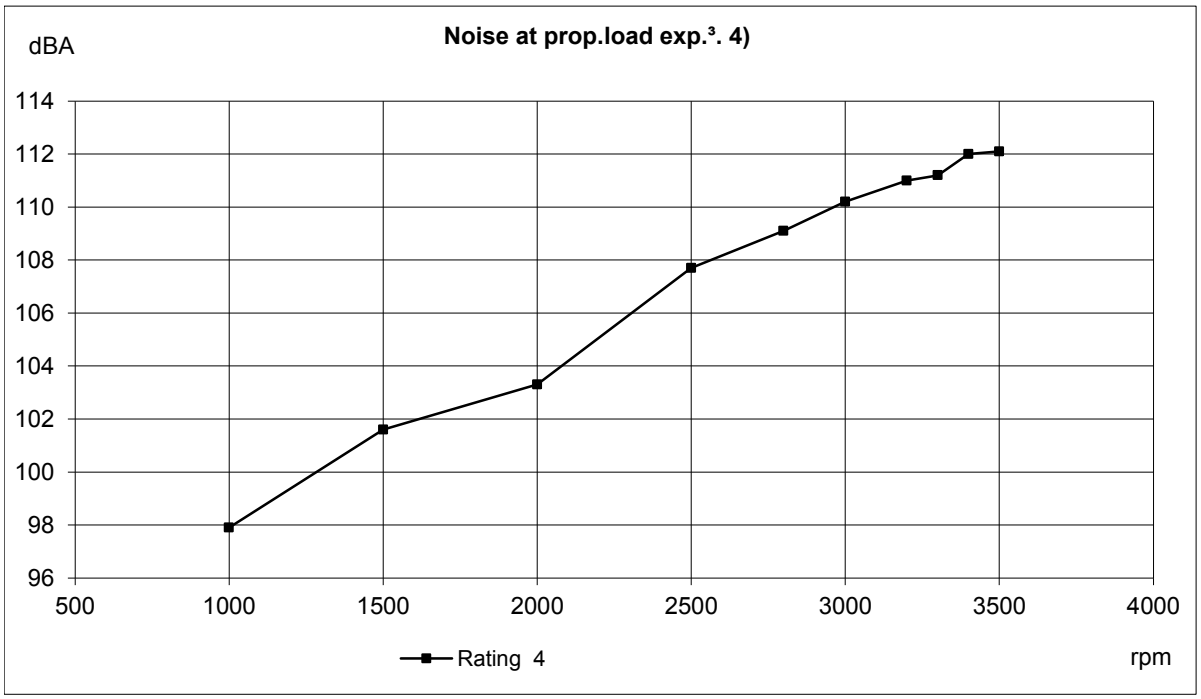

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Battery capacity 12V DPI

Temp [°C]	Min battery size [Ah]	CCA EN (Cold cranking Amps) [A]	Max line resistance @ 20°C [mΩ]	Recommended max cable resistance @ 20°C [mΩ]	Min cross sectional area (due to heat increase) [mm²]
5	95	850 (EN)	2	1.8	70
-5	120	1150 (EN)	2	1.8	70

