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General

4-stroke direct injected, turbocharged and aftercooled diesel engine

Engine Rating		5
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 R5	rpm	3500
Governed speed R5	rpm	3630
Propeller selection range R5		3450-3630
Dry weight engine BT	kg lb	525 1157
Dry weight with reverse gear HS85A	kg lb	605 1334
Dry weight with reverse gear HS68A	kg lb	580 1279
Dry weight with reverse gear HS68IV	kg lb	610 1345
Dry weight with reverse gear ZF68	kg lb	580 1279

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**	**3400**	**3500**	**3600**
Crankshaft power 1), 5)	kW	30	59	111	183	205	218	220	221	221	221
	hp	41	80	151	249	279	296	299	300	300	300
Propeller shaft power 1) (At full load)	kW	29	57	107	176	197	209	211	212	212	212
	hp	39	77	145	239	268	285	287	288	288	288
Propellershaft power at prop. load $x^{2,5}$	kW	9	25	52	91	121	144	169	197	212	212
	hp	13	35	71	124	165	196	230	268	288	289
Propellershaft power at prop. load x^3	kW	5	17	40	77	108	133	162	194	212	212
	hp	7	23	54	105	147	181	220	264	288	289
Torque at crankshaft 2)	Nm	286	376	530	699	699	694	657	620	602	585
	lbf ft	211	277	391	516	516	512	484	457	444	432
Mean piston speed	m/s	3.7	5.5	7.3	9.2	10.3	11.0	11.7	12.5	12.8	13.2
	ft/s	12.0	18.0	24.1	30.1	33.7	36.1	38.5	40.9	42.1	43.3
Effective mean pressure 2)	MPa	0.98	1.29	1.82	2.40	2.40	2.38	2.25	2.12	2.06	2.01
	psi	142.4	186.7	263.5	347.5	347.6	345.0	326.4	308.0	299.2	290.9
Max combustion pressure 2)	MPa	12.2	15.2	19.8	19.6	19.8	19.8	19.3	18.8	18.9	19.1
	psi	1774	2201	2867	2839	2874	2875	2797	2727	2736	2766

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**	**3400**	**3500**	**3600**
Specific fuel consumption 2)	g/kWh	262.0	237.0	228.0	207.0	204.0	207.0	211.0	217.0	219.0	222.0
	lb/hph	0.424	0.384	0.369	0.335	0.33	0.335	0.342	0.352	0.355	0.36
Fuel consumption, Test cycle E5 EU	g/kWh	222									
	lb/hph	0.36									
Fuel consumption at prop. load $x^{2,5}$	l/h	2.9	6.9	13.8	24.1	31.7	37.9	45.2	53.5	57.8	58.7
	US gal/h	0.8	1.8	3.6	6.4	8.4	10.0	11.9	14.1	15.3	15.5

Fuel system	**rpm**	**1000**	**1500**	**2000**	**2500**	**2800**	**3000**	**3200**	**3400**	**3500**	**3600**
Fuel consumption at prop. load x^3	l/h	2.0	4.9	10.7	20.8	28.8	35.6	43.6	52.8	57.8	58.7
	US gal/h	0.5	1.3	2.8	5.5	7.6	9.4	11.5	13.9	15.3	15.5
Fuel consumption at full load	l/h	9.4	16.7	30.3	45.3	50.0	54.0	55.6	57.3	57.8	58.6
	US gal/h	2.5	4.4	8.0	12.0	13.2	14.3	14.7	15.1	15.3	15.5

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	57.9
	US gal/h	15.30
Fuel inlet flow to engine	l/h	84.9
	US gal/h	22.43
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	3400	3500	3600
Specific exhaust heating effect in percent of crankshaft power	%	43	43	56	56	57	58	61	64	65	67
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.	°C	358	418	492	464	417	407	400	394	391	392
	°F	676	784	918	867	783	765	752	741	736	738
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	3400	3500	3600
Engine air consumption at 25°C / 77°F atmospheric pressure 100kPA	m³/min	1.7	2.8	5.5	10.3	13.5	15	16.2	17.1	17.6	18.1
	cu.ft./min	60.03	98.88	194.2	363.7	476.7	529.7	572.1	603.9	621.5	639.2
Charge air pressure Inlet manifold	kPa	12	28	76	168	206	221	227	228	230	231
	psi	1.7	4.1	11.0	24.4	29.9	32.1	32.9	33.1	33.4	33.5
Exhaust gas flow	m³/min	4	7.1	15.3	25.6	30	32	33.3	34.2	34.7	35.3
	cu.ft./min	141.3	250.7	540.3	904.1	1059	1130	1176	1208	1225	1247

Cooling system	rpm	1000	1500	2000	2500	2800	3000	3200	3400	3500	3600
Radiated heat of crankshaft power at full load.	kW	0.9	1.8	3.3	5.7	6.3	6.7	6.7	6.7	6.7	6.7
Heat rejection to charge air cooler of crankshaft power at full load.	kW	1.0	1.7	8.0	26.3	39.0	45.9	51.0	55.0	56.8	59.4
Coolant heat rejection to HE, incl. engine oil cooler and excl. charge air cooler, of crankshaft power at full load.	kW	36	62	91	129	131	136	142	149	142	145
Coolant flow with fully open thermostat and std cooling system	l/min	58	91	122	154	175	188	201	214	221	227
	cu.ft./min	2.0	3.2	4.3	5.4	6.2	6.6	7.1	7.6	7.8	8.0
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	3400	3500	3600
Nominal raw water design flow	l/min	50	72	92	108	116	121	126	132	134	137
	cu.ft/min	1.8	2.5	3.2	3.8	4.1	4.3	4.4	4.7	4.7	4.8
Nominal raw water pump pressure head at design flow.	kPa	18	38	63	91	106	116	127	139	145	151
	psi	2.6	5.5	9.1	13.2	15.4	16.8	18.4	20.2	21.0	21.9
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	3400	3500	3600
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	3400	3500	3600
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	3400	3500	3600
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										137
	cu.ft./min										4.8
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	3400	3500	3600
Design point for keel cooler, engine outlet temperature	°C										83
	°F										181
Maximum temperature to engine from external HT-cooling system circuit	°C										58
	°F										136
Coolant flow through keel cooler, HT-cooling system circuit at design point	l/min										100
	cu.ft./min										3.5
Maximun coolant flow through keel cooler, HT-cooling system circuit	l/min										227
	cu.ft./min										8.0
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	3400	3500	3600
Smoke at prop. load $x^{2,5}$	*BSU	0.1	0.1	0.2	0.3	0.2	0.2	0.2	0.4	0.6	0.5
Smoke at prop. load x^3	*BSU	0.1	0.1	0.1	0.3	0.2	0.2	0.2	0.4	0.6	0.5
Noise at prop. load $x^{2,5}$. 4)	dBA	98.5	101.7	104.2	106.8	108.3	109.4	110.2	111.9	111.9	112.1
Noise at prop. load x^3. 4)	dBA	98.2	101.7	103.2	106	107.9	109.2	110.2	112.2	112	112.2

