

VOLVO PENTA	Document No	Issue Index
	23609283	01

D6-440 WJ**General**

4-stroke direct injected, turbocharged and aftercooled diesel engine

Engine Rating		5
Number of cylinders		6
No of valves		24
Displacement, total	litres	5.50
	in ³	335.6
Firing order		1-5-3-6-2-4
Rotational direction, viewed from the front		Clockwise
Bore	mm	103
	in	4.06
Stroke	mm	110
	in	4.33
Compression ratio		18.0:1
Compression pressure at 240 rpm	MPa	
	psi	
Max. static forward inclination:	°	0
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:	°	20 or 30 for max 30 sec
Idling speed	rpm	600-650
Rated speed R5	rpm	3700
Governed speed R5	rpm	3830
Propeller selection range R5		3650-3830
Dry weight engine BT	kg	625
	lb	1378
	kg	
	lb	
	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).

3) If reverse gear is used, 4% in heat rejection will be added for its oil cooler.

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Performance	rpm	1000	1500	2000	2500	2800	3000	3200	3500	3700	3800
Crankshaft power 1), 5)	kW	49	88	181	288	323	346	351	352	353	353
	hp	67	120	246	392	439	471	477	479	480	480
Propeller shaft power 1) (At full load)	kW	49	88	181	288	323	346	351	352	353	353
	hp	67	120	246	392	439	471	477	479	480	480
Propellershaft power at prop. load x ^{2.5}	kW	13	37	76	132	176	209	246	307	353	353
	hp	18	50	103	180	239	284	334	418	480	461
Propellershaft power at prop. load x ³	kW	7	24	56	109	153	188	228	299	353	353
	hp	9	32	76	148	208	256	311	406	480	461
Torque at crankshaft 2)	Nm	467.9	560.2	864.2	1100	1102	1101	1047	960.4	911.1	887.1
	lbf ft	345	413	637	811	812	812	773	708	672	654
Mean piston speed	m/s	3.7	5.5	7.3	9.2	10.3	11.0	11.7	12.8	13.6	13.9
	ft/s	12.0	18.0	24.1	30.1	33.7	36.1	38.5	42.1	44.5	45.7
Effective mean pressure 2)	MPa	1.07	1.28	1.97	2.51	2.52	2.52	2.39	2.19	2.08	2.03
	psi	155.1	185.7	286.4	364.6	365.1	365.0	347.1	318.3	301.9	294.0
Max combustion pressure 2)	MPa	12.8	15.1	19.7	19.8	19.8	19.8	19.6	19.1	19.1	19.1
	psi	1856	2184	2857	2876	2866	2866	2837	2773	2765	2776

Lubricating system

Specific lubricating oil consumption.	g/kWh	< 0.2
Max. oil volume including filters for all allowed installation inclinations:	litres	20
	US gal	5.28
Max. oil volume excluding filters for all allowed installation inclinations:	litres	18.5
	US gal	4.89
Min. oil volume excluding filters for all allowed installation inclinations:	litres	15
	US gal	3.96

Fuel system	rpm	1000	1500	2000	2500	2800	3000	3200	3500	3700	3800
Specific fuel consumption 2)	g/kWh	255	248	233	208	201	206	207	216	223	227
	lb/hph	0.413	0.402	0.377	0.337	0.326	0.334	0.335	0.35	0.361	0.368
Fuel consumption, Test cycle E5 EU	g/kWh	219									
	lb/hph	0.35									
Fuel consumption at prop. load x ^{2.5}	l/h	4.0	9.5	19.1	32.8	43.4	53.3	61.7	79.4	94.2	95.9
	US gal/h	1.1	2.5	5.1	8.7	11.5	14.1	16.3	21.0	24.9	25.3

Fuel system	rpm	1000	1500	2000	2500	2800	3000	3200	3500	3700	3800
Fuel consumption at prop. load x ³	l/h	2.6	6.7	14.5	27.6	38.6	48.2	57.7	77.6	94.2	95.9
	US gal/h	0.7	1.8	3.8	7.3	10.2	12.7	15.2	20.5	24.9	25.3
Fuel consumption at full load	l/h	15.0	26.1	50.5	71.7	77.7	85.3	87.0	91.0	94.2	95.9
	US gal/h	4.0	6.9	13.3	18.9	20.5	22.5	23.0	24.0	24.9	25.3

Full load performance at rated speed

Fuel inlet temperature	°C	40
	°F	104
Fuel return temperature from engine	°C	64
	°F	147.2
Fuel consumption	l/h	94.2
	US gal/h	24.89
Fuel inlet flow to engine	l/h	133
	US gal/h	35.13
Fuel return flow from engine	l/h	39
	US gal/h	10.30

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Intake and exhaust system		rpm	1000	1500	2000	2500	2800	3000	3200	3500	3700	3800	
Specific exhaust heating effect in percent of crankshaft power	%		55	56	61	57	56	58	58	62	66	68	
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.	°C		428	476	526	435	404	401	392	391	395	402	
	°F		802	889	979	815	759	754	738	736	743	756	
Permitted exhaust back pressure after turbocharger at rated speed. (Installed back pressure)	kPa								Max	30			
	psi									4.4			
	kPa								Min	15			
	psi									2.2			

Intake and exhaust system		rpm	1000	1500	2000	2500	2800	3000	3200	3500	3700	3800
Engine air consumption at 25°C / 77°F atmospheric pressure 100kPa	m³/min		2.9	4.5	9	17	20.5	23	24.5	26.6	27.8	28.3
	cu.ft./min		102.4	158.9	317.8	600.3	724	812.2	865.2	939.4	981.7	999.4
Charge air pressure Inlet manifold	kPa		18	27	92	200	210	227	226	229	232	232
	psi		2.6	3.9	13.3	29.0	30.5	32.9	32.8	33.2	33.6	33.6
Exhaust gas flow	m³/min		7.4	12.4	25.7	40	43.7	47.1	48.2	50.9	52.6	53.7
	cu.ft./min		261.3	437.9	907.6	1413	1543	1663	1702	1798	1858	1896

Cooling system		rpm	1000	1500	2000	2500	2800	3000	3200	3500	3700	3800	
Radiated heat of crankshaft power at full load.	kW		1.5	2.6	5.4	8.5	9.5	10.3	10.6	10.6	10.6	10.6	
Heat rejection to charge air cooler of crankshaft power at full load.	kW		1.6	2.7	16.3	50.8	67.8	81.3	88.7	100.3	108.2	112.8	
Coolant heat rejection to HE, incl. engine oil cooler and excl. charge air cooler, of crankshaft power at full load.	kW		51	88	162	196	213	223	233	231	250	254	
Coolant flow with fully open thermostat and std cooling system	l/min		96	144	192	240	269	289	308	334	349	358	
	cu.ft./min		3.4	5.1	6.8	8.5	9.5	10.2	10.9	11.8	12.3	12.6	
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								16				
	US gal.								4.23				
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	3500	3700	3800
Nominal raw water design flow	l/min	77	111	144	174	189	198	207	218	222	225
	cu.ft./min	2.7	3.9	5.1	6.1	6.7	7.0	7.3	7.7	7.8	7.9
Nominal raw water pump pressure head at design flow.	kPa	25	53	85	119	138	149	161	177	189	195
	psi	3.6	7.7	12.3	17.3	20.0	21.6	23.4	25.7	27.4	28.3
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	3500	3700	3800
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	3500	3700	3800
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	3500	3700	3800
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										225
	cu.ft./min										7.9
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	3500	3700	3800
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											160
	cu.ft./min											5.7
Maximum coolant flow through keel cooler, HT-cooling system circuit	l/min											358
	cu.ft./min											12.6
Pressure drop in external HT-cooling system circuit, including piping	kPa	70										
	psi	10.2										
Coolant volume engine	litres	16.0										
	US gal.	4.23										