Battery capacity 24V DPI

5	75	750(EN)	2	1.8	50
-5	95	850 (EN)	2	1.8	50

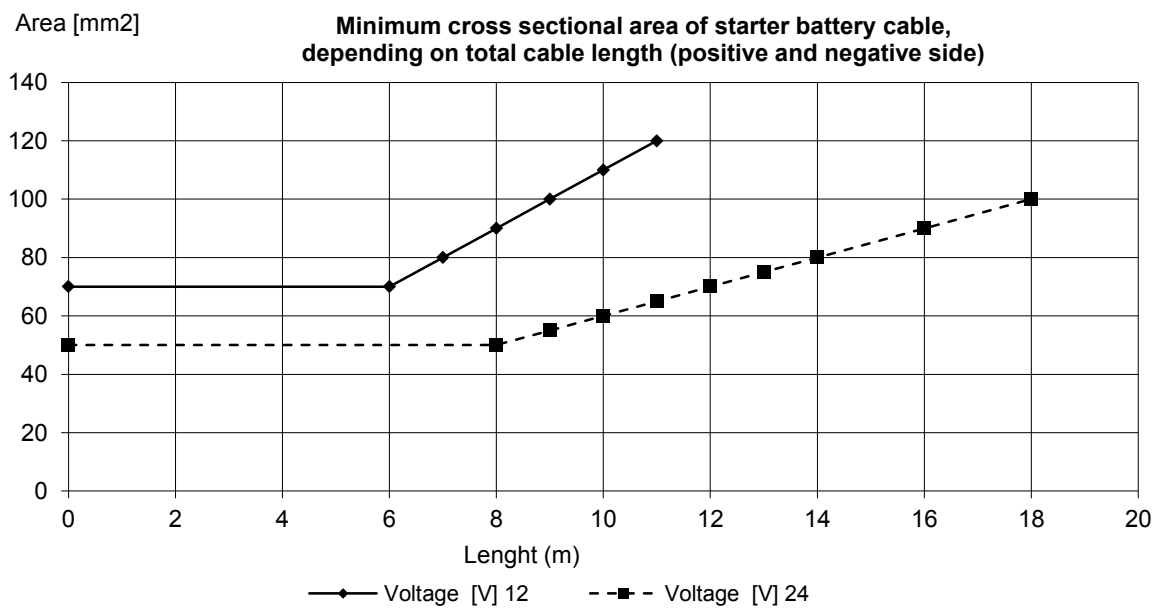
Battery capacity 12V DPH

5	95	750 (EN)	2	1.8	70
-5	110	850 (EN)	2	1.8	70

Battery capacity 24V DPH

5	70	600(EN)	2	1.8	50
-5	75	750 (EN)	2	1.8	50

Minimum cable cross sectional area



Fuses size:

	[A]
Engine:	10
Control system:	10

Max current consumption during normal operation:

	[A]
Engine :	2 - 4

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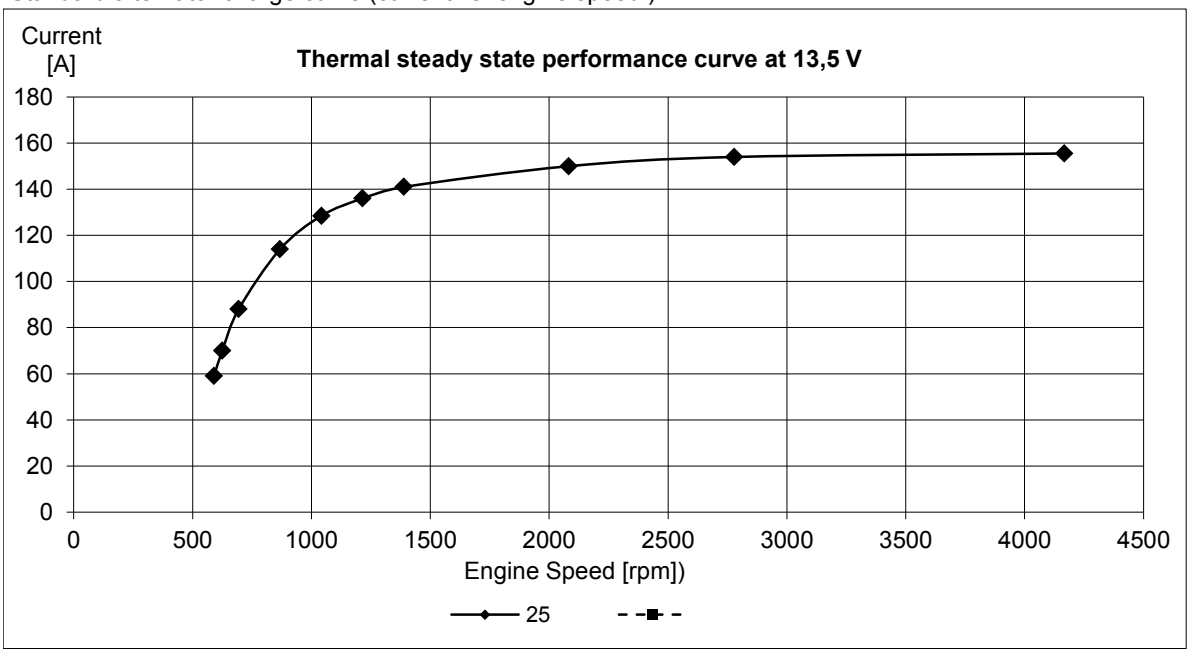
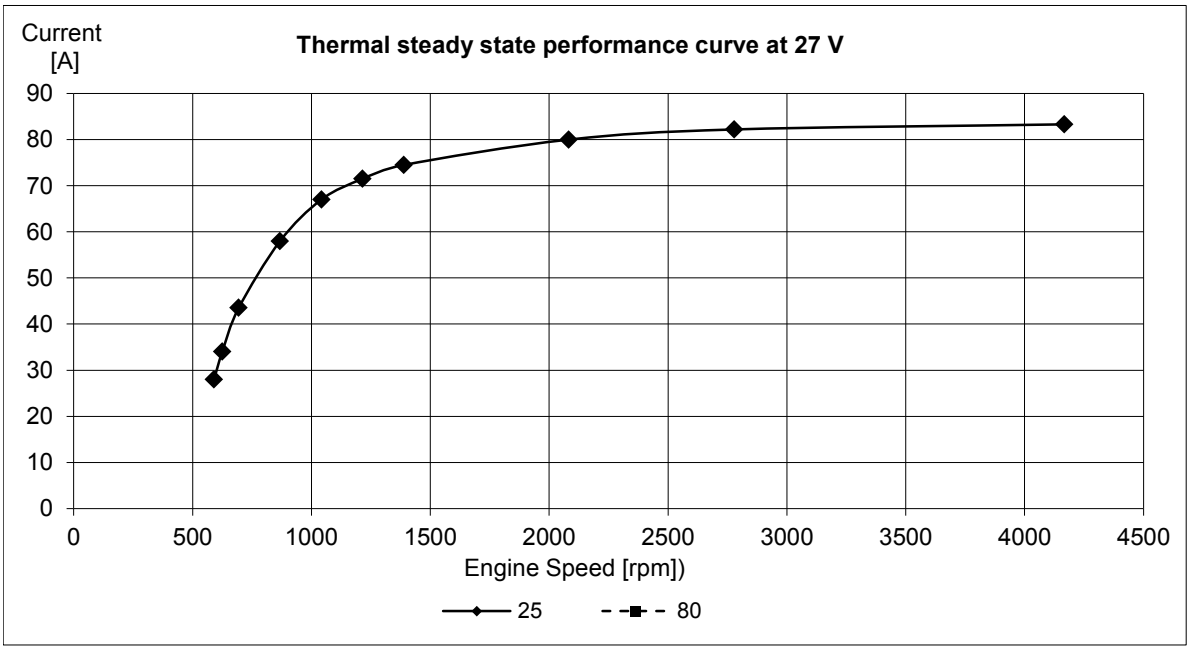
Alternator data:

Standard alternator charge curve (current vs. engine speed.)