***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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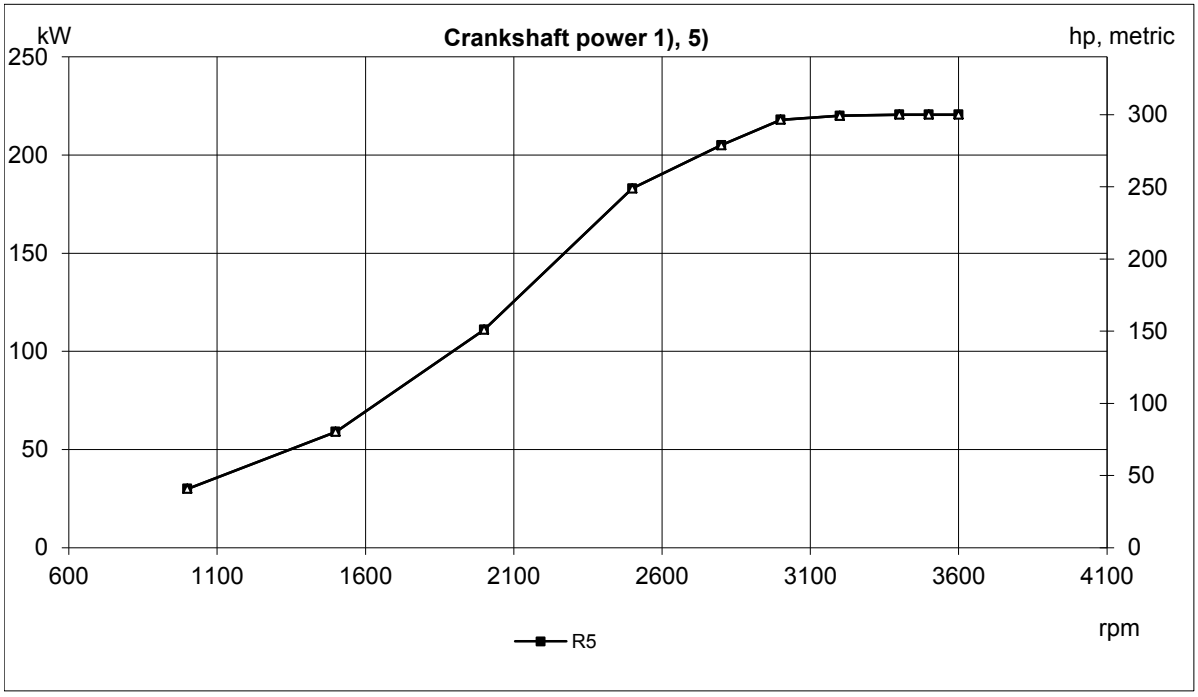

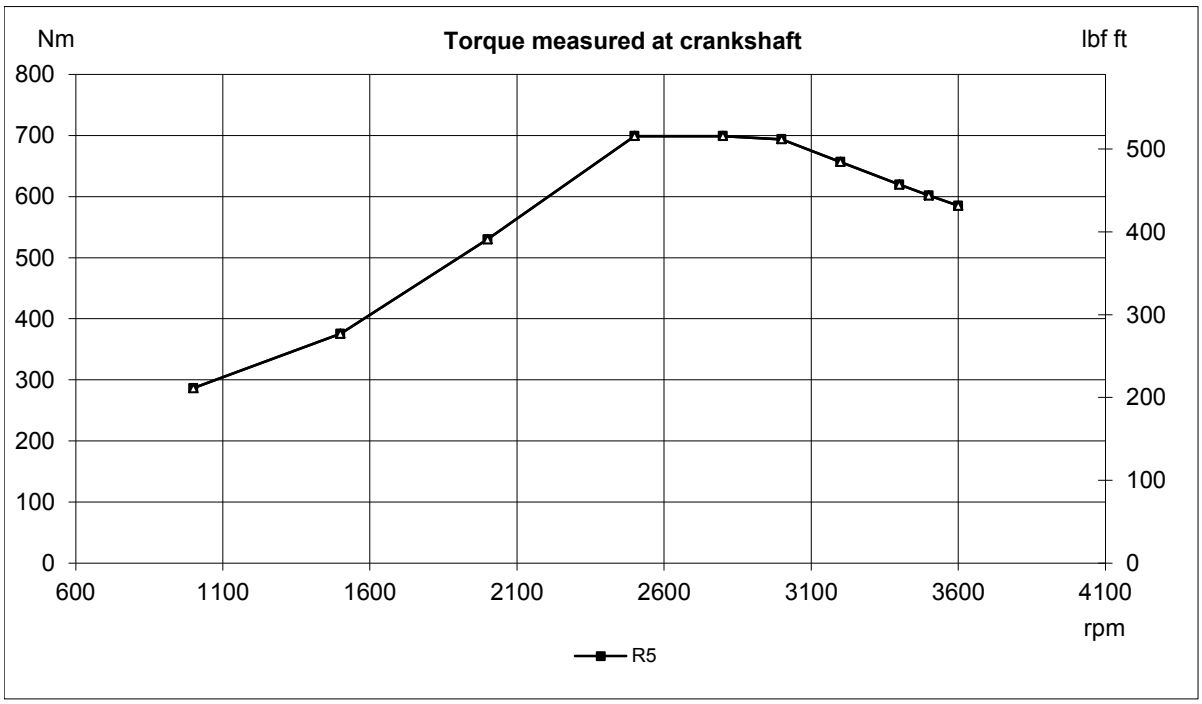

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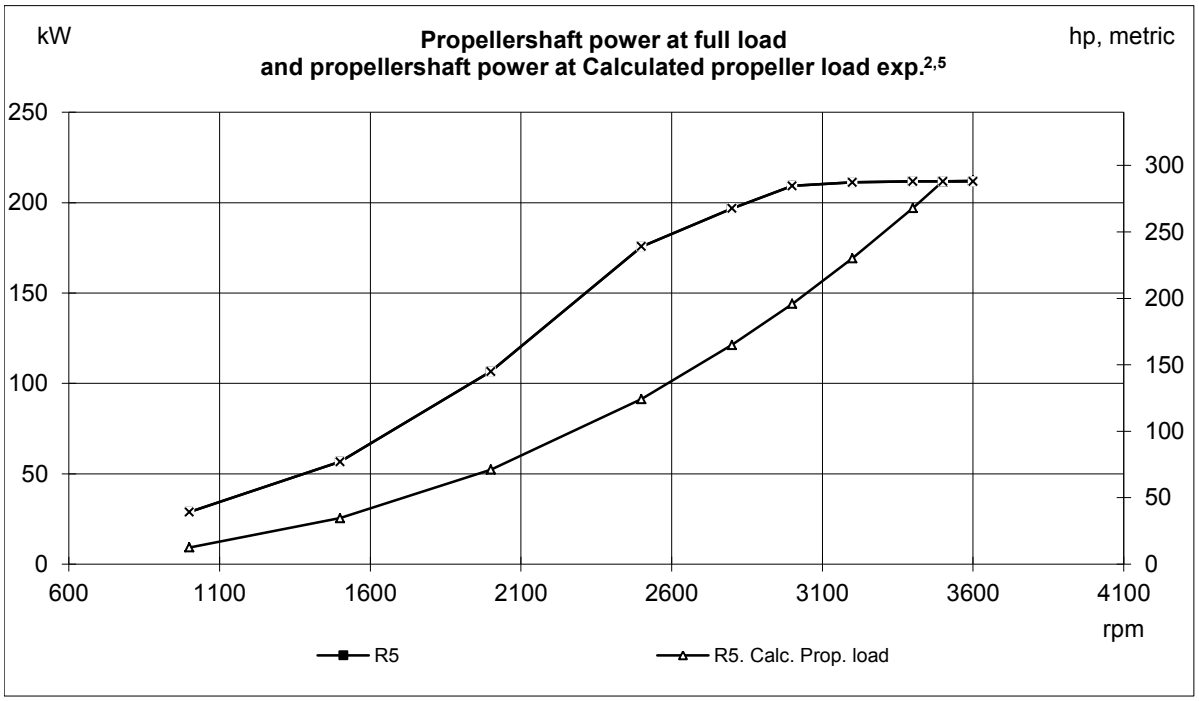

