General

4-stroke direct injected, turbocharged and aftercooled diesel engine

Number of cylinders		6
No of valves		24
Displacement, total	litres in³	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	NS4-NS5, N1-N7
Dry weight engine BT	kg lb	880 1940

Performance	**Rating**	**rpm**	**600**	**800**	**1200**	**1700**	**2000**	**2200**	**2400**	**2600**	**2700**	**2850**
Crankshaft power 1), 5)	4	kW	50	80	159	280	329	362	374	374	374	374
		hp	68	109	216	380	447	492	509	509	509	509
Propeller shaft power 1) (At full load) With drive	4	kW	48	76	151	266	313	344	355	355	355	355
		hp	65	103	205	361	425	468	483	483	483	483
Propellershaft power at prop. load $x^{2,5}$	4	kW	7	15	41	98	147	186	231	282	310	355
		hp	10	20	56	133	199	253	314	384	422	483
Propellershaft power at prop. load x^{3}	4	kW	3	8	27	75	123	163	212	270	302	355
		hp	5	11	36	103	167	222	289	367	411	483
Torque at crankshaft 2)	4	Nm	800,1	954	1263	1571	1571	1571	1488	1374	1323	1253
		lbf ft	590	704	932	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
		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	1,31	1,56	2,06	2,56	2,56	2,56	2,43	2,24	2,16	2,05
		psi	189,4	225,8	298,9	371,9	371,8	371,9	352,2	325,1	313,1	296,6
Max combustion pressure 2)	4	MPa	17,3	18,5	18,6	19,2	18,9	18,4	17	16,9	16,7	16,8
		psi	2509	2683	2698	2785	2741	2669	2466	2451	2422	2437

Lubricating system

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

Fuel system	Rating	rpm	600	800	1200	1700	2000	2200	2400	2600	2700	2850
Specific fuel consumption 2)	4	g/kWh	224	214	204	200	197	200	208	219	221	226
		lb/hph	0,363	0,347	0,33	0,324	0,319	0,324	0,337	0,355	0,358	0,366
Fuel consumption at Test cycle?	4	g/kWh	NA									
		lb/hph										
		g/kWh	NA									
		lb/hph										
Fuel consumption at prop. load x [2,5]	4	l/h	2,5	4,5	10,9	25,8	38,6	49,3	62,1	77,4	86,1	102,8
		US gal/h	0,7	1,2	2,9	6,8	10,2	13,0	16,4	20,4	22,7	27,2
Fuel consumption at prop. load x [3]	4	l/h	1,6	2,9	7,7	20,3	32,8	43,9	57,4	73,9	83,8	102,8
		US gal/h	0,4	0,8	2,0	5,4	8,7	11,6	15,2	19,5	22,1	27,2
	4	US gal/h	3,7	5,5	10,5	18,0	20,6	23,1	24,9	26,2	26,5	27,2

Full load preformance 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

Intake and exhaust system	Rating	rpm	600	800	1200	1700	2000	2200	2400	2600	2700	2850
Specific exhaust heating effect in percent of crankshaft power	4	%	34	37	48	65	63	65	67	79	79	83
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.	4	°C	326	351	438	549	468	434	418	472	467	479
		°F	619	664	820	1020	874	813	784	882	873	894
		°C										
		°F										
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	
Engine air consumption at 25°C / 77°F atmospheric pressure 100kPA and relative humidity 30%.	4	m³/min	4,46	6,66	10,69	15,52	21,07	25,68	29,23	29,38	30,33	30,74
		cu.ft./min	157,5	235,2	377,5	548,1	744,1	906,9	1032	1038	1071	1086
		m³/min										
		cu.ft./min										
Charge air pressure Inlet manifold	4	kPa	210	233	259	265	303	338	355	332	333	326
		psi	30,5	33,8	37,6	38,4	43,9	49,0	51,5	48,2	48,3	47,3
Exhaust gas flow	4	m³/min	9,28	14,6	26,7	43,8	51,6	58,3	62,7	67,42	68,4	70,2
		cu.ft./min	327,7	515,6	942,9	1547	1822	2059	2214	2381	2416	2479

1) ISO 3046, fuel temp 40°C.
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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	%	20	22	19	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	%	73	61	52	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 $x^{2,5}$	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^3	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 $x^{2,5}$. 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^3. 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

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

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 absoulte)	310 (410 abs.) *	NA	NA
Charge air temperaure	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*

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

Technical data - Drive unit

Drive line		D8-IPS800
Transmission type		IPS15-A
Gear ratio (total)		1,84:1
Steering angle, max.		+/- 34
Total weight of drive unit (1)	kg	470
Oil capacity, approx.	litres	23
Oil volume difference MIN-MAX	litres	0,5
Oil type		Volvo Penta API GL5 75W/90
Propeller range		NS4-NS5, N1-N7

(1) Including oil, exhaust pipe and elbow, clamping ring and various installation components. Propellers are not included in total weight

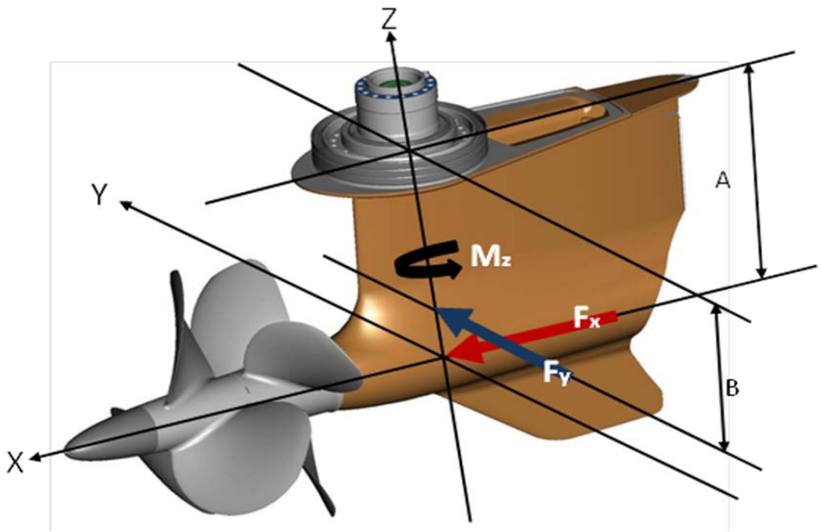
"Generalized maximum load document"for IPS3

Valid products	Drive Unit	Gear Ratio
IPSxxxx	IPSx	1,84:1
IPSxxxx	IPSx	1,xx:1
IPSxxxx	IPSx	1,xx:1

