

<b>VOLVO PENTA</b> D8 R4 510 INB	Document No	Issue Index
	<b>23073274</b>	<b>03</b>

## General

4-stroke direct injected, turbocharged and aftercooled diesel engine

Number of cylinders		6
No of valves		24
Displacement, total	litres in <sup>3</sup>	7,70 469,9
Firing order		1-4-2-6-3-5
Rotational direction, viewed from the front		Clockwise
Bore	mm in	110 4,33
Stroke	mm in	135 5,31
Compression ratio		16,5:1
Compression pressure at 240 rpm	MPa psi	3,2 464
Max. static forward inclination:	°	0
Max. static backward inclination:	°	10
Max. intermittent forward inclination while running:	°	33
Max. intermittent backward inclination while running:	°	17
Max. intermittent side inclination while running:	°	30
Idling speed	rpm	600 ± 10
Rated speed R4	rpm	2850
Propeller selection range R4	rpm	2800-2900
Dry weight engine BT	kg lb	840 1852

Performance		Rating	rpm	600	800	1200	1700	2000	2200	2400	2600	2700	2850
Crankshaft power 1), 5)	4	kW	40	59	127	280	329	362	374	374	374	374	374
			hp	54	80	173	380	447	492	509	509	509	509
Propeller shaft power 1) (At full load) With reverse gear	4	kW	38	57	123	271	319	351	363	363	363	363	363
			hp	52	77	167	369	434	477	493	493	493	493
Propellershaft power at prop. load x <sup>2,5</sup>	4	kW	7	15	42	100	150	190	236	288	317	363	363
			hp	10	21	57	136	204	258	321	392	431	493
Propellershaft power at prop. load x <sup>3</sup>	4	kW	3	8	27	77	125	167	217	275	308	363	363
			hp	5	11	37	105	171	227	295	375	420	493
Torque at crankshaft 2)	4	Nm	629,9	700	1010	1571	1571	1571	1488	1374	1323	1253	1253
			lbf ft	465	516	745	1159	1159	1159	1098	1013	976	924
Mean piston speed		m/s	2,7	3,6	5,4	7,7	9,0	9,9	10,8	11,7	12,2	12,8	12,8
			ft/s	8,9	11,8	17,7	25,1	29,5	32,5	35,4	38,4	39,9	42,1
Effective mean pressure 2)	4	MPa	1,03	1,14	1,65	2,56	2,56	2,56	2,43	2,24	2,16	2,05	2,05
			psi	149,1	165,7	239,1	371,9	371,9	371,9	352,2	325,1	313,1	296,6
Max combustion pressure 2)	4	MPa	8,9	9,3	11,8	17,4	16,5	16,5	15,9	15,3	15,2	14,8	14,8
			psi	1291	1349	1711	2524	2393	2393	2306	2219	2205	2147

## Lubricating system

Specific lubricating oil consumption.	g/kWh	0,1
Max. oil volume including filters for all allowed installation inclinations:	litres	29,4
	US gal	7,77
Max. oil volume excluding filters for all allowed installation inclinations:	litres	28
	US gal	7,40
Min. oil volume excluding filters for all allowed installation inclinations:	litres	22
	US gal	5,81

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.

4) Acc. to ISO 3744

5) At installed back pressure

<b>Fuel system</b>	<b>Rating</b>	<b>rpm</b>	<b>600</b>	<b>800</b>	<b>1200</b>	<b>1700</b>	<b>2000</b>	<b>2200</b>	<b>2400</b>	<b>2600</b>	<b>2700</b>	<b>2850</b>
Specific fuel consumption 2)	4	g/kWh lb/hph	226,2 0,366	223,7 0,362	217,9 0,353	198,9 0,322	196,4 0,318	200 0,324	206,7 0,335	219,6 0,356	221,7 0,359	225,6 0,365
Fuel consumption at prop. load x <sup>2,5</sup>	4	l/h US gal/h	2,5 0,7	4,5 1,2	10,9 2,9	25,8 6,8	38,6 10,2	49,3 13,0	62,1 16,4	77,4 20,4	86,1 22,7	102,8 27,2
Fuel consumption at prop. load x <sup>3</sup>	4	l/h US gal/h	1,6 0,4	2,9 0,8	7,7 2,0	20,3 5,4	32,8 8,7	43,9 11,6	57,4 15,2	73,9 19,5	83,8 22,1	102,8 27,2
Fuel consumption at full load	4	l/h US gal/h	11,0 2,9	16,2 4,3	33,6 8,9	67,8 17,9	77,7 20,5	87,5 23,1	94,2 24,9	99,4 26,3	100,5 26,5	102,7 27,1

**Full load performance at rated speed**

Fuel return temperature from engine	°C	49
	°F	120,2
Fuel consumption	l/h	102
	US gal/h	26,9
Fuel inlet flow to engine	l/h	175
	US gal/h	46,2
Fuel return flow from engine	l/h	73
	US gal/h	19,3

<b>Intake and exhaust system</b>	<b>Rating</b>	<b>rpm</b>	<b>600</b>	<b>800</b>	<b>1200</b>	<b>1700</b>	<b>2000</b>	<b>2200</b>	<b>2400</b>	<b>2600</b>	<b>2700</b>	<b>2850</b>
Specific exhaust heating effect in percent of crankshaft power	4	%	50	56	69	64	63	65	67	79	80	83
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.	4	°C	420	491	617	547	467	432	416	473	468	480
		°F	788	916	1143	1017	873	810	781	883	874	896
Permitted back pressure in the exhaust line at rated speed. (Installed back pressure)	4	°C										
		°F										
		kPa								Max		30
		psi										4,4
		kPa							Min		10	
		psi									1,5	

<b>Intake and exhaust system</b>	<b>Rating</b>	<b>rpm</b>	<b>600</b>	<b>800</b>	<b>1200</b>	<b>1700</b>	<b>2000</b>	<b>2200</b>	<b>2400</b>	<b>2600</b>	<b>2700</b>	<b>2850</b>
Engine air consumption at 25°C / 77°F atmospheric pressure 100kPA and relative humidity 30%.	4	m <sup>3</sup> /min	2,2	3,12	6,35	15,23	20,93	25,52	29,09	29,17	30,03	30,58
		cu.ft./min	77,69	110,2	224,2	537,8	739,1	901,2	1027	1030	1060	1080
Charge air pressure	4	kPa	111	117	154	263	304	339	356	333	332	326
Inlet manifold		psi	16,1	17,0	22,3	38,1	44,1	49,2	51,6	48,3	48,2	47,3
Exhaust gas flow	4	m <sup>3</sup> /min	5,7	8,8	20,5	43	51,1	57,9	62,3	67,1	68	69,8
		cu.ft./min	201,3	310,8	724	1519	1805	2045	2200	2370	2401	2465

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.

