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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	2800
Governed speed R4	rpm	2930
Propeller selection range R4		2750-2930
Dry weight engine BT	kg lb	510 1124
Dry weight with reverse gear HS85A	kg lb	590 1301
Dry weight with reverse gear HS68A	kg lb	565 1246
Dry weight with reverse gear HS68IV	kg lb	595 1312
Dry weight with reverse gear ZF68	kg lb	565 1246
Dry weight with reverse gear HS45A	kg lb	560 1235

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	1800	2000	2200	2500	2600	2700	2800	2900
Crankshaft power 1), 5)	kW	30	69	100	112	124	129	129	129	129	129
	hp	41	94	136	152	169	175	175	175	175	175
Propeller shaft power 1) (At full load)	kW	29	66	96	108	119	124	124	124	124	124
	hp	39	90	131	146	162	168	168	168	168	168
Propellershaft power at prop. load $x^{2,5}$	kW	9	26	41	53	68	93	103	113	124	124
	hp	13	35	56	73	92	127	140	154	168	168
Propellershaft power at prop. load x^3	kW	6	19	33	45	60	88	99	111	124	124
	hp	8	26	45	61	82	120	135	151	168	168
Torque at crankshaft 2)	Nm	286	439	531	535	538	493	474	456	440	425
	lbf ft	211	324	391	394	397	363	349	337	324	313
Mean piston speed	m/s	3.7	5.5	6.6	7.3	8.1	9.2	9.5	9.9	10.3	10.6
	ft/s	12.0	18.0	21.7	24.1	26.5	30.1	31.3	32.5	33.7	34.9
Effective mean pressure 2)	MPa	0.98	1.51	1.82	1.83	1.84	1.69	1.62	1.56	1.51	1.46
	psi	142.4	218.4	263.7	265.8	267.6	245.0	235.5	226.8	218.7	211.2
Max combustion pressure 2)	MPa	12.9	16.7	18.6	19.2	18.7	16.4	14.2	13.6	13.0	13.2
	psi	1869	2426	2702	2781	2718	2372	2057	1968	1879	1913

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	1800	2000	2200	2500	2600	2700	2800	2900
Specific fuel consumption 2)	g/kWh	261	246	223	210	201	204	208	209	217	222
	lb/hph	0.423	0.399	0.361	0.34	0.326	0.33	0.337	0.339	0.352	0.36
Fuel consumption, Test cycle E5 EU	g/kWh	219									
	lb/hph	0.35									
Fuel consumption at prop. load $x^{2,5}$	l/h	2.9	7.0	11.2	14.2	17.9	24.4	27.2	30.0	33.5	34.3
	US gal/h	0.8	1.8	3.0	3.7	4.7	6.5	7.2	7.9	8.8	9.1

Fuel system	rpm	1000	1500	1800	2000	2200	2500	2600	2700	2800	2900
Fuel consumption at prop. load x^3	l/h	2.1	5.4	9.2	12.3	16.2	23.3	26.3	29.5	33.5	34.3
	US gal/h	0.6	1.4	2.4	3.2	4.3	6.2	7.0	7.8	8.8	9.1
Fuel consumption at full load	l/h	9.4	20.3	26.7	28.1	29.8	31.5	32.1	32.3	33.5	34.3
	US gal/h	2.5	5.4	7.1	7.4	7.9	8.3	8.5	8.5	8.8	9.1

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	33.5
	US gal/h	8.85
Fuel inlet flow to engine	l/h	56.5
	US gal/h	14.93
Fuel return flow from engine	l/h	23
	US gal/h	6.08

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Intake and exhaust system	rpm	1000	1500	1800	2000	2200	2500	2600	2700	2800	2900
Specific exhaust heating effect in percent of crankshaft power	%	51	52	58	55	52	56	57	57	61	64
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.	°C	401	464	502	455	407	365	354	339	335	331
	°F	754	867	936	851	765	689	669	642	635	628
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	1800	2000	2200	2500	2600	2700	2800	2900
Engine air consumption at 25°C / 77°F atmospheric pressure 100kPA	m³/min	1.8	3.1	5.0	6.1	7.0	9.3	10.1	10.6	11.5	12.1
	cu.ft./min	63.57	109.5	176.6	215.4	247.2	328.4	356.7	374.3	406.1	427.3
Charge air pressure Inlet manifold	kPa	12	37	79	91	103	135	146	149	161	167
	psi	1.7	5.4	11.5	13.2	14.9	19.6	21.2	21.6	23.4	24.2
Exhaust gas flow	m³/min	4.4	8.5	13.9	15.4	16.4	19.4	20.2	20.5	21.7	22.5
	cu.ft./min	155.4	300.2	490.9	543.8	579.2	685.1	713.4	724	766.3	794.6

Cooling system	rpm	1000	1500	1800	2000	2200	2500	2600	2700	2800	2900
Radiated heat of crankshaft power at full load.	kW	0.9	1.9	3.0	3.4	3.6	3.9	3.9	3.9	3.9	3.9
Heat rejection to charge air cooler of crankshaft power at full load.	kW	0.7	2.5	8.1	10.8	13.0	20.7	23.6	25.2	29.0	31.3
Coolant heat rejection to HE, incl. engine oil cooler and excl. charge air cooler, of crankshaft power at full load.	kW	33.2	57.3	85.5	84.9	79.6	78.8	81.0	83.1	84.6	78.9
Coolant flow with fully open thermostat and std cooling system	l/min	59	91	110	122	133	152	158	164	170	190
	cu.ft./min	2.1	3.2	3.9	4.3	4.7	5.4	5.6	5.8	6.0	6.7
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	1800	2000	2200	2500	2600	2700	2800	2900
Nominal raw water design flow	l/min	50	72	86	92	100	108	111	114	116	119
	cu.ft/min	1.8	2.5	3.0	3.2	3.5	3.8	3.9	4.0	4.1	4.2
Nominal raw water pump pressure head at design flow.	kPa	21	43	58	67	78	95	100	103	106	113
	psi	3.0	6.2	8.4	9.7	11.3	13.8	14.5	14.9	15.4	16.4
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	1800	2000	2200	2500	2600	2700	2800	2900
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	1800	2000	2200	2500	2600	2700	2800	2900
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	1800	2000	2200	2500	2600	2700	2800	2900
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										119
	cu.ft./min										4.2
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	1800	2000	2200	2500	2600	2700	2800	2900
Design point for keel cooler, engine outlet temperature	°C										83
	°F										181
Maximum temperature to engine from external HT-cooling system circuit	°C										66
	°F										151
Coolant flow through keel cooler, HT-cooling system circuit at design point	l/min										80
	cu.ft./min										2.8
Maximun coolant flow through keel cooler, HT-cooling system circuit	l/min										190
	cu.ft./min										6.7
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	1800	2000	2200	2500	2600	2700	2800	2900
Smoke at prop. load $x^{2,5}$	*BSU	0.1	0.1	0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.4
Smoke at prop. load x^3	*BSU	0.1	0.1	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.4
Noise at prop. load $x^{2,5}$. 4)	dBA	98.8	101.8	103.4	105.1	106.6	108.1	108.8	109.5	110.3	110.4
Noise at prop. load x^3. 4)	dBA	98.3	102.5	103	103.5	105.6	107.6	108.5	109.5	110.3	110.4

