

General

4-stroke direct injected, turbocharged and aftercooled diesel engine

Number of cylinders		6
No of valves		24
Displacement, total	litres in ³	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	2900
Rated speed R3	rpm	2700
Propeller selection range R4	rpm	2850-2950
Propeller selection range R3	rpm	2650-2750
Dry weight engine BT	kg lb	840 1852

Performance	Rating	rpm	600	800	1200	1700	2000	2200	2400	2600	2700	2900
Crankshaft power 1), 5)	4	kW	40	59	127	296	349	384	405	405	405	405
		hp	54	80	173	403	474	522	550	550	550	550
	3	kW	40	59	127	261	307	331	331	331	331	
		hp	54	80	173	354	417	450	450	450	450	
Propeller shaft power 1) (At full load) With drive	4	kW	38	57	123	288	338	372	392	392	392	392
		hp	52	77	167	391	460	506	534	534	534	534
	3	kW	38	57	123	253	297	321	321	321	321	
		hp	52	77	167	344	404	436	437	436	437	
Propellershaft power at prop. load x ^{2,5}	4	kW	8	16	43	103	155	197	244	299	328	392
		hp	10	21	59	140	211	267	332	406	446	534
	3	kW	7	15	42	101	152	192	239	292	321	
		hp	10	21	58	137	206	262	325	397	437	
Propellershaft power at prop. load x ³	4	kW	3	8	28	79	129	171	222	283	317	392
		hp	5	11	38	107	175	233	302	385	431	534
	3	kW	4	8	28	80	131	174	226	287	321	
		hp	5	11	38	109	178	236	307	390	437	
Torque at crankshaft 2)	4	Nm	629,9	700	1010	1665	1665	1665	1609	1486	1431	1332
		lbf ft	465	516	745	1228	1228	1228	1187	1096	1055	982
	3	Nm	629,9	700	1010	1464	1464	1436	1317	1215	1171	
		lbf ft	465	516	745	1080	1080	1059	971	896	864	
Mean piston speed		m/s	2,7	3,6	5,4	7,7	9,0	9,9	10,8	11,7	12,2	13,1
		ft/s	8,9	11,8	17,7	25,1	29,5	32,5	35,4	38,4	39,9	42,8
Effective mean pressure 2)	4	MPa	1,03	1,14	1,65	2,72	2,72	2,72	2,63	2,42	2,33	2,17
		psi	149,1	165,7	239,1	394,1	394,1	394,1	381,0	351,7	338,6	315,3
	3	MPa	1,03	1,14	1,65	2,39	2,39	2,34	2,15	1,98	1,91	

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

	Rating	psi	149,1	165,7	239,1	346,5	346,5	339,9	311,7	287,6	277,2	
Max combustion pressure 2)	4	MPa	9,1	9,6	11,8	17,8	17,2	17	16,9	15,6	15,4	14,9
		psi	1320	1392	1711	2582	2495	2466	2451	2263	2234	2161
	3	MPa	10	10,17	12,78	16,33	17,02	16,73	15,62	15,77	15,83	
		psi	1450	1475	1854	2368	2469	2426	2265	2287	2296	

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

Fuel system	Rating	rpm	600	800	1200	1700	2000	2200	2400	2600	2700	2900
Specific fuel consumption 2)	4	g/kWh	227,3	224,5	219,2	199,2	196,7	201,1	205,4	214,8	219,1	224,4
		lb/hph	0,368	0,364	0,355	0,323	0,319	0,326	0,333	0,348	0,355	0,364
	3	g/kWh	223,2	220,1	217	199,6	196,8	200,1	208	215,8	219,3	
		lb/hph	0,362	0,357	0,352	0,323	0,319	0,324	0,337	0,35	0,355	
Fuel consumption at Test cycle?		g/kWh lb/hph	NA									
Fuel consumption at prop. load x ^{2.5}	4	l/h	2,6	4,6	11,2	26,4	39,5	50,8	63,7	79,3	87,9	109,5
		US gal/h	0,7	1,2	3,0	7,0	10,4	13,4	16,8	20,9	23,2	28,9
	3	l/h	2,5	4,5	10,9	26,5	38,8	49,8	62,8	78,2	90,5	
		US gal/h	0,7	1,2	2,9	7,0	10,2	13,2	16,6	20,7	23,9	
Fuel consumption at prop. load x ³	4	l/h	1,6	3,0	7,8	20,5	33,3	44,6	58,9	75,1	85,4	109,5
		US gal/h	0,4	0,8	2,1	5,4	8,8	11,8	15,6	19,8	22,6	28,9
	3	l/h	1,7	3,0	7,9	21,7	33,9	45,4	59,5	76,8	90,6	
		US gal/h	0,4	0,8	2,1	5,7	9,0	12,0	15,7	20,3	23,9	
Fuel consumption at full load	4	l/h	11,0	16,1	33,5	71,8	82,6	93,3	100,5	104,2	106,7	109,7
		US gal/h	2,9	4,2	8,8	19,0	21,8	24,6	26,5	27,5	28,2	29,0
	3	l/h	11,0	16,2	33,6	62,9	72,7	79,6	83,4	86,3	88,1	
		US gal/h	2,9	4,3	8,9	16,6	19,2	21,0	22,0	22,8	23,3	

Full load performance at rated speed

	Rating	4	3
Fuel return temperature from engine	°C	52	49
	°F	126	120
Fuel consumption	l/h	109	88
	US gal/h	28,8	23,2
Fuel inlet flow to engine	l/h	184	159
	US gal/h	48,6	42,0
Fuel return flow from engine	l/h	75	71
	US gal/h	19,8	18,8

Intake and exhaust system	Rating	rpm	600	800	1200	1700	2000	2200	2400	2600	2700	2900	
Specific exhaust heating effect in percent of crankshaft power	4	%	50	57	69	64	63	65	67	76	79	84	
	3		36	41	50	48	47	48	51	54	55		
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.	4	°C	422	494	621	551	471	441	435	486	492	509	
		°F	792	921	1150	1024	880	826	815	907	918	948	
	3	°C	415	485	615	546	469	434	408	395	394		
		°F	779	905	1139	1015	876	813	766	743	741		
Permitted back pressure in the exhaust line at rated speed. (Installed back pressure)		kPa								Max	30		
		psi									4,4		
		kPa								Min	10		
		psi									1,5		

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

Intake and exhaust system	Rating	rpm	600	800	1200	1700	2000	2200	2400	2600	2700	2900
Engine air consumption at 25°C / 77°F atmospheric pressure 100kPa and relative humidity 30%.	4	m³/min cu.ft./min	2,2 77,69	3,1 109,5	6,4 226	16,1 568,6	22 776,9	26,8 946,4	29,7 1049	30,5 1077	31,1 1098	31,1 1098
	3	m³/min cu.ft./min	2,2 77,69	3,1 109,5	6,2 219	14,1 497,9	19,3 681,6	23,2 819,3	26,4 932,3	28,9 1021	29,83 1053	
Charge air pressure Inlet manifold	4	kPa psi	109 15,8	115 16,7	153 22,2	275 39,9	318 46,1	354 51,3	362 52,5	333 48,3	334 48,4	323 46,8
	3	kPa psi	112 16,2	118 17,1	155 22,5	248 36,0	288 41,8	315 45,7	328 47,6	336 48,7	337 48,9	
Exhaust gas flow	4	m³/min cu.ft./min	5,7 201,3	8,9 314,3	20,7 731	45,5 1607	54 1907	60,9 2151	65 2295	70,8 2500	70,9 2504	73 2578
	3	m³/min cu.ft./min	5,6 197,8	8,7 307,2	20 706,3	39,7 1402	47 1660	52,3 1847	55,8 1971	58,5 2066	59,6 2105	