Emissions	rpm	1000	1500	2000	2500	2800	3000	3200	3500	3700	3800
Smoke at prop. load $x^{2.5}$	*BSU	0.1	0.2	0.2	0.3	0.2	0.2	0.2	0.4	0.7	0.7
Smoke at prop. load x^3	*BSU	0.1	0.1	0.2	0.3	0.2	0.2	0.3	0.4	0.7	0.7
Noise at prop. load $x^{2.5}$. 4)	dBA	99.5	102.9	105.8	109.1	110.3	111.8	112.3	114.7	116.2	115.2
Noise at prop. load x^3 . 4)	dBA	98.5	102.8	104.7	108.2	109.5	111.2	112.3	114.7	116.2	115.2

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

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Sensors : Control and Monitoring System							Engine protection action
Sensors	Signal	Range	Unit	Warning Initial Delay / Warning Delay	Warning Level	Derating Level	
Coolant level switch	Digital	ON/OFF		30 sec from start / 5 sec	Low (ON / Closed)	NA	Warning only
Coolant temperature	50-0 k Ω	-40 - 140	°C	30 sec from start / 5 sec	96	99	See derating map
Fuel temperature	50-0 k Ω	-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
					0 rpm	1200 rpm	2000 rpm	2500 rpm	3600 rpm	
Charge air temperature	50-0 k Ω	-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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Remarks