***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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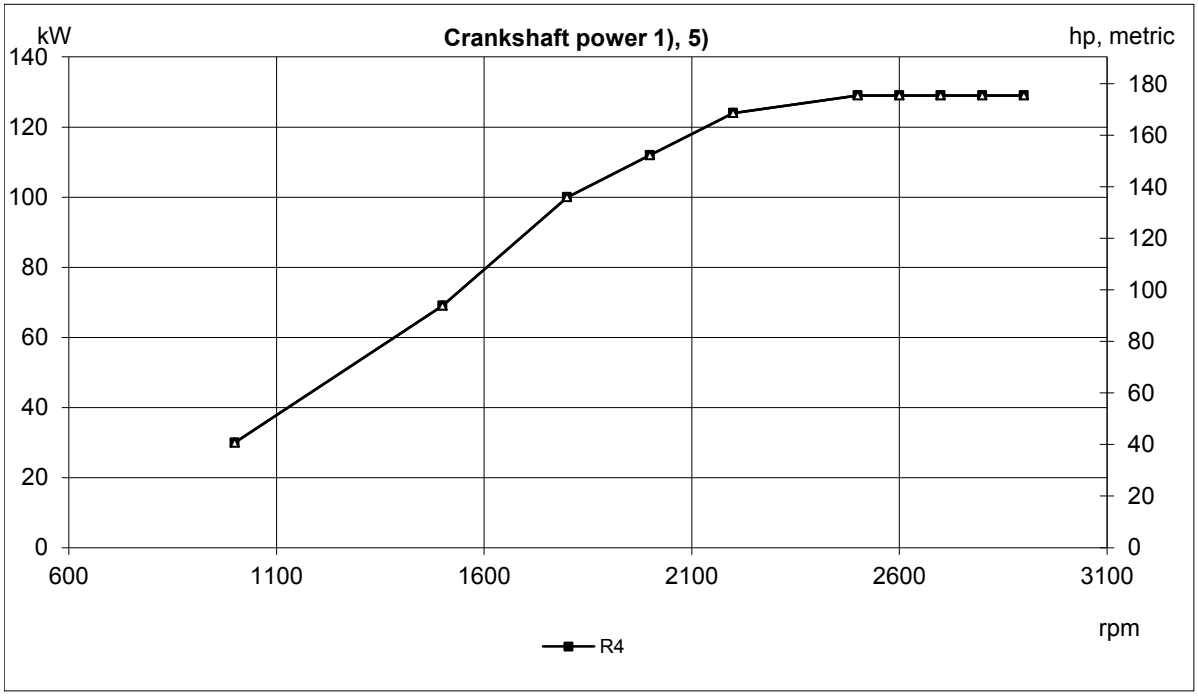