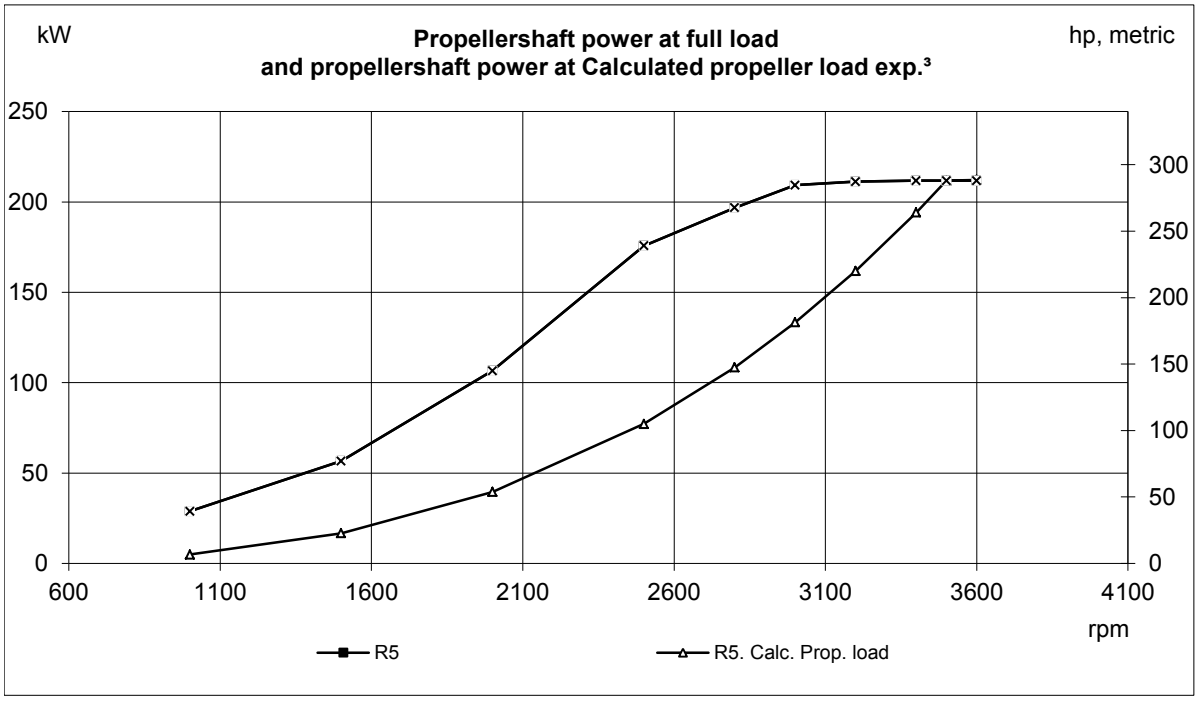

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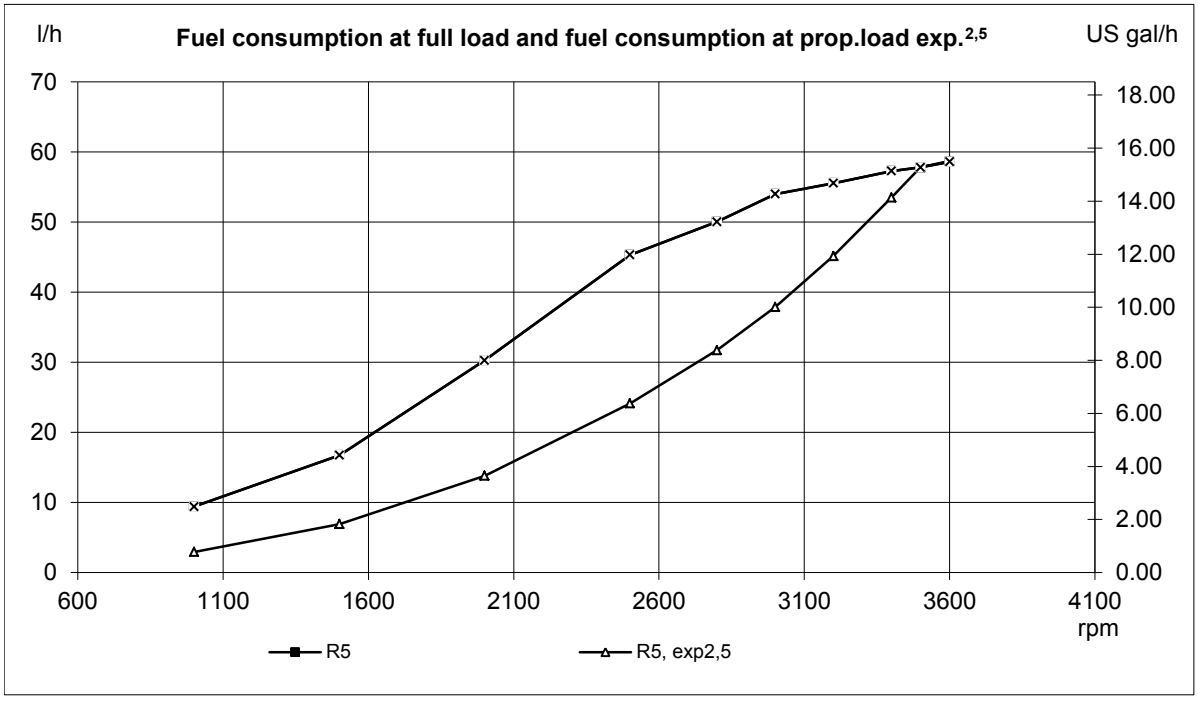