4) Acc. to ISO 3744

5) At installed back pressure

Cooling system	Rating	rpm	600	800	1200	1700	2000	2200	2400	2600	2700	2850
Radiated heat in percent of crankshaft power.	4	%	1,9	1,8	1,7	1,6	1,5	1,5	1,5	1,5	1,5	1,5
Heat rejection to charge air cooler in percent of crankshaft power.	4	%	2	2	6	14	19	22	26	24	25	25
Coolant heat rejection to HE, incl. engine oil cooler and excl. charge air cooler, in percent of crankshaft power.	4	%	94	83	73	50	46	44	45	50	50	51
Coolant flow with fully open thermostat and std cooling system		l/min cu.ft./min	66 2,3	88 3,1	129 4,6	182 6,4	212 7,5	229 8,1	244 8,6	259 9,1	265 9,4	270 9,5
Extra water pump flow through charge air cooler		l/min cu.ft./min	NA									
Max. pump pressure at extra pump pressure side (pressure set system)		kPa psi	NA									
Max. permissible temperature on coolant in engine outlet		°C °F	NA									
Coolant volume engine, including heat exchanger and charge air cooler		litres US gal.	25 6,60									
Max. additional coolant for cabin heater etc. with std. Expansion tank		litres US gal.	20 5,28									
Maximum coolant flow to cabin heater etc.		l/min cu.ft./min	34,2 1,21									
Thermostat, start open at		°C °F	76 169									
Thermostat, fully open at		°C °F	86 187									

Raw water circuit	rpm	600	800	1200	1700	2000	2200	2400	2600	2700	2850
Nominal raw water design flow	l/min cu.ft./min	60 2,1	82 2,9	125 4,4	170 6,0	200 7,1	220 7,8	240 8,5	245 8,7	252 8,9	256 9,0
Nominal raw water pump pressure head at design flow. (measured before and after pump)	kPa psi	5 0,7	11 1,6	27 3,9	50 7,3	67 9,7	87 12,6	101 14,6	105 15,2	107 15,5	107 15,6
Maximum raw water pump suction head	kPa psi	-30 -4,4									
Maximum additional pressure drop excl. reverse gear oil cooler	kPa psi	97 14,1	93 13,5	83 12,0	63 9,1	50 7,3	40 5,8	31 4,5	25 3,6	20 2,9	16 2,3
Pressure drop over reverse gear oil cooler (optional equipment)	kPa psi	1 0,2	1 0,2	2 0,3	4 0,6	5 0,8	6 0,9	7 1,0	8 1,2	8 1,2	9 1,3
Maximum sea water temperature	°C °F	32 90									

Emissions	Rating	rpm	600	800	1200	1700	2000	2200	2400	2600	2700	2850
Smoke at prop. load x <sup>2.5</sup>	4	*BSU	0,2	0,2	0,3	0,9	0,8	0,7	0,6	0,5	0,5	0,6
Smoke at prop. load x <sup>3</sup>	4	*BSU	0,2	0,2	0,2	0,7	0,8	0,7	0,6	0,5	0,5	0,6
Noise at prop. load x <sup>2.5</sup> . 4)	4	dBA	96,9	99,4	100,7	103,5	107,0	107,9	109,1	111,1	111,7	112,2
Noise at prop. load x <sup>3</sup> . 4)	4	dBA	95,9	97,7	101,1	103,0	107,3	108,1	109,1	111,2	112,0	112,1

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

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- 4) Acc. to ISO 3744
- 5) At installed back pressure

Sensors Control and Monitoring System							Switches Engine Shutdown System	
Sensors	Signal	Unit	Range	Warning Initial Delay / Fault detection time	Warning Level	Derating Level	Shutdown Initial Delay / Shutdown Delay	Shutdown Level (Tolerance)
Charge air pressure		kPa	50 - 400 (150-500 abs).	30 sec from start / 3 sec	300 (400 absolute)	310 (410 abs.) *	NA	NA
Charge air temperature	50-0 kΩ	°C	-40 - 130	30 sec from start / 3 sec	80	90 (soft 3)	NA	NA
Coolant level switch	Digital		ON/OFF	30 sec from start / 5 sec	Low (ON / Closed)	NA	NA	NA
Coolant temperature	50-0 kΩ	°C	-40 - 140	30 sec from start / 3 sec	98	103 (soft 1)	NA	NA
Coolant temperature (SDU)	Digital	°C	ON/OFF	NA	NA	NA	1 sec.	105
Engine speed cam	Frequency	rpm		Instant	Lost signal	NA	NA	NA
Engine speed crank	Frequency	rpm		Instant	Lost signal	NA	NA	NA
Eng. overspeed (SDU) max rpm+15%	Frequency	rpm	173 pulse./rev	NA	Lost signal	NA	Instant	Nom. Rpm +15% -0 +1%
Exhaust gas temperature wet	PT200	°C	0 - 850	30 sec from start / 3 sec	200	225(soft 4)	NA	NA
Exhaust gas temperature dry	PT200	°C	0 - 850	30 sec from start / 3 sec	650	665(soft 5)**	NA	NA
Oil level sensor	Digital		ON/OFF	30 sec from start / 5 sec	Low level	NA	NA	NA
Oil temperature	50-0 kΩ	°C	-40 - 140	30 sec from start / 5 sec	125	127 (soft 2)	NA	NA
Gear oil pressure (SDU)	Digital	kPa	ON/OFF	NA	NA	NA	11sec. / 1 sec	IPS: 400 kPa IB: Depends on gearbox (see manufactures recommendations)
Gear oil pressure (EVC-IPS)	0,5-4,5 V	kPa	0-3000 ±3%	60 sec. from start / 4 sec.	700	NA	NA	NA
Gear oil pressure (EVC-IB)	0,5-4,5 V	kPa	0-3000 ±3%	60 sec. from start / 4sec.	700 (Can be changed by VODIA, see gearbox manufact. recom.)	NA	NA	NA
Gear oil temperature	50-0 kΩ	°C	-40 - 140 ±2.5%	>95, 2 sec	NA	NA	NA	NA
Fuel leak pressure		kPa		0 sec. from start / 10 sec.	260/270	NA	NA	NA

NA = Not applicable

\* Yes, 50% of engine prot. map.

\*\* Max 1200 rpm at 675°C

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Sensors (rpm dependent)	Signal	Unit	Range	Initial Delay / Fault	Warning Level / Derating Level					Switches
<b>Fuel pressure</b>	0,5-4,5 V	kPa	0-700		<b>600 rpm</b>	<b>1000 rpm</b>	<b>1500 rpm</b>	<b>2000 rpm</b>	<b>3000 rpm</b>	
Warning Level		kPa		30 sec from start / 5 sec	300	335	370	420	450	
Derating Level		kPa		NA	NA	NA	NA	NA	NA	
Rail pressure ?										
Derating level										
<b>Oil pressure</b>	0,5-4,5 V	kPa	0-700		<b>550 rpm</b>	<b>600 rpm</b>	<b>1000 rpm</b>	<b>2000 rpm</b>	<b>3000 rpm</b>	
Warning Level		kPa		30 sec from start / 2 sec	NA	100	150	200	300	
Derating Level (100% derate)		kPa		10% trq. decr. per sec	NA	75	125	175	275	
Engine speed limit		kPa		Max 1000 rpm	0	70	120	170	270	
Oil pressure switch (SDU)	Digital	kPa	ON/OFF	11sec. / 1 sec	0	120±20	120±20	120±20	120±20	SDM dataset
<b>Coolant pressure</b>		kPa			<b>550 rpm</b>	<b>600 rpm</b>	<b>1000 rpm</b>	<b>2000 rpm</b>	<b>3000 rpm</b>	
Warning Level		kPa		30 sec from start / 2 sec	NA	5	15	60	175	
Derating Level (100% derate)		kPa		10% trq. decr. per sec	NA	NA	3	48	163	
<b>Seawater pressure</b>		kPa			<b>550 rpm</b>	<b>600 rpm</b>	<b>1000 rpm</b>	<b>2000 rpm</b>	<b>3000 rpm</b>	
Warning Level		kPa		30 sec from start / 2 sec	NA	5	10	30	45	
Derating Level (100% derate)		kPa		10% trq. decr. per sec	NA	NA	NA	18	33	