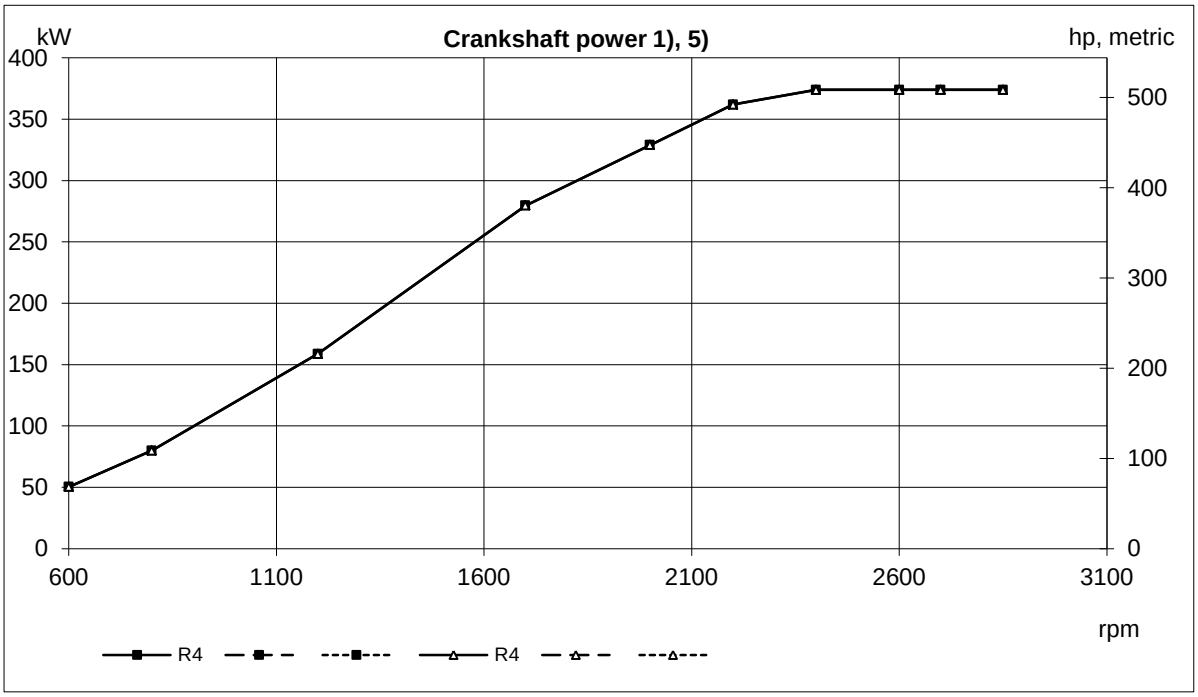
Loads provided in chart are single maximum loads i.e. not to be used for fatigue calculations

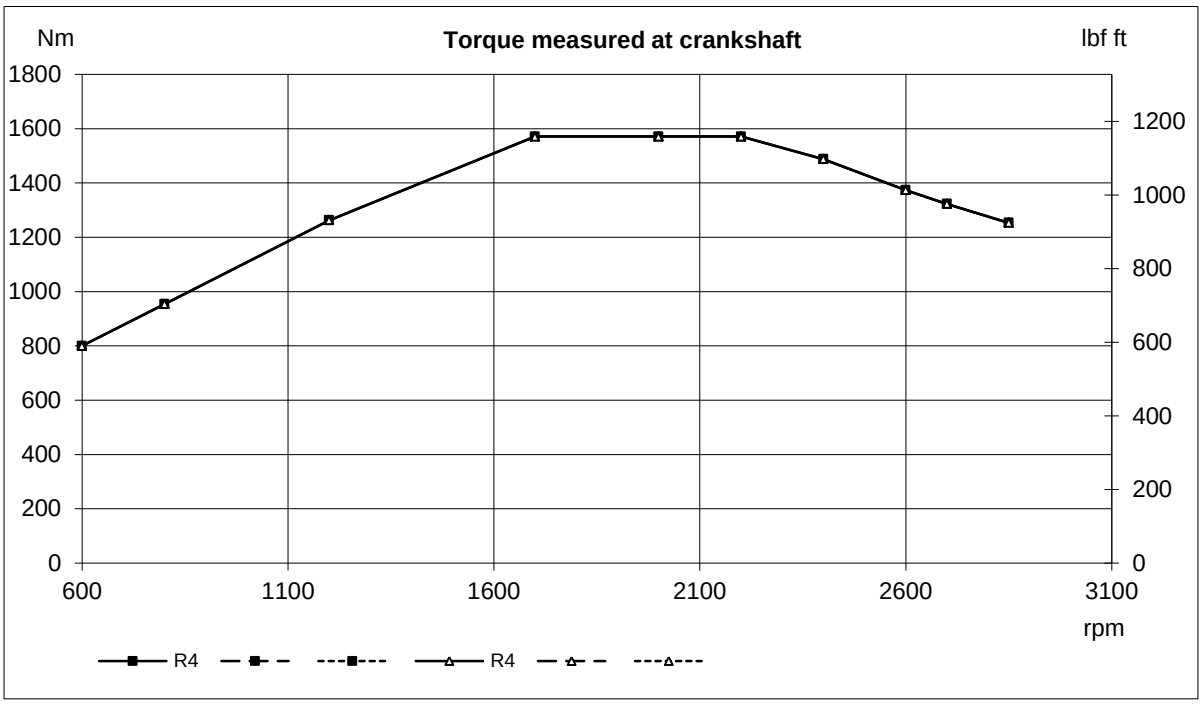
Speed range (top speed)	Load vektor	Maximum load
20-28 kn	Fx	19 kN
	Fy (+/-)	24 kN
	Mz (+/-)	9,5 kNm
28-42 kn	Fx	15 kN
	Fy (+/-)	48 kN
	Mz (+/-)	9,5 kNm