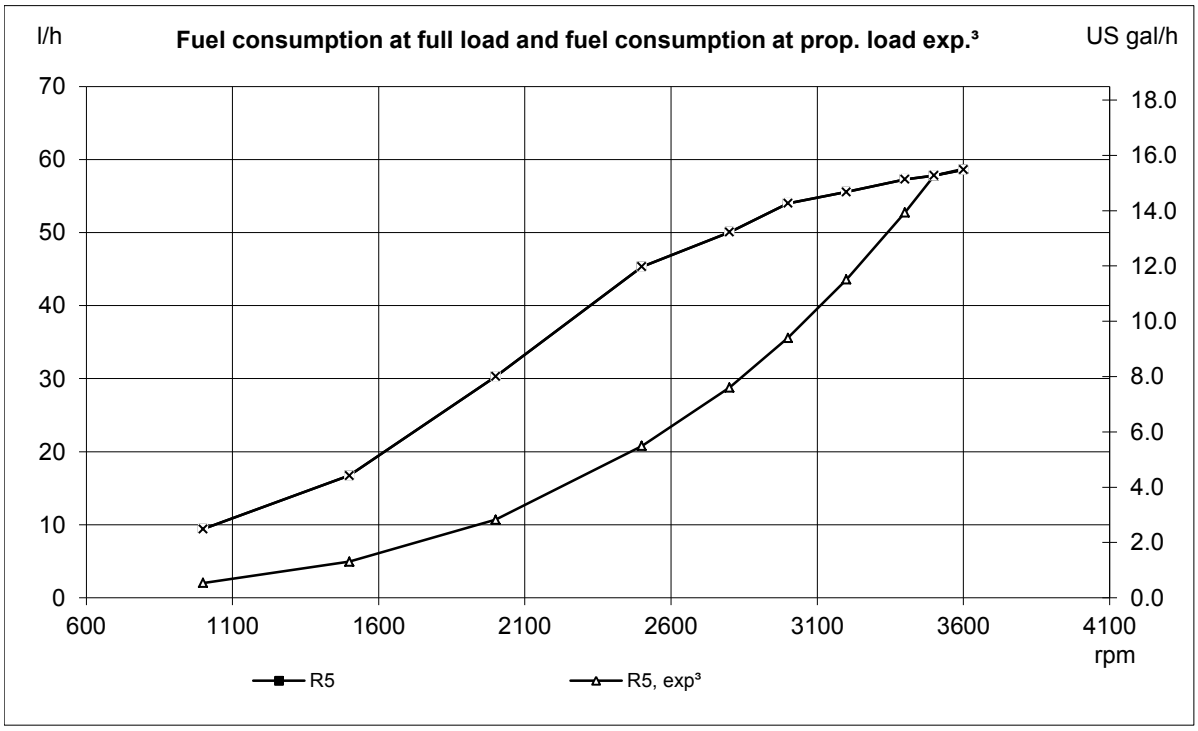

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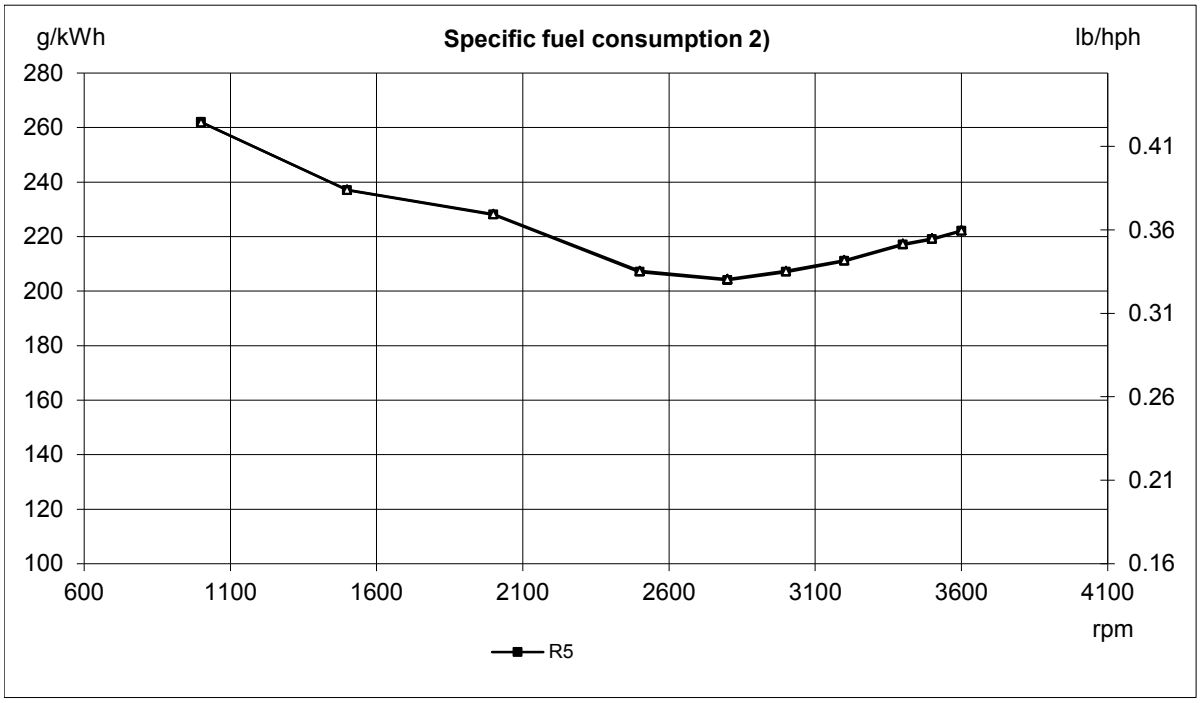