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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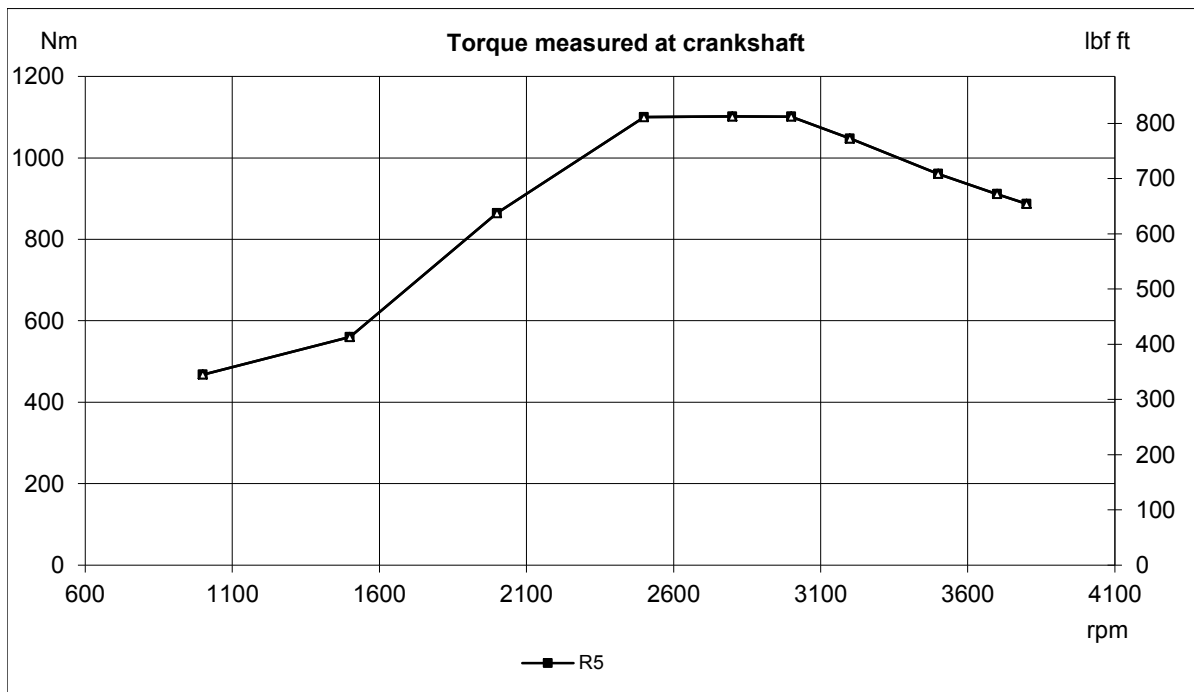
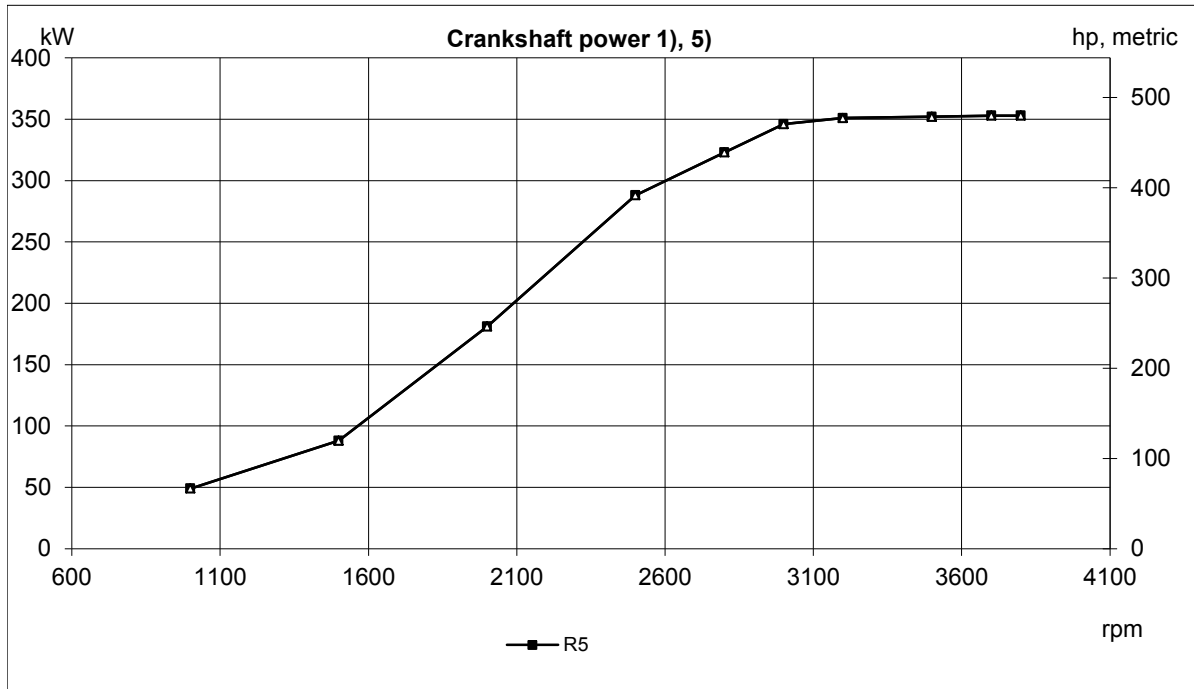
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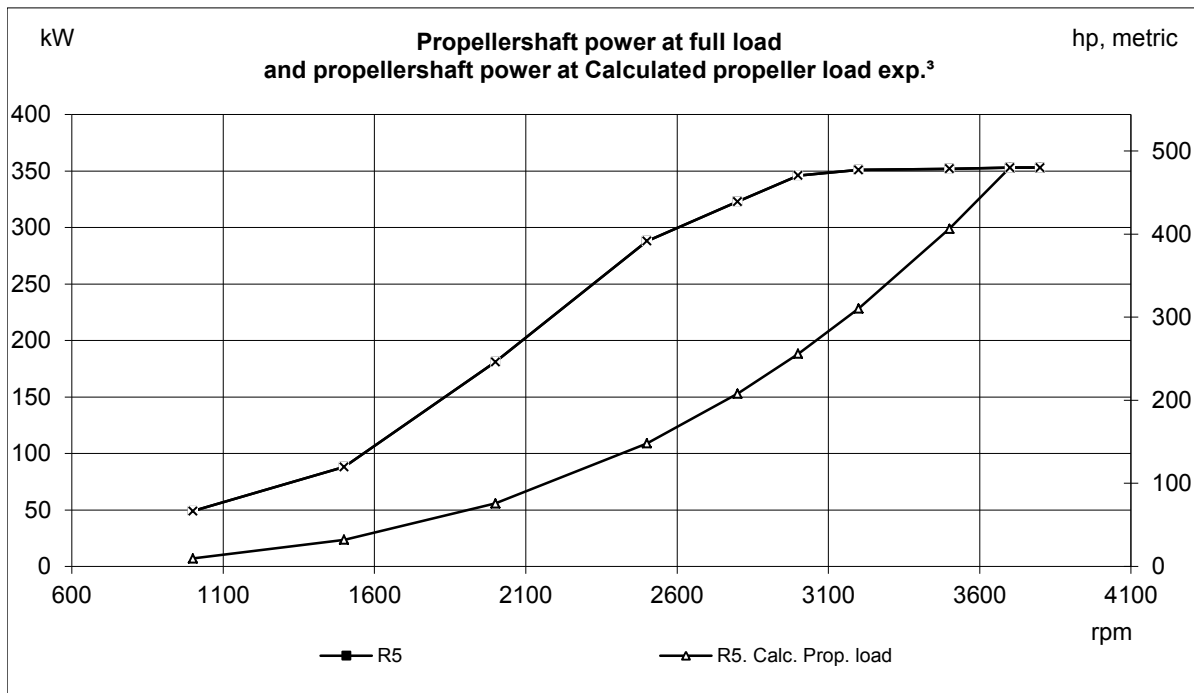