Warning = Yellow Lamp active

Derating = Red Lamp active

## Remarks

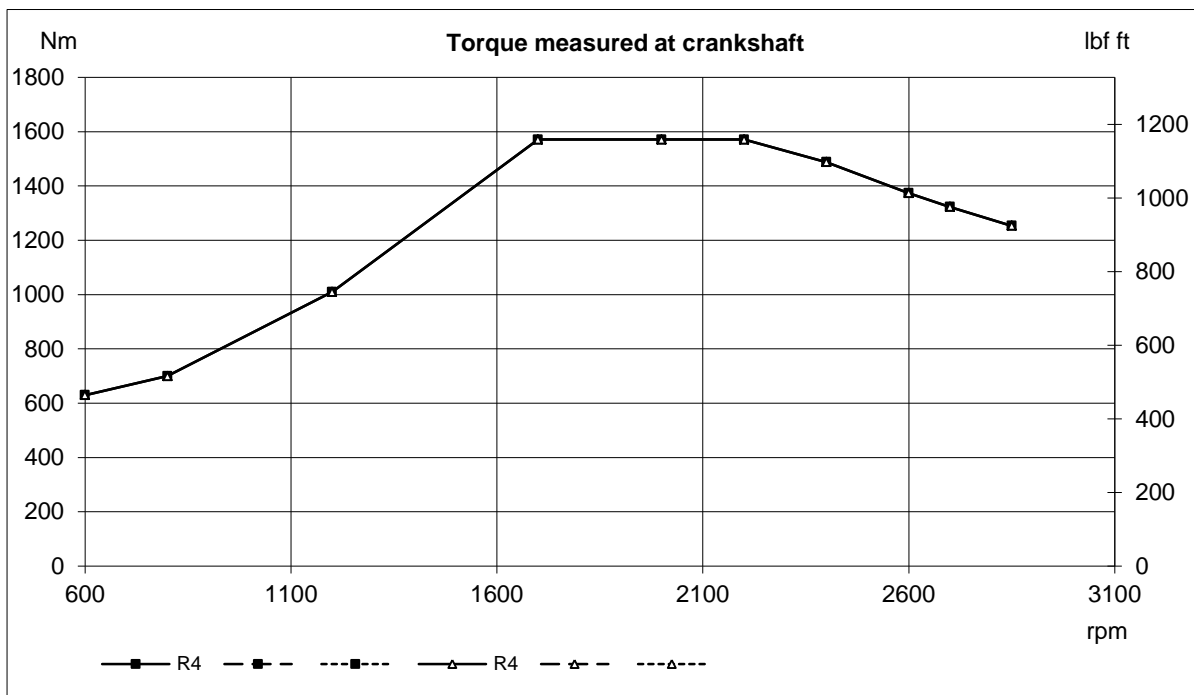
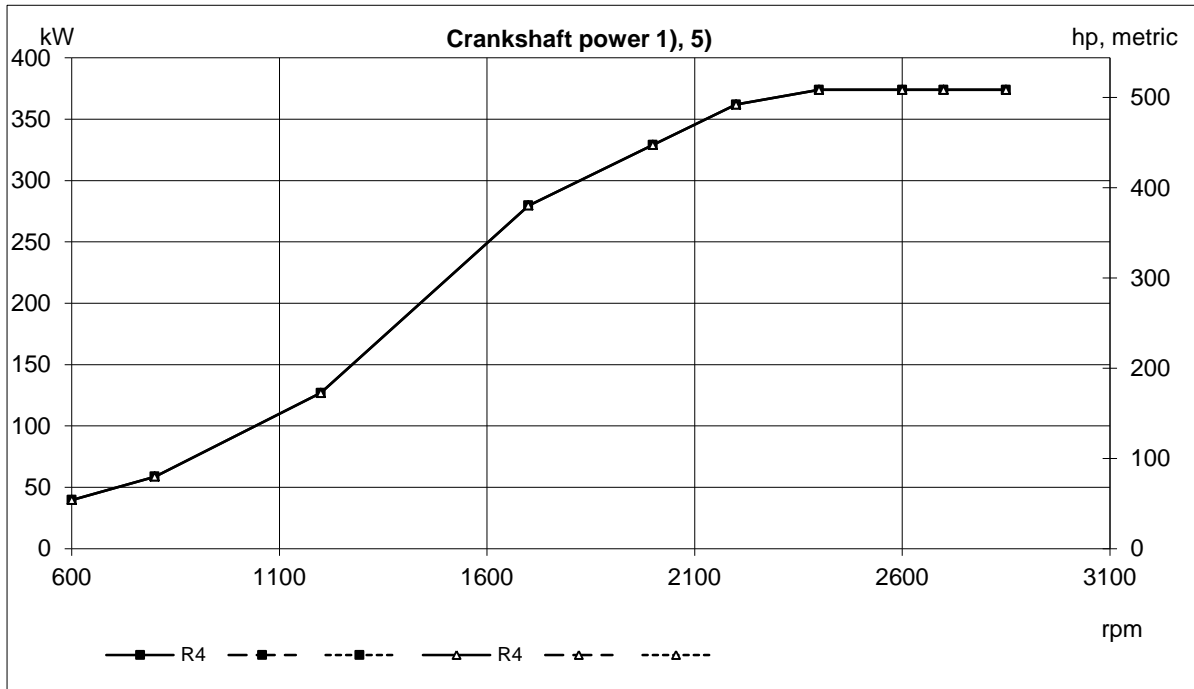
	Speed / °C	103°C	105.5°C	108°C
<b>Soft 1) Soft derate Coolant temp</b>				
Remaining torque in %	600	100%	100%	100%
	1200	100%	85%	70%
	1800	100%	50%	0%

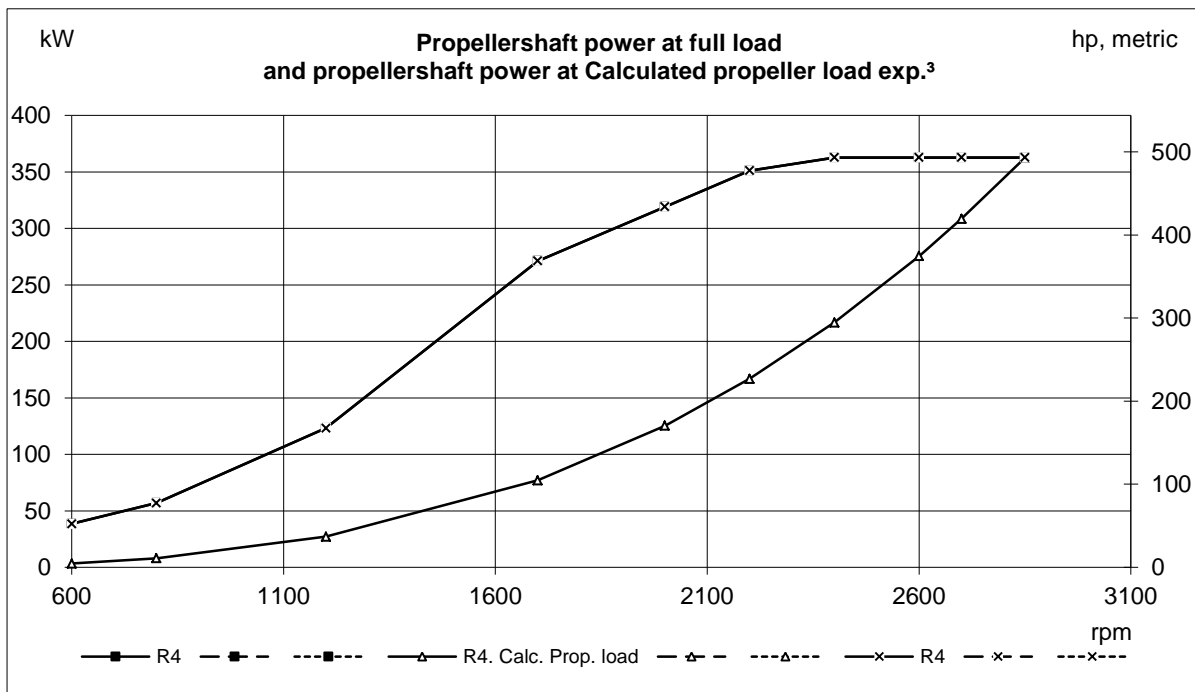
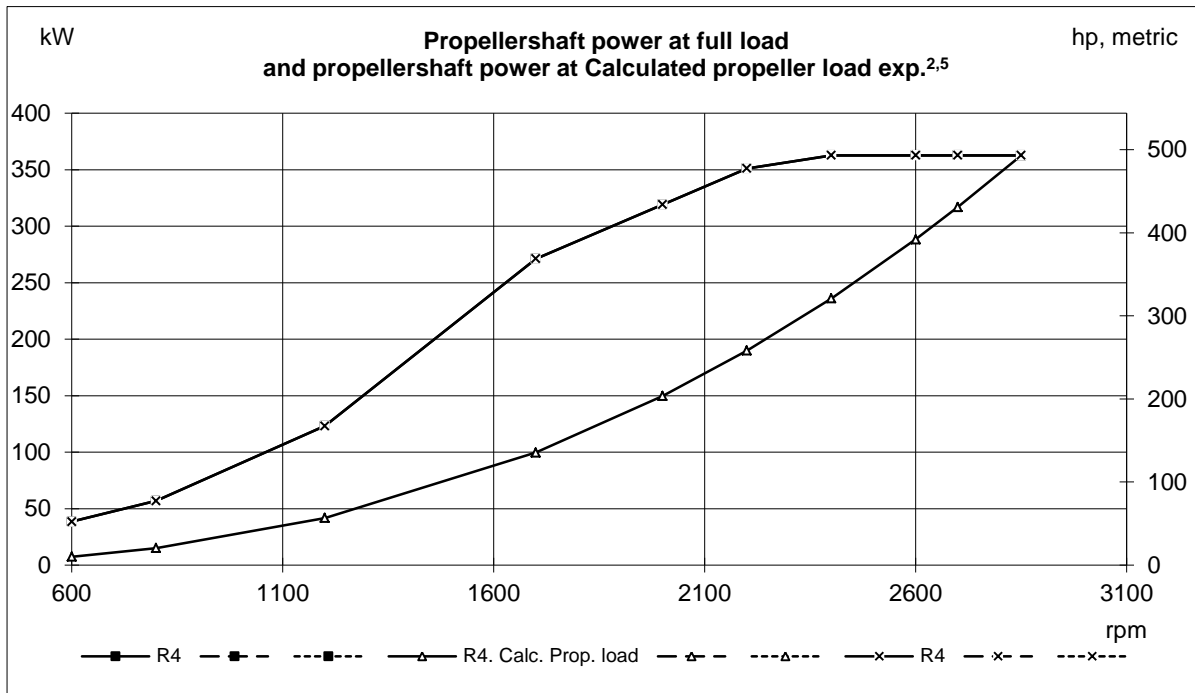
	Speed / °C	127°C	129°C	131°C
<b>Soft 2) Soft derate Oil temp</b>				
Remaining torque in %	600	100%	100%	100%
	1200	100%	85%	70%
	1800	100%	50%	0%