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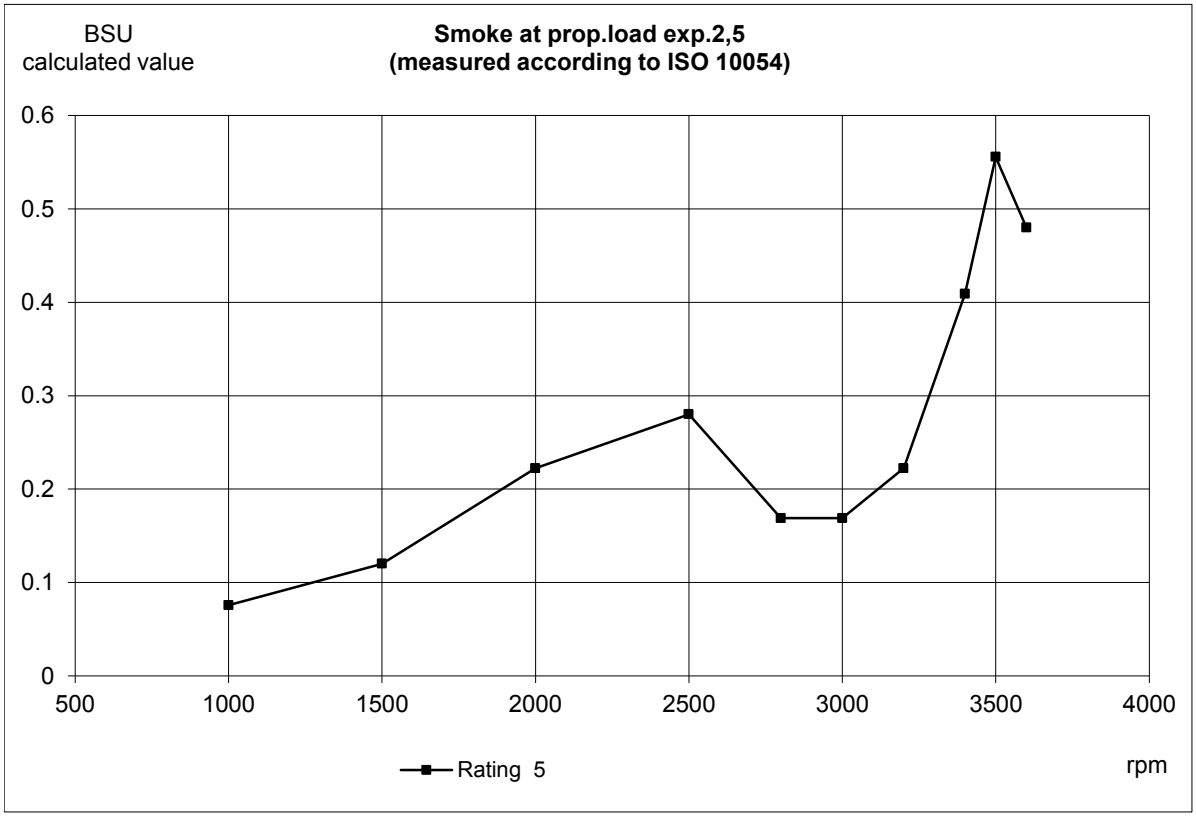

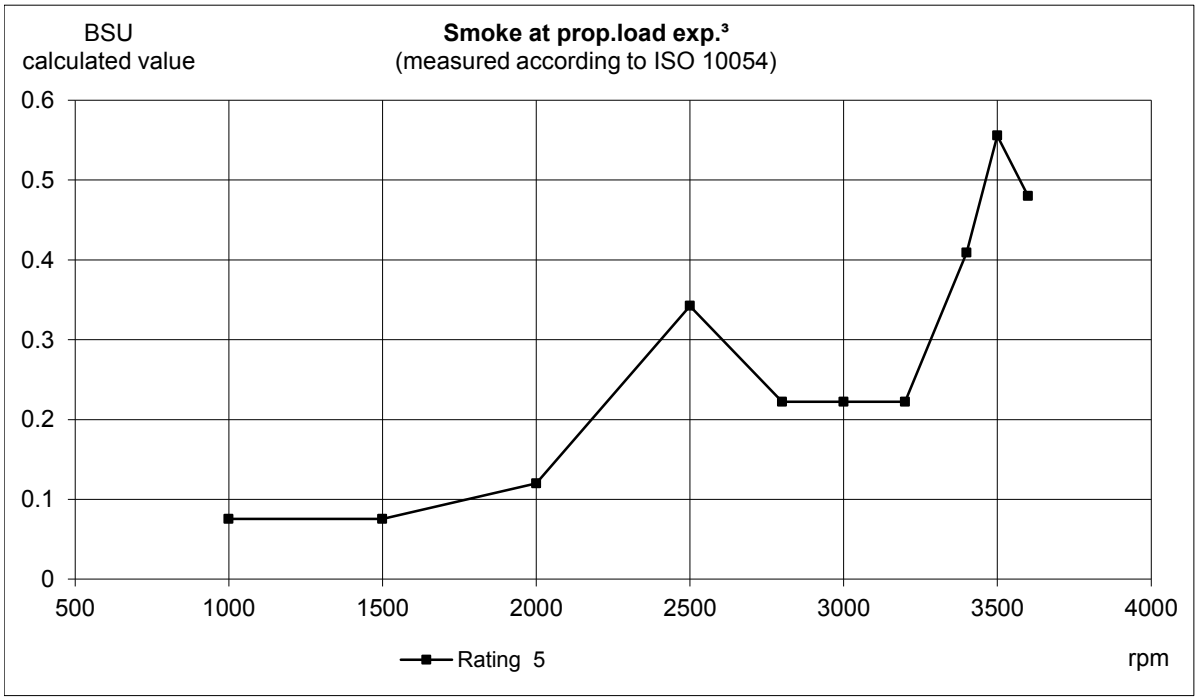

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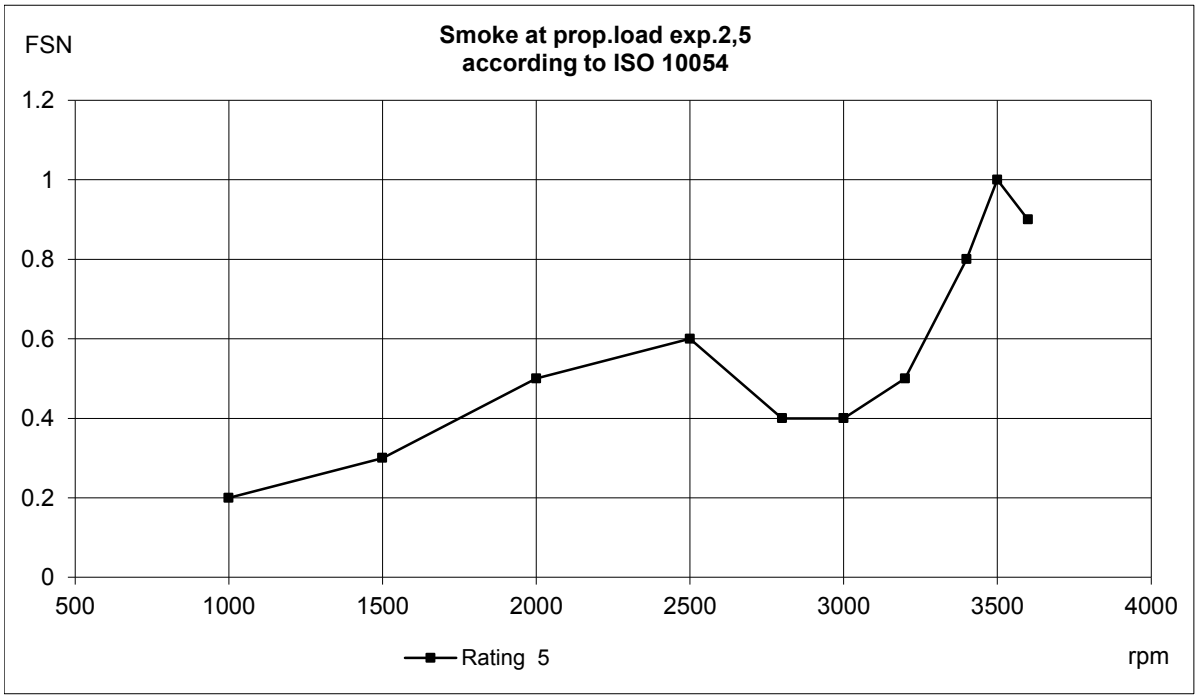