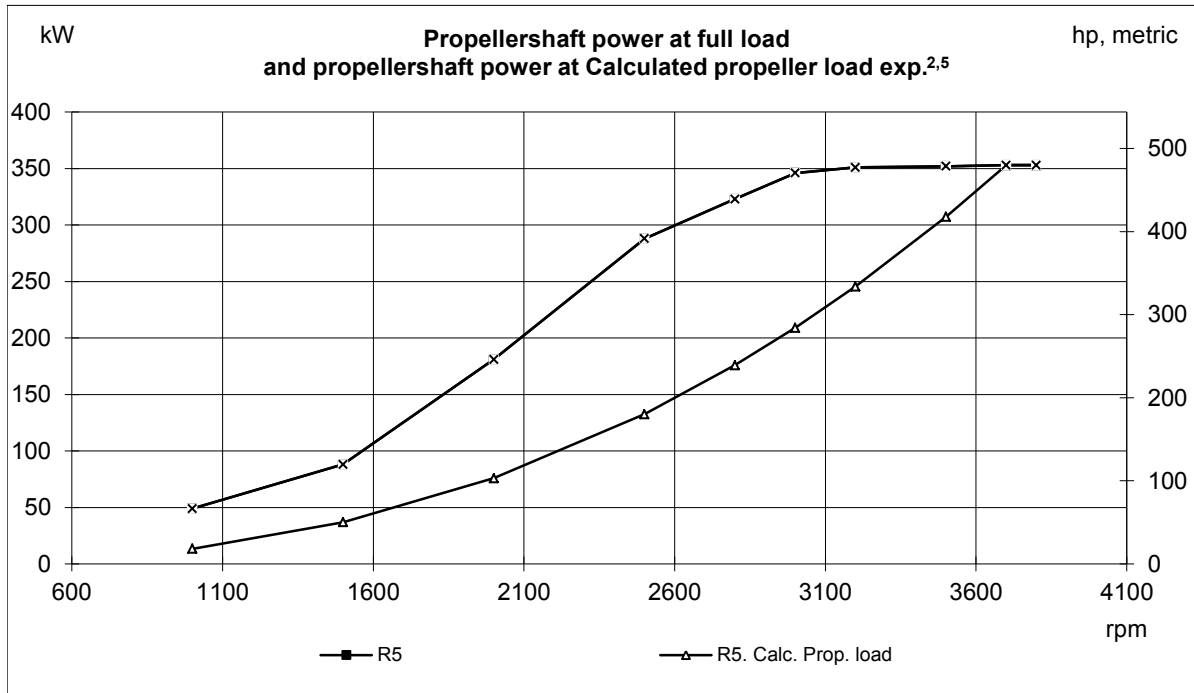
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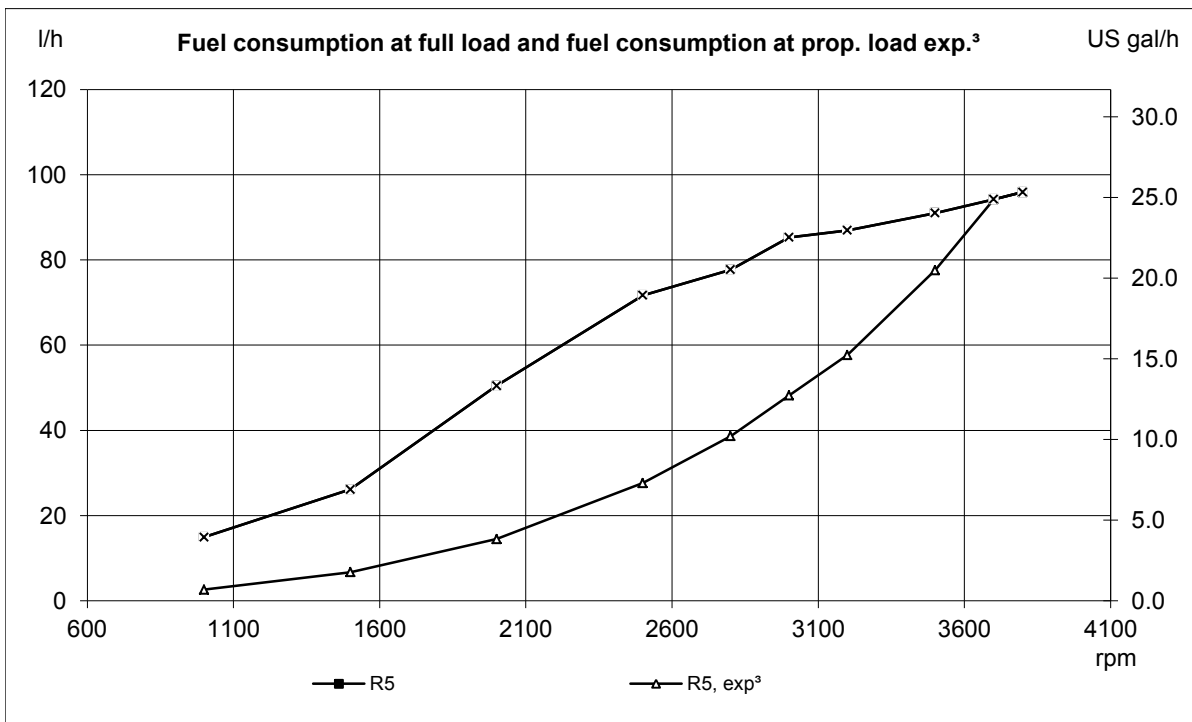
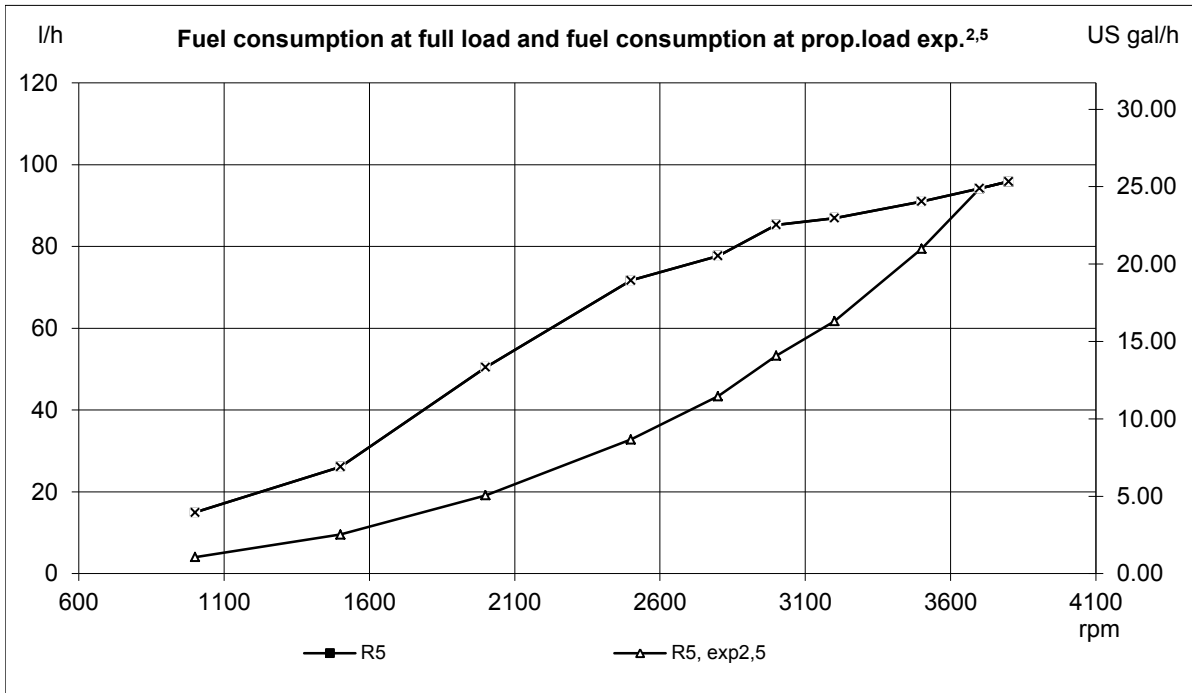
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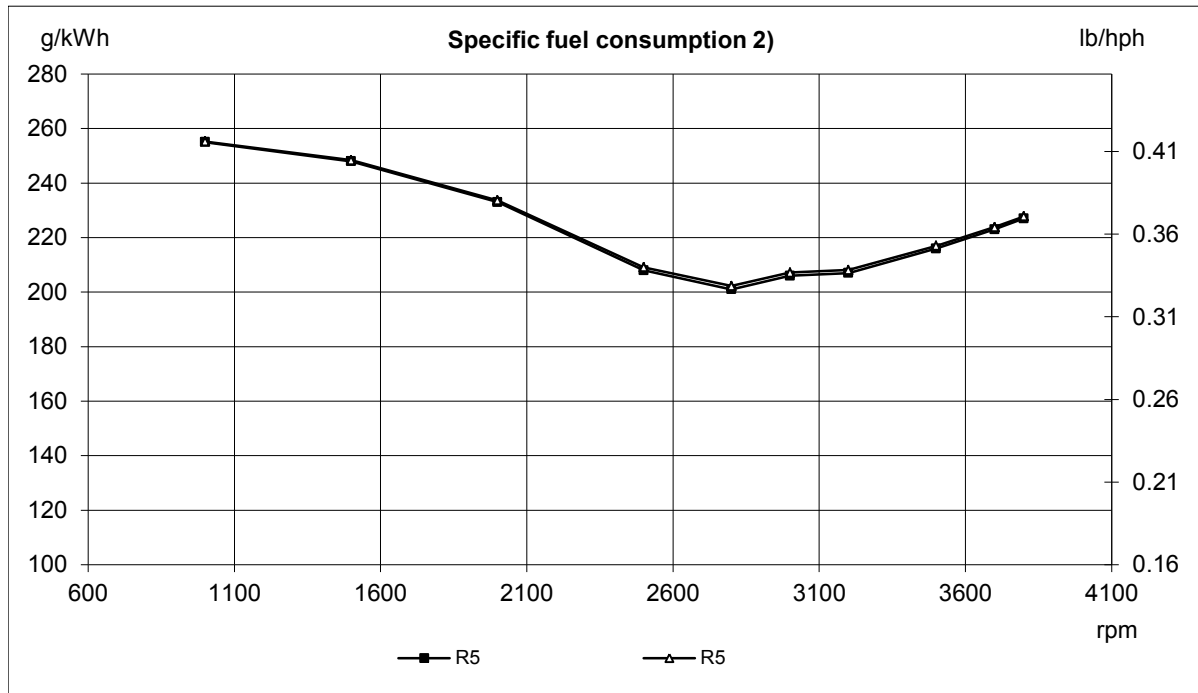