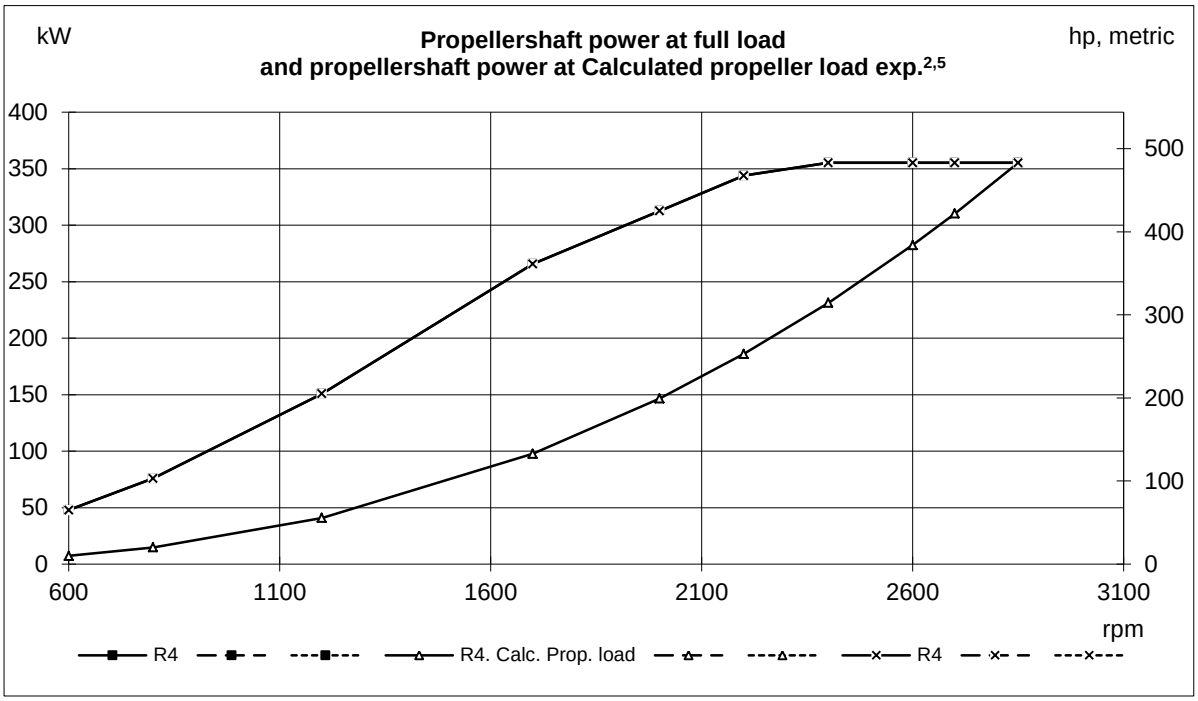
A	425 mm
B	320 mm

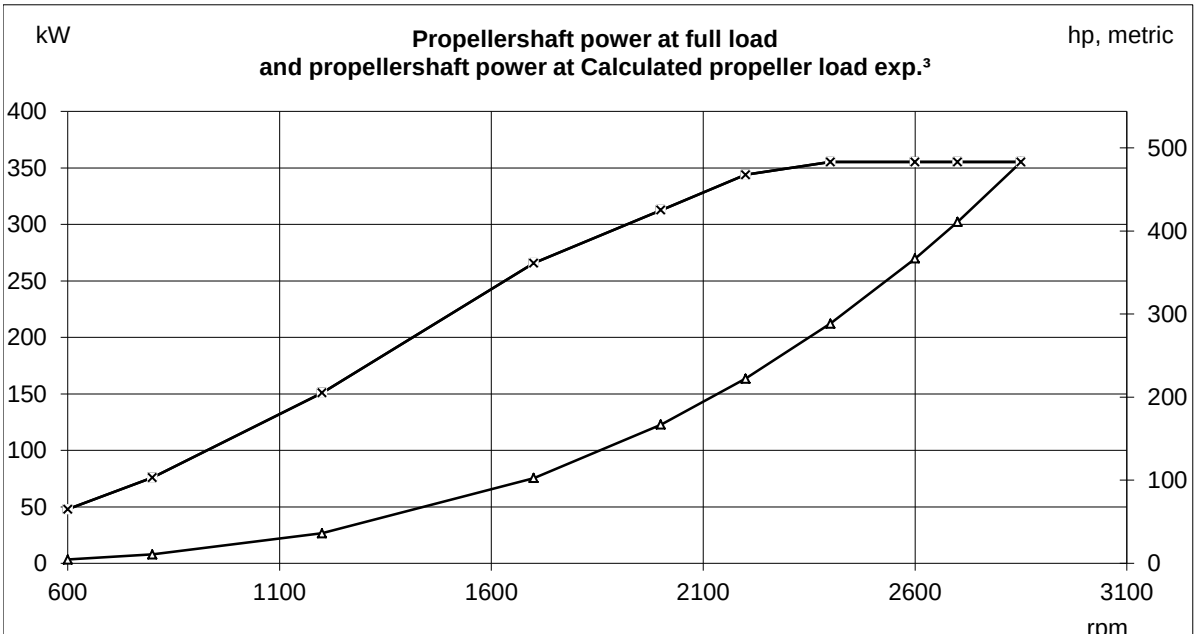


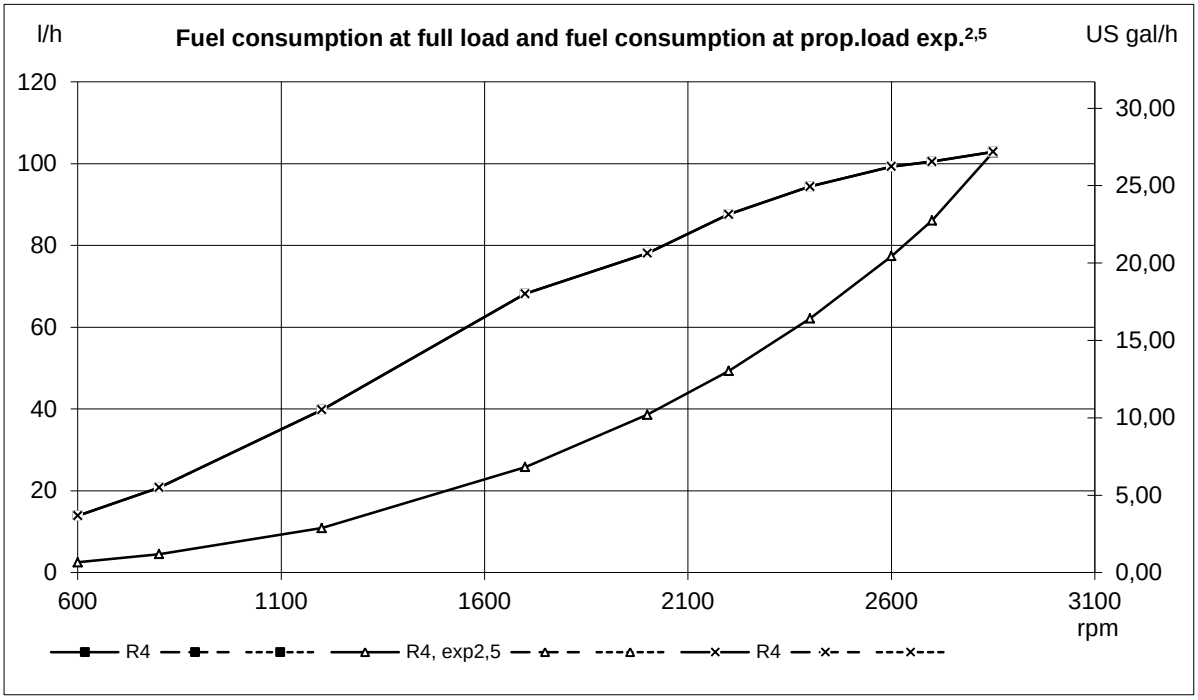
Important Note!
The above forces and torque are to be used as the base for maximum load in normal operations.
Volvo Penta requires however that the detailed guidelines for the structure around
the IPS unit are followed in order to ensure structural strength in case of grounding.