Cooling system	Rating	rpm	600	800	1200	1700	2000	2200	2400	2600	2700	2900
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
	3		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	15	19	23	25	23	24	24
	3		2	2	6	13	17	21	24	27	28	
Coolant heat rejection to HE, incl. engine oil cooler and excl. charge air cooler, in percent of crankshaft power.	4	%	94	85	76	50	44	45	45	49	49	51
	3		92	82	70	52	46	45	46	47	48	
Coolant flow with fully open thermostat and std cooling system		l/min	66	88	129	182	212	229	244	259	265	272
		cu.ft./min	2,3	3,1	4,6	6,4	7,5	8,1	8,6	9,1	9,4	9,6
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	25									
		US gal.	6,60									
Max. additional coolant for cabin heater etc. with std. Expansion tank		litres	20									
		US gal.	5,28									
Maximum coolant flow to cabin heater etc.		l/min	34,2									
		cu.ft./min	1,21									
Thermostat, start open at		°C	76									
		°F	169									
Thermostat, fully open at		°C	86									
		°F	187									

Raw water circuit	rpm	600	800	1200	1700	2000	2200	2400	2600	2700	2900
Nominal raw water design flow	l/min	60	82	125	170	200	220	240	245	252	258
	cu.ft./min	2,1	2,9	4,4	6,0	7,1	7,8	8,5	8,7	8,9	9,1
Nominal raw water pump pressure head at design flow. (measured before and after pump)	kPa	5	11	27	50	67	87	101	105	107	107
	psi	0,7	1,6	3,9	7,3	9,7	12,6	14,6	15,2	15,5	15,6
Maximum raw water pump suction head	kPa	-30									
	psi	-4,4									
Maximum additional pressure drop excl. reverse gear oil cooler	kPa	97	93	83	63	50	40	31	25	20	14
	psi	14,1	13,5	12,0	9,1	7,3	5,8	4,5	3,6	2,9	2,0
Pressure drop over reverse gear oil cooler (optional equipment)	kPa	1	1	2	4	5	6	7	8	8	9
	psi	0,2	0,2	0,3	0,6	0,8	0,9	1,0	1,2	1,2	1,3
Maximum sea water temperature	°C	32									
	°F	90									

1) ISO 3046, fuel temp 40°C.

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2) At power according to 1).

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5) At installed back pressure

1 1/2 circuit keel cooling system (Two circuit system with one keel cooler)

	rpm	600	800	1200	1700	2000	2200	2400	2600	2700	2900
Design point for keel cooler, engine outlet temperature	°C	46	46	49	61	61	60	60	59	59	59
	°F	115	115	120	142	142	140	140	138	138	138
Maximum temperature to charge air cooler from external cooling system circuit	°C	32	38	34	42	41	38	38	38	38	38
	°F	90	100	93	108	106	100	100	100	100	100
Coolant flow through keel cooler at design point	l/min	58	77	115	161	188	205	219	232	235	236
	cu.ft./min	2,0	2,7	4,1	5,7	6,6	7,2	7,7	8,2	8,3	8,3
Pressure drop in external circuit, including piping	kPa	90									
	psi	13,1									
Coolant volume engine, excl. heat exchangers	litres	23									
	US gal.	5,94									

Emissions

	Rating	rpm	600	800	1200	1700	2000	2200	2400	2600	2700	2900
Smoke at prop. load $x^{2.5}$	4	*BSU	0,2	0,2	0,3	0,9	0,7	0,7	0,5	0,4	0,4	0,6
	3	*BSU	0,2	0,2	0,3	0,7	0,8	0,7	0,5	0,5	0,4	
		*BSU										
Smoke at prop. load x^3	4	*BSU	0,3	0,2	0,2	0,6	0,7	0,7	0,7	0,5	0,4	0,6
	3	*BSU	0,2	0,2	0,2	0,7	0,8	0,7	0,6	0,5	0,4	
		*BSU										
Noise at prop. load $x^{2.5}$. 4)	4	dBA	96,5	99,8	100,6	103,5	107,1	107,8	109	111,4	111,9	112,3
	3	dBA	96,5	99,2	100,9	106,4	107	107,8	109,2	111,4	112,1	
		dBA										
Noise at prop. load x^3 . 4)	4	dBA	95,8	98,5	101	103,2	107,4	108,1	109,1	111,4	111,9	112,4
	3	dBA	95,9	97,5	101,5	107,8	107,2	108,1	109,3	111,4	112	
		dBA										

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

1) ISO 3046, fuel temp 40°C.

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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	0,5-4,5 V	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

VOLVO PENTA

D8 R4 - R3 INB

Document No

22964274

Issue Index

03

Sensors (rpm dependent)	Signal	Unit	Range	Initial Delay / Fault	Warning Level / Derating Level					Switches
Fuel pressure	0,5-4,5 V	kPa	0-700		600 rpm	1000 rpm	1500 rpm	2000 rpm	3000 rpm	
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										
Oil pressure	0,5-4,5 V	kPa	0-700		550 rpm	600 rpm	1000 rpm	2000 rpm	3000 rpm	
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
Coolant pressure		kPa			550 rpm	600 rpm	1000 rpm	2000 rpm	3000 rpm	
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	
Seawater pressure		kPa			550 rpm	600 rpm	1000 rpm	2000 rpm	3000 rpm	
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