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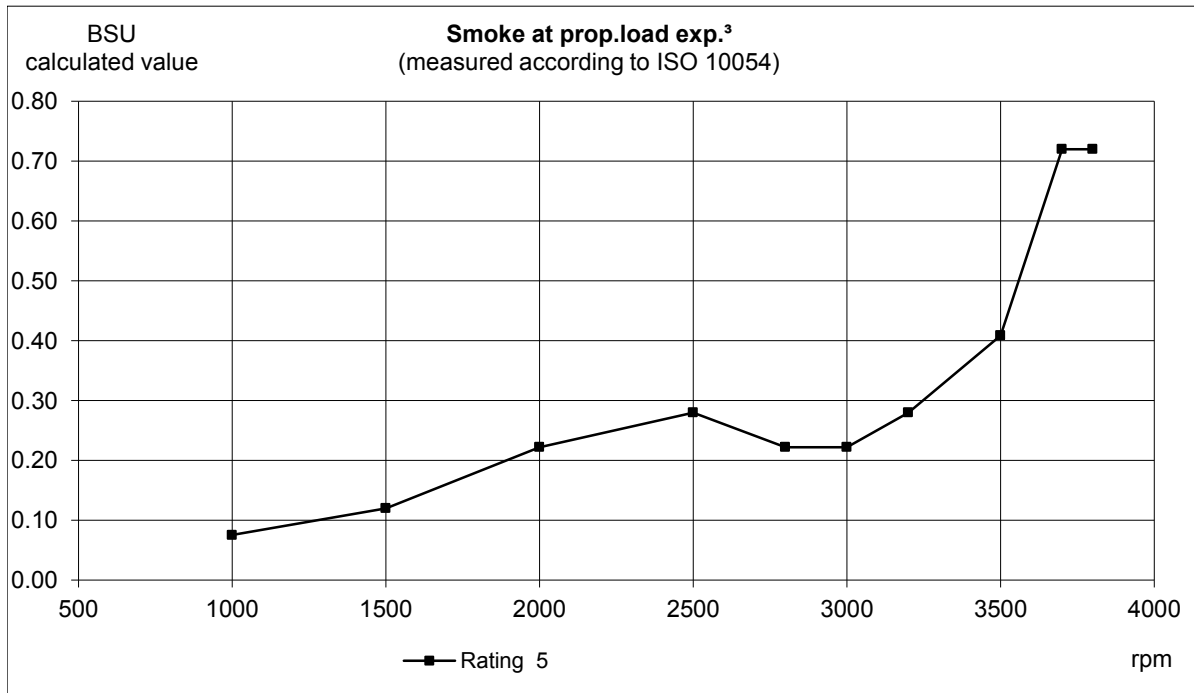
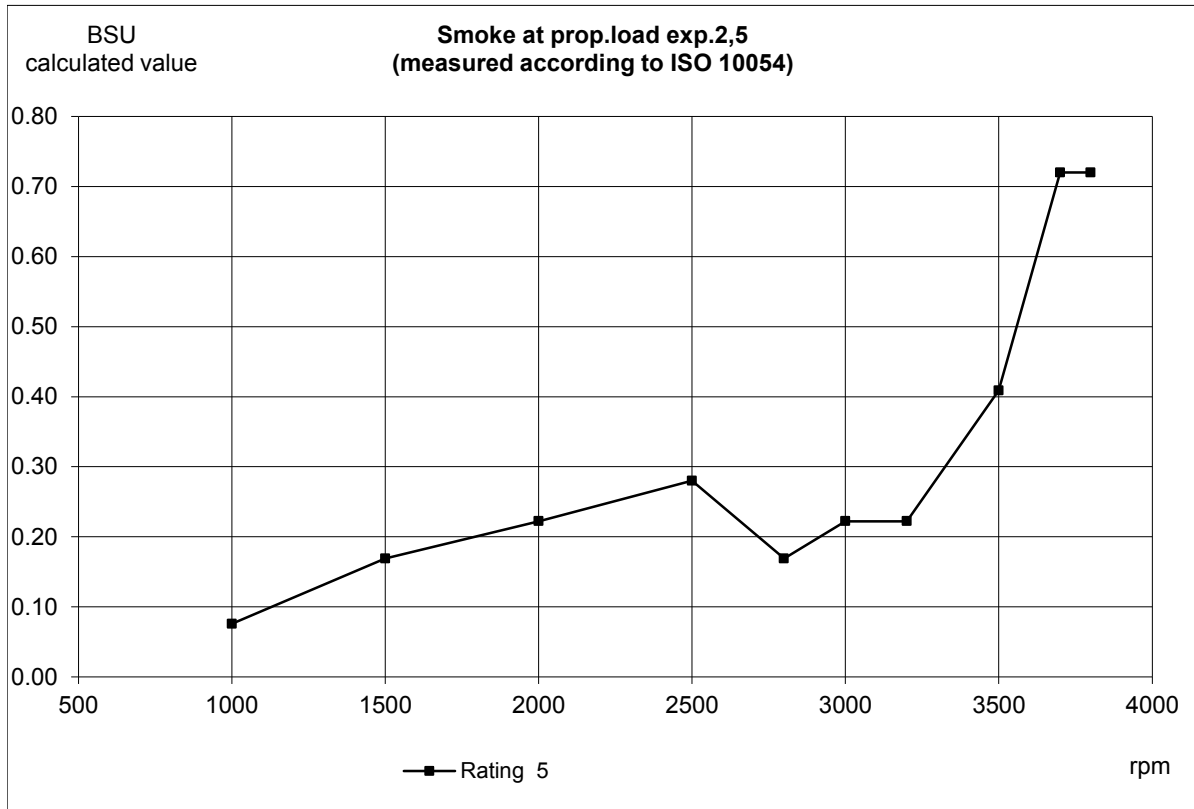
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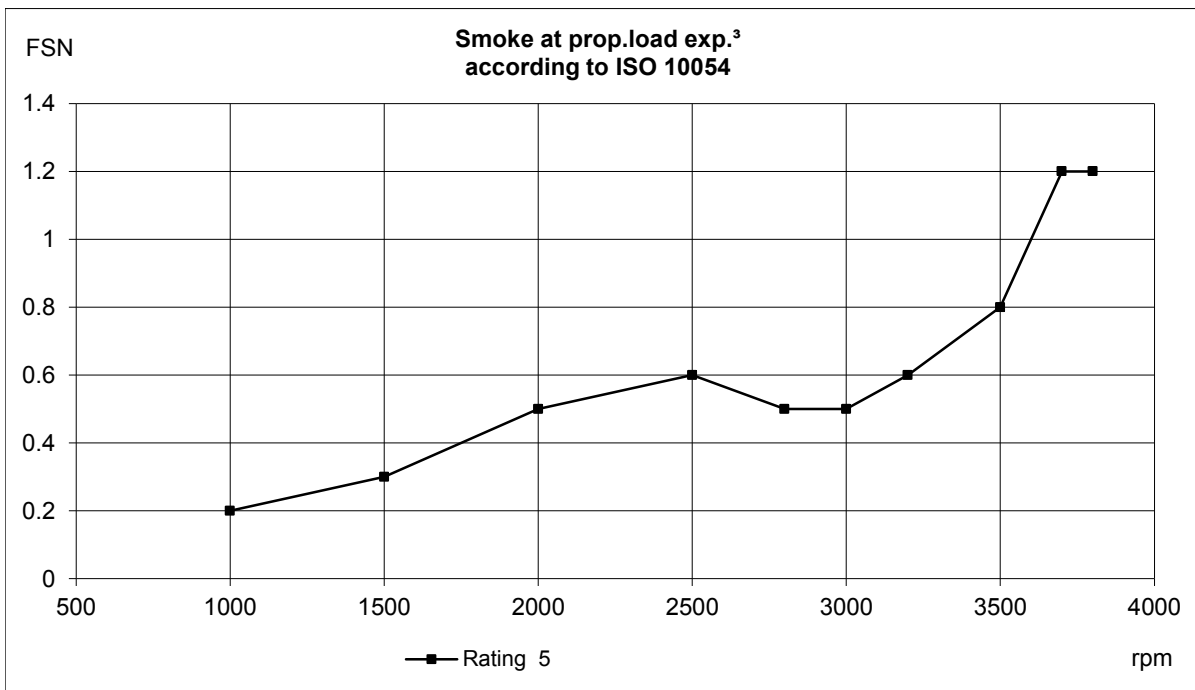
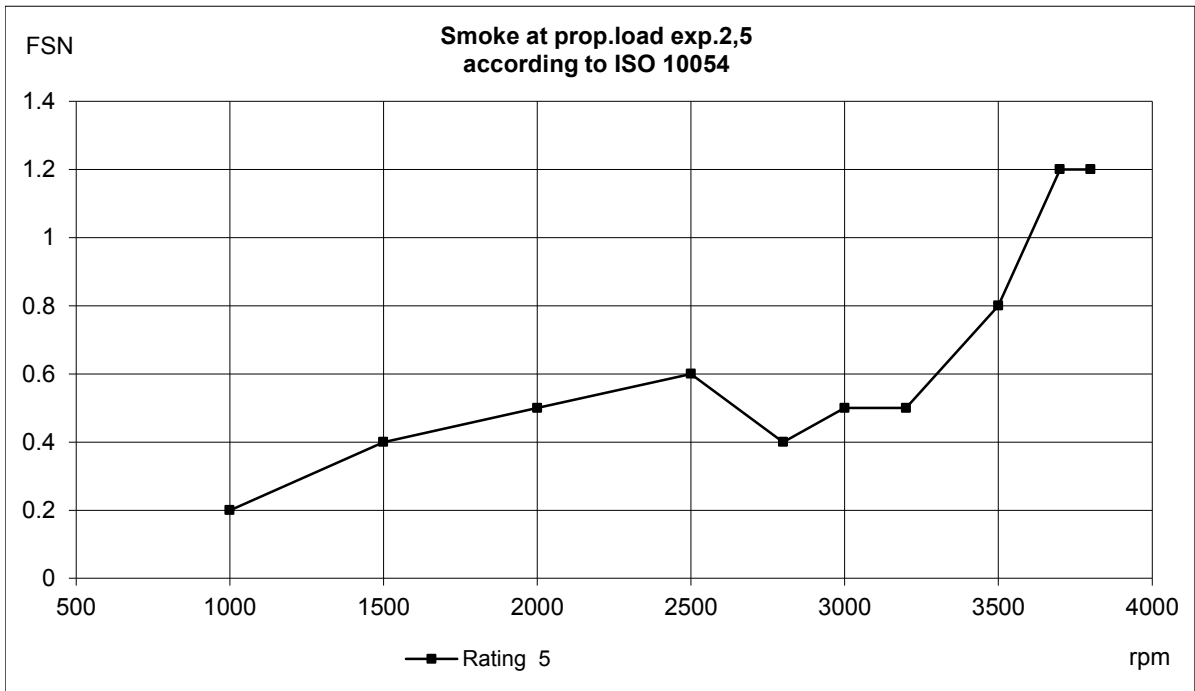