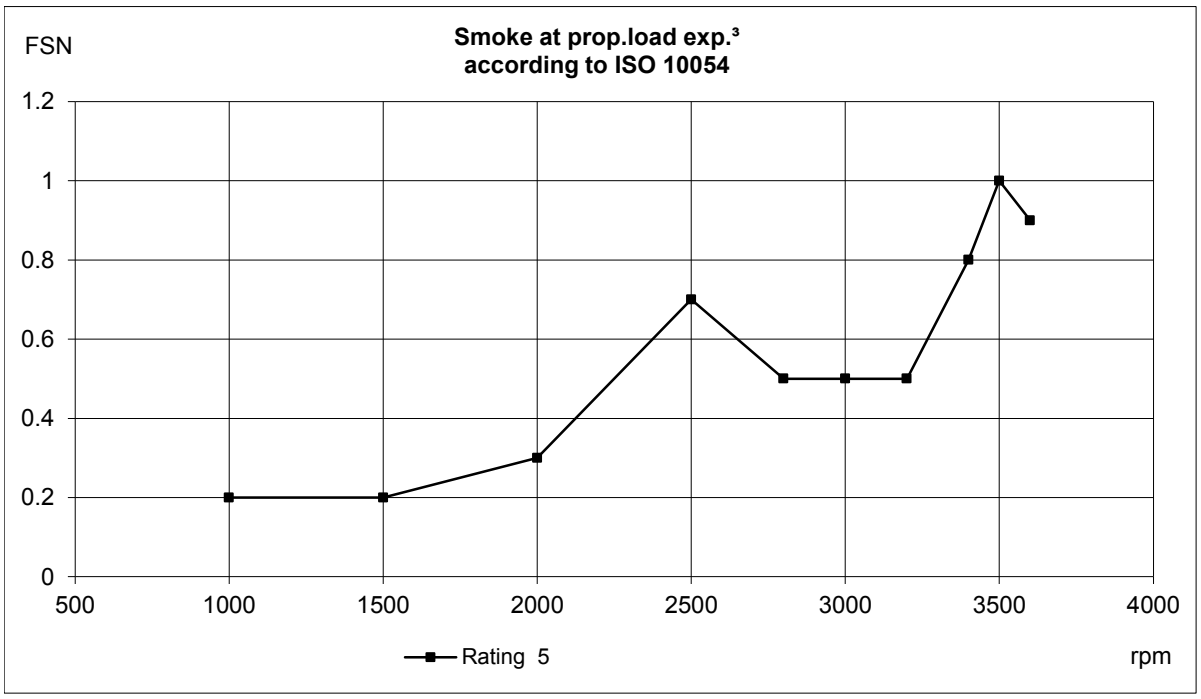

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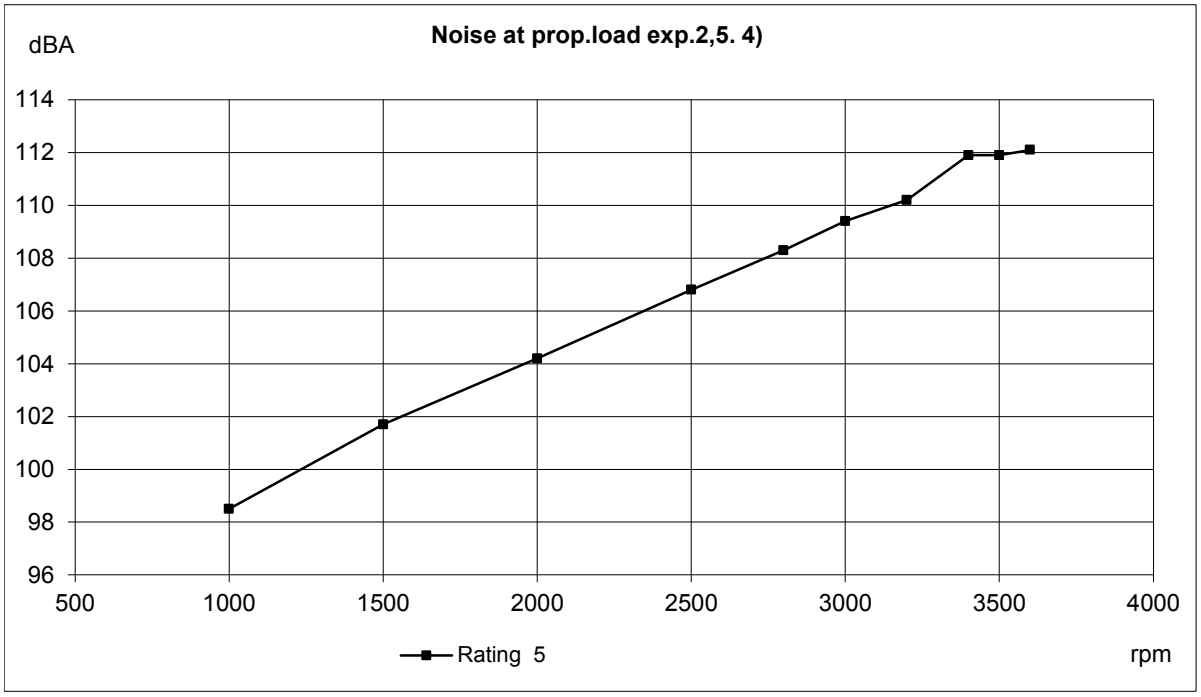