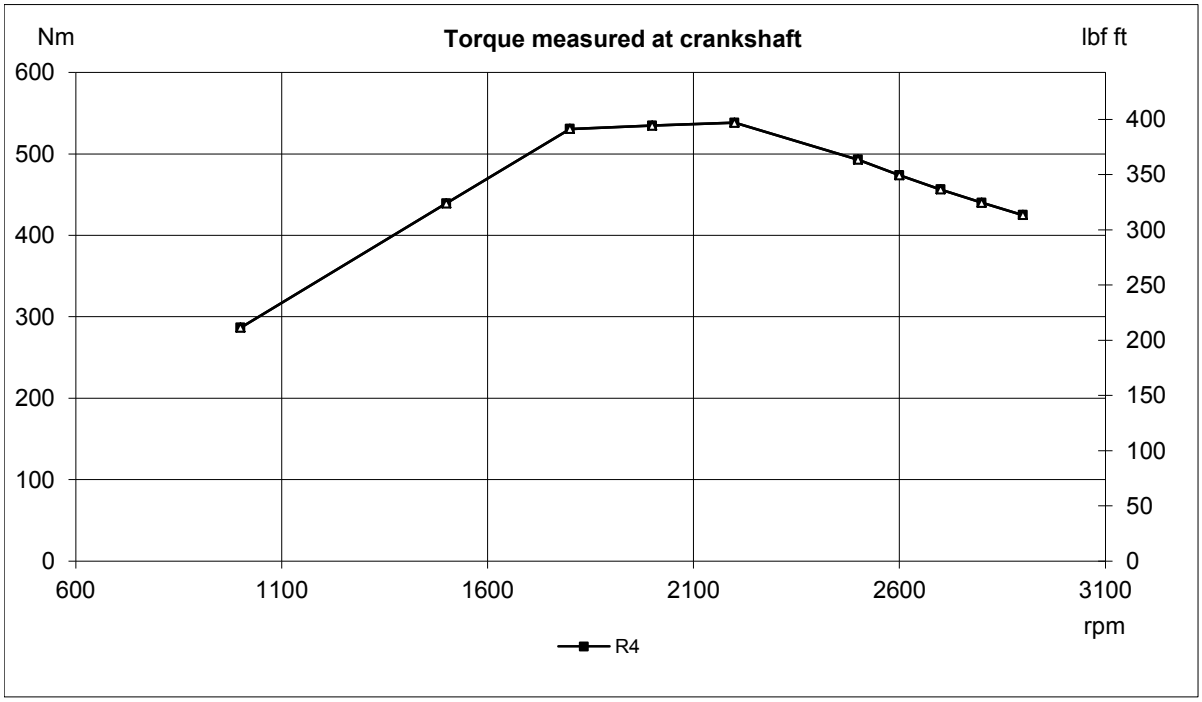

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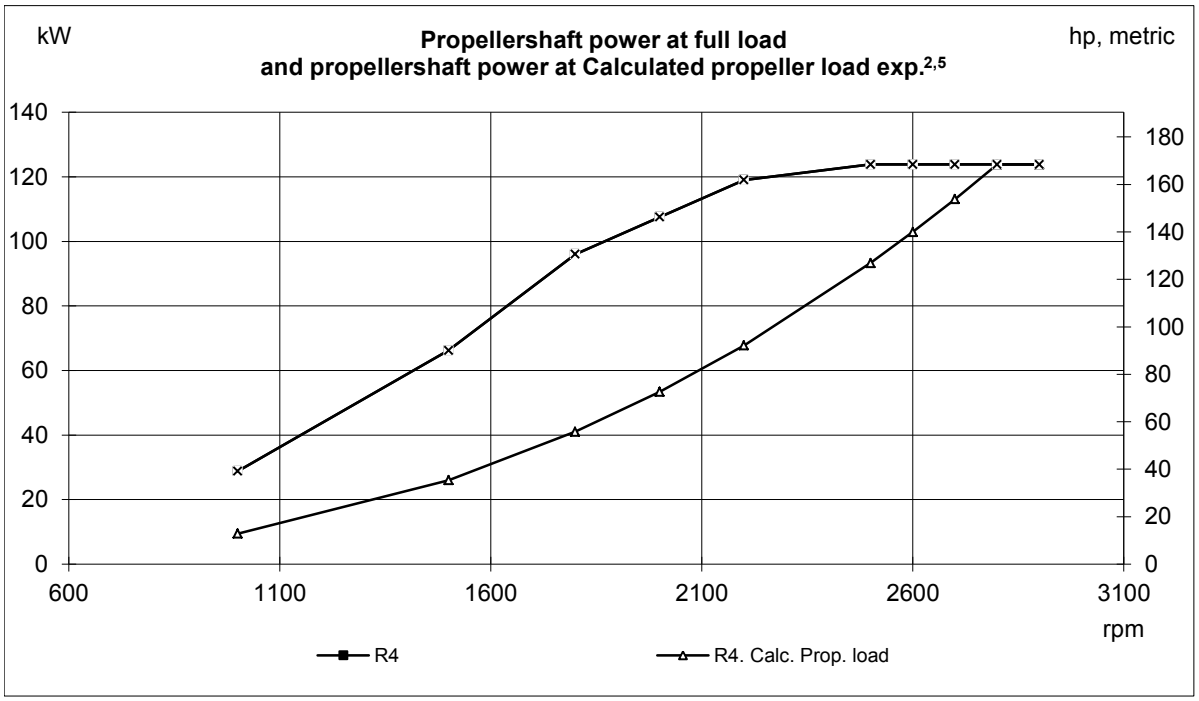

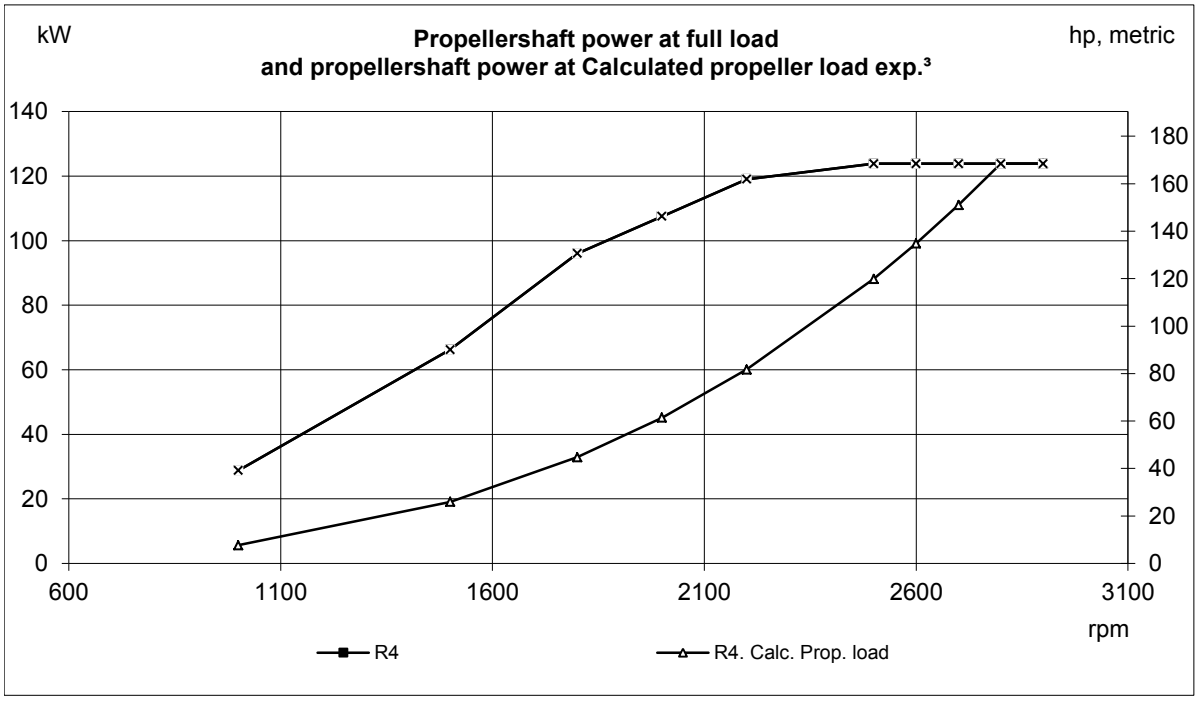

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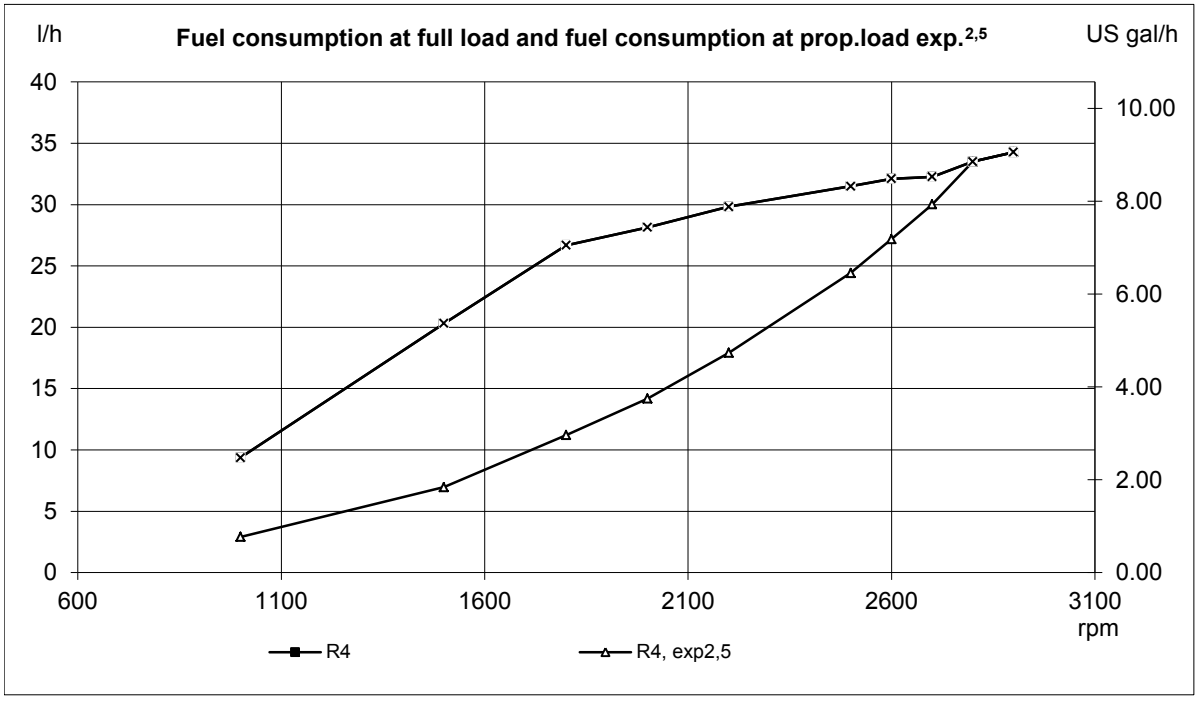

