

VOLVO PENTA D13 MP (R4-800)	Document No	Issue Index
	23432752	02

General

4-stroke direct injected, turbocharged and aftercooled diesel engine

Number of cylinders		6
No of valves		24
Displacement, total	litres in ³	12,78 779,7
Firing order		1-5-3-6-2-4
Rotational direction, viewed from the front		Clockwise
Bore	mm in	131 5,16
Stroke	mm in	158 6,22
Compression ratio		16,5
Compression pressure at 240 rpm	MPa psi	N/A
Max. static forward inclination:	°	0
Max. static backward inclination:	°	10
Max. intermittent forward inclination while running:	°	5
Max. intermittent backward inclination while running:	°	17
Max. intermittent side inclination while running:	°	30
Idling speed	rpm	600 + 50
Rated speed R4	rpm	2300
Propeller selection range R4	rpm	2250-2350
Dry weight engine BT	kg lb	1560 3439

Performance	Rating	rpm	600	800	1000	1100	1300	1500	1800	2000	2100	2300
Crankshaft power 1), 5)	4	kW	79	253	322	351	415	477	568	588	588	588
		hp	107	344	437	477	565	649	773	800	800	800
Propeller shaft power 1) (At full load) With drive IPS	4	kW	74	238	302	330	390	448	534	553	553	553
		hp	100	323	411	449	531	610	726	752	752	752
Torque at crankshaft 2)	4	Nm	1251	3016	3070	3046	3051	3037	3014	2807	2674	2441
		lbf ft	923	2225	2264	2247	2251	2240	2223	2071	1972	1801
Mean piston speed	4	m/s	3,2	4,2	5,3	5,8	6,8	7,9	9,5	10,5	11,1	12,1
		ft/s	10,4	13,8	17,3	19,0	22,5	25,9	31,1	34,6	36,3	39,7
Effective mean pressure 2)	4	MPa	1,23	2,97	3,02	3,00	3,00	2,99	2,96	2,76	2,63	2,40
		psi	178,4	430,3	437,9	434,5	435,3	433,3	429,9	400,5	381,4	348,2
Max combustion pressure 2)	4	MPa	12,9	18,8	19,9	19,5	19,7	19,7	19,4	19,9	19,7	19,7
		psi	1871	2727	2886	2828	2857	2857	2814	2886	2857	2857

Lubricating system

Specific lubricating oil consumption.	g/kWh	0,05
Max. oil volume including filters for all allowed installation inclinations:	litres	45
	US gal	11,89
Max. oil volume excluding filters for all allowed installation inclinations:	litres	40
	US gal	10,57
Min. oil volume excluding filters for all allowed installation inclinations:	litres	32
	US gal	8,45

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	1000	1100	1300	1500	1800	2000	2100	2300
Specific fuel consumption att full load	4	g/kWh lb/hph	241 0,39	204,3 0,331	190,6 0,309	192,2 0,311	193,7 0,314	196,5 0,318	203,7 0,33	205,1 0,332	208,0 0,337	211,8 0,343
Fuel consumption, Test cycle E3	4	g/kWh lb/hph	206,6 0,33									
Fuel consumption at prop. load x ^{2,5}	4	l/h US gal/h	6,0 1,6	11,0 2,9	18,0 4,8	23,0 6,1	34,0 9,0	48,0 12,7	76,0 20,1	100,0 26,4	114,0 30,1	149,0 39,4
Fuel consumption at prop. load x ³	4	l/h US gal/h	4,0 1,1	7,0 1,8	13,0 3,4	17,0 4,5	26,0 6,9	40,0 10,6	68,0 18,0	93,0 24,6	109,0 28,8	149,0 39,4
Fuel consumption at full load	4	l/h US gal/h	22,7 6,0	61,8 16,3	73,3 19,4	80,7 21,3	96,3 25,4	112,2 29,6	138,5 36,6	144,3 38,1	146,3 38,7	149,0 39,4

Intake and exhaust system	Rating	rpm	600	800	1000	1100	1300	1500	1800	2000	2100	2300
Specific exhaust heating effect in percent of crankshaft power	4	%	58,7	62,6	56,2	58,8	62,2	65,0	55,8	60,4	41,9	46,9
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.	4	°C °F	499 930	599 1110	435 815	455 851	475 887	486 907	512 954	475 887	468 874	454 849
Exhaust back pressure after turbocharger at rated speed during test.		kPa psi										28 4,1
Permitted exhaust back pressure after turbocharger. (Installed back pressure)		kPa psi										Max 38 5,5
		kPa psi										Min 0 0,0
Engine air consumption at 25°C / 77°F atmospheric pressure 100kPa	4	m ³ /min cu.ft./min	4,4 155,4	14 494,4	20,2 713,4	22,2 784	26,6 939,4	31,3 1105	39 1377	42,9 1515	44,3 1564	46,4 1639
Charge air pressure Inlet manifold	4	kPa psi	32 4,6	215 31,2	269 39,0	271 39,3	280 40,6	301 43,7	332 48,2	343 49,7	343 49,7	340 49,3
Exhaust gas flow	4	m ³ /min cu.ft./min	12 423,8	38,6 1363	47,4 1674	52,6 1858	62,8 2218	72,2 2550	76,2 2691	82,8 2924	69,8 2465	74,4 2627

Cooling system	Rating	rpm	600	800	1000	1100	1300	1500	1800	2000	2100	2300
Radiated heat (per engine)	4	kW	5	6	6	6	7	7	8	8	8	9
Heat rejection to charge air coolers	4	kW	3	39	62	67	81	99	132	149	155	164
Coolant heat rejection to HE, incl. engine oil cooler and excl. charge air coolers.	4	kW	98	165	166	178	205	233	363	348	410	465
Coolant flow with fully open thermostat and std cooling system		l/min	90	150	252	282	335	380	480	516	528	600
		cu.ft./min	3,2	5,3	8,9	10,0	11,8	13,4	17,0	18,2	18,6	21,2
Max. permissible temperature on coolant in engine outlet		°C	98									
		°F	208									
Coolant volume engine, including heat exchanger and charge air cooler		litres	57									
		US gal.	15,06									
Max. additional coolant for cabin heater etc. with std. Expansion tank		litres	15									
		US gal.	3,96									
Maximum coolant flow to cabin heater etc.		l/min	40									
		cu.ft./min	1,41									
Thermostat, start open at		°C	82									
		°F	180									
Thermostat, fully open at		°C	92									
		°F	198									

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Raw water circuit	rpm	600	800	1000	1100	1300	1500	1800	2000	2100	2300
Nominal raw water design flow	l/min	167	220	276	304	355	398	438	433	428	406
	cu.ft/min	5,9	7,8	9,7	10,7	12,5	14,1	15,5	15,3	15,1	14,3
Nominal raw water pump pressure head at design flow. (measured before and after pump)	kPa	31	45	65	77	101	126	148	146	142	128
	psi	4,5	6,5	9,4	11,2	14,6	18,3	21,5	21,2	20,6	18,6
Maximum raw water pump suction head	kPa	-30									
	psi	-4,4									
Maximum raw water temperature entering heat exchanger	°C	30									
	°F	86									

Emissions	Rating	rpm	600	800	1000	1100	1300	1500	1800	2000	2100	2300
Smoke at prop. load x ^{2.5}	4	*BSU	0,16	0,34	0,36	0,23	0,19	0,11	0,13	0,12	0,16	0,1
Smoke at prop. load x ³	4	*BSU	0,15	0,15	0,30	0,36	0,28	0,34	0,18	0,13	0,15	0,1
Noise at prop. load x ^{2.5} . 4)	4	dBA	100,2	107,6	108,4	108	107,8	109,4	111,6	113,6	114,6	115,7
Noise at prop. load x ³ . 4)	4	dBA	100	102,3	108,4	108,7	108,2	109,6	111,4	113,4	114,5	115,9