	Speed / °C	90°C	95°C	100°C
<b>Soft 3) Soft derate Charge Air Temp</b>				
Remaining torque in %	600	100%	100%	100%
	1200	100%	85%	70%
	1800	100%	50%	0%

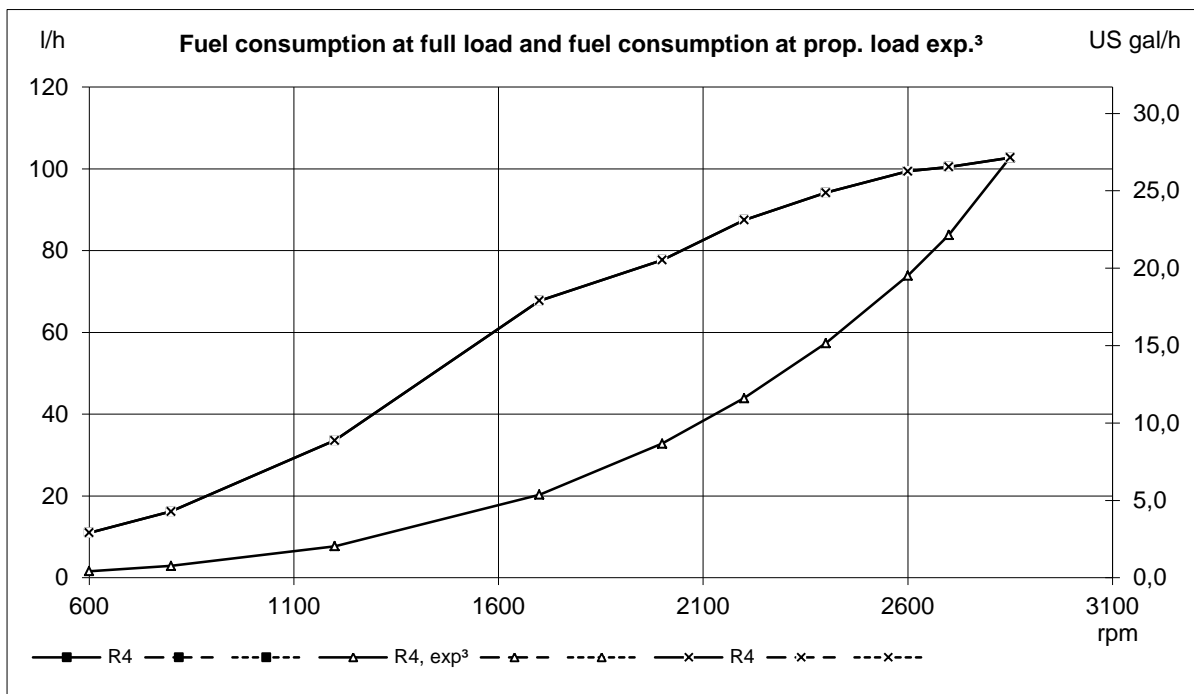
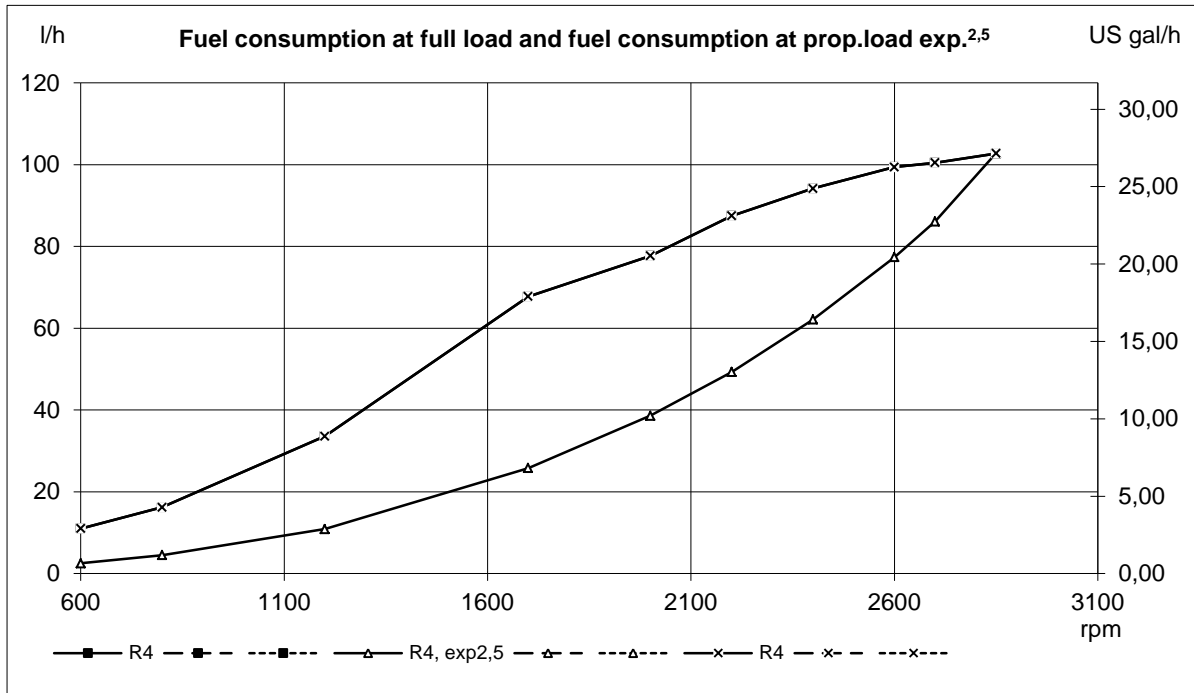
	Speed / °C	225°C	235°C	245°C	255°C
<b>Soft 4) Soft derate Exhaust Temp wet</b>					
Remaining torque in %	600	100%	100%	100%	100%
	1200	100%	85%	78%	70%
	1800	100%	50%	25%	0%