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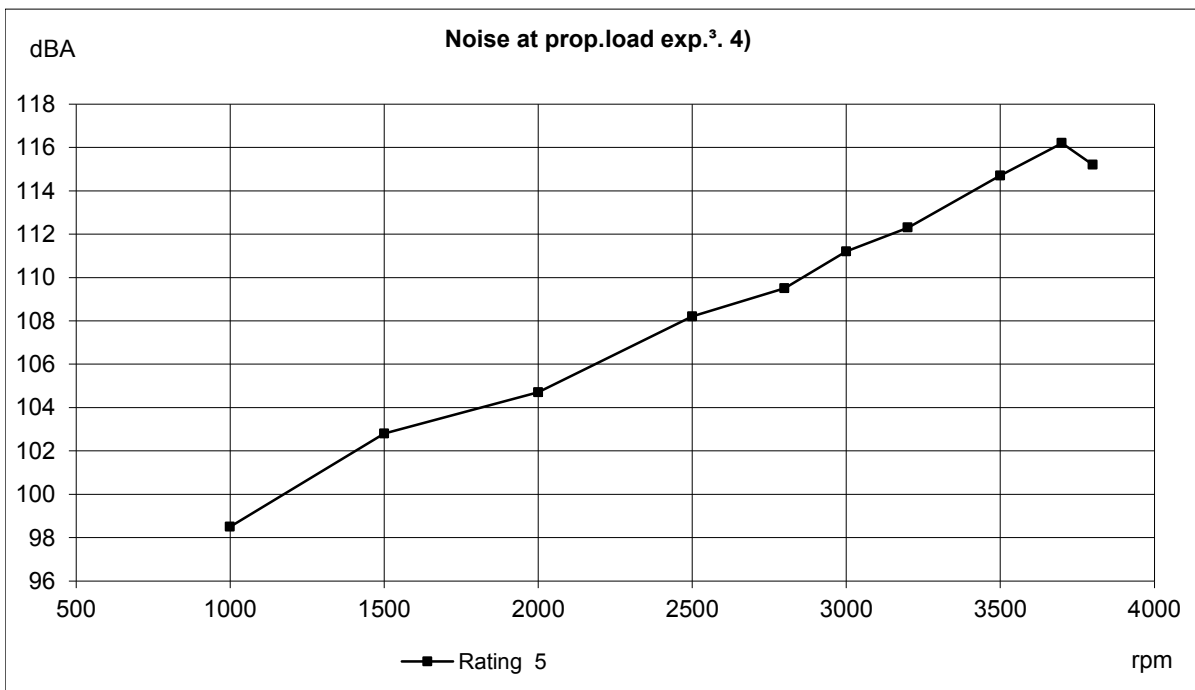
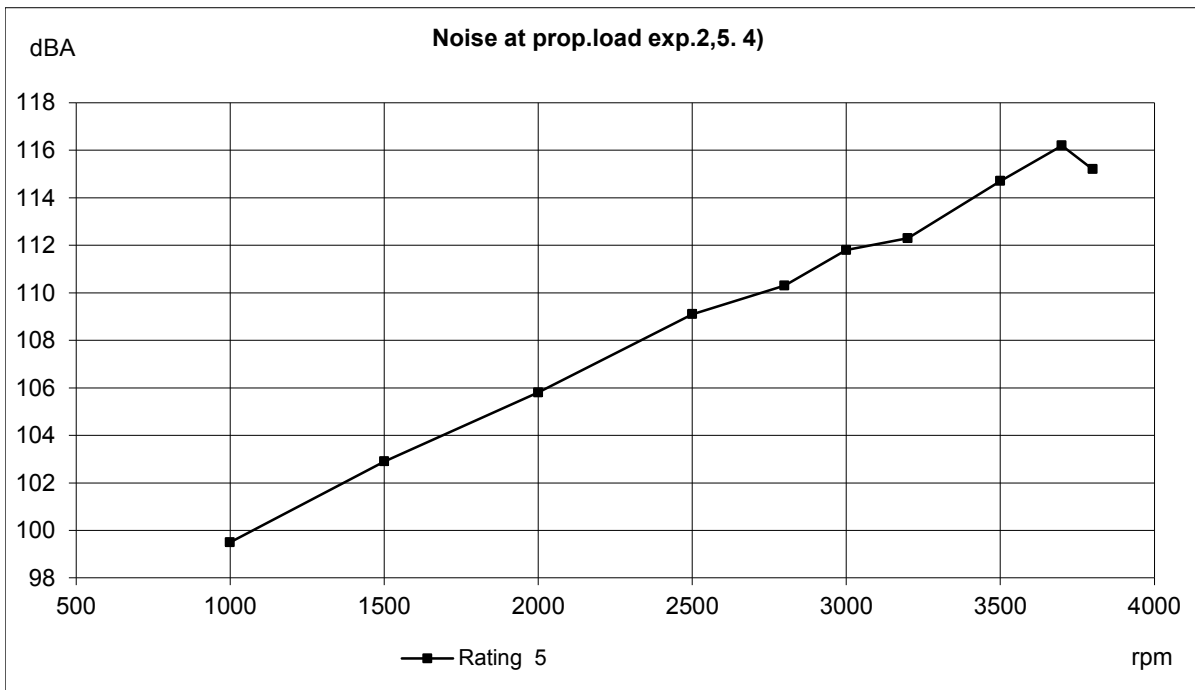
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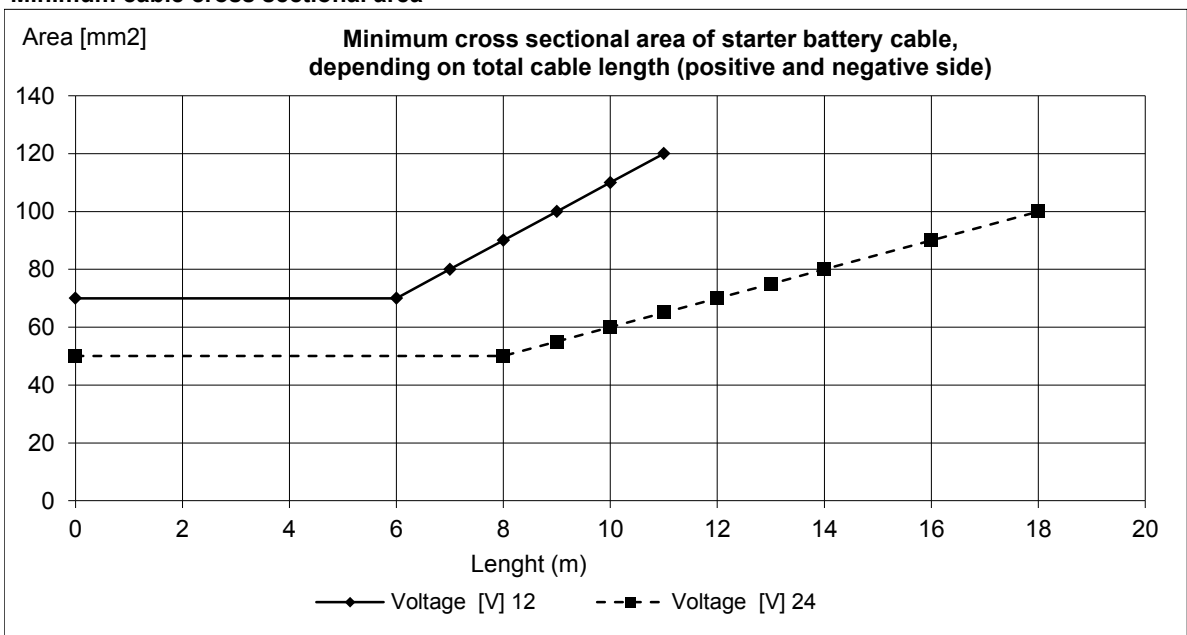
Battery capacity 12V