Constant charge voltage: [V]	14.3	+/- 0,3



Constant charge voltage: [V]	28.3	+/- 0,3

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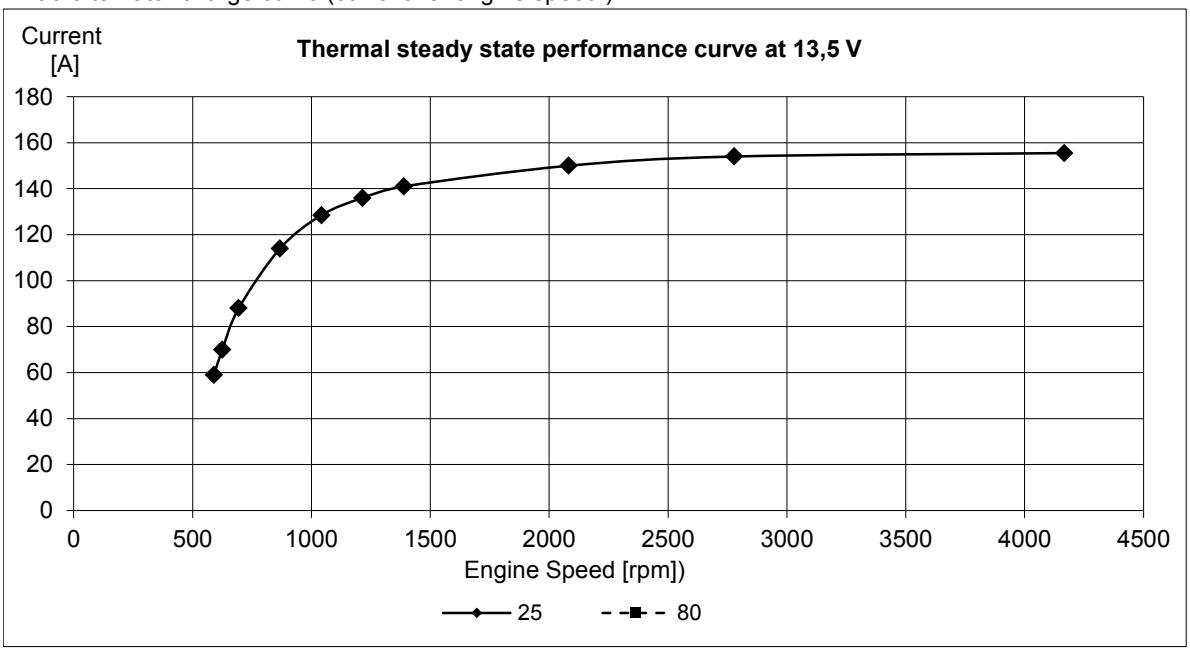
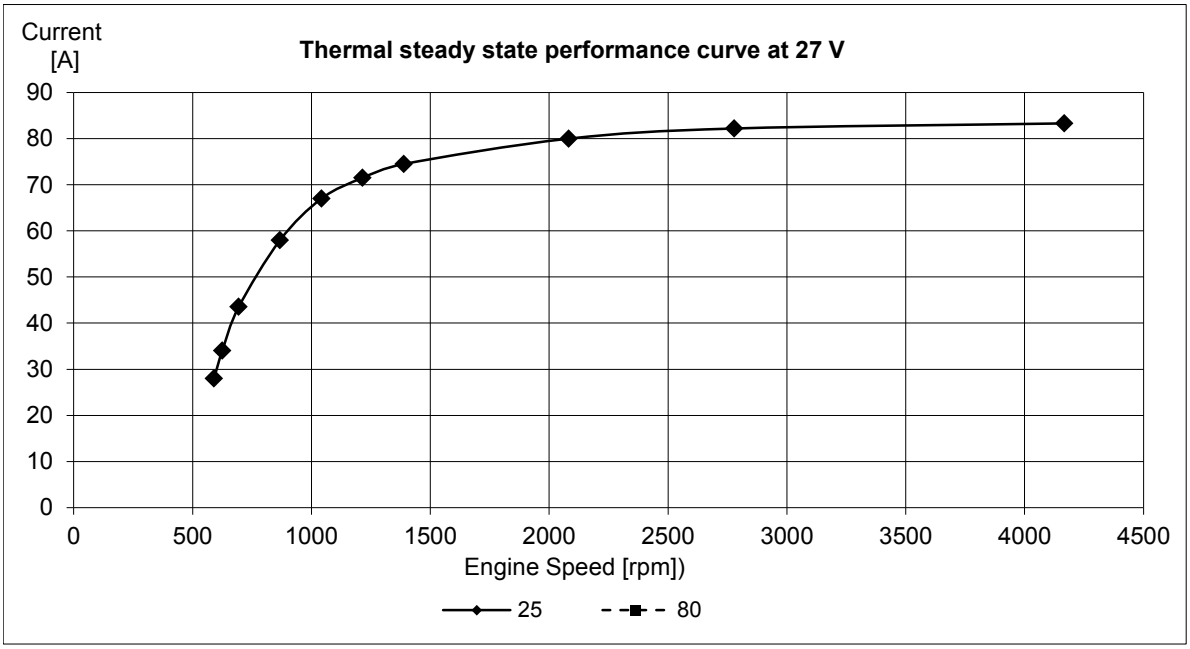
Alternator data:

Extra alternator charge curve (current vs. engine speed.)



Constant charge voltage: [V]	14.3	+/- 0,3



Constant charge voltage: [V]	28.3	+/- 0,3