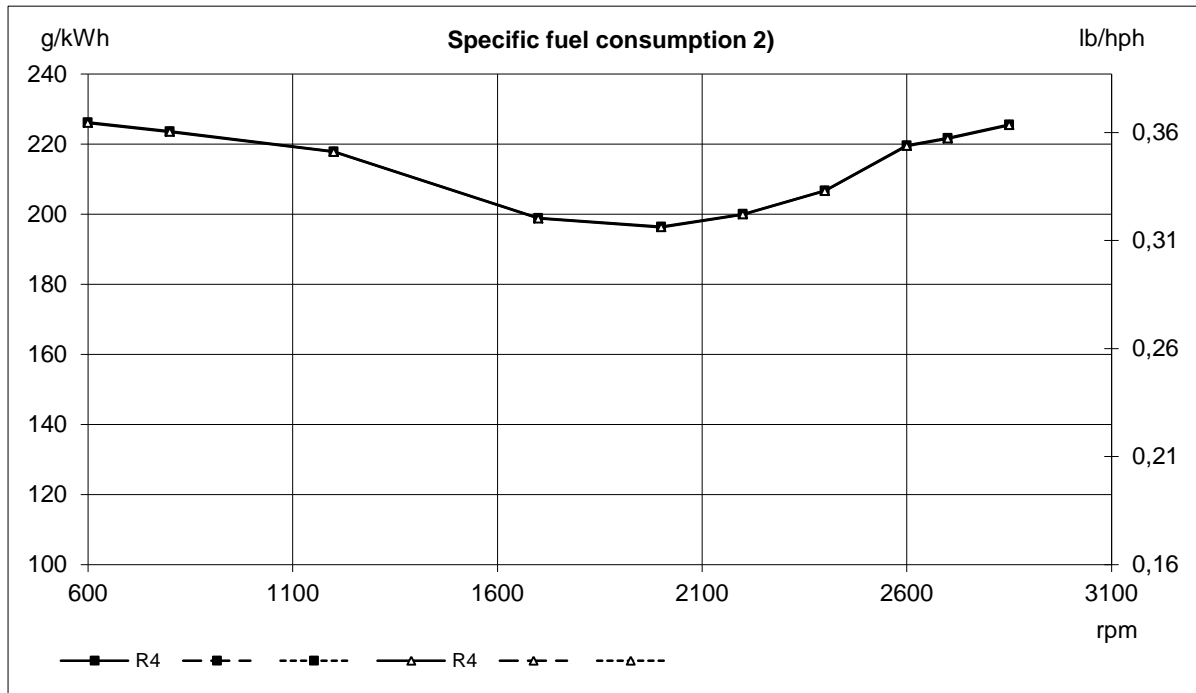
	Speed / °C	665°C	675°C	680°C	685°C	690°C
<b>Soft 5) Soft derate Exhaust Temp dry</b>						
Remaining torque in %	600	100%	100%	100%	100%	100%
	1200	100%	85%	78%	0%	max 1000rpm
	1800	100%	50%	25%	0%	max 1000rpm

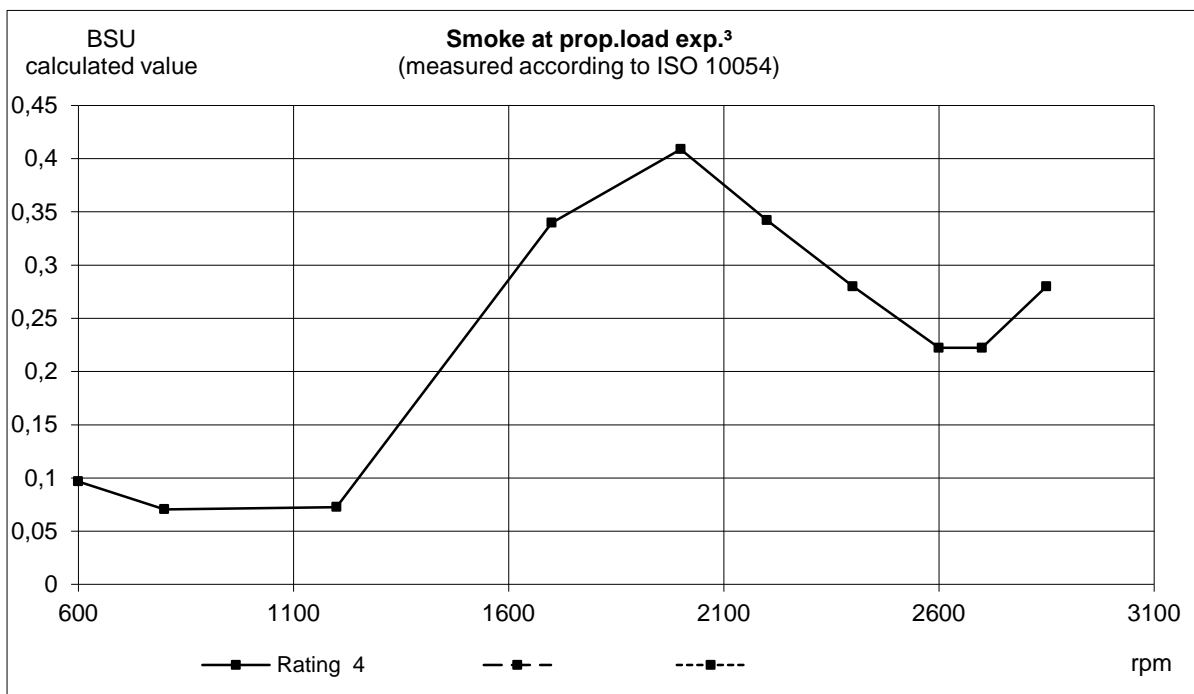
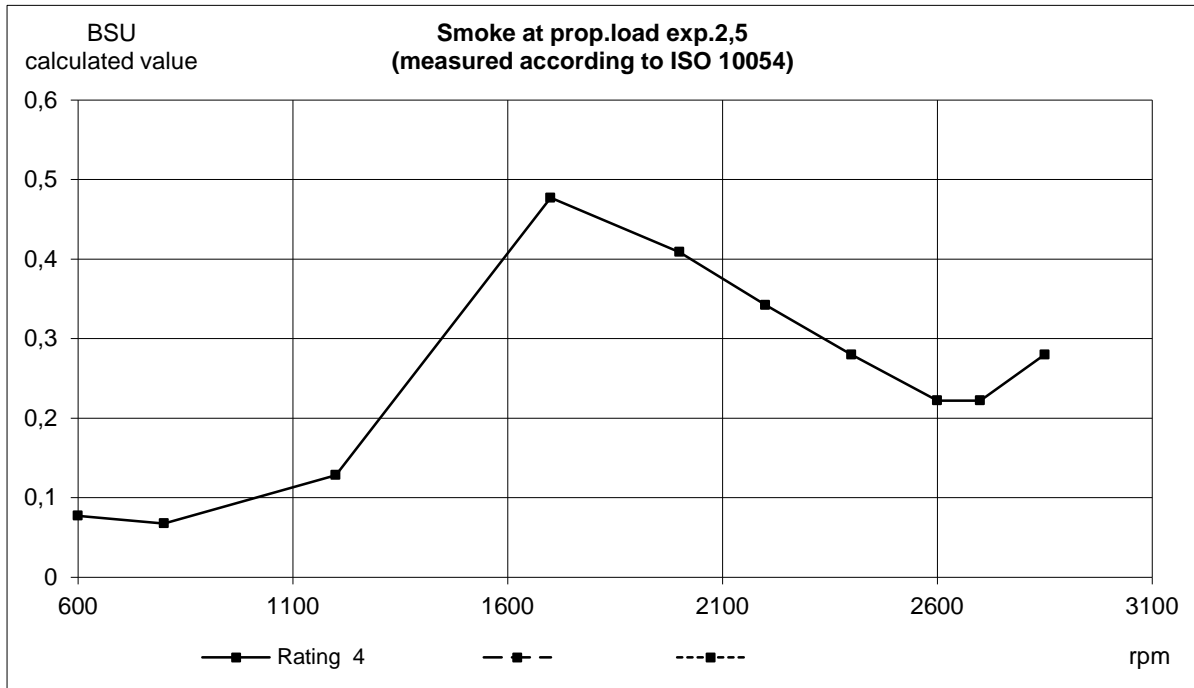