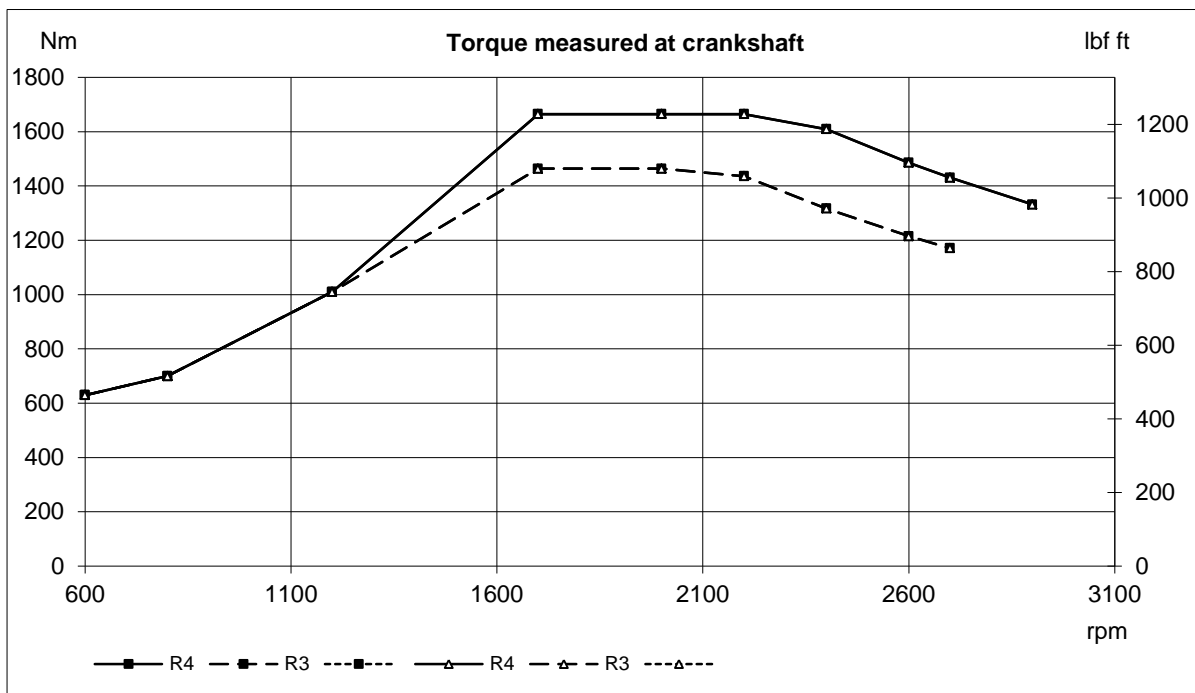
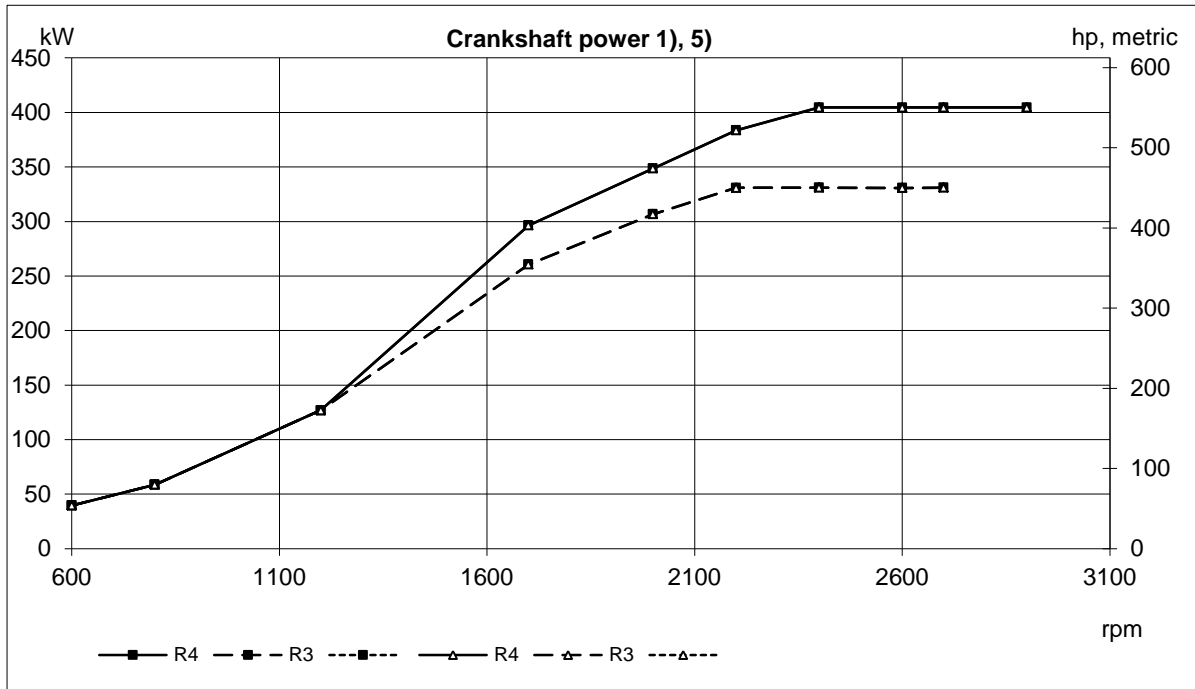
	Speed / °C	103°C	105.5°C	108°C
Soft 1) Soft derate Coolant temp				
Remaining torque in %	600	100%	100%	100%
	1200	100%	85%	70%
	1800	100%	50%	0%

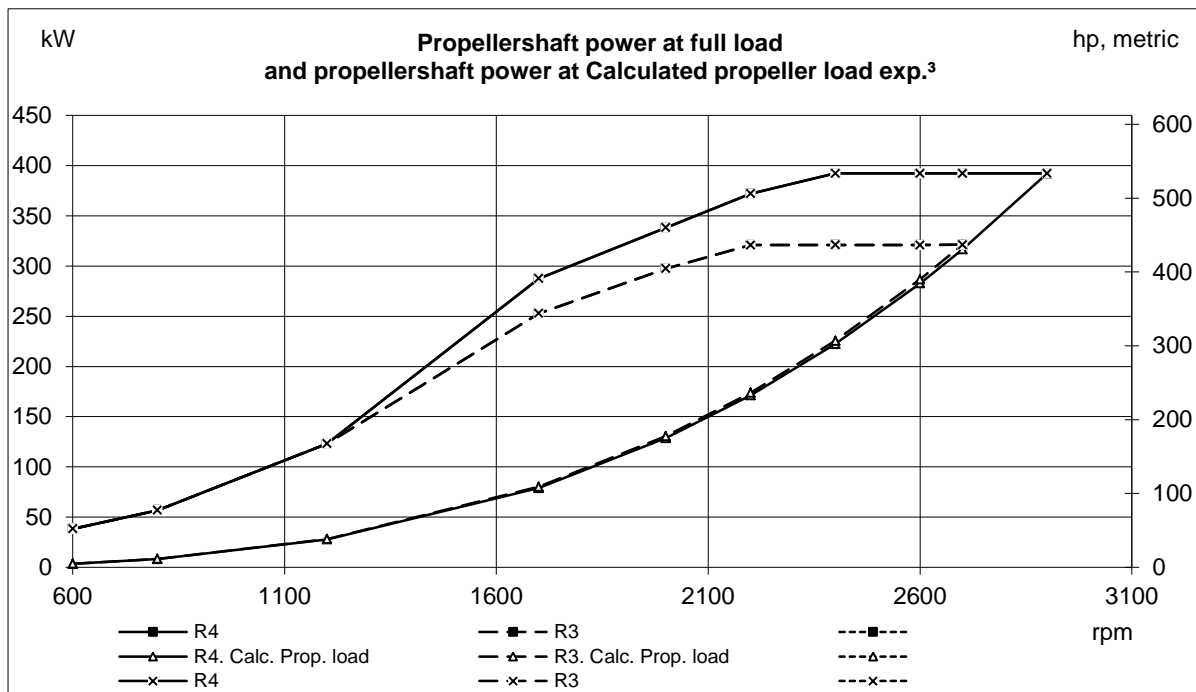
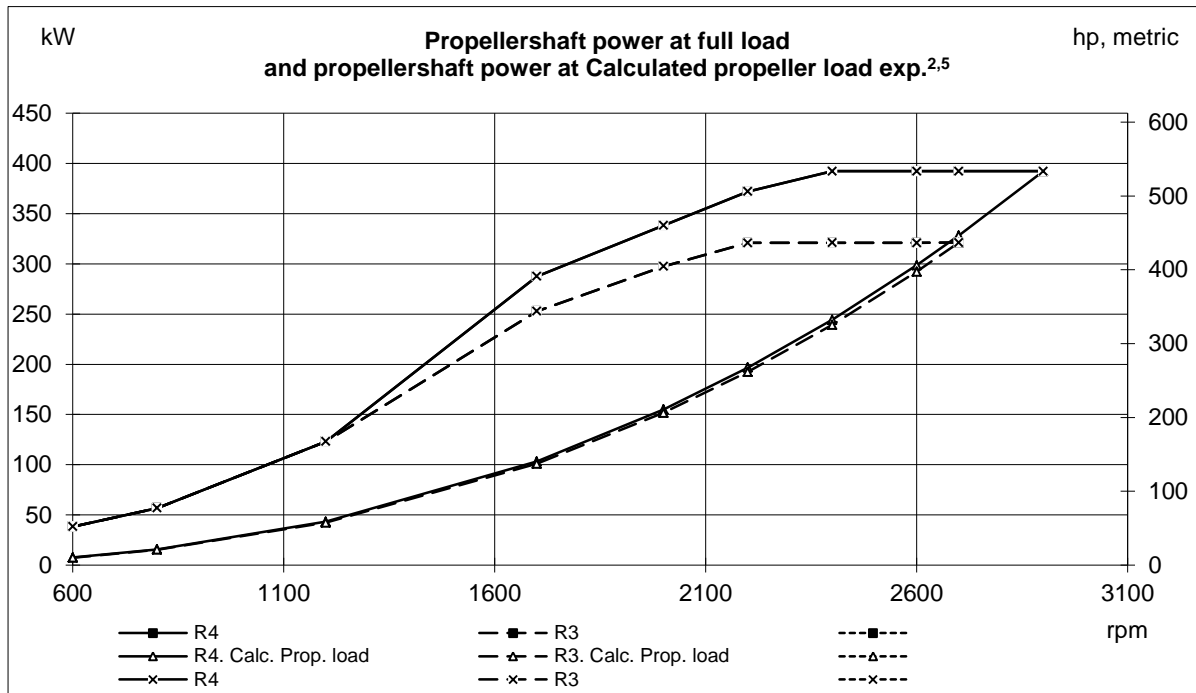
	Speed / °C	127°C	129°C	131°C
Soft 2) Soft derate Oil temp				
Remaining torque in %	600	100%	100%	100%
	1200	100%	85%	70%
	1800	100%	50%	0%