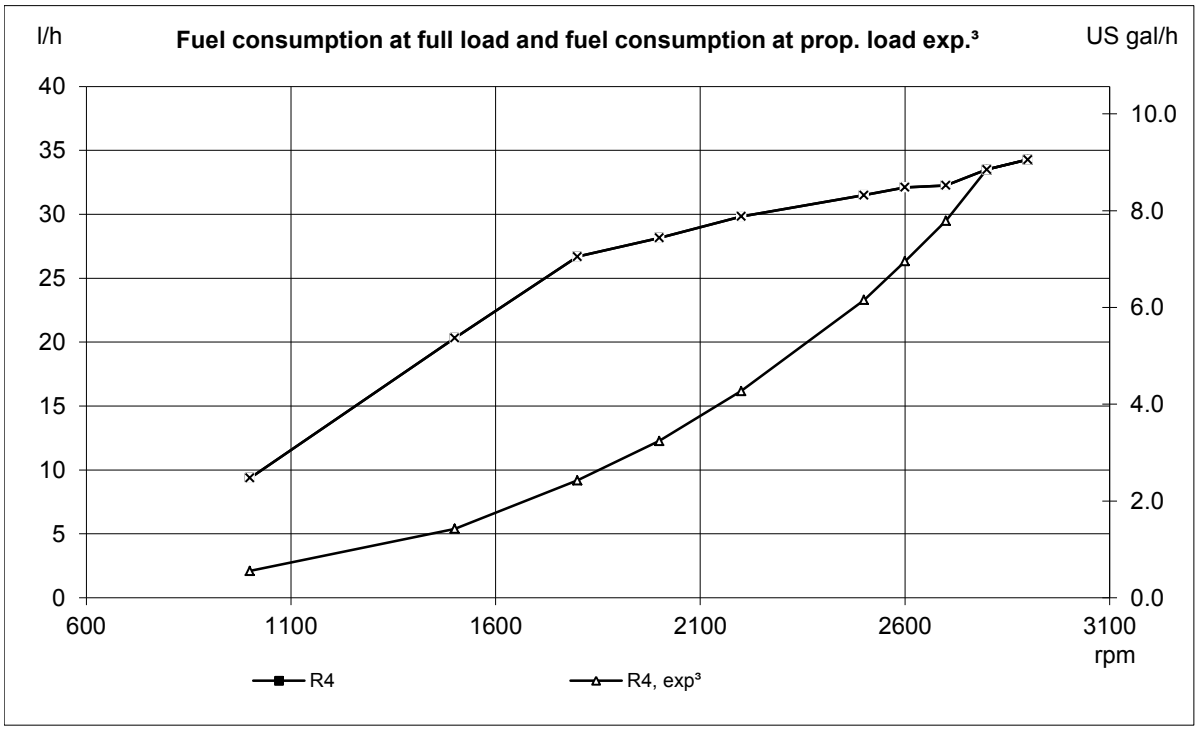

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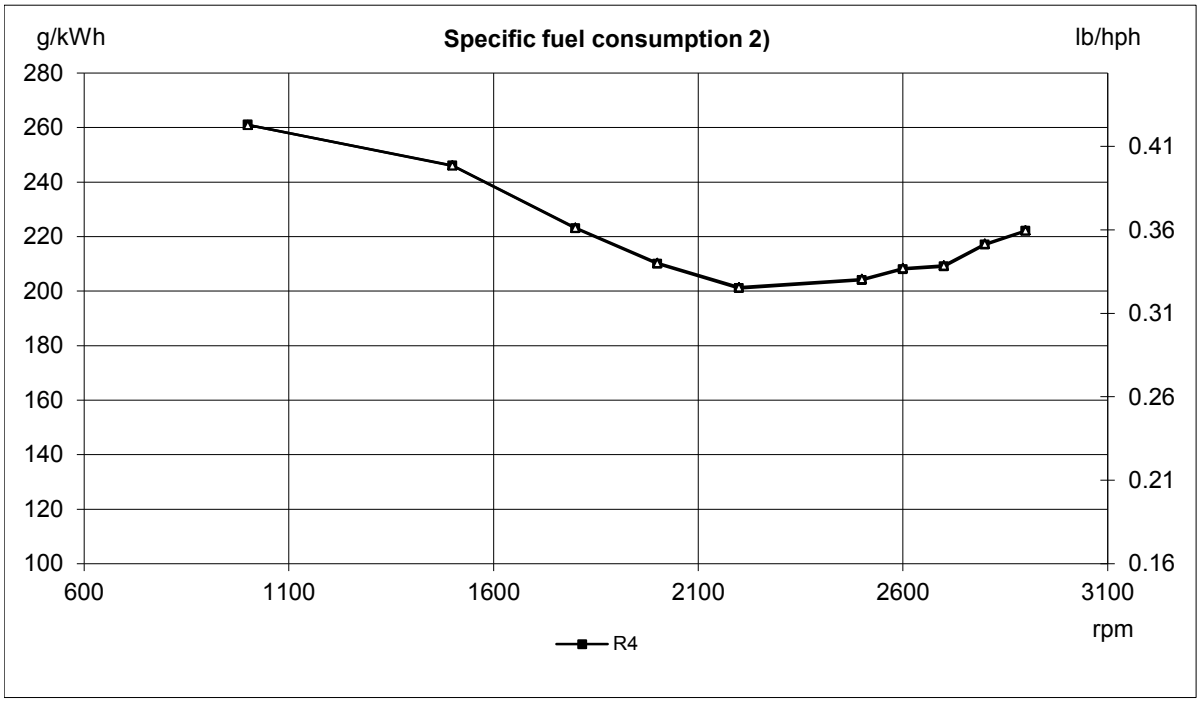