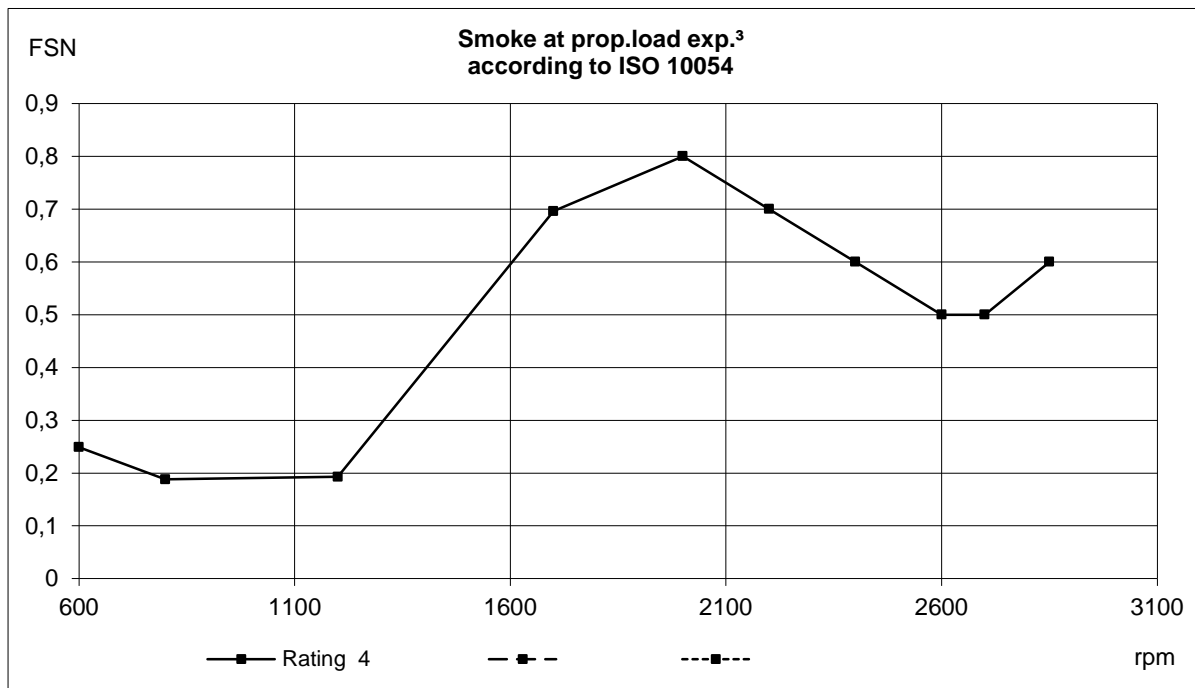
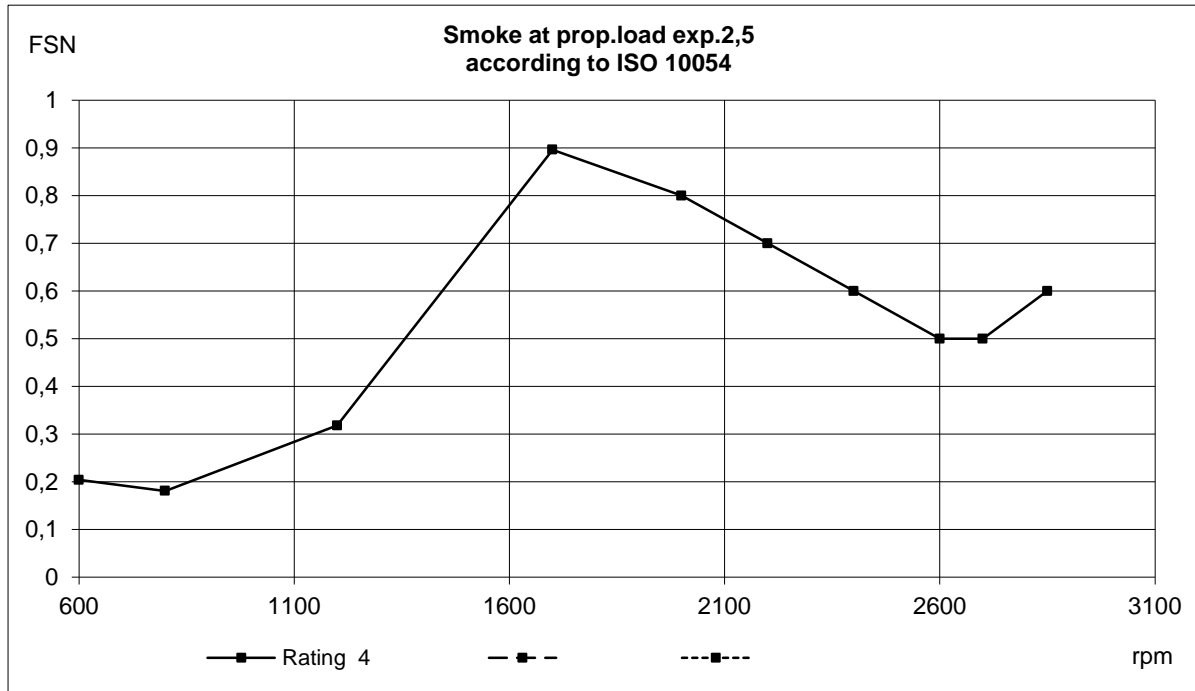