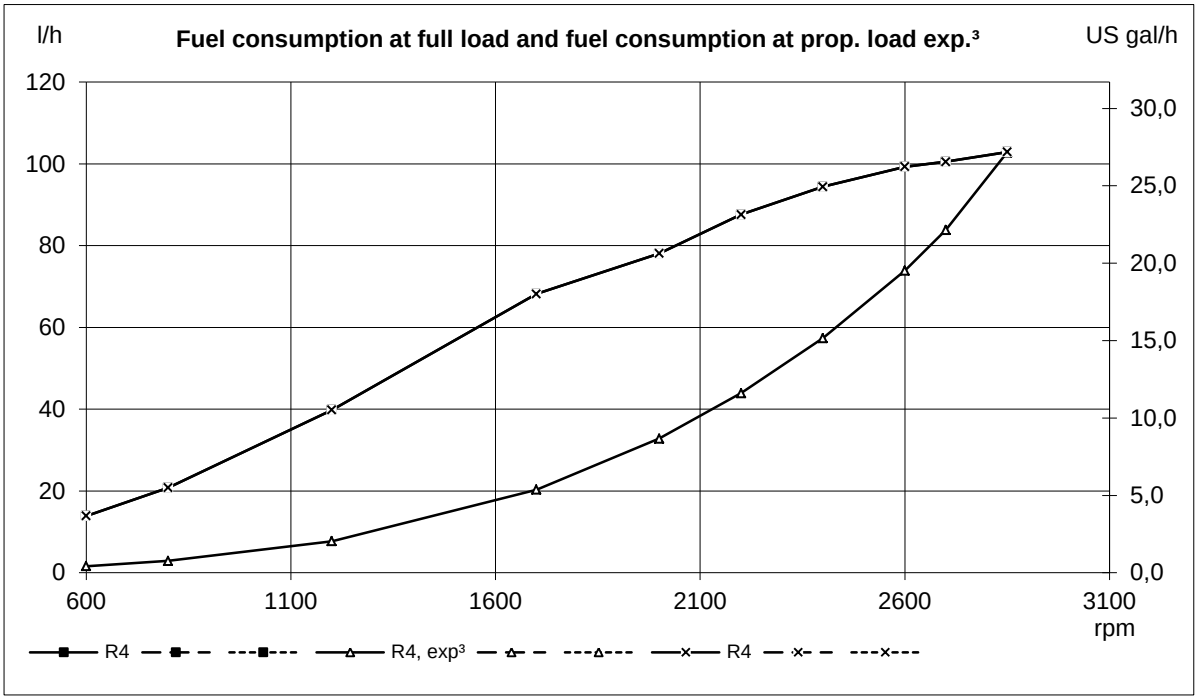

kW
Crankshaft power 1), 5)
hp, metric
400
350
300
250
200
150
100
50
0
500
400
300
200
100
0
600
1100
1600
2100
2600
3100
rpm
R4
R4

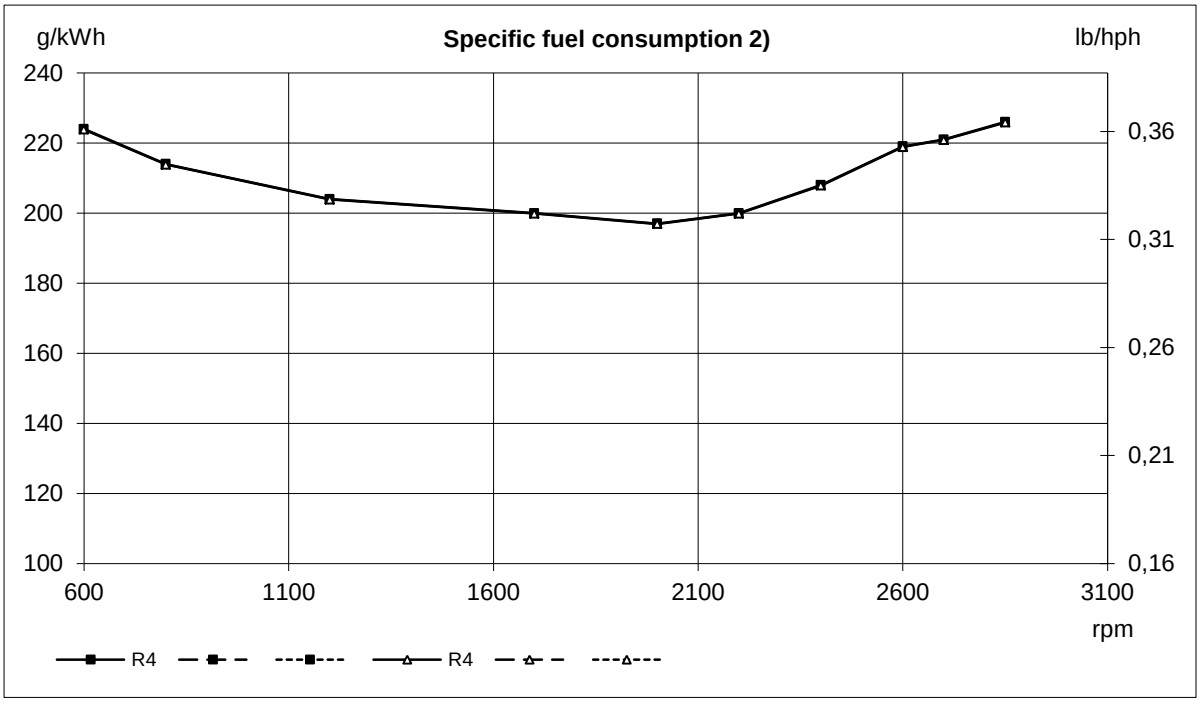

Nm
Torque measured at crankshaft
lbf ft
1800
1600
1400
1200
1000
800
600
400
200
0
1200
1000
800
600
400
200
0
600
1100
1600
2100
2600
3100
rpm
R4
R4