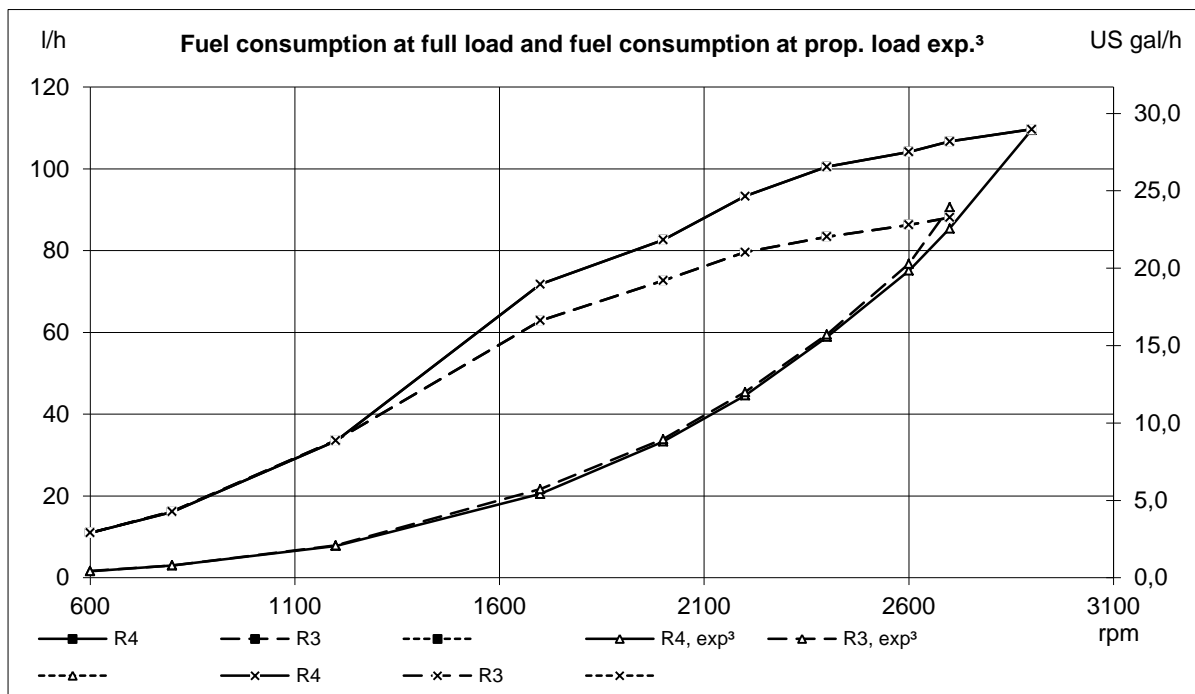
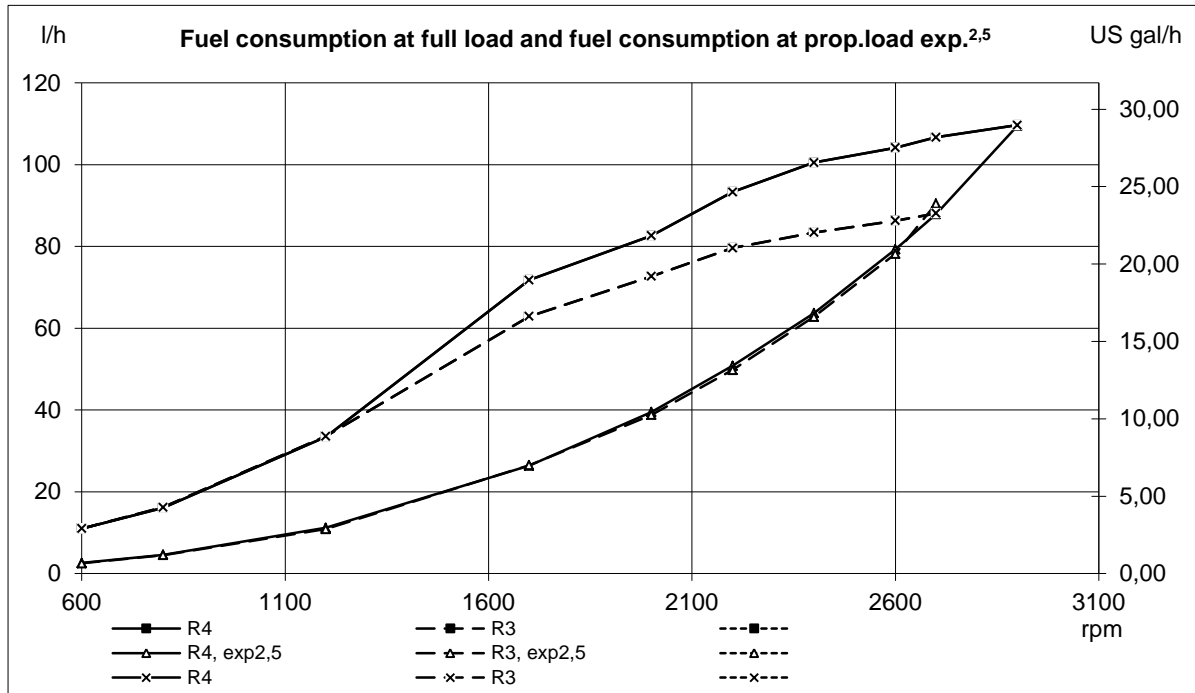
	Speed / °C	90°C	95°C	100°C
Soft 3) Soft derate Charge Air Temp				
Remaining torque in %	600	100%	100%	100%
	1200	100%	85%	70%
	1800	100%	50%	0%