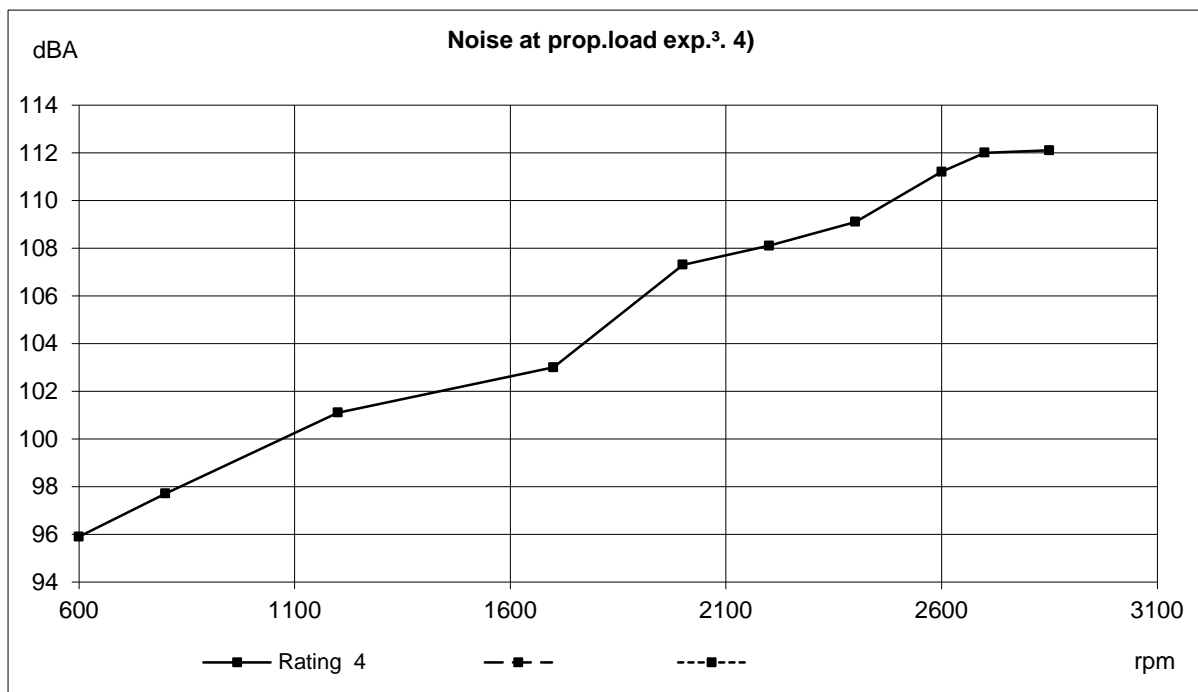
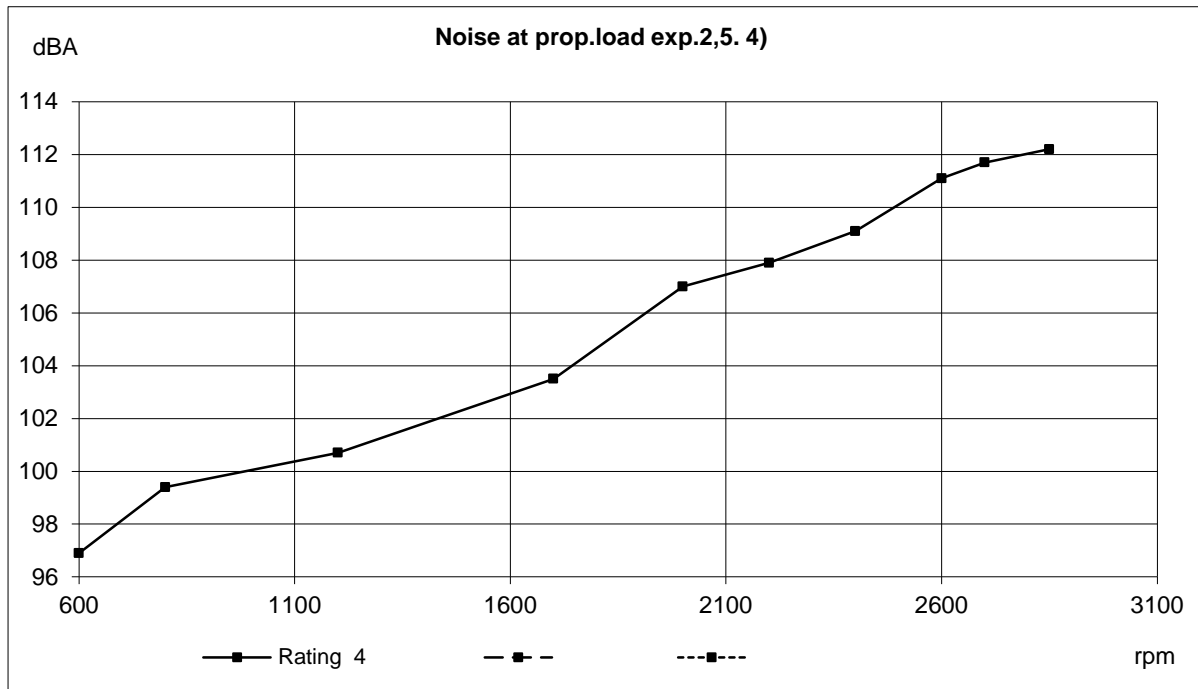








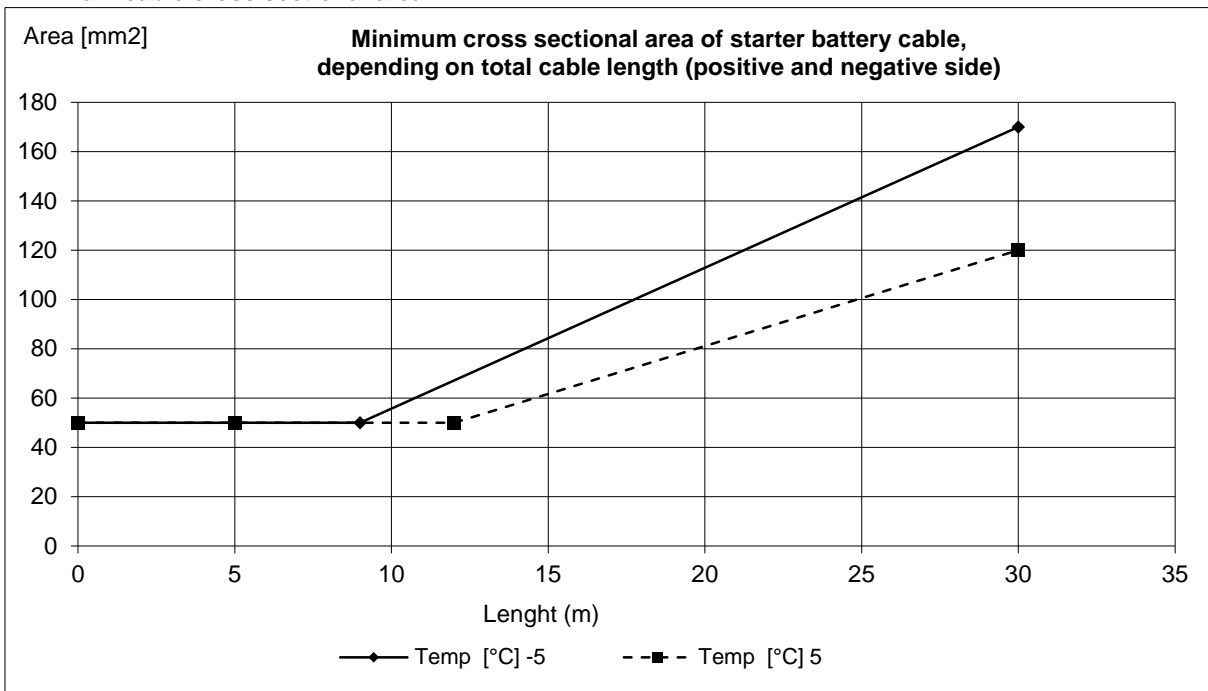




**Battery capacity**

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	90	670 EN	5	4	50
-5	100	720 EN	4	3	50