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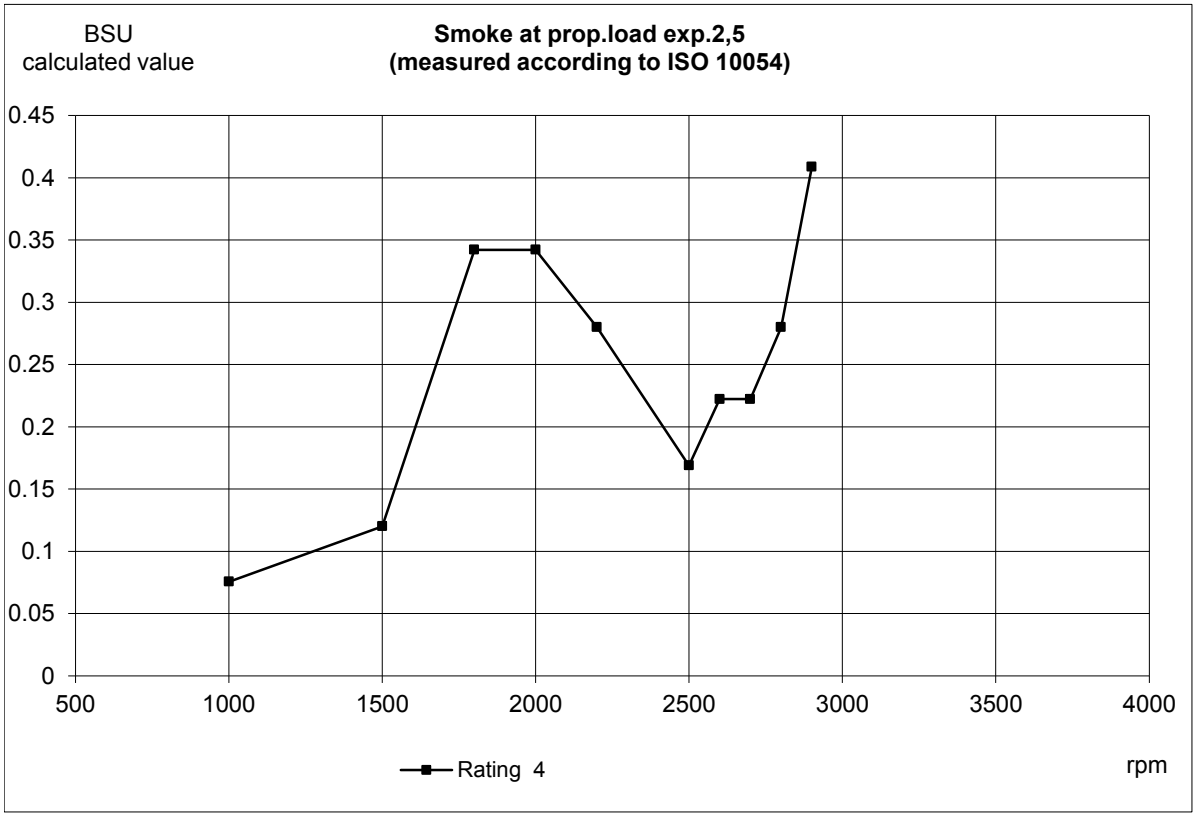

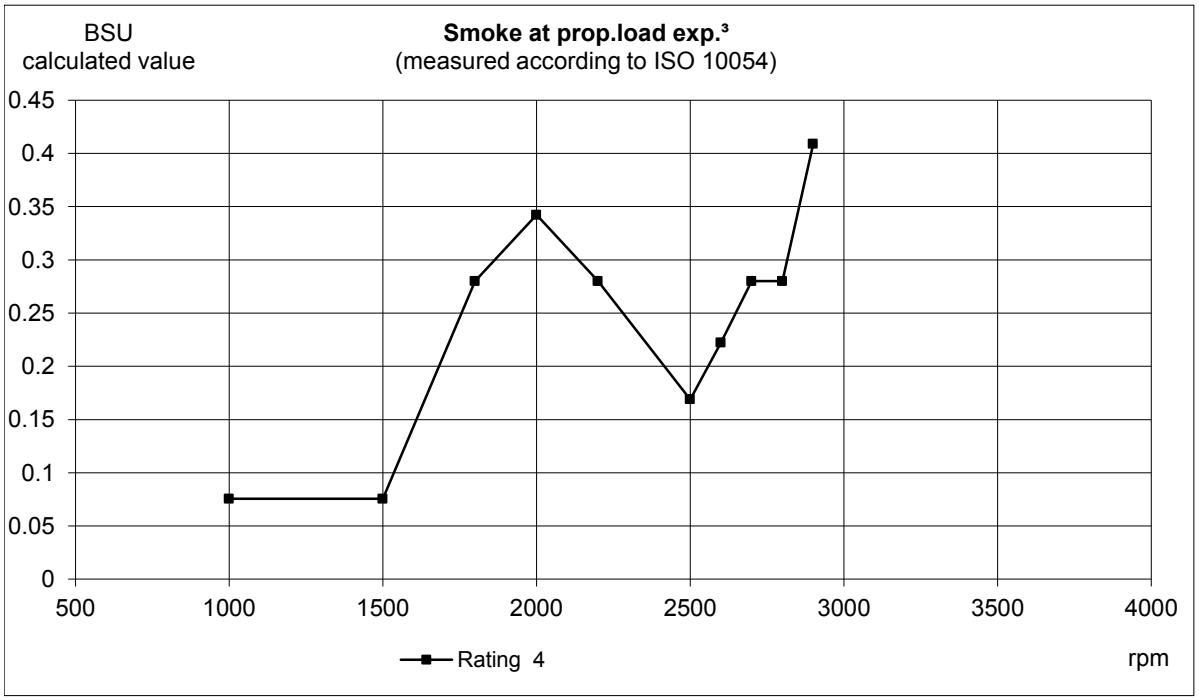

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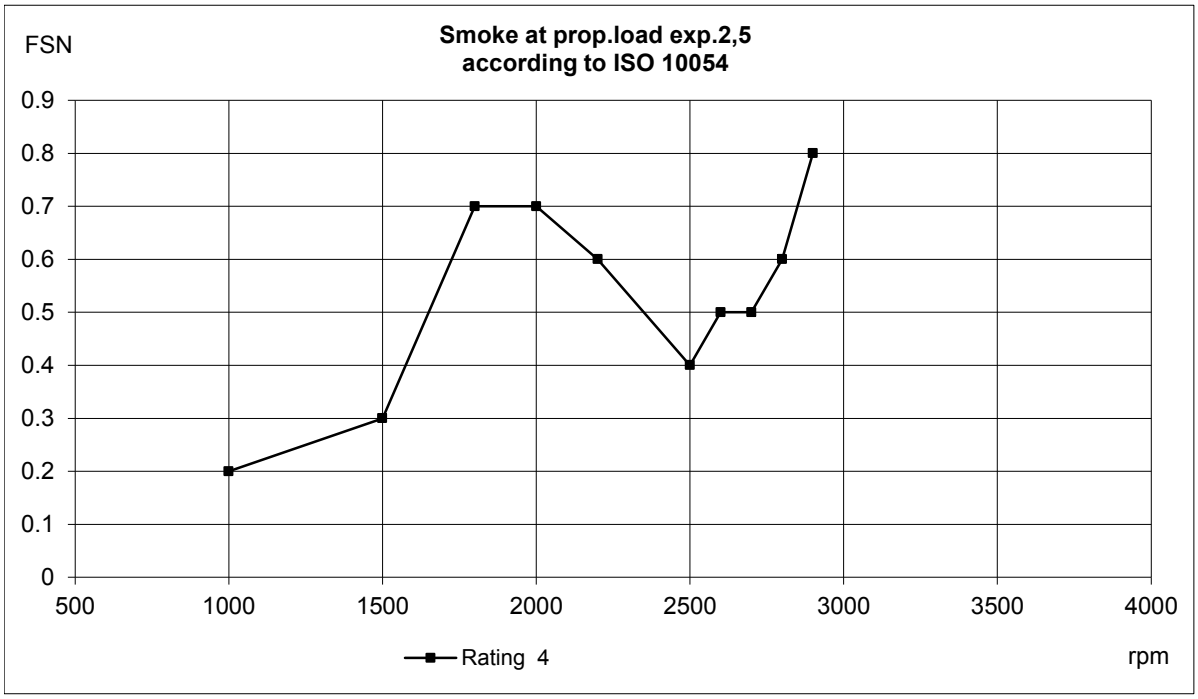