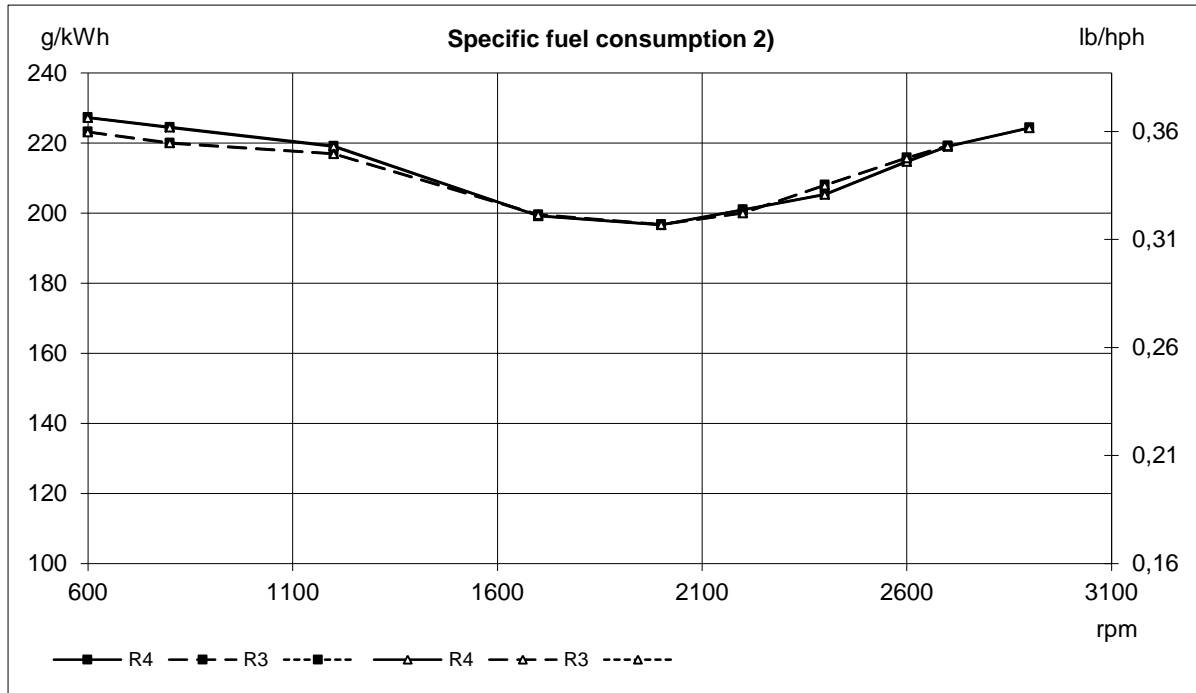
	Speed / °C	225°C	235°C	245°C	255°C
Soft 4) Soft derate Exhaust Temp wet					
Remaining torque in %	600	100%	100%	100%	100%
	1200	100%	85%	78%	70%
	1800	100%	50%	25%	0%

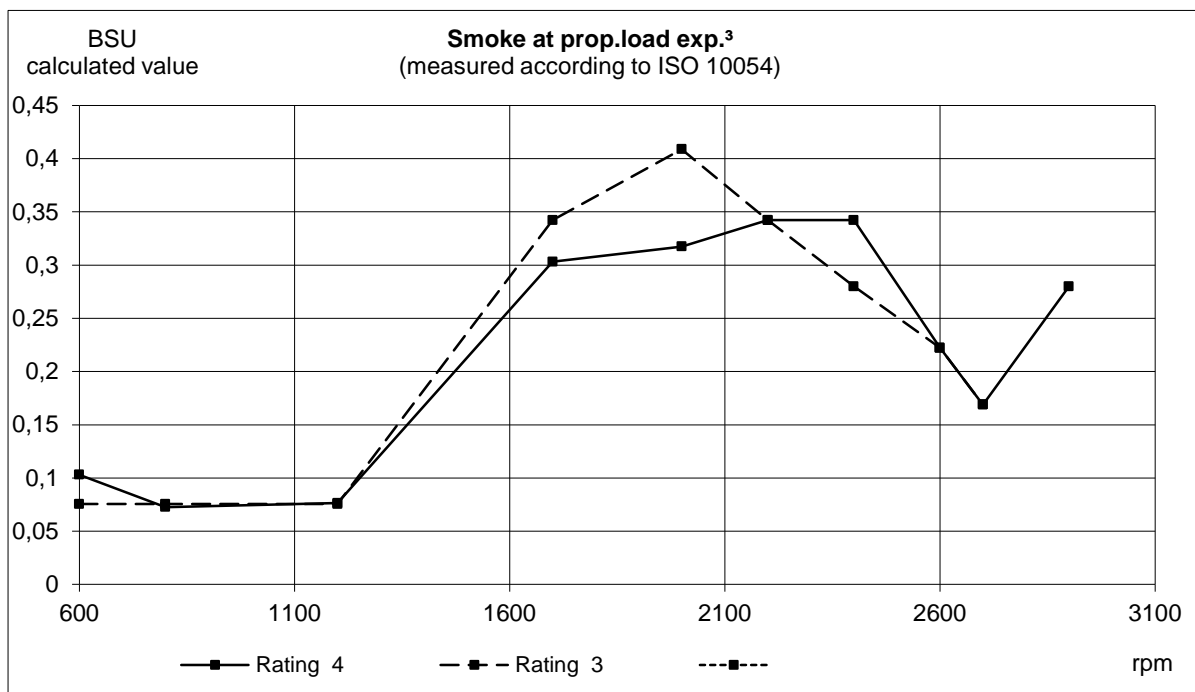
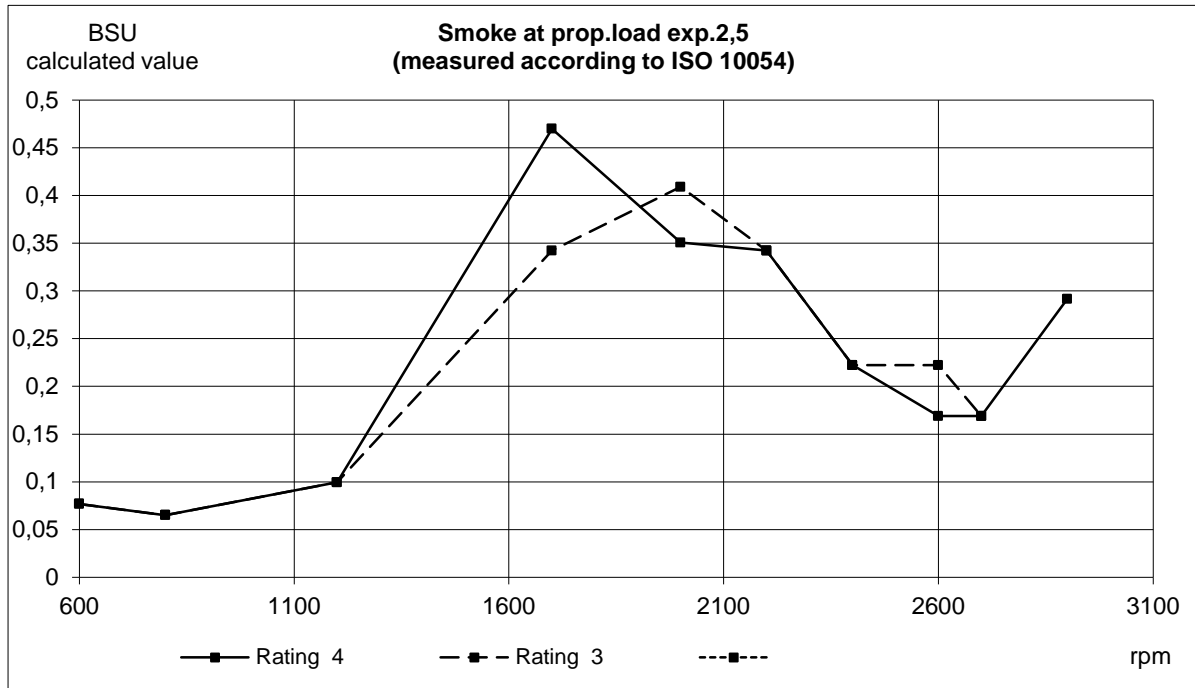
	Speed / °C	665°C	675°C	680°C	685°C	690°C
Soft 5) Soft derate Exhaust Temp dry						
Remaining torque in %	600	100%	100%	100%	100%	100%
	1200	100%	85%	78%	0%	max 1000rpm
	1800	100%	50%	25%	0%	max 1000rpm