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:

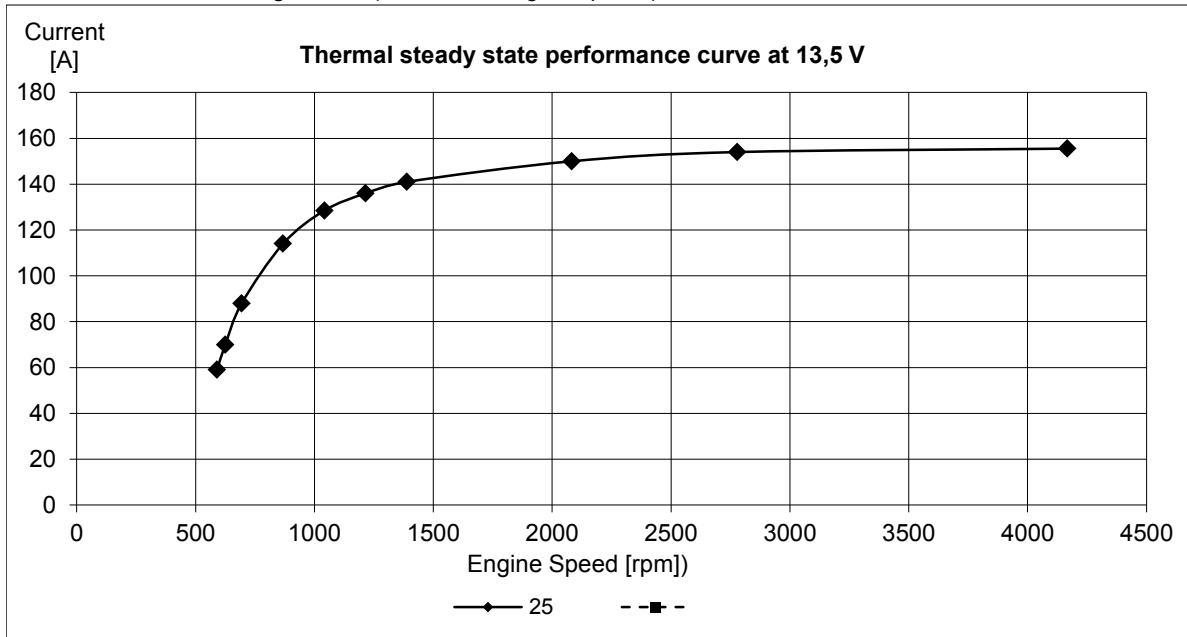
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Engine:	10
Control system:	10