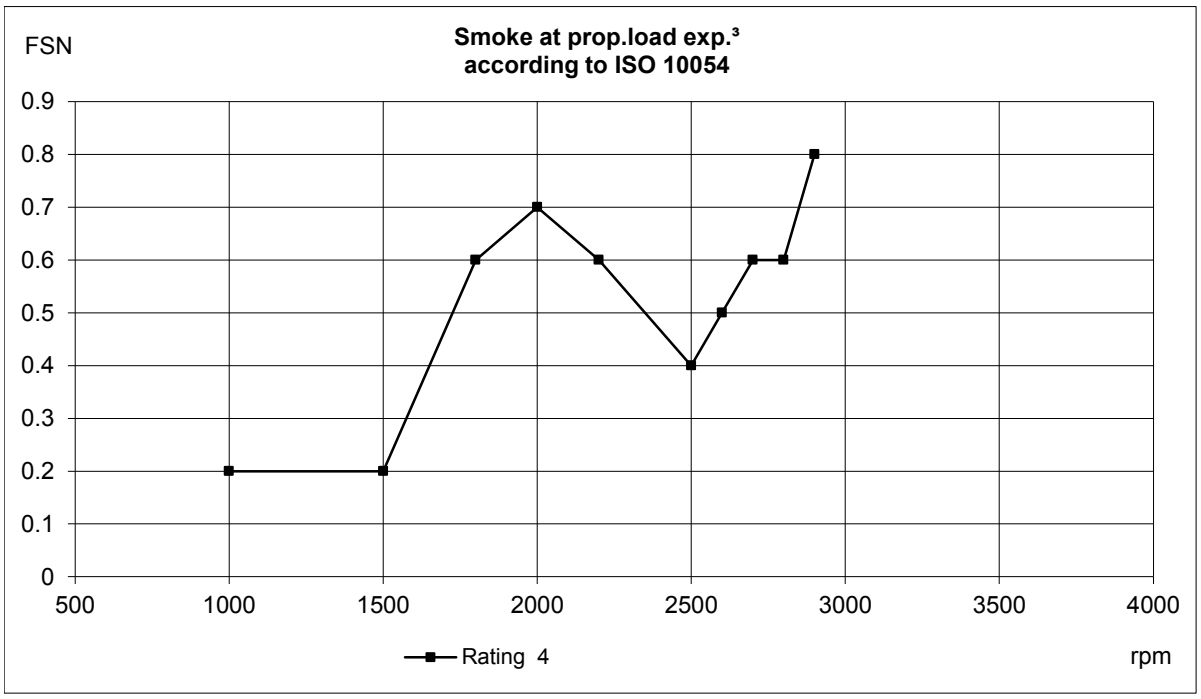

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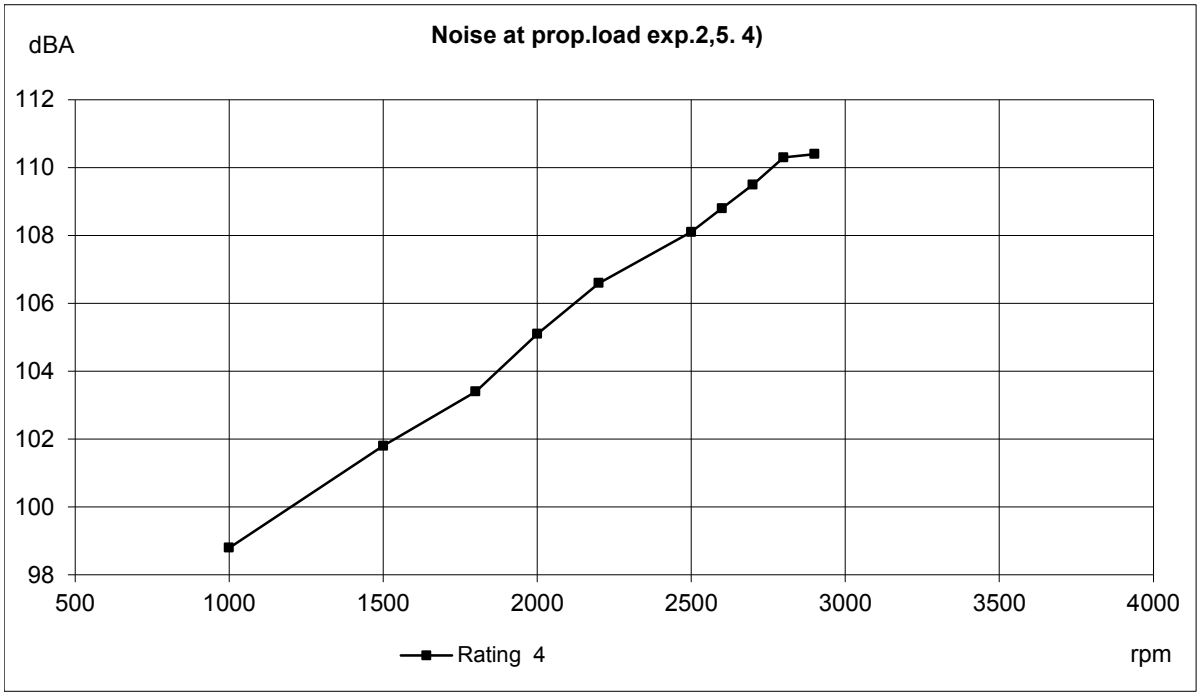