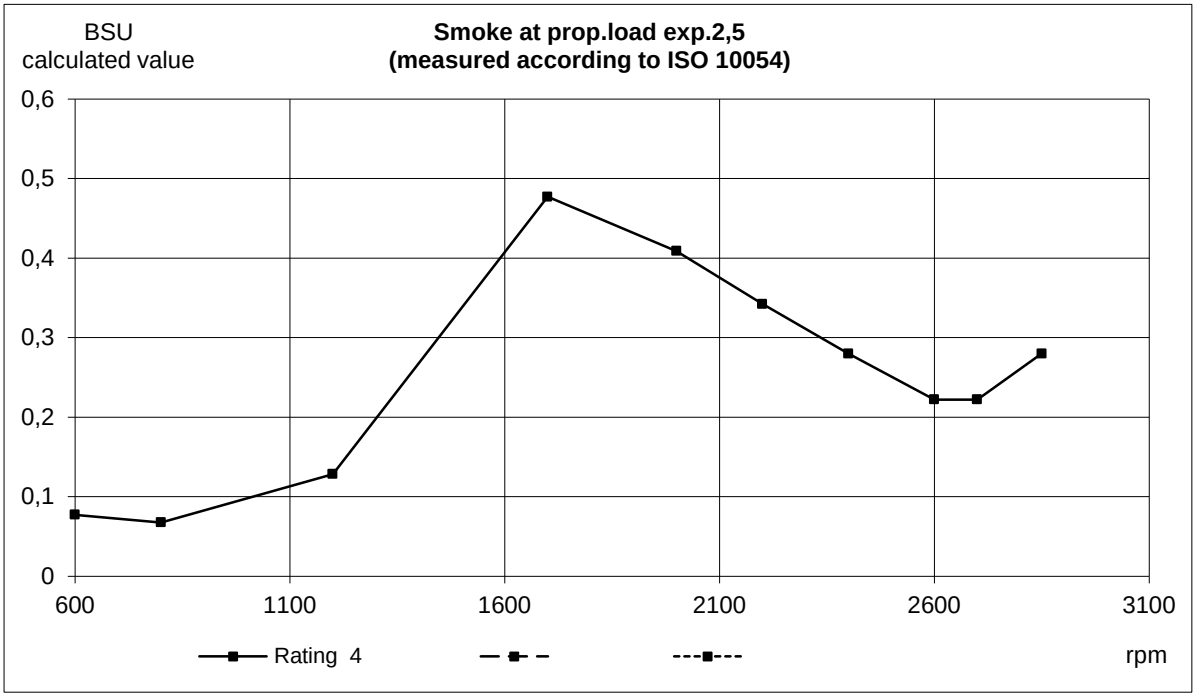

kW
Propellershaft power at full load
and propellershaft power at Calculated propeller load exp.2,5
hp, metric
400
350
300
250
200
150
100
50
0
500
400
300
200
100
0
600
1100
1600
2100
2600
3100
rpm
R4
R4. Calc. Prop. load
R4

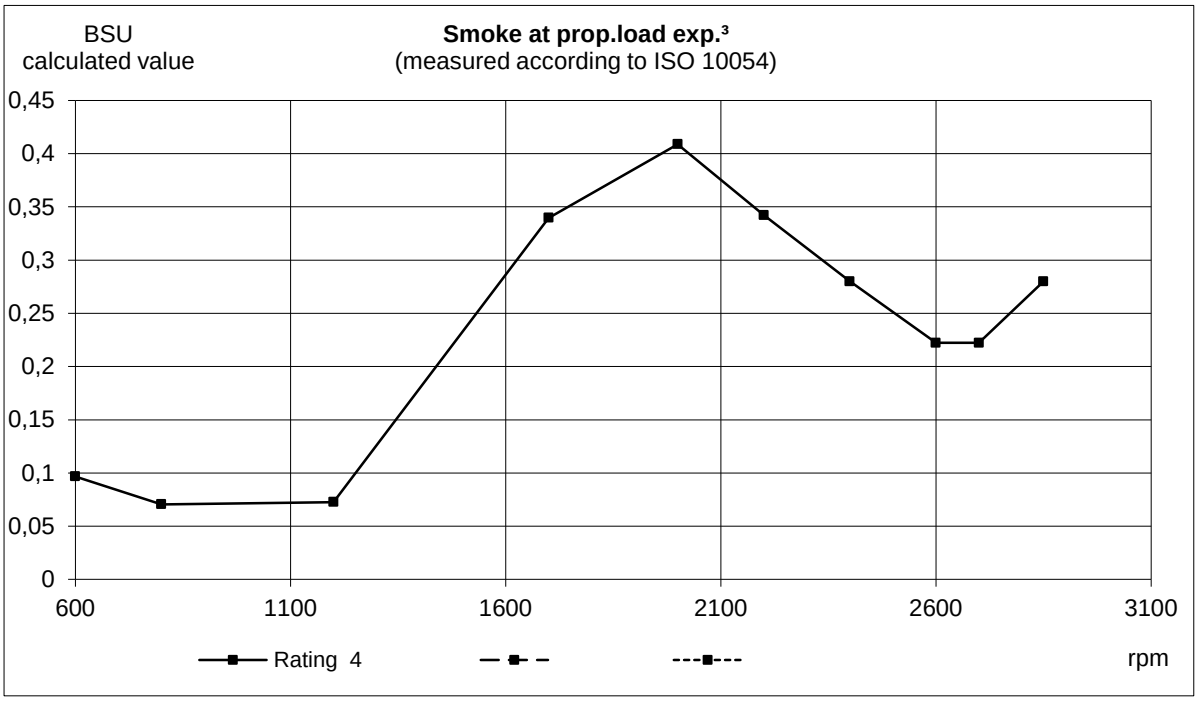

kW
Propellershaft power at full load
and propellershaft power at Calculated propeller load exp.3
hp, metric
400
350
300
250
200
150
100
50
0
500
400
300
200
100
0
600
1100
1600
2100
2600
3100
rpm

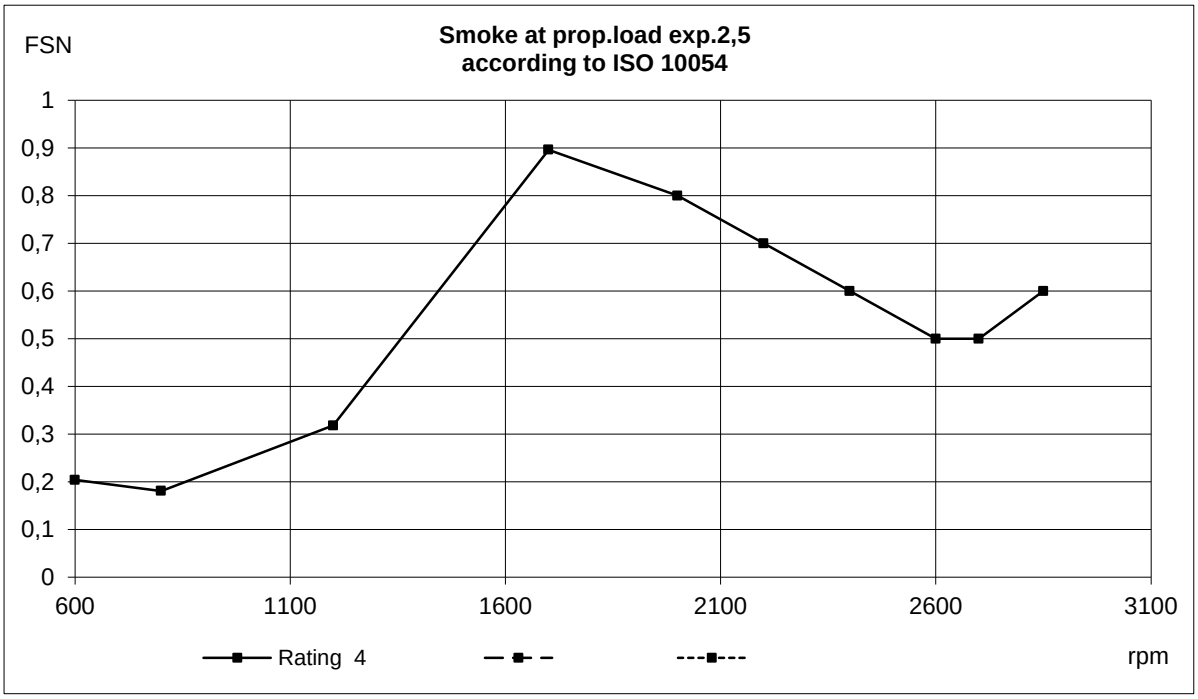

l/h
Fuel consumption at full load and fuel consumption at prop.load exp.2,5
US gal/h
120
100
80
60
40
20
0
30,00
25,00
20,00
15,00
10,00
5,00
0,00
600
1100
1600
2100
2600
3100
rpm
R4
R4, exp2,5
R4