Max current consumption during normal operation:

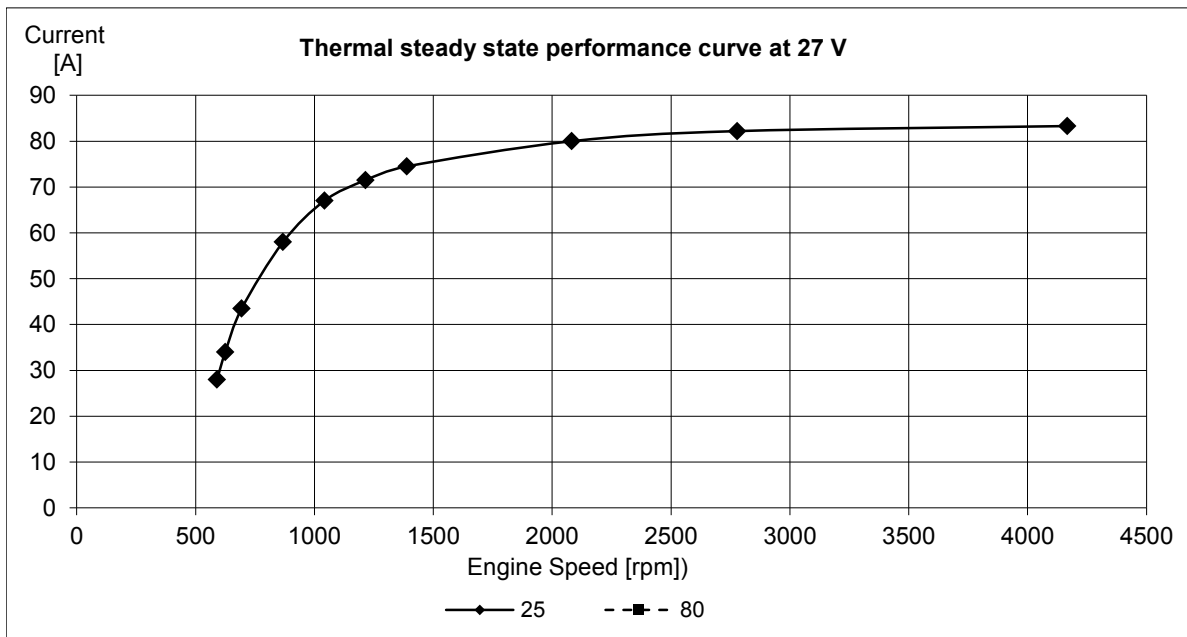
	[A]
Engine :	2 - 4

Alternator data:

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



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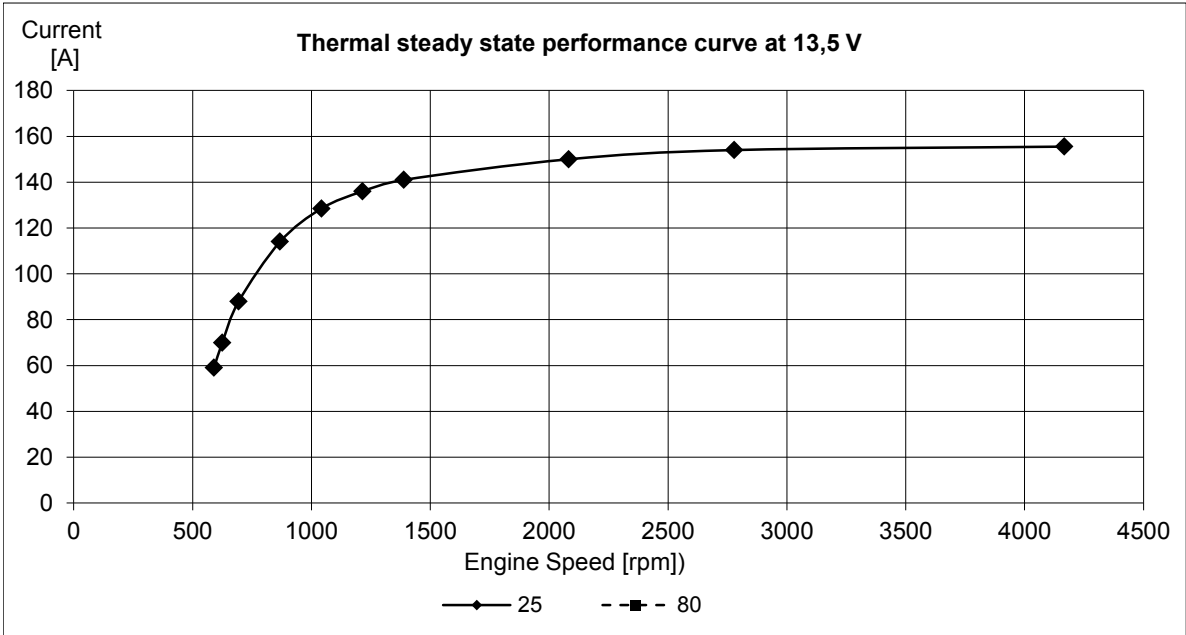


Constant charge voltage: [V]	28.3	+/- 0,3
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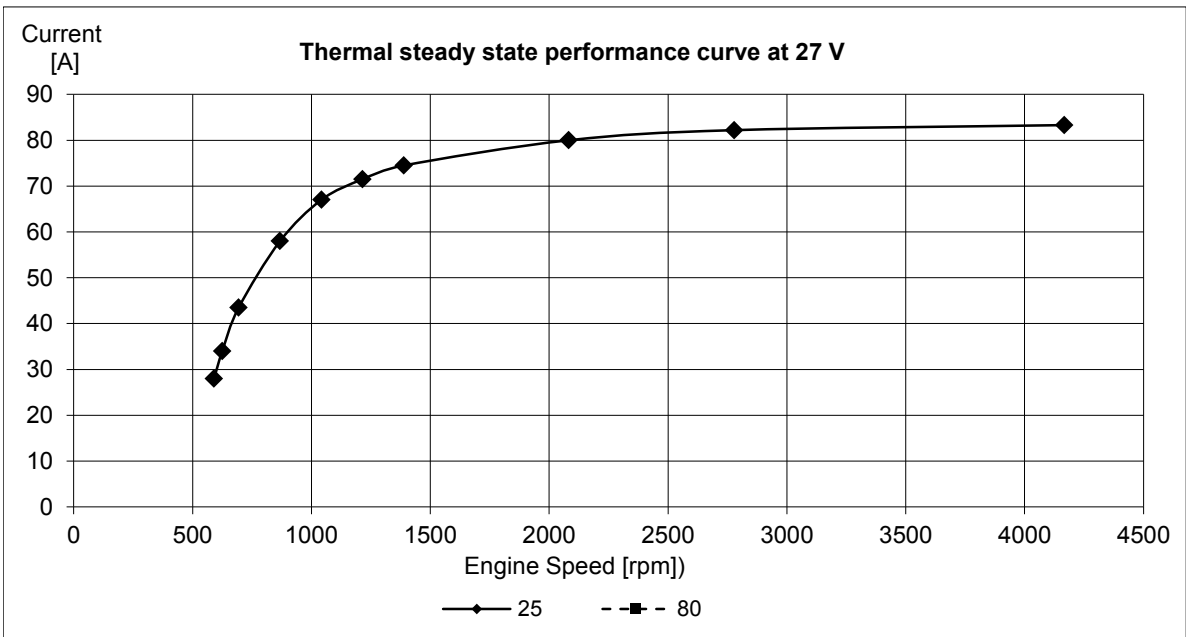
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Alternator data:

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



Constant charge voltage: [V]	14.3	+/- 0,3
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Constant charge voltage: [V]	28.3	+/- 0,3
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