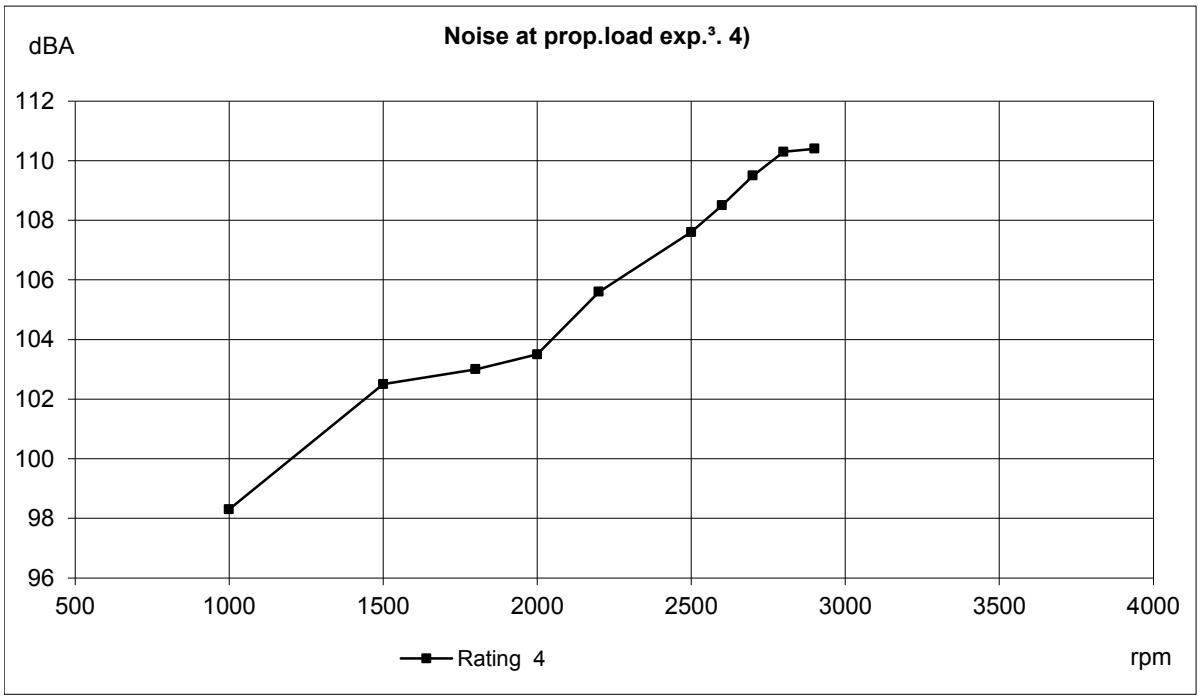

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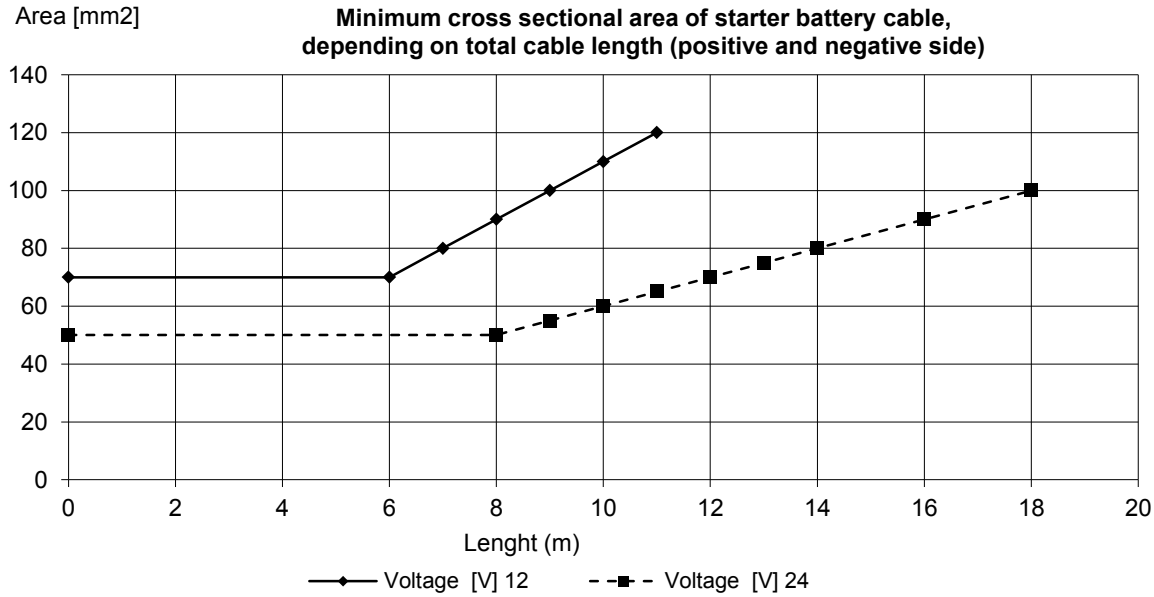
Battery capacity 12V

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

Battery capacity 24V

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

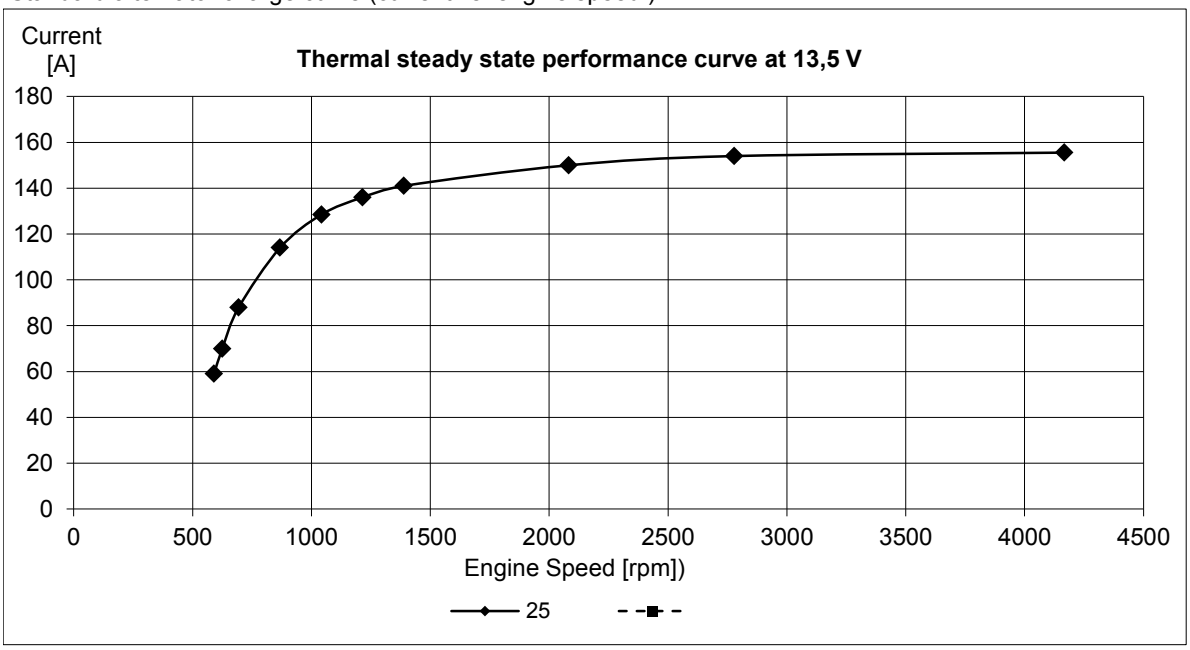
Max current consumption during normal operation:

	[A]
Engine :	2 - 4

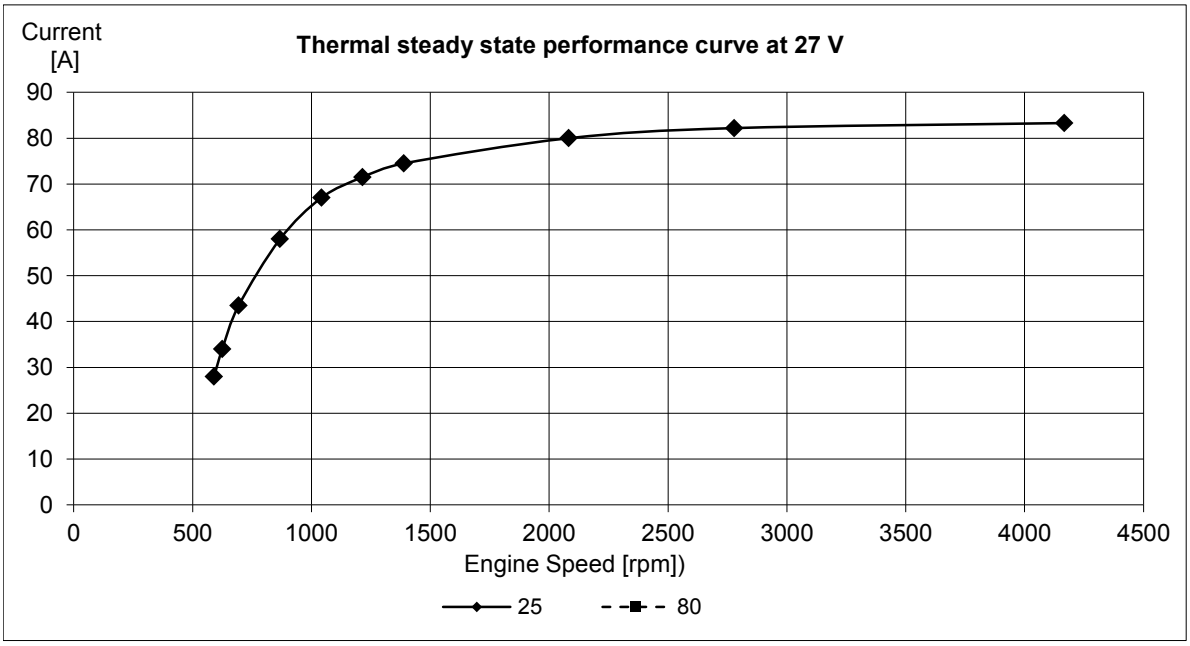
VOLVO PENTA	Document No	Issue Index
D4-175 INB	**23609285**	**03**

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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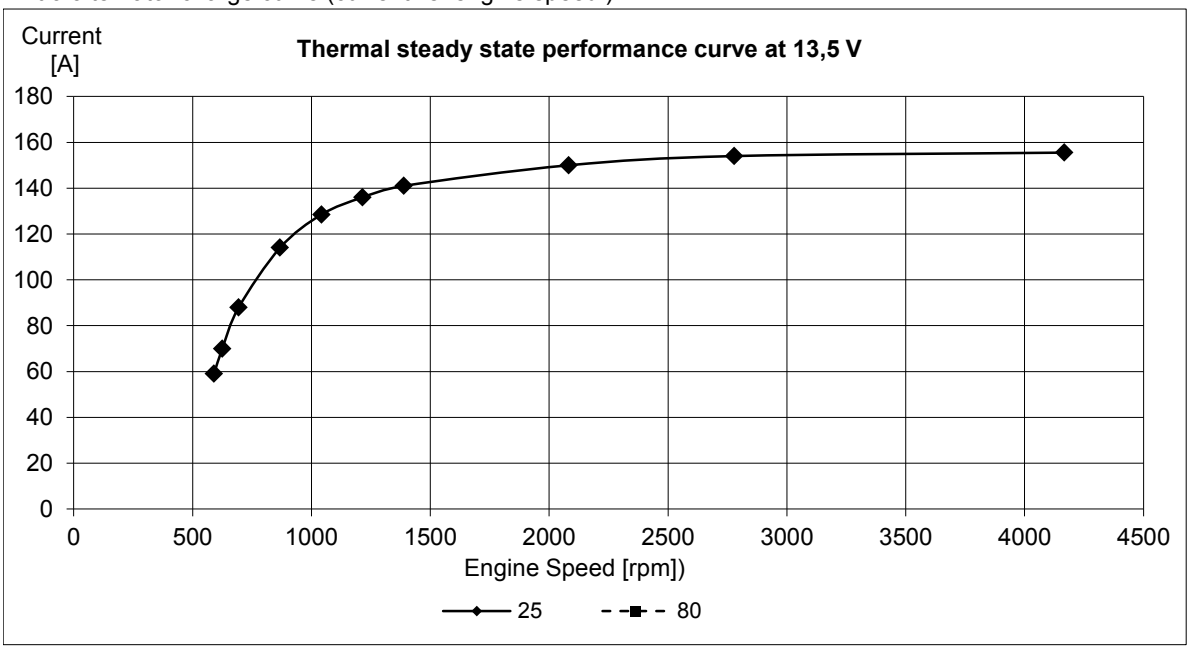
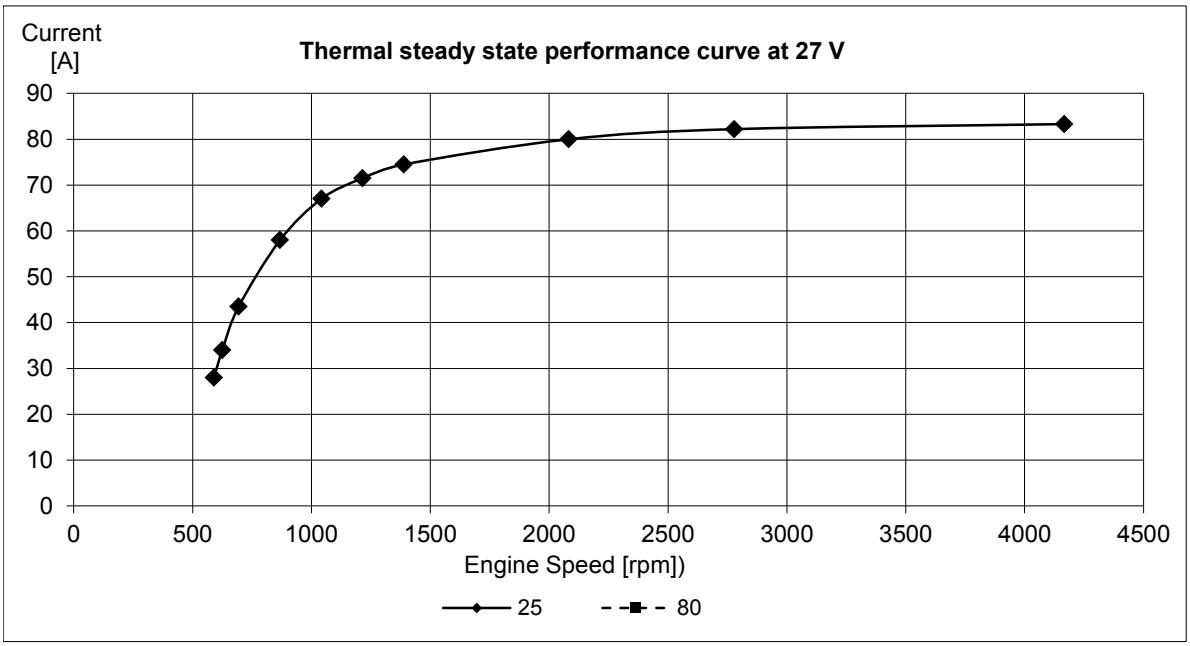
Alternator data:

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



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



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