**Minimum cable cross sectional area**



**Fuses size:**

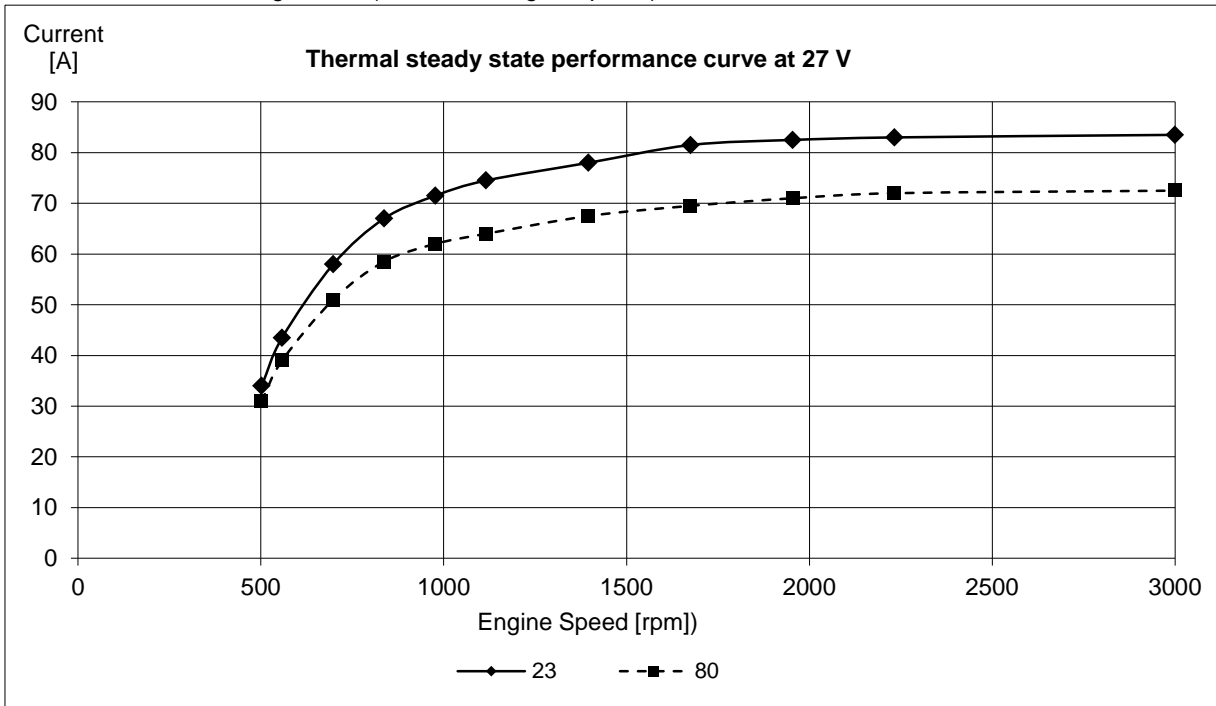
	[A]
Engine:	10
Control system:	10

**Max current consumption during normal operation:**

	[A]
Engine :	4,5

**Alternator data:**

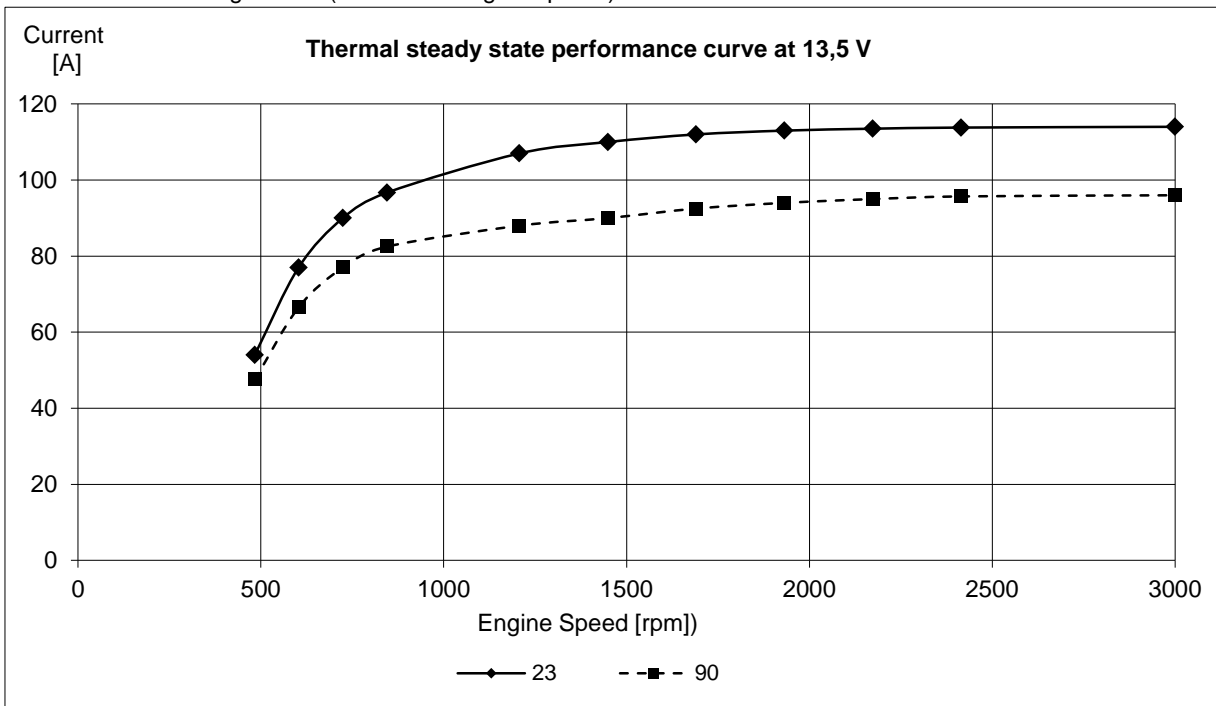
Standard alternator charge curve (current vs. engine speed.)



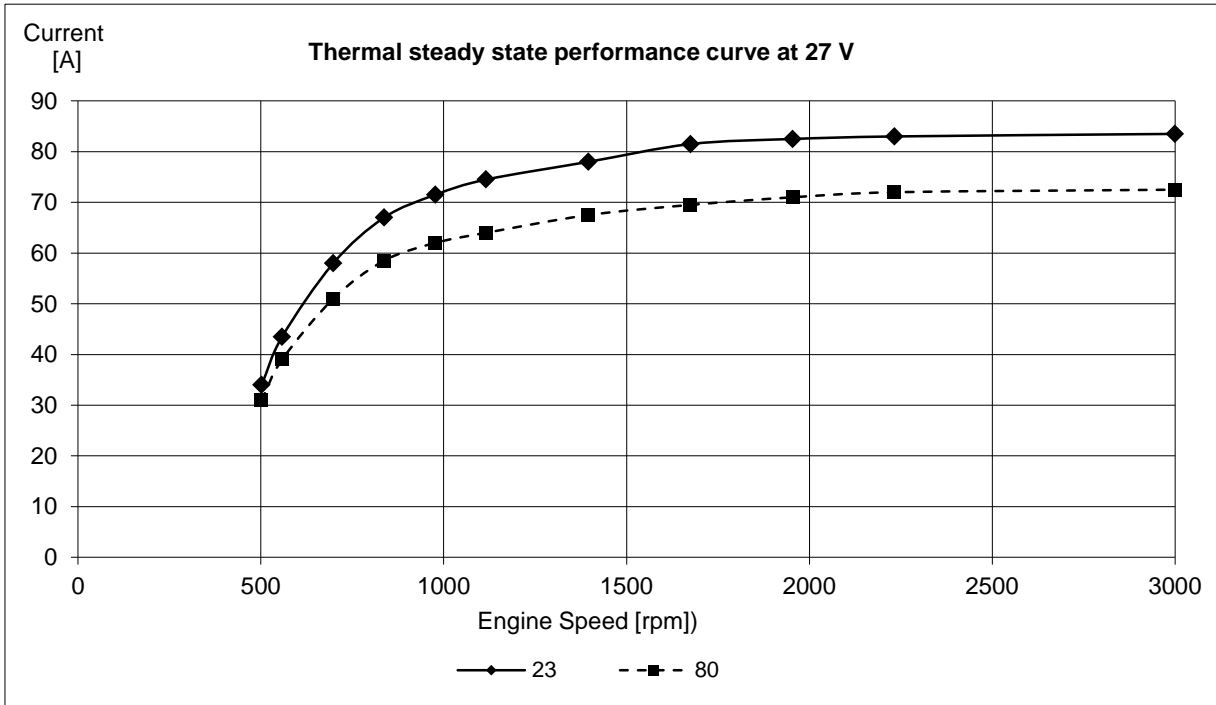
Constant charge voltage: [V]	28,3	+/- 0,3
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**Alternator data:**

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



Constant charge voltage: [V]	14,3	+/- 0,3
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Constant charge voltage: [V]	28,3	+/- 0,3
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