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

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- 2) At power according to 1).
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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
AUS/DEF concentration			%	N/A	28	N/A	Warning only
AUS/DEF Tank Empty			%	30 sec	0	N/A	Warning only
AUS/DEF Tank Low level			%	30 sec	15	N/A	Warning only
AUS/DEF tank temp High alarm			°C	1 sec	70	N/A	Warning only
Coolant level switch	Digital	ON/OFF		30 sec from start / 11 sec	Low (ON / Closed)	N/A	Warning only
Coolant temperature	50-0 kΩ	-40 - 140 ±1.5°C	°C	30 sec from start / 2 sec	98	101	See derating map
Engine speed cam	Frequency		rpm	Instant	Lost signal	N/A	Warning only
Engine speed crank	Frequency		rpm	Instant	Lost signal	N/A	Warning only
Exhaust gas temperature	PT200	-40 - 750 ± 2.5%	°C	30 sec from start / 2 sec	542	550	See derating map
Oil level sensor	Digital	± 1.9 mm		30 sec from start / 5 sec	Low level	N/A	Warning only
Oil temperature	50-0 kΩ	-40 - 140 ± 1.5°C	°C	30 sec from start/1.5 sec	125	130	See derating map
SCR temp	PT200	-40 - 750 ± 2.5%	°C	30 sec from start / 2 sec	532	540	Engine derate
Water In fuel switch	Digital	ON/OFF		Instant	Water in fuel	N/A	Warning only
Wet Exhaust temp	PT200	0 - 850	°C	30 sec from start / 5 sec	192	200	See derating map

Sensors (rpm dependent)	Signal	Range	Unit	Initial Delay / Delay	Warning Level / Derating Level / Shutdown Level rpm Map					Comment
					600 rpm	1000 rpm	1200 rpm	1800 rpm	2300 rpm	
Charge air pressure	0,5-4,5 V	50-600 ±4.2 kPa	kPa		600 rpm	1000 rpm	1200 rpm	1800 rpm	2300 rpm	<i>From prop curve 2.5 with IPS drive</i>
Warning Level			kPa	30 sec from start / 2.2sec	515	220	215	332	485	
Derating Level			kPa	10% trq. decr. per sec	525	230	225	342	495	
Charge air temperature	50-0 kΩ	-40 - 130 ±4%	°C		600 rpm	1000 rpm	1200 rpm	1800 rpm	2300 rpm	
Warning Level			°C	60 sec from start / 15 sec	80	80	80	76	65	
Derating Level			°C		85	85	85	81	70	See derating map
Coolant pressure	0,5-4,5 V	0-300 ± 3%	kPa		600 rpm	1000 rpm	1200 rpm	1800 rpm	2300 rpm	
Warning Level			kPa	30 sec from start /1.5sec	0	25	35	76	120	
Derating Level			kPa	10% trq. decr. per sec	-5	20	30	71	115	
Fuel pressure	0,5-4,5 V	0-700 ±2.5%	kPa		600 rpm	1000 rpm	1200 rpm	1800 rpm	2300 rpm	
Warning Level			kPa	60 sec from start / 5 sec	80	80	80	280	280	
Derating Level			kPa	NA	NA	NA	NA	NA	NA	
Oil pressure	0,5-4,5 V	0-700 ±2.5%	kPa		600 rpm	1000 rpm	1200 rpm	1800 rpm	2300 rpm	
Warning Level			kPa	30 sec from start / 3 sec	120	200	224	260	260	
Derating Level			kPa	10% trq. decr. per sec	95	175	199	235	235	
Seawater pressure	0,5-4,5 V	0-300 ± 3%	kPa		600 rpm	1000 rpm	1200 rpm	1800 rpm	2300 rpm	
Warning Level			kPa	30 sec from start /5 sec	-5	10	18	45	50	
Derating Level			kPa	10% trq. decr. per sec	-15	0	8	35	40	

Warning = Yellow Lamp active

Derating = Red Lamp active

Remarks

Charge Air Temp [°C]	rpm	90°C	95°C	105°C
Remaining torque in %	600	100%	100%	100%
	1200	100%	82%	74%
	1800	100%	66%	52%

Coolant temp [°C]	rpm	96°C	103°C	106°C
Remaining torque in %	600	100%	100%	100%
	1200	100%	97%	93%
	1800	100%	50%	0%

Exhaust Temp [°C]	rpm	545°C	560°C	575°C	580°C
Remaining torque in %	600	100%	100%	100%	100%
Max 1000 rpm in engine prot map	1200	100%	97%	95%	93%
> 570°C	1800	100%	50%	25%	0%

Oil temp [°C]	rpm	125°C	132°C	134°C
Remaining torque in %	600	100%	100%	100%
	1200	100%	97%	93%
	1800	100%	50%	0%

Wet exhaust temp [°C]	rpm	190°C	200°C	205°C	210°C
Remaining torque in %	600	100%	100%	100%	100%
	1200	100%	96%	93%	89%
	1800	100%	93%	86%	80%

Transmission: Control and Monitoring System						Engine protection action
Sensors	Signal	Range	Unit	Warning Initial Delay / Warning Delay	Warning 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/7sec	700	Warning only

For SDM only

Sensors Control and Monitoring System						Engine protection action
Sensors	Signal	Range	Unit	Warning Initial Delay / Warning Delay	Shutdown level	
Coolant temperature	Digital	ON/OFF	°C	12sec from start/1 sec	105	Shutdown
Eng. overspeed SDM 2300+15%	Frequency	153 puls./rev	rpm / Hz	Instant	2645 rpm / 6745 Hz	Shutdown

Sensors (rpm dependent)	Signal	Range	Unit	Initial Delay / Delay	Warning Level / Derating Level / Shutdown Level rpm Map					Engine protection action
					0 rpm	600 rpm	1000 rpm	1500 rpm	1800 rpm	
Oil pressure	Digital	ON/OFF	kPa	12 sec from start / 1 sec	NA	120 ±20	120 ±20	120 ±20	120 ±20	Shutdown
Gear oil pressure (IPS)	Digital	ON/OFF	kPa	12 sec from start / 1 sec	NA	400 ±20	400 ±20	400 ±20	400 ±20	Shutdown
Gear oil pressure (Reverse gear ZF)	Digital	500-3000	kPa	12 sec from start / 1 sec	NA	2100±20	2100±20	2100±20	2100±20	Shutdown
Gear oil pressure (Reverse gear Other)	Digital	500-3000	kPa	12 sec from start / 1 sec	NA	X±20	X±20	X±20	X±20	Shutdown Level depending on type of gearbox

Technical data - Drive unit

Drive line		IPS900 & IPS1050
Transmission type		IPS3-C
Gear ratio (total)		1,99:1 and 1,88:1 for IPS 1050 >37 knots
Steering angle, max.		+/- 27
Total weight of drive unit (1)	kg	691
Oil capacity, approx.	litres	30
Oil volume difference MIN-MAX	litres	0,5
Oil type		Volvo Penta API GL5 75W/90
Propeller range		QS5, Q1-Q7, QE1-QE4

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

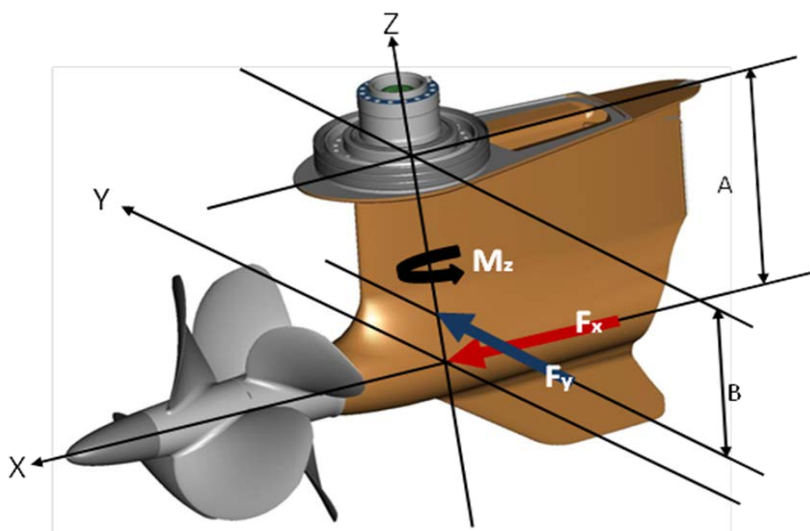
"Generalized maximum load document"for IPS3

Valid products	Drive Unit	Gear Ratio
IPS900	IPSx	1,99:1
IPS1050	IPSx	1,99:1
IPS1050	IPSx	1,88:1

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	F _x	47 kN
	F _y (+/-)	32 kN
	M _z (+/-)	12 kNm
28-42 kn	F _x	32 kN
	F _y (+/-)	65kN
	M _z (+/-)	12 kNm

A	530 mm
B	442 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.

Technical data - Exhaust AfterTreatment System data (EATS)**Weight data:**

SCR system weight: (incl SCR unit, AUS injector pipe, AUS sensor and bracket)			kg	115,7
			lb	255,1
Total SCR system weight for IPS: (incl SCR unit, AUS injector pipe, AUS sensor and bracket, exhaust piping)			kg	115,7
			lb	255,1
AUS pump			kg	3,1
			lb	6,8
AUS cabinet 20l weight: (incl tank, pump,UQS, ACM)			kg	36,4
			lb	80,2
AUS tank 160l weight:			kg	45,0
			lb	99,2
UQS - Lenght/Weight	mm	439,0	kg	1,2
	in	17,3	lb	2,6
UQS - Lenght/Weight	mm	597,0	kg	1,2
	in	23,5	lb	2,6
UQS - Lenght/Weight	mm	715,0	kg	1,3
	in	28,1	lb	2,9

Dimension data:

SCR Surface area		m2/ft2	2.2 / 23.7
SCR Flange:	Standard type		
	Diameter:	in/mm	6 / 152
	Number of Inlet / Outlet:	1 inlet / 2 outlet	

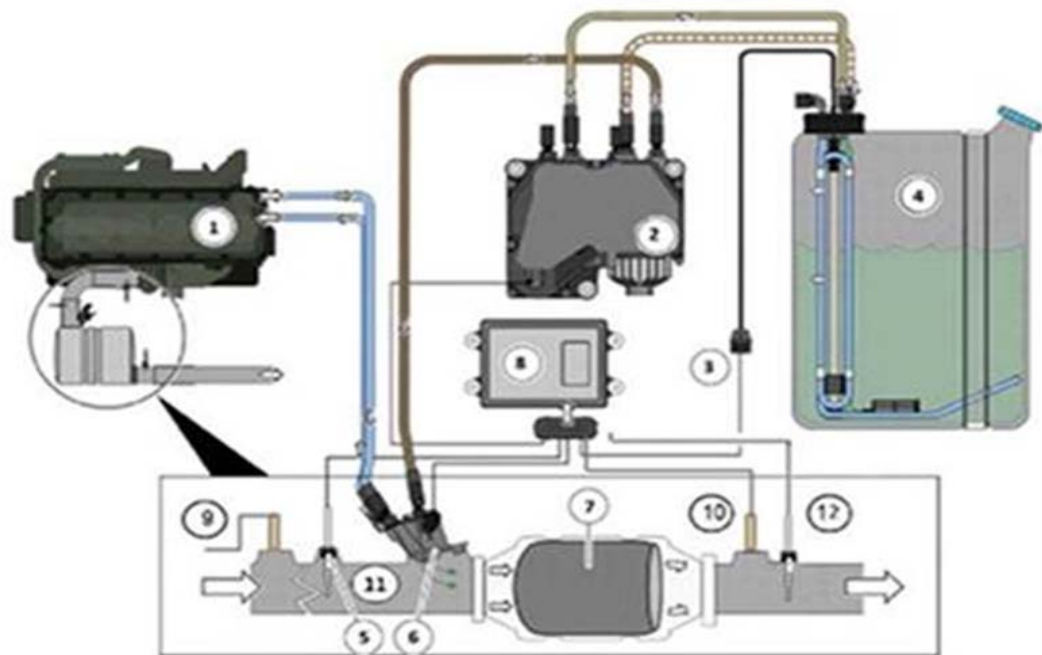
Flow data:

Max AUS flow to injector	l/h	7,9
	US gal/h	2,1
Max collant flow to AUS injector	l/h	6,7
	US gal/h	1,8

Exhaust system	Rating	rpm	600	800	1000	1100	1300	1500	1800	2000	2100	2300
Max allowable temperature drop between turbine and SCR muffler inlet.		°C	10	10	10	10	10	10	10	10	10	10
		°F	50	50	50	50	50	50	50	50	50	50
SCR muffler pressure drop at prop. load x ³		kPa	0	0	1	1	1	3	4	7	10	14
		psi			0,1	0,1	0,1	0,4	0,6	1,0	1,5	2,0
SCR muffler pressure drop at Full load		kPa	1	3	4	5	6	8	12	12	13	14
		psi	0,1	0,4	0,6	0,7	0,9	1,2	1,7	1,7	1,9	2,0

AUS system	Rating	rpm	600	800	1000	1100	1300	1500	1800	2000	2100	2300
Specific AUS consumption		g/kWh	11,08	8,13	12,52	11,50	10,75	9,87	8,25	8,95	8,85	9,61
		lb/hph	0,02	0,01	0,02	0,02	0,02	0,02	0,01	0,01	0,01	0,02
AUS consumption at prop. load x ^{2.5}		l/h	0,00	0,22	0,55	0,87	1,95	2,23	5,08	6,34	7,12	6,37
		US gal/h		0,06	0,15	0,23	0,52	0,59	1,34	1,67	1,88	1,68
AUS consumption at prop. load x ³		l/h	0,00	0,00	0,05	0,40	1,10	1,74	4,16	5,73	7,00	6,30
		US gal/h			0,01	0,11	0,29	0,46	1,10	1,51	1,85	1,66
AUS consumption at Full load		l/h	0,95	2,24	4,39	4,40	4,87	5,13	5,11	5,76	5,71	6,23
		US gal/h	0,25	0,59	1,16	1,16	1,29	1,36	1,35	1,52	1,51	1,65

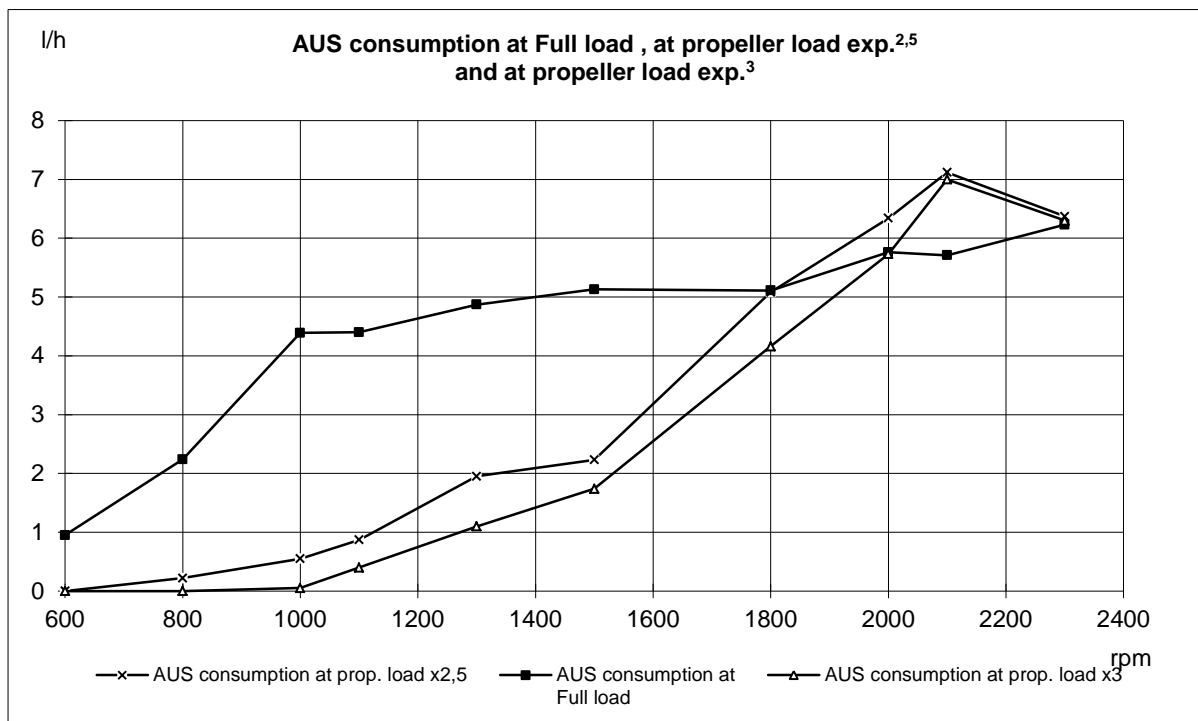
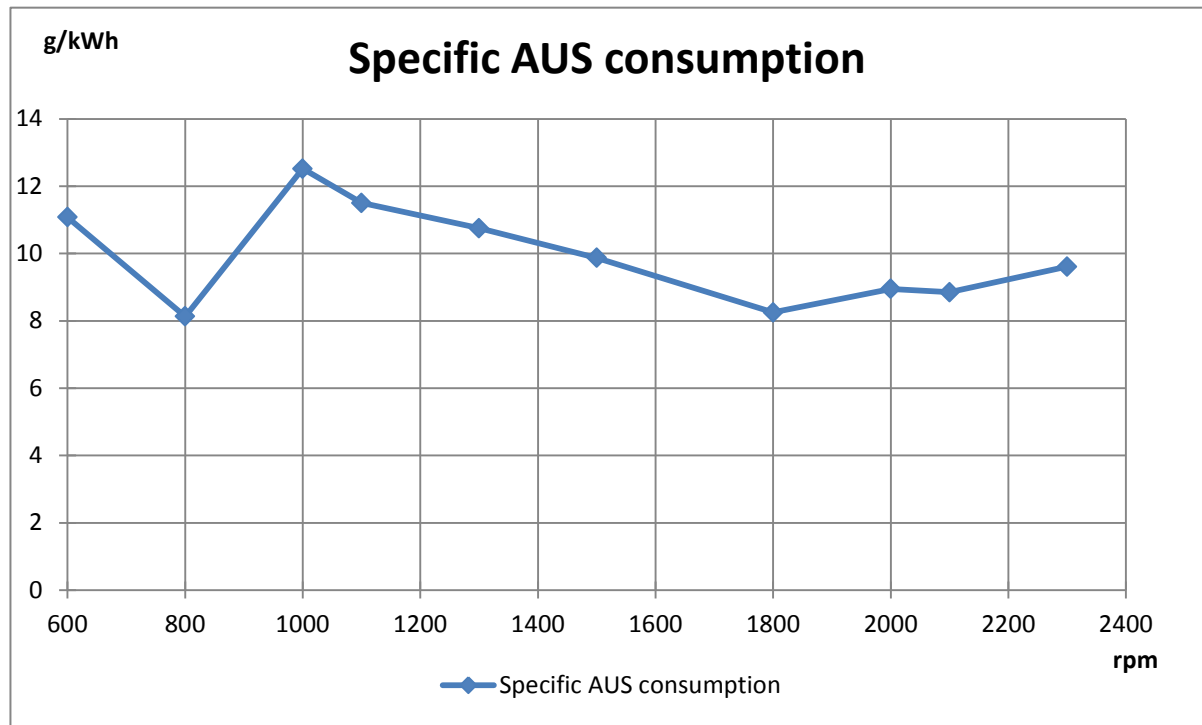
AUS concentration 32.5%

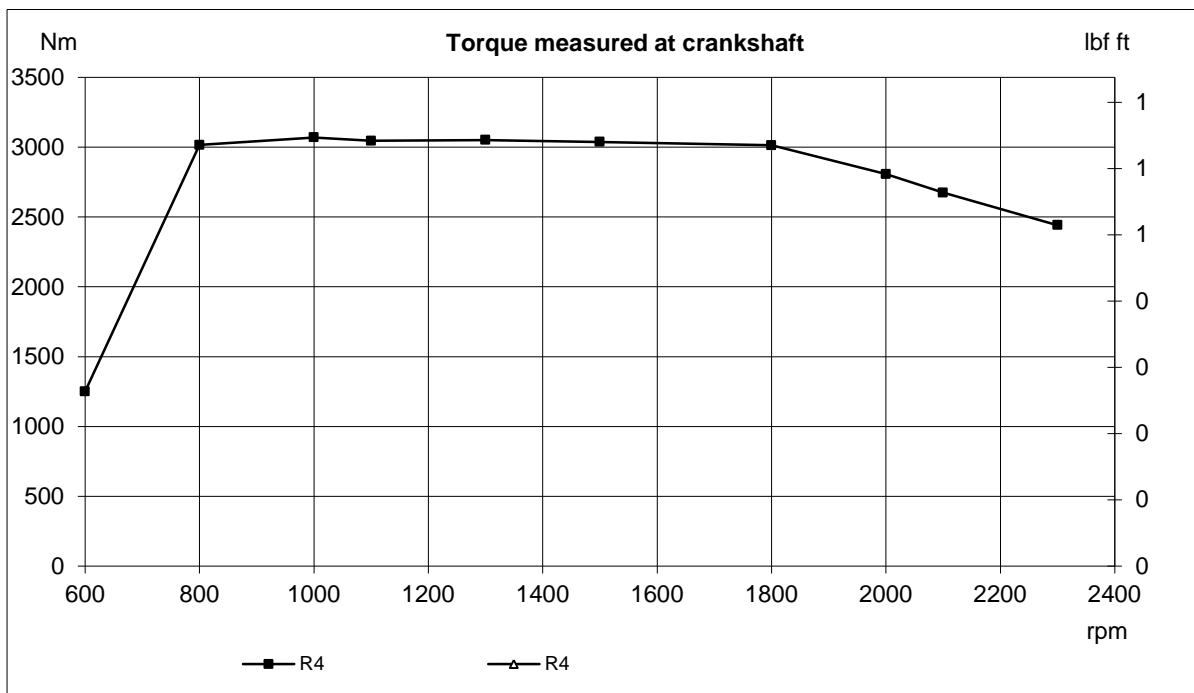
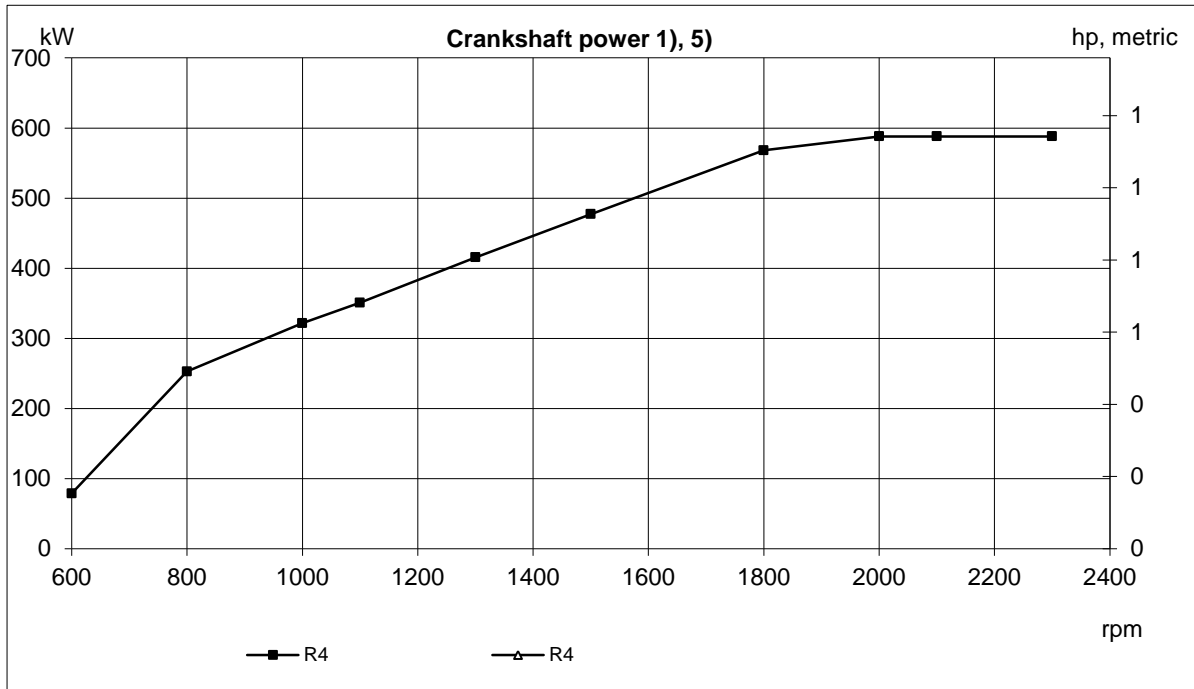


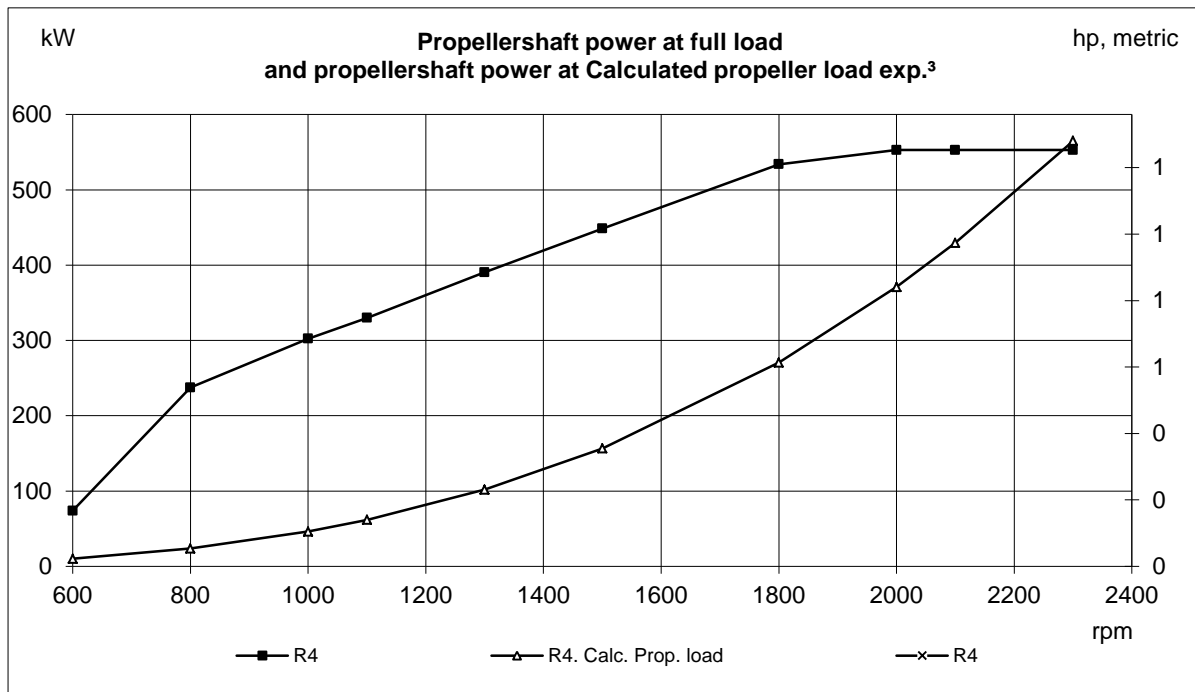
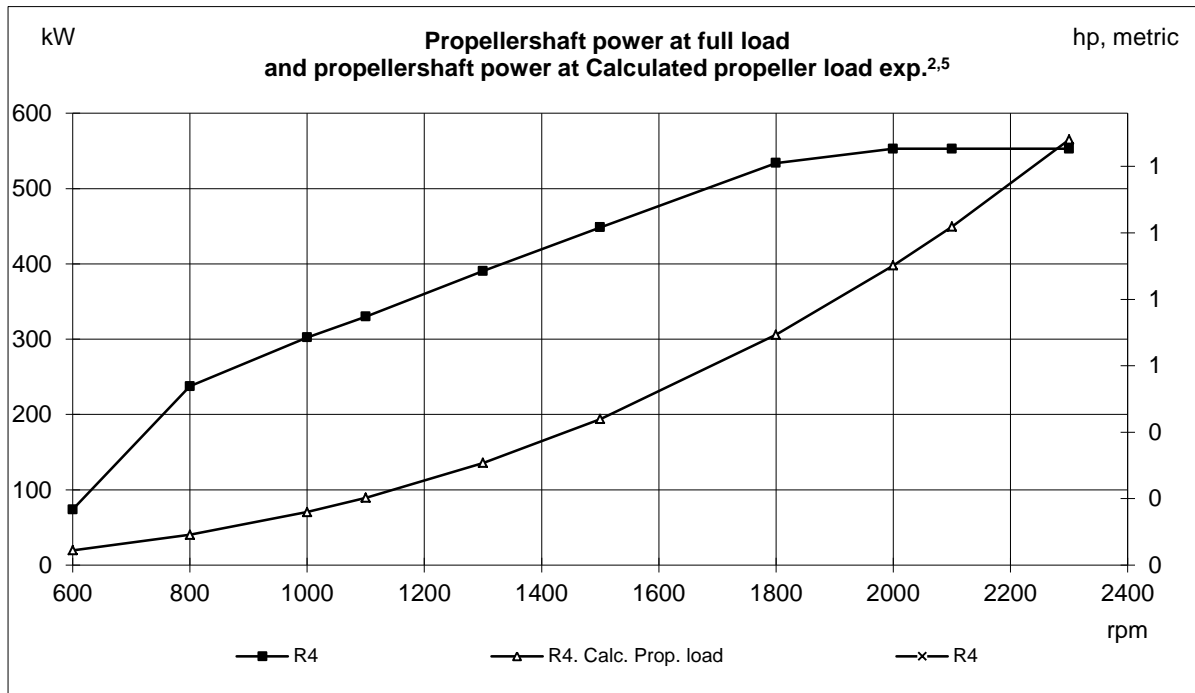
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|-------------------------------------|-------------------------------------|
| 1. Engine | 7. Catalytic converter (SCR) |
| 2. AUS pump | 8. ACM (After Treatment Module) |
| 3. Sensor connector QLT | 9. Front NOx sensor |
| 4. AUS tank with QLT | 10. Rear NOx sensor |
| 5. Front exhaust temperature sensor | 11. Injector pipe |
| 6. AUS injector | 12. Rear exhaust temperature sensor |

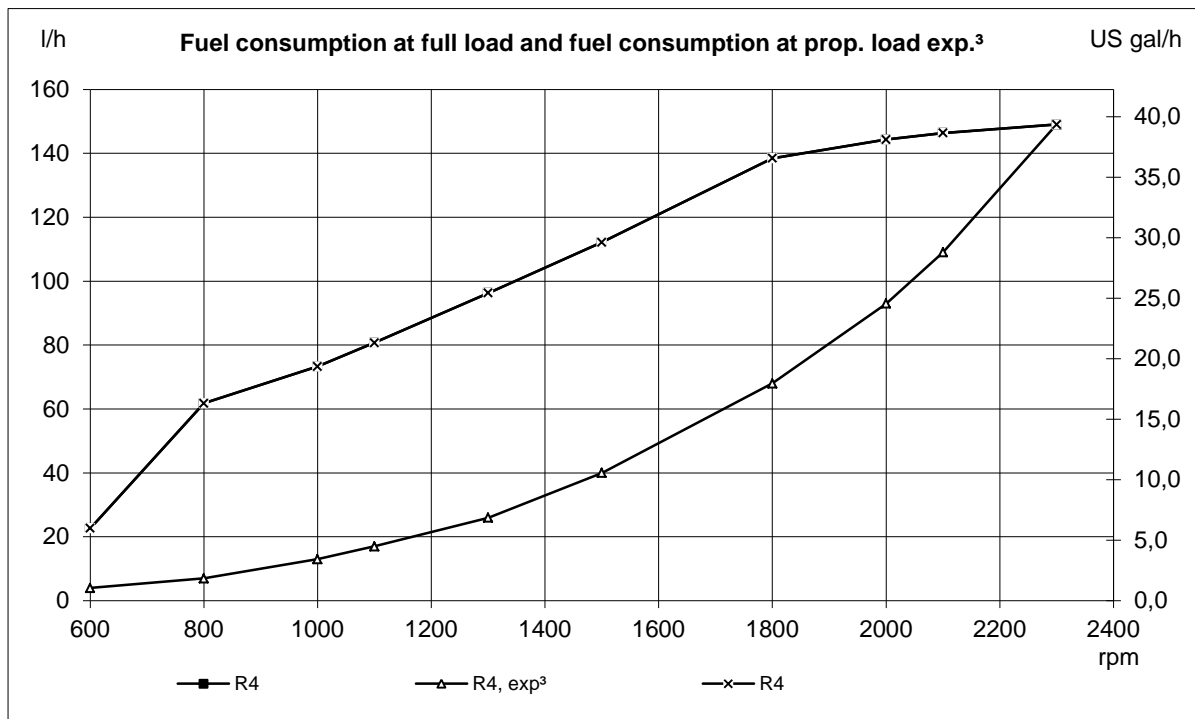
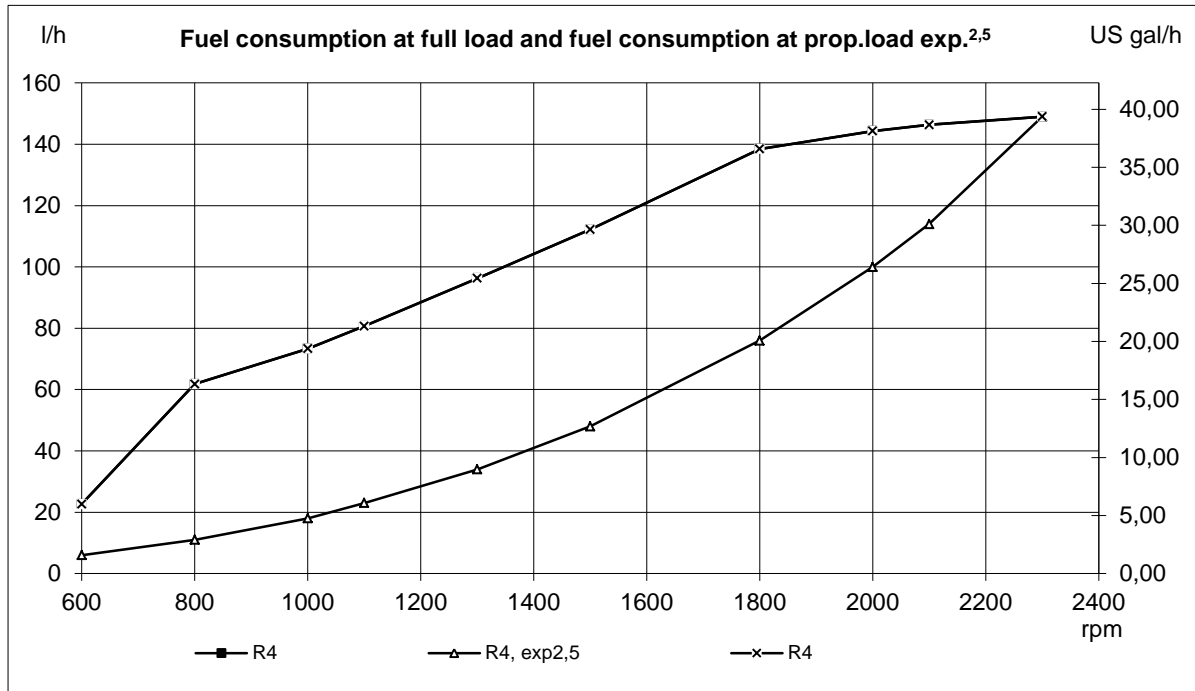
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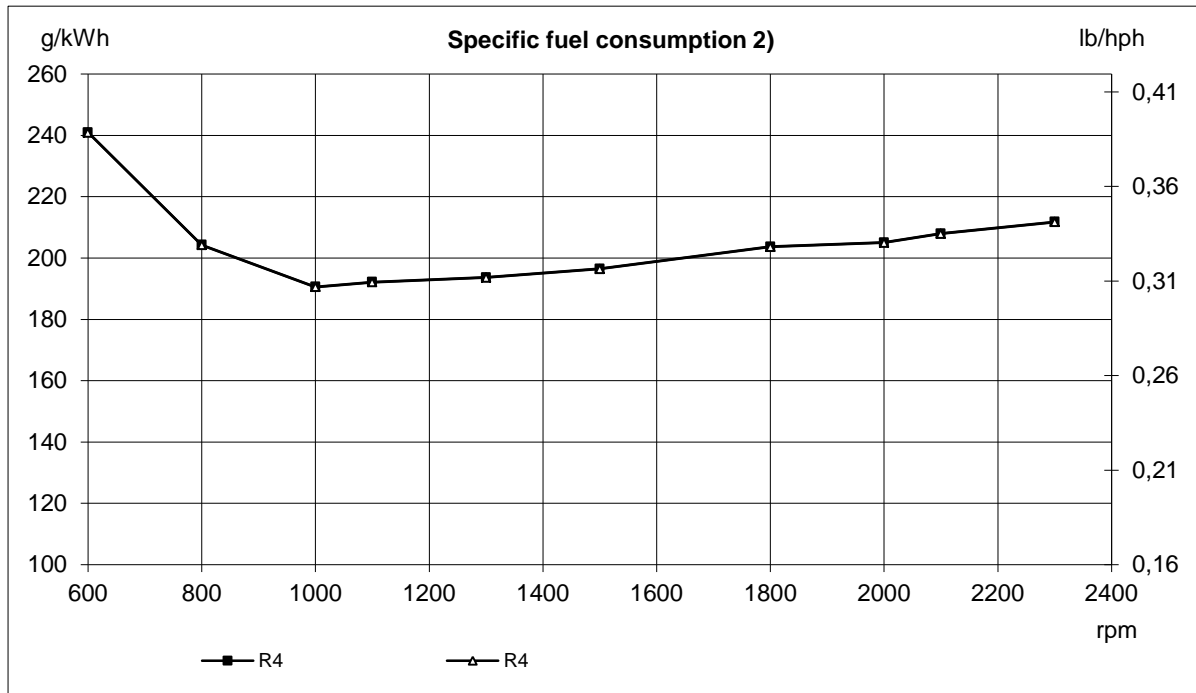
ACM	Aftertreatment Control Module
AUS	Aqueous Urea Solution
EATS	Exhaust Aftertreatment System
SCR	Selective Catalytic Reduction
UDS	Urea Dosing System
UQS	Urea Quality Sensor

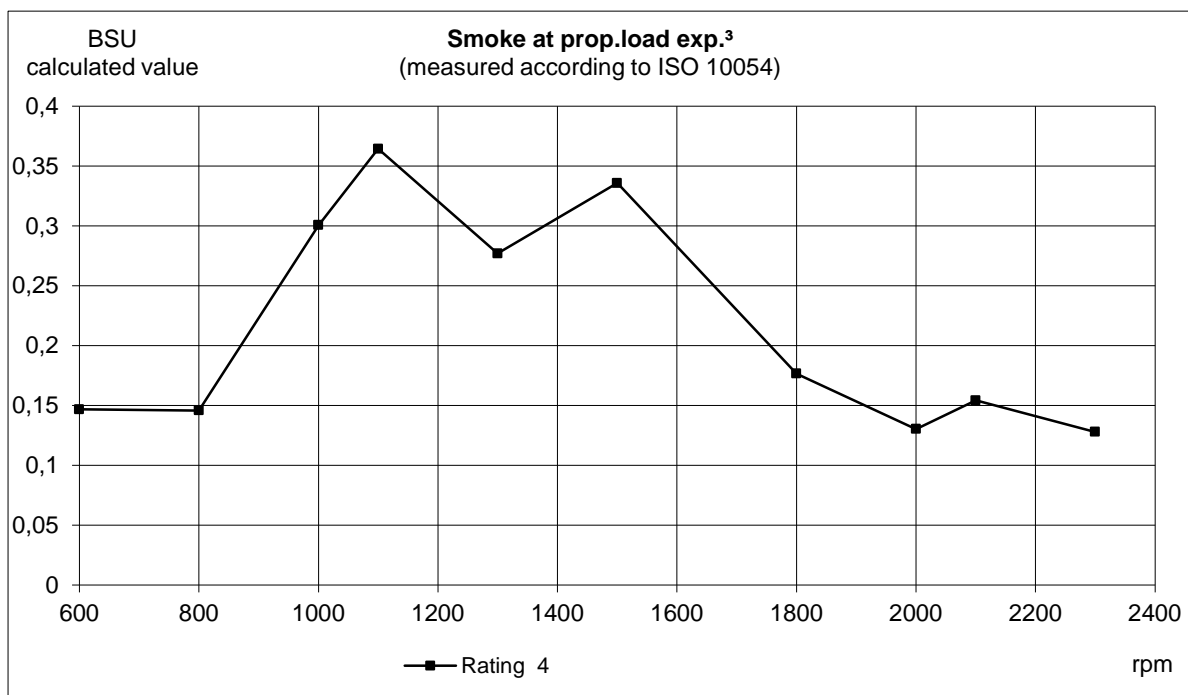
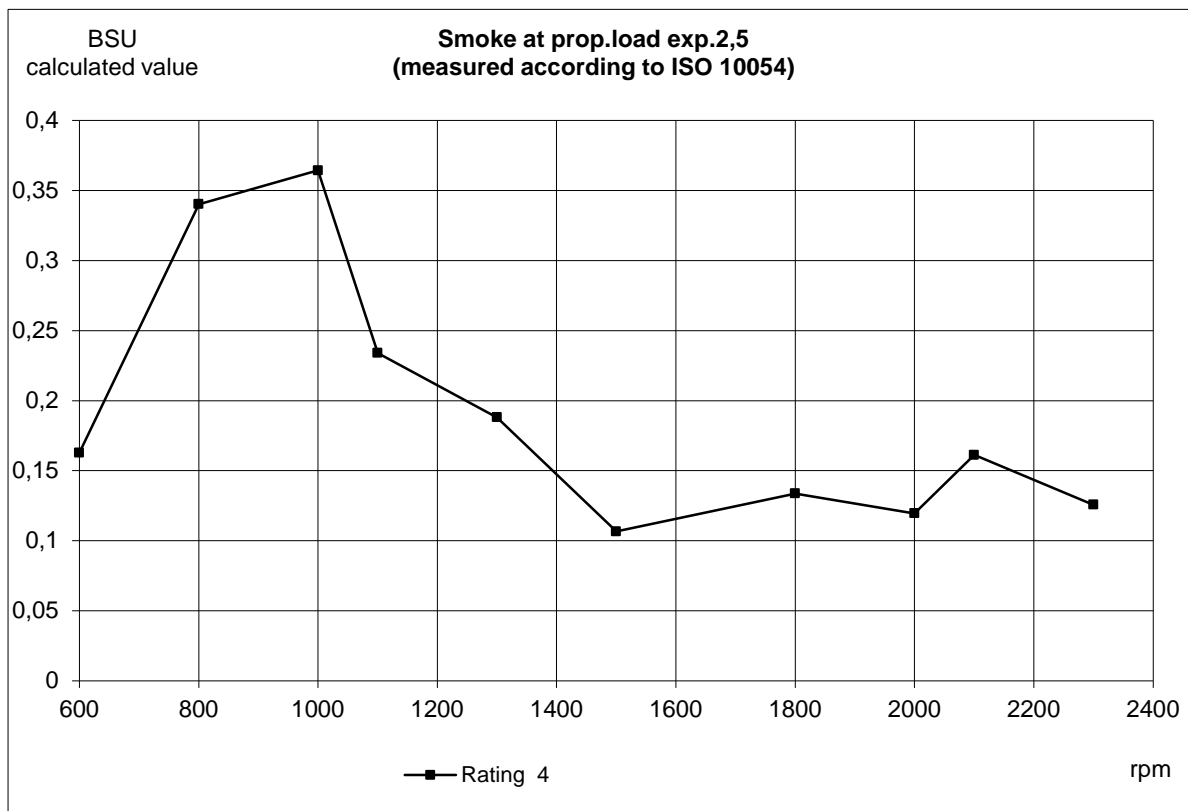


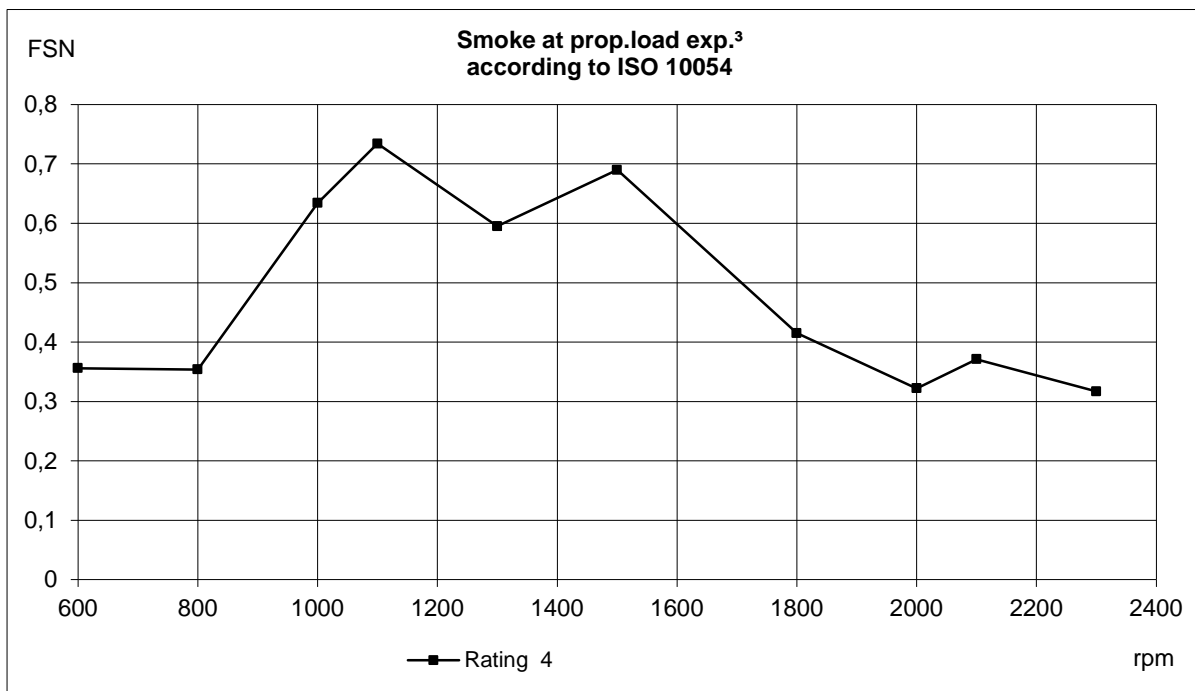
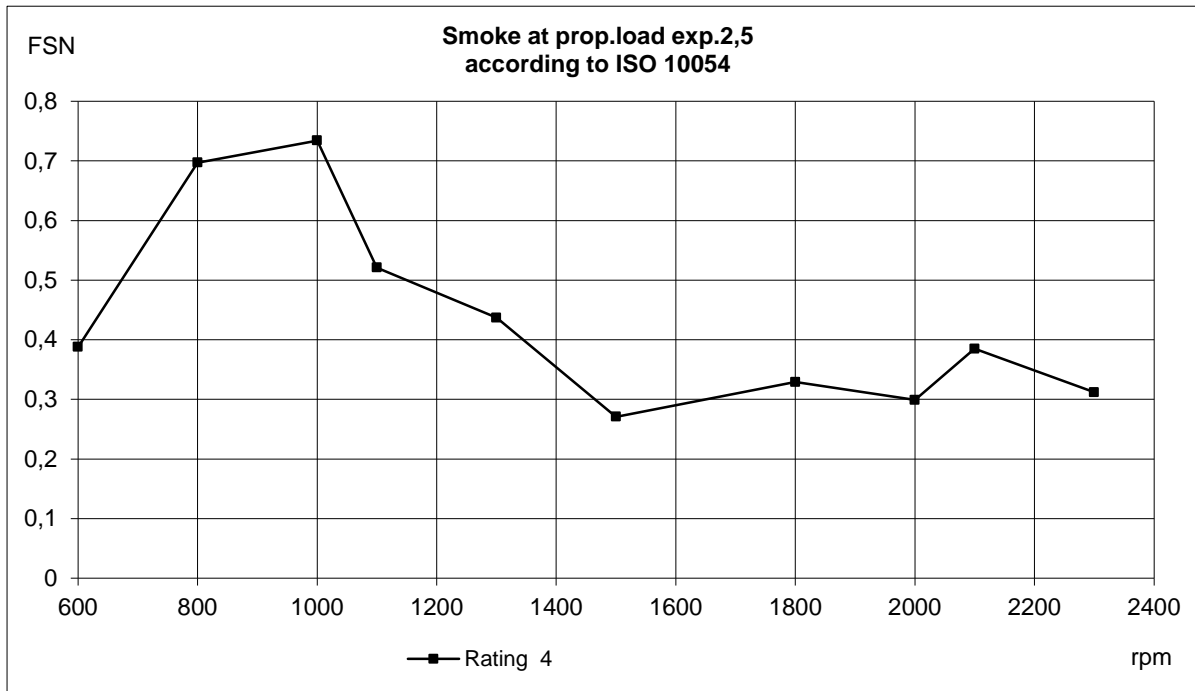


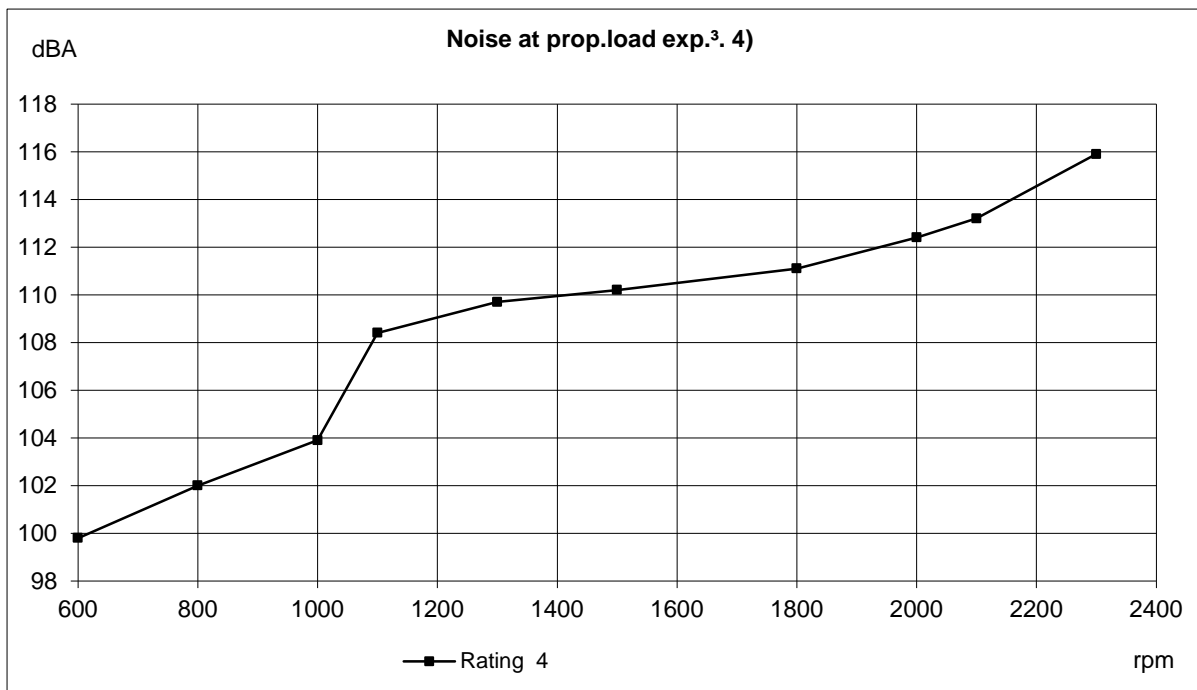
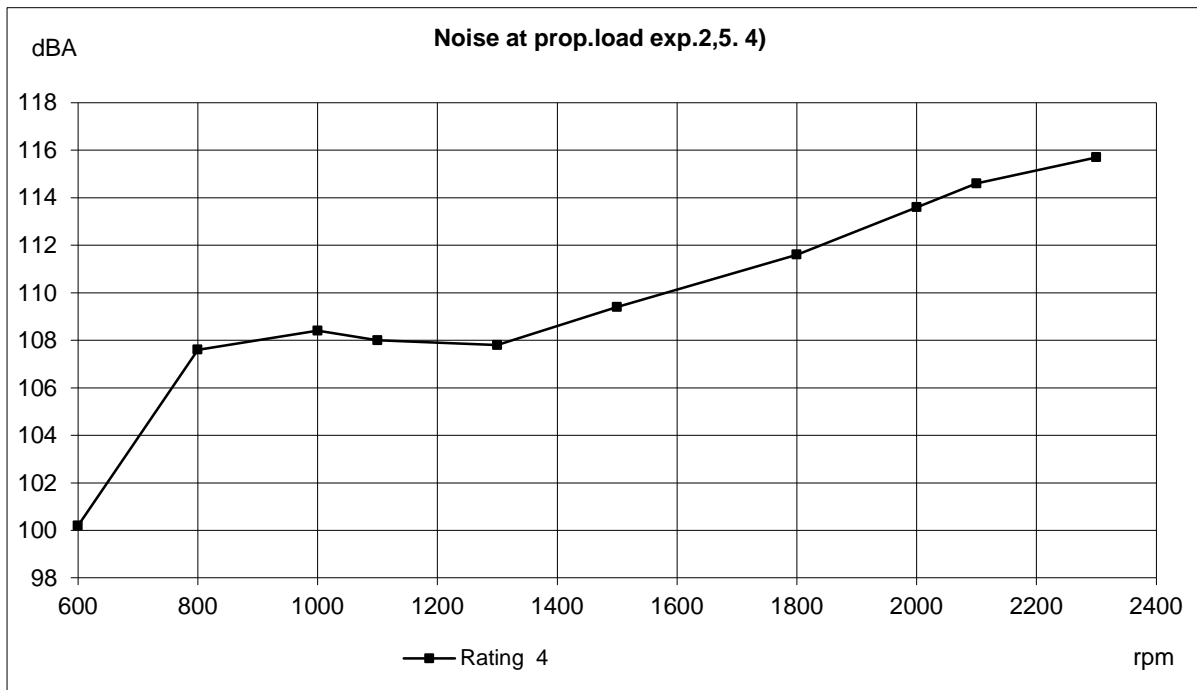