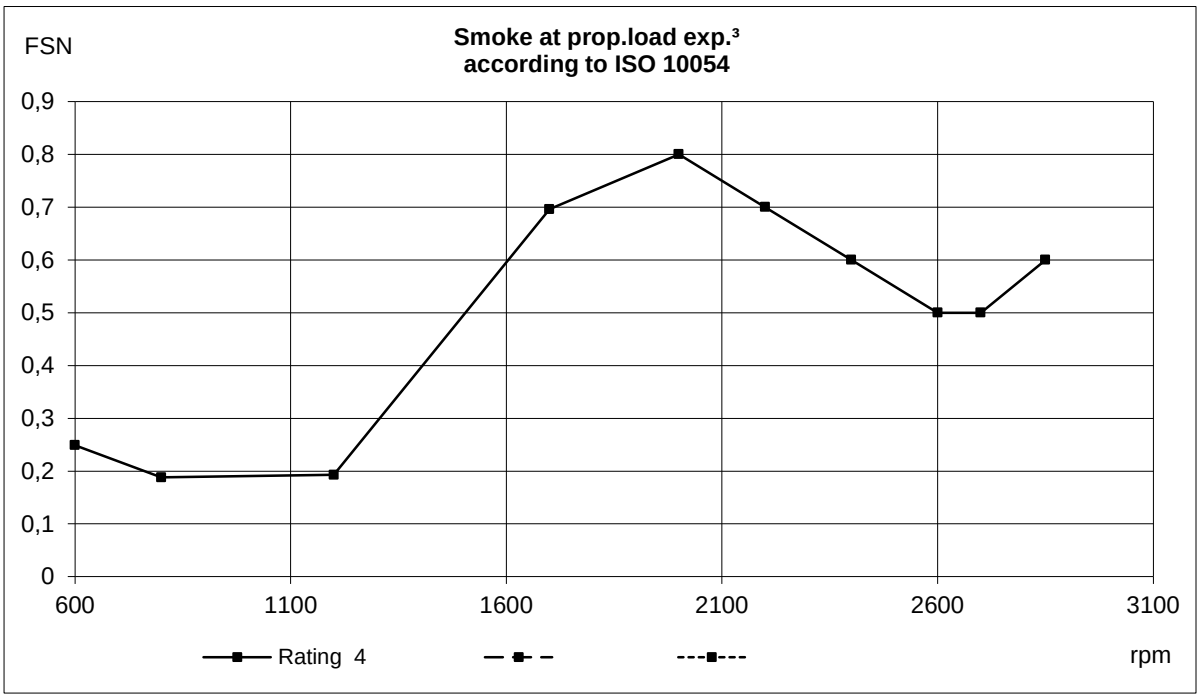

l/h
Fuel consumption at full load and fuel consumption at prop. load exp.3
US gal/h
120
100
80
60
40
20
0
30,0
25,0
20,0
15,0
10,0
5,0
0,0
600
1100
1600
2100
2600
3100
rpm
R4
R4, exp3
R4

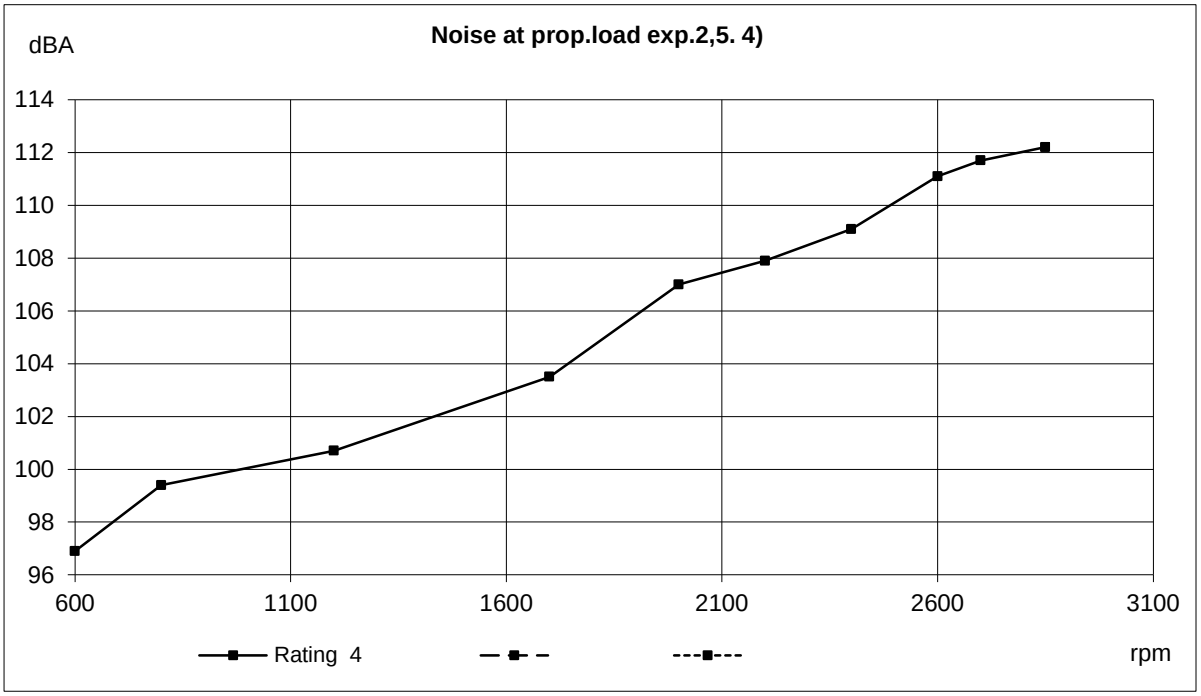

g/kWh
Specific fuel consumption 2)
lb/hph
240
220
200
180
160
140
120
100
0,36
0,31
0,26
0,21
0,16
600
1100
1600
2100
2600
3100
rpm
R4
R4