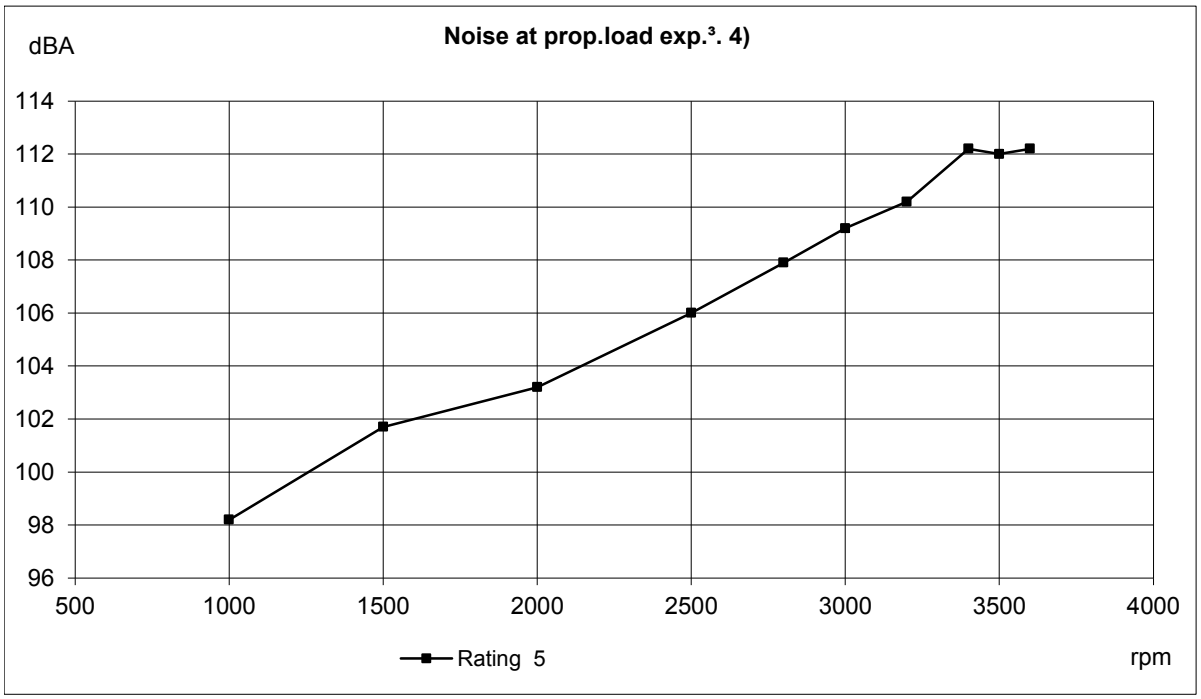

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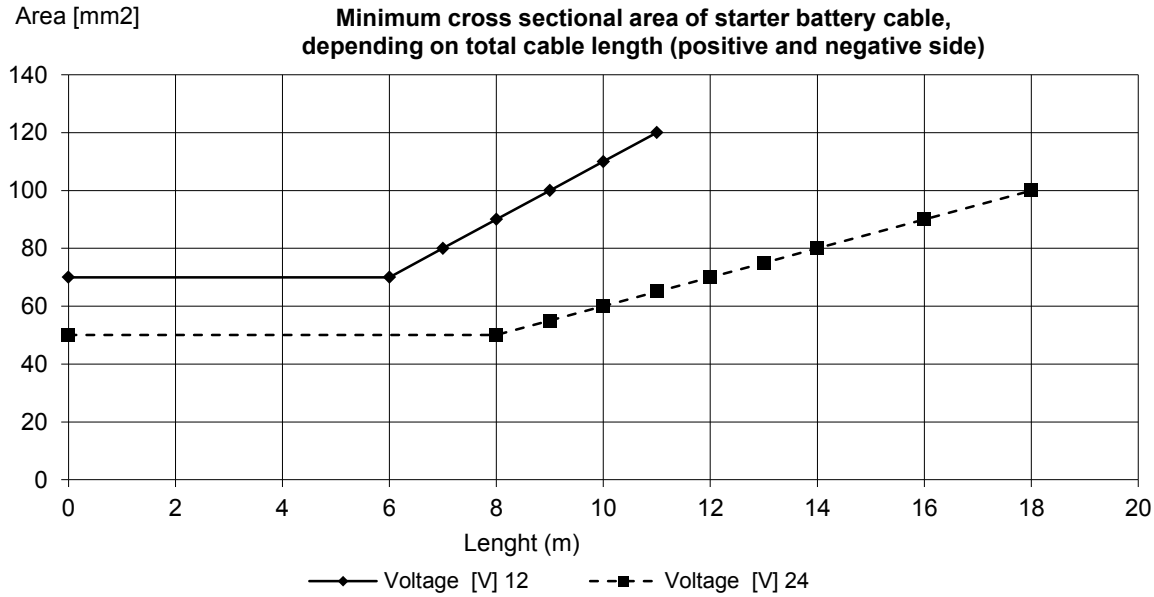
Battery capacity 12V

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

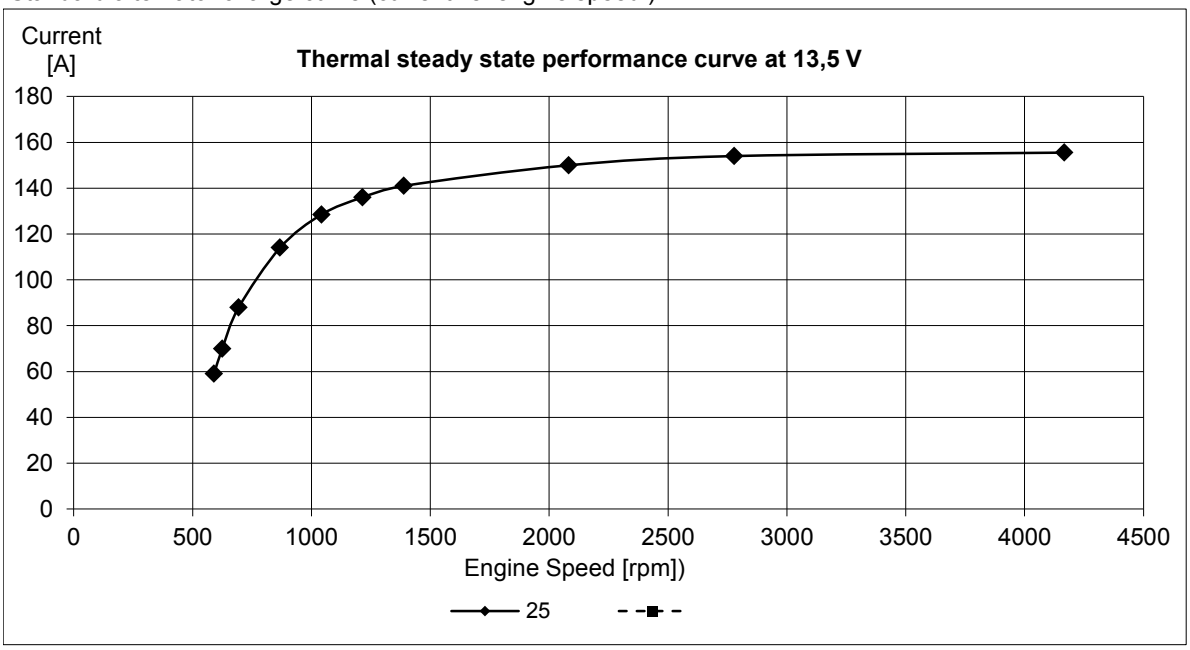
Max current consumption during normal operation:

	[A]
Engine :	2 - 4

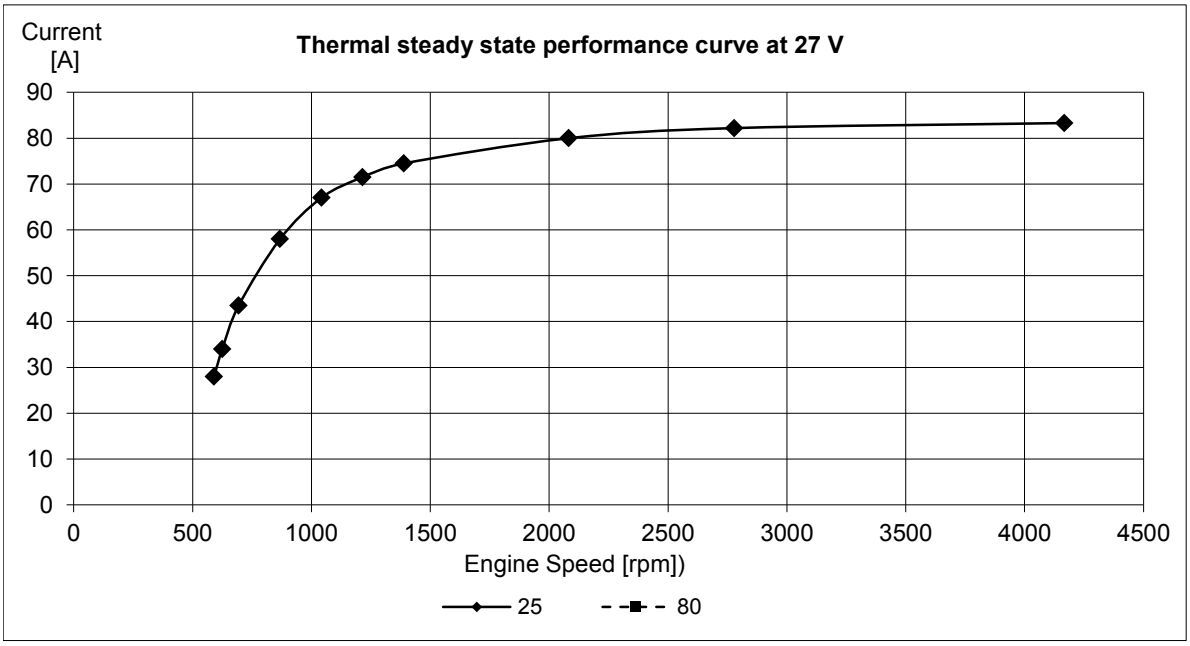
VOLVO PENTA	Document No	Issue Index
D4-300 INB	**23609291**	**03**

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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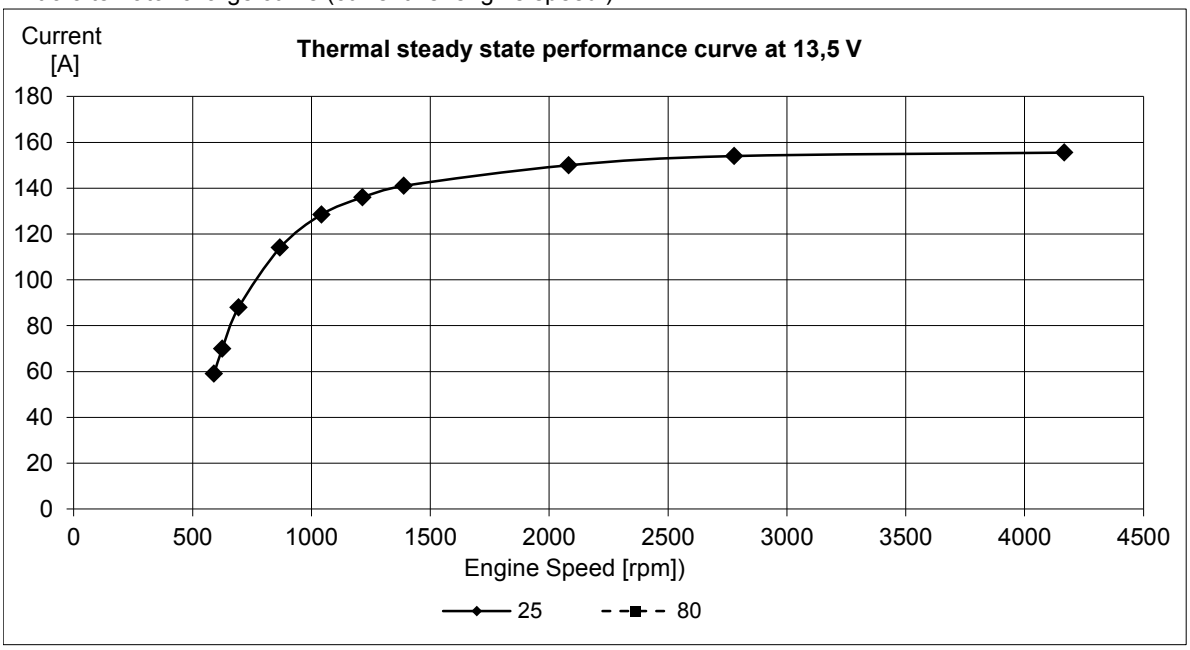
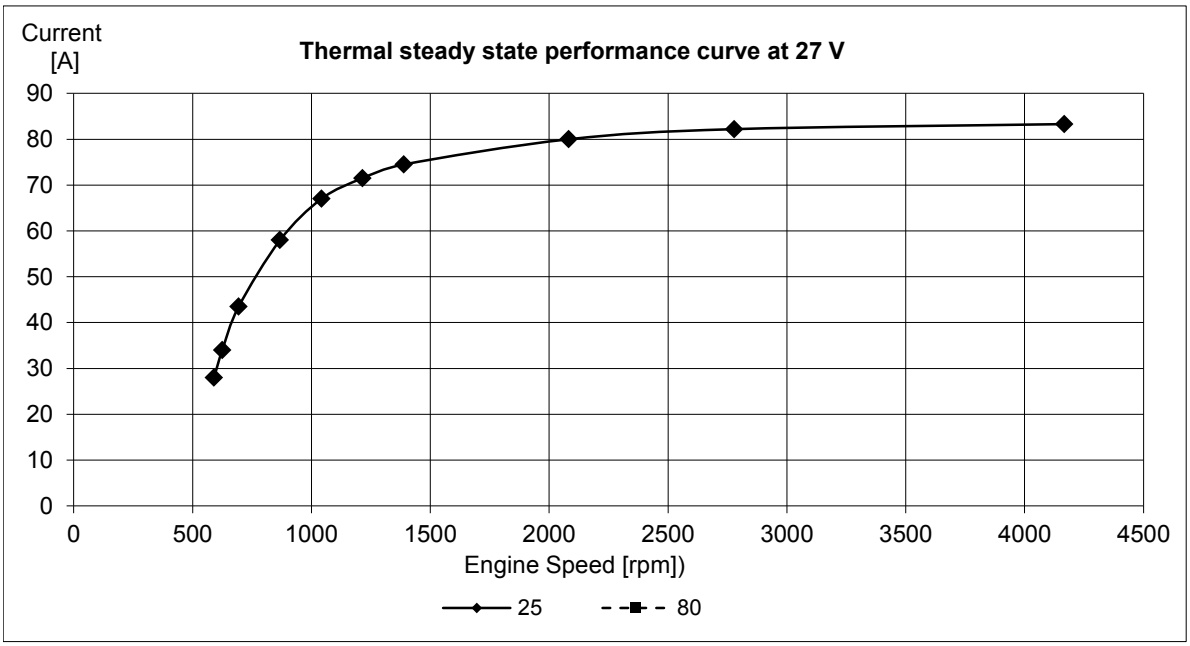
Alternator data:

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



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



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