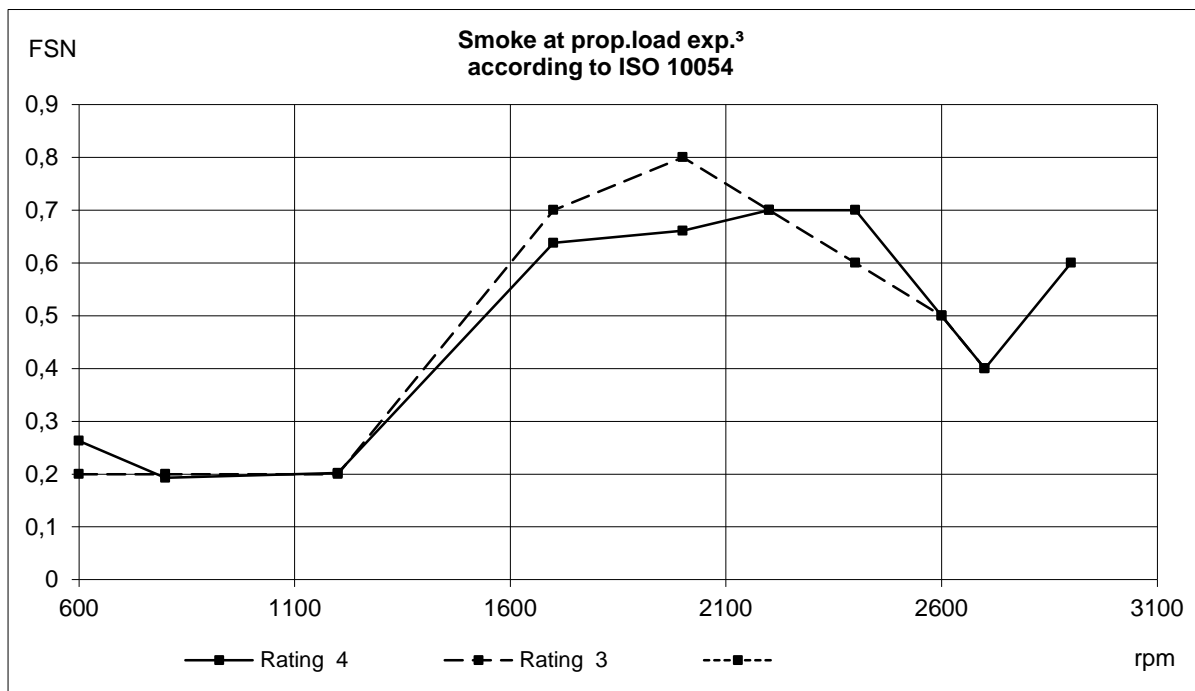
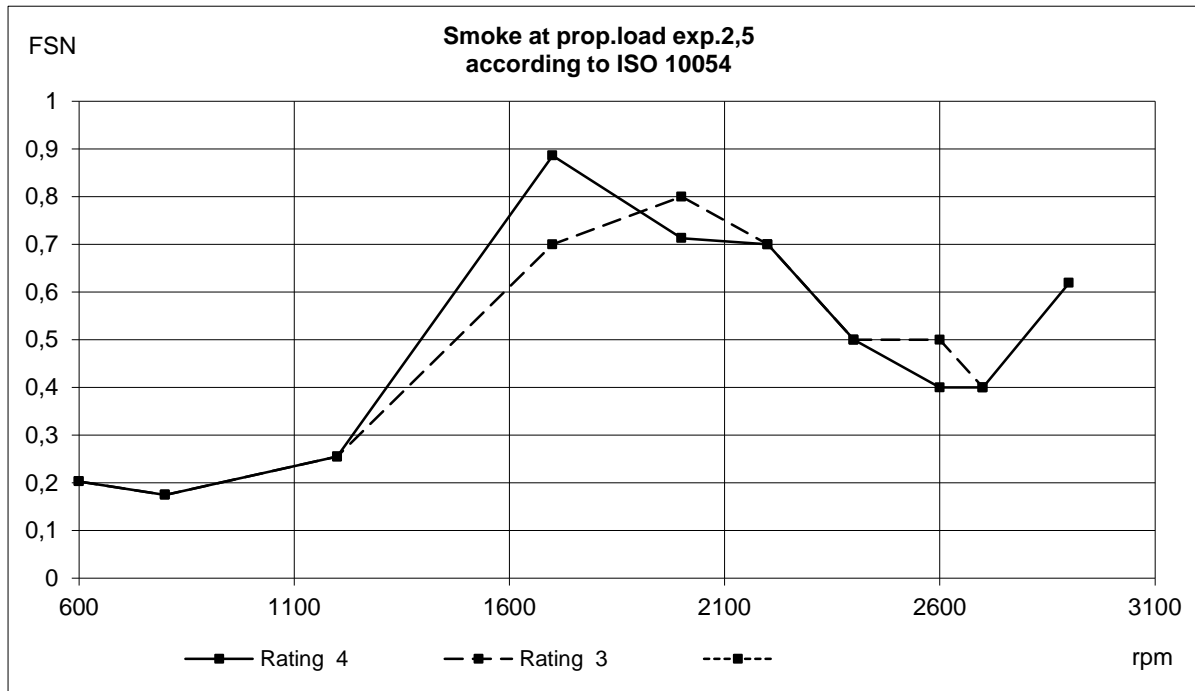


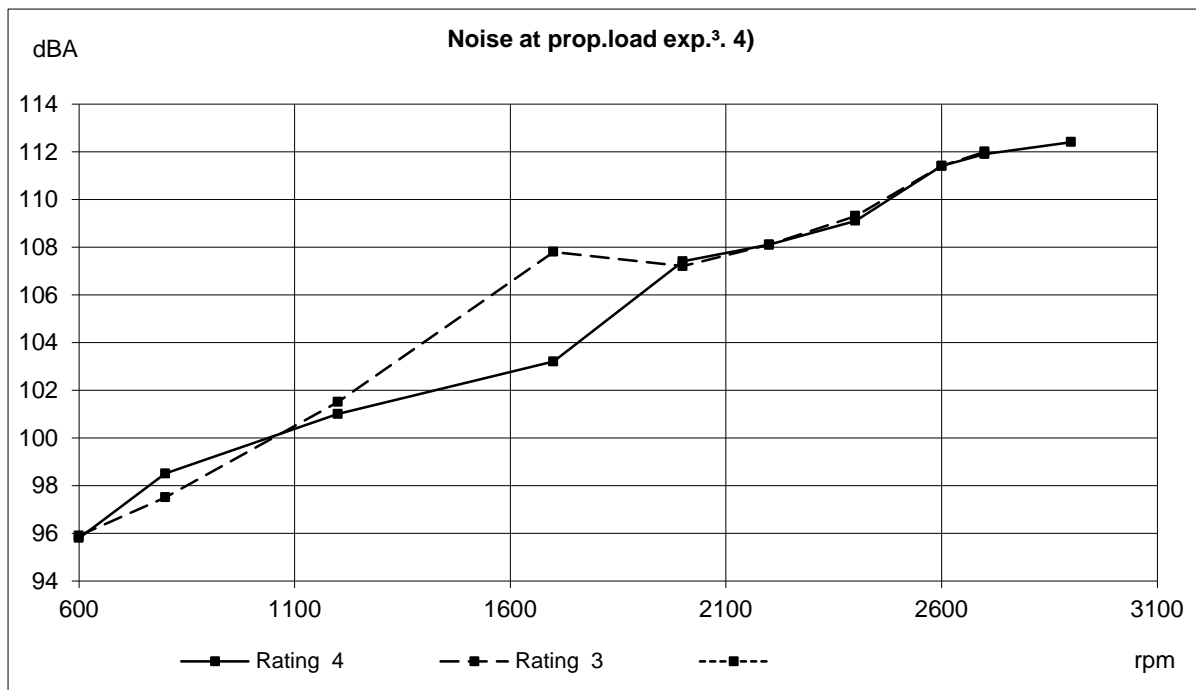
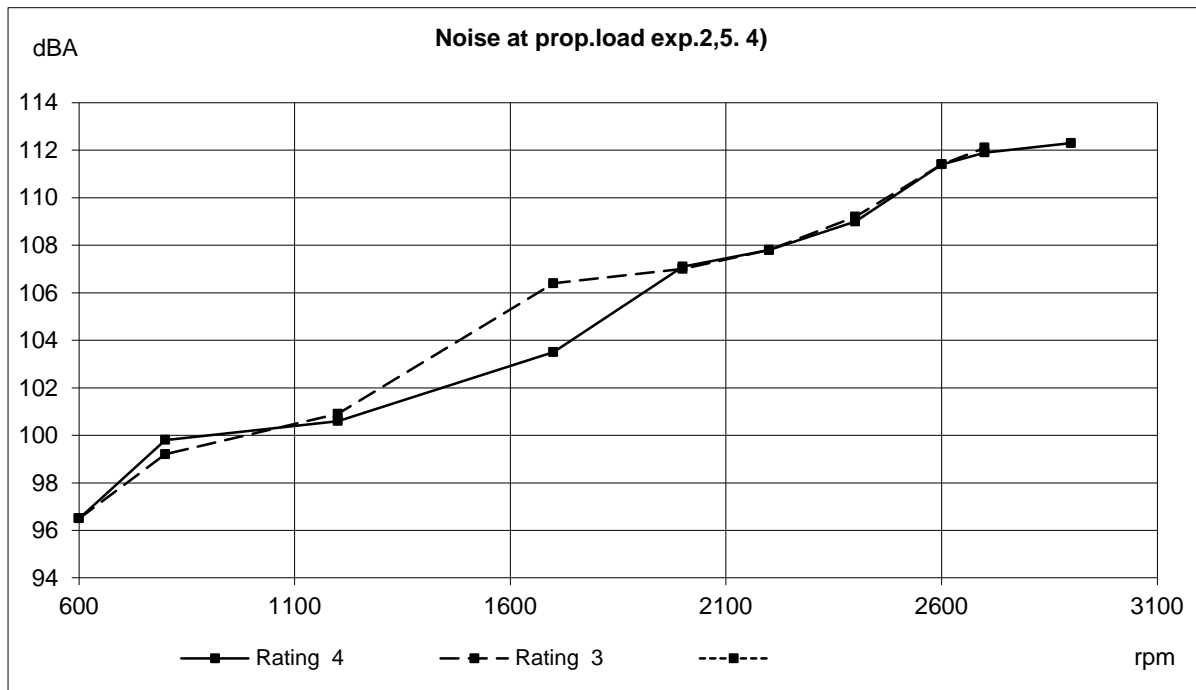








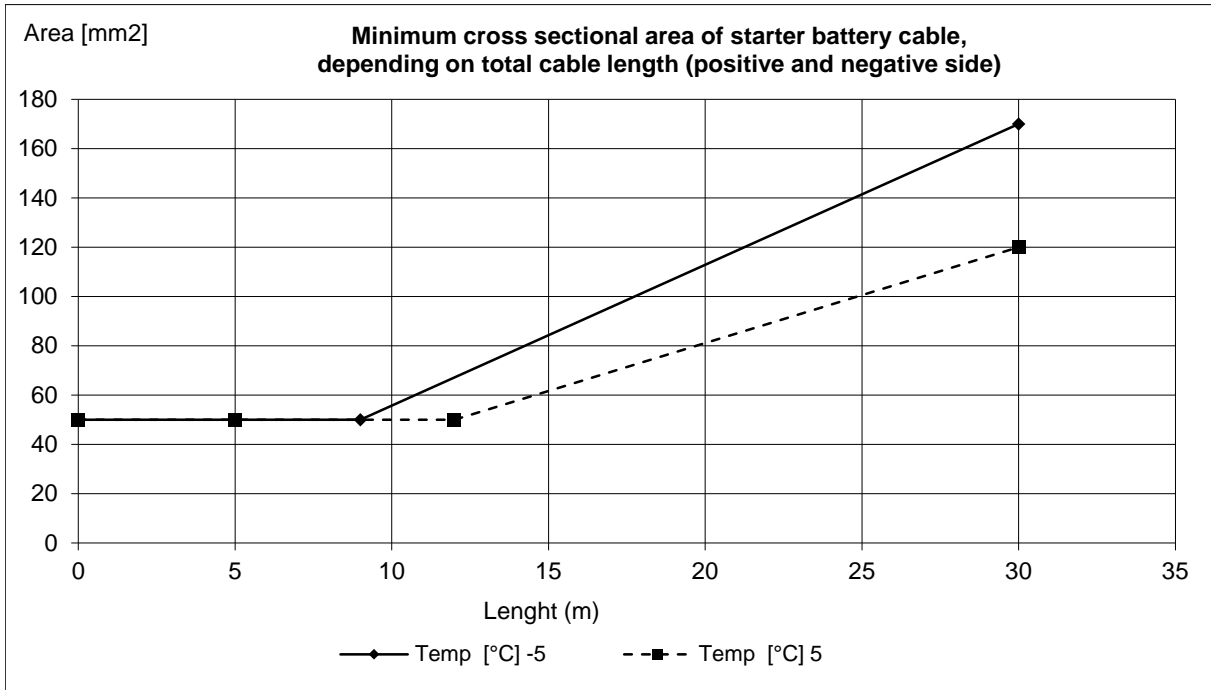




Battery capacity

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:

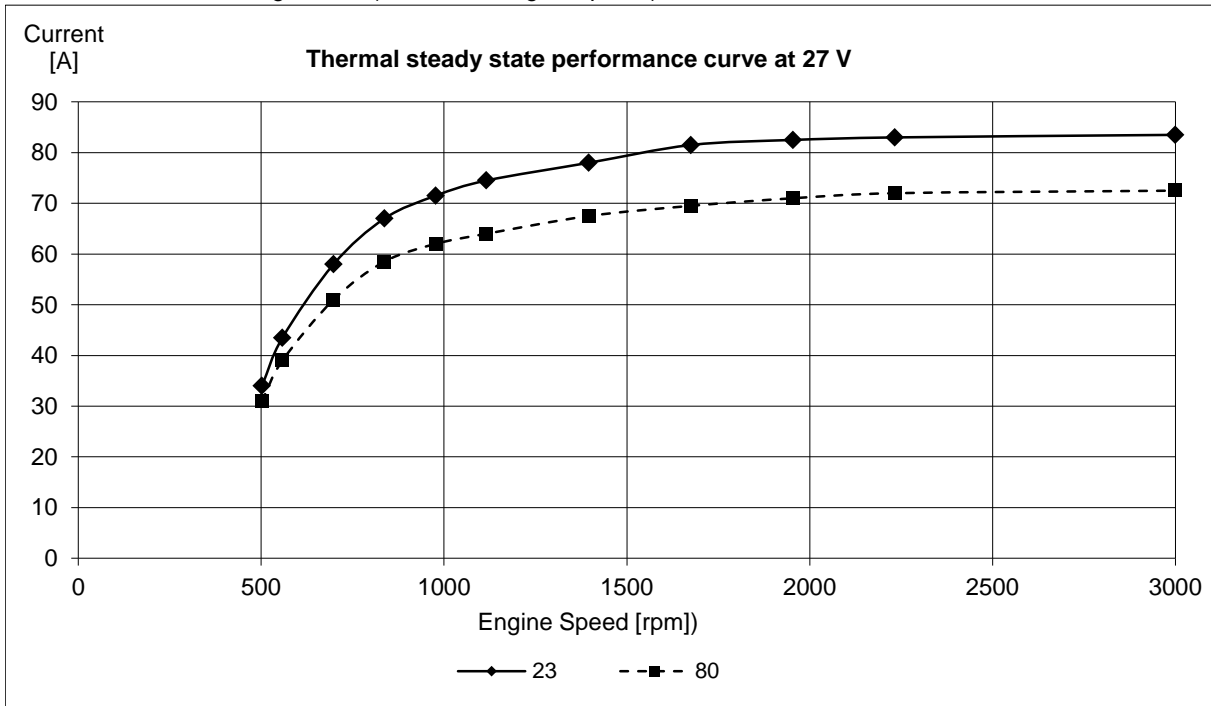
	[A]
Engine:	10
Control system:	10

Max current consumption during normal operation:

	[A]
Engine :	4,5

Alternator data:

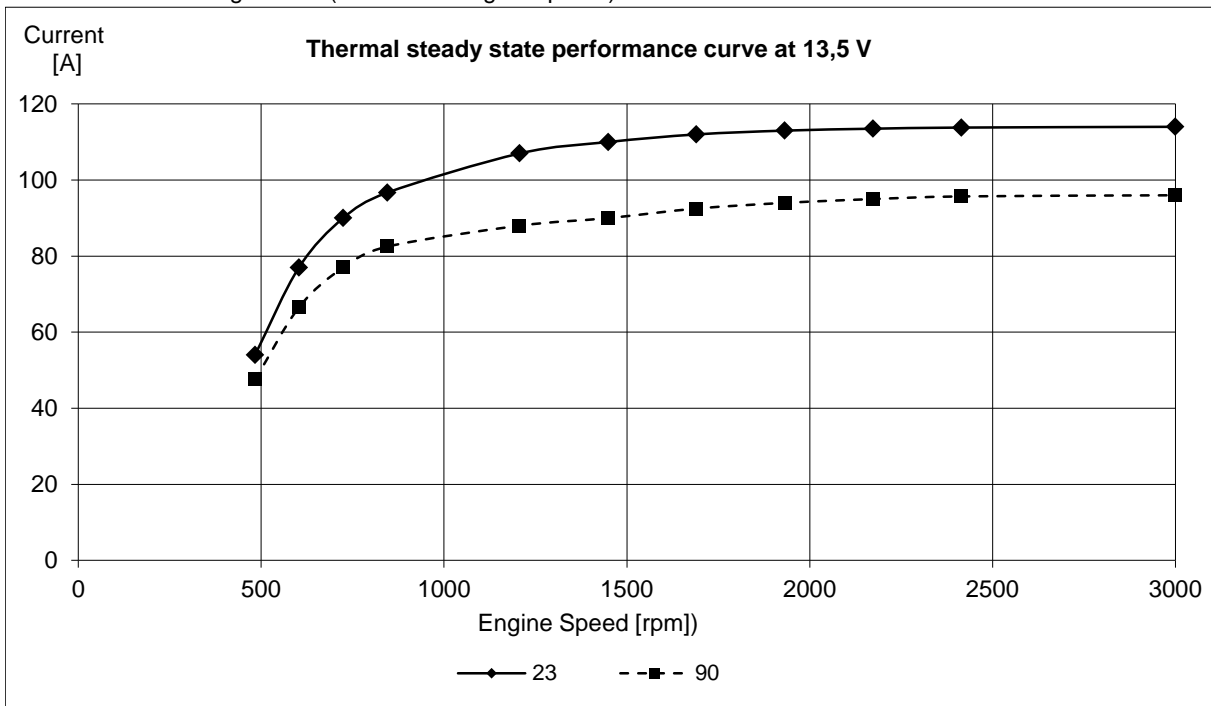
Standard alternator charge curve (current vs. engine speed.)



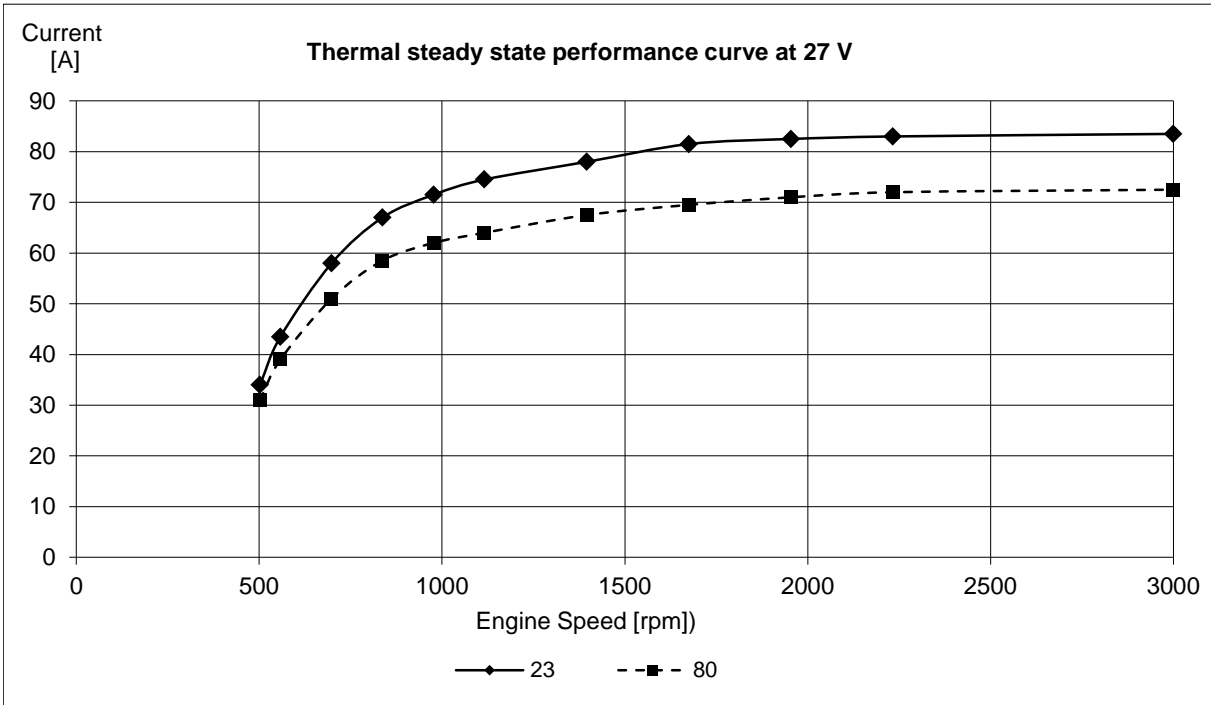
Constant charge voltage: [V]	28,3	+/- 0,3
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Alternator data:

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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