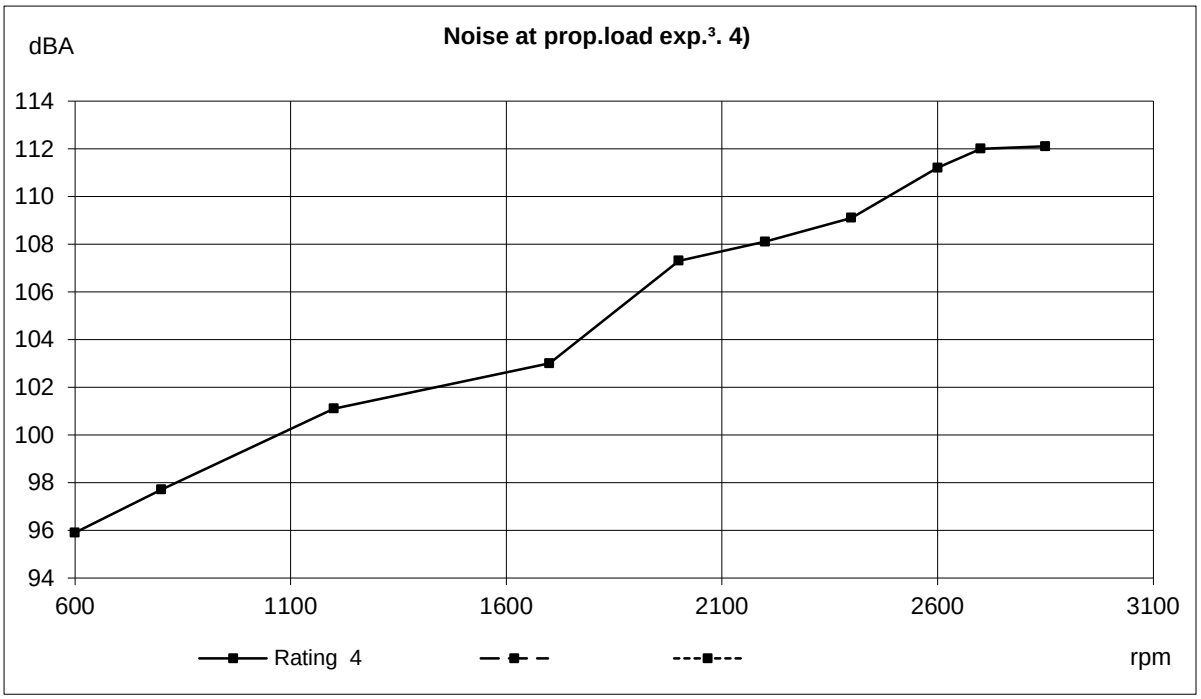

BSU
calculated value
Smoke at prop.load exp.2,5
(measured according to ISO 10054)
0,6
0,5
0,4
0,3
0,2
0,1
0
600
1100
1600
2100
2600
3100
Rating 4
rpm


BSU
calculated value
Smoke at prop.load exp.3
(measured according to ISO 10054)
0,45
0,4
0,35
0,3
0,25
0,2
0,15
0,1
0,05
0
600
1100
1600
2100
2600
3100
Rating 4
rpm


FSN
Smoke at prop.load exp.2,5
according to ISO 10054
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
600
1100
1600
2100
2600
3100
Rating 4
rpm


FSN
Smoke at prop.load exp.3
according to ISO 10054
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
600
1100
1600
2100
2600
3100
Rating 4
rpm

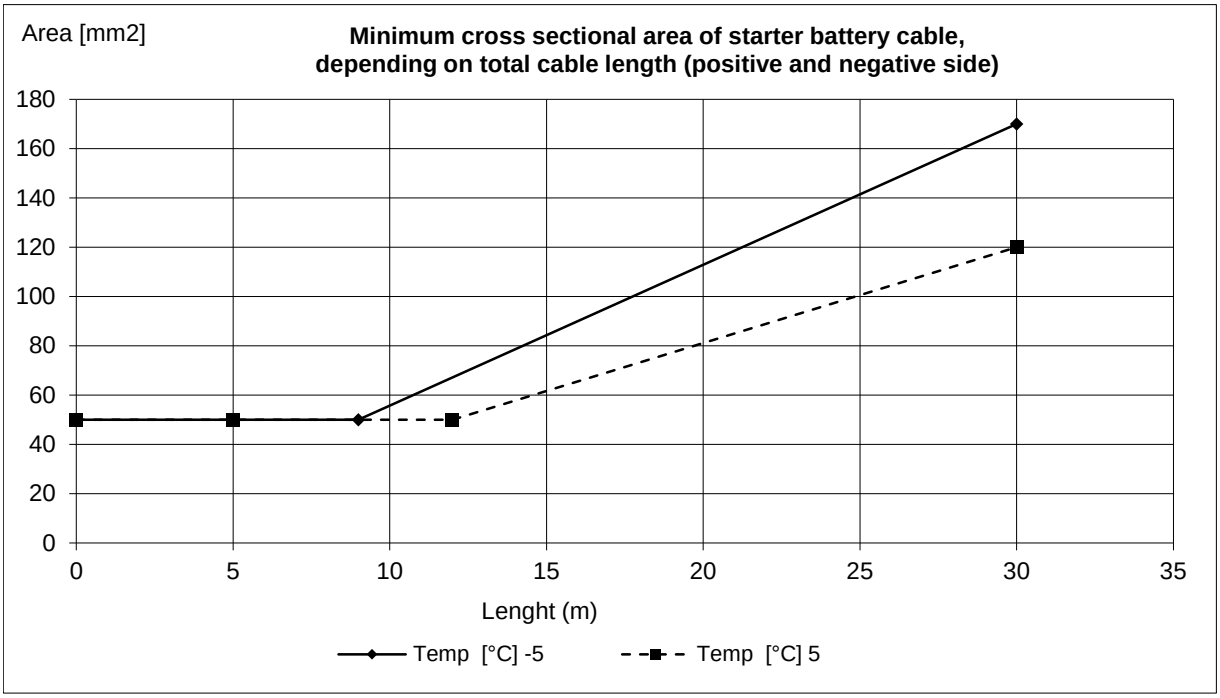

Noise at prop.load exp.2,5. 4)
dBA
114
112
110
108
106
104
102
100
98
96
600
1100
1600
2100
2600
3100
Rating 4
rpm


Noise at prop.load exp.³. 4)
dBA
114
112
110
108
106
104
102
100
98
96
94
600
1100
1600
2100
2600
3100
Rating 4
rpm

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:

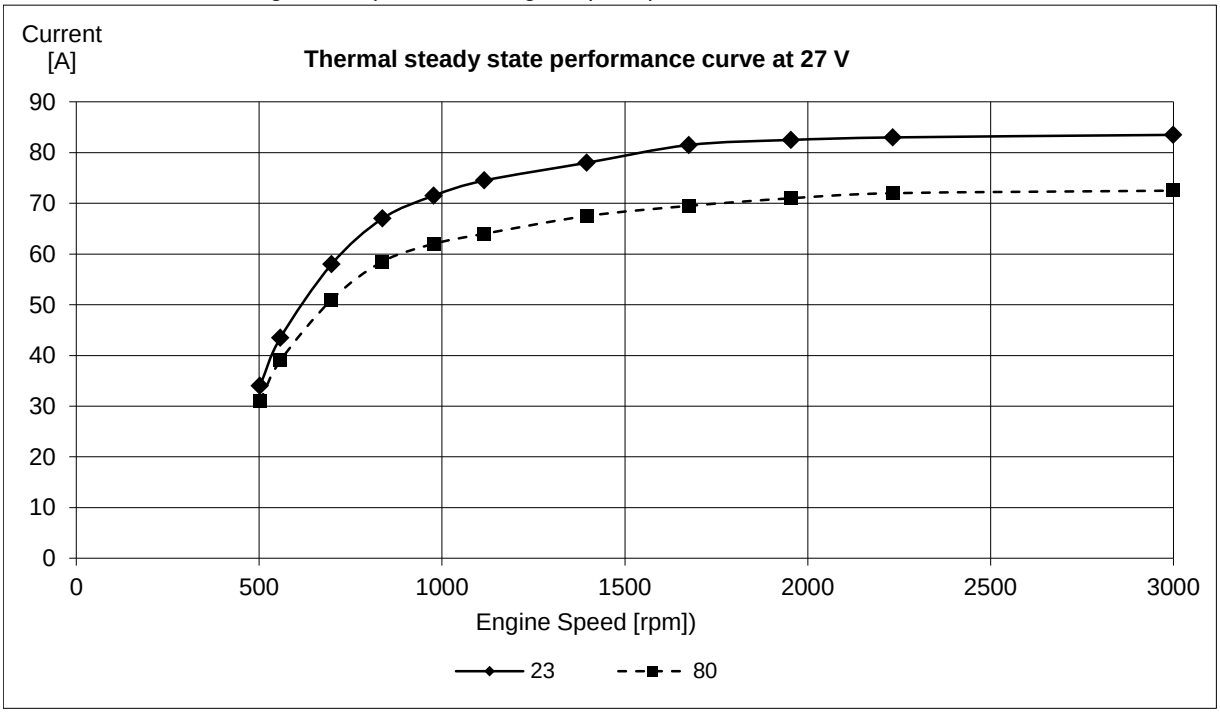
	[A]
Engine:	10
Control system:	10

Max current consumption during normal operation:

	[A]
Engine :	4,5

Alternator data:

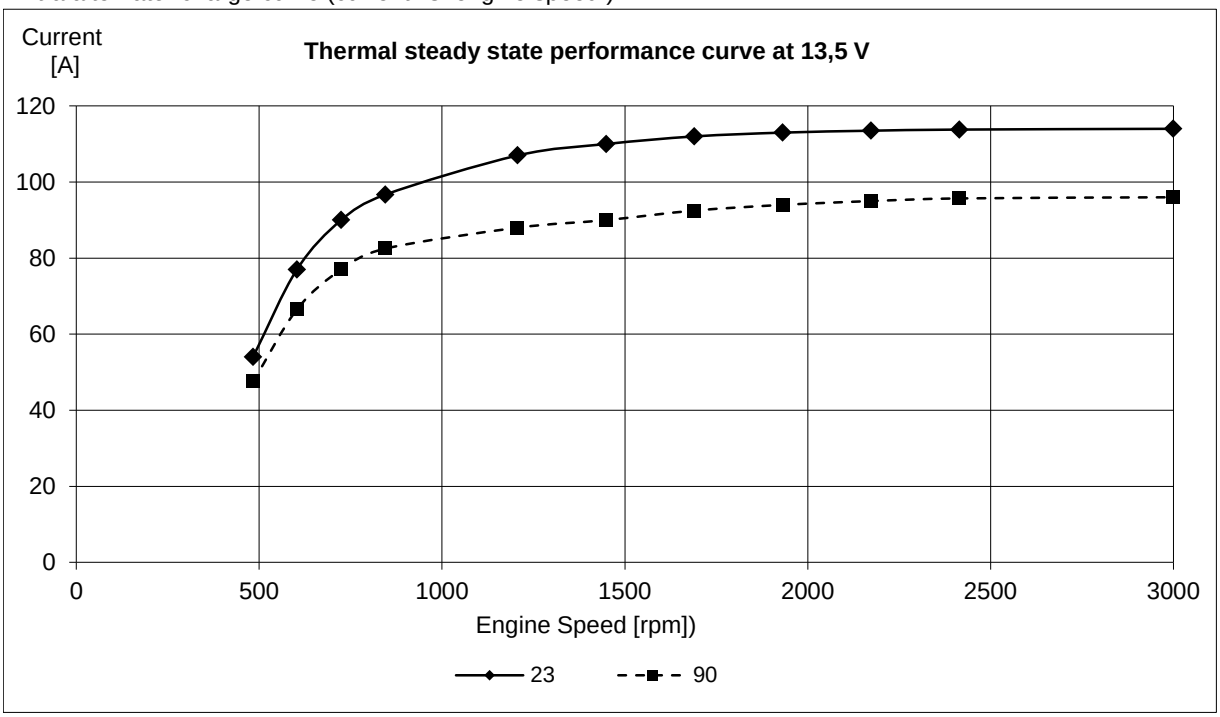
Standard alternator charge curve (current vs. engine speed.)



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

Alternator data:

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



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

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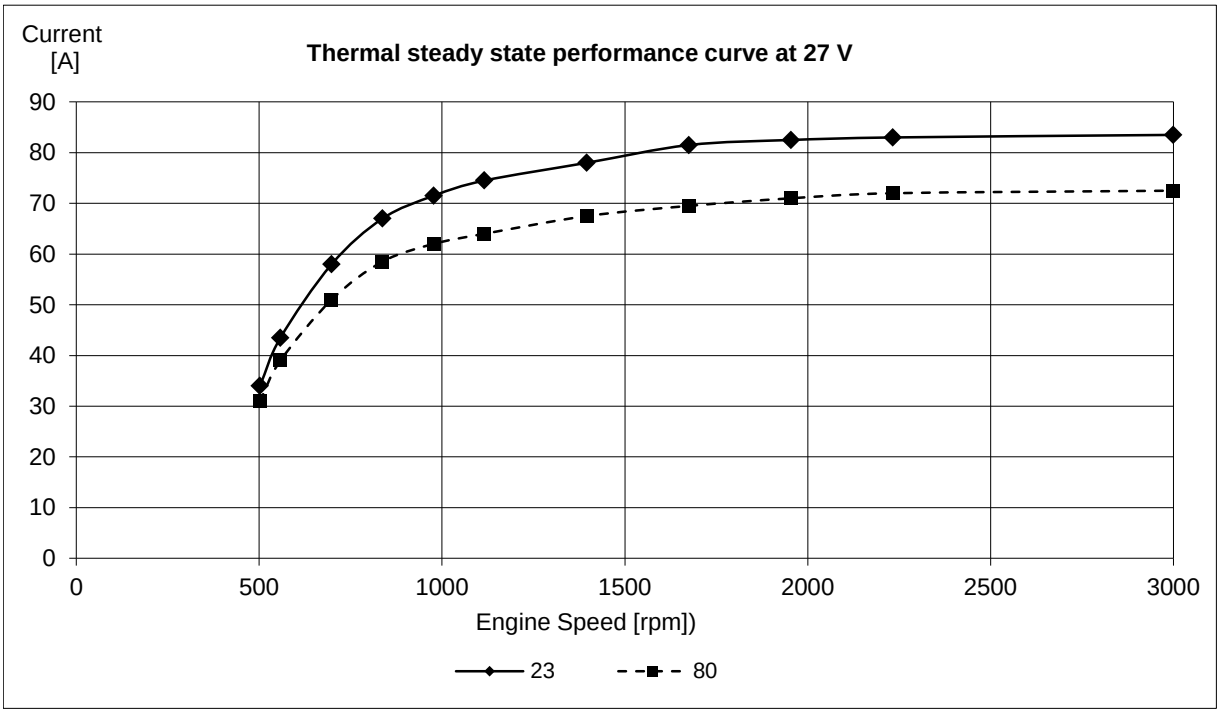

Constant charge voltage: [V]	28,3	+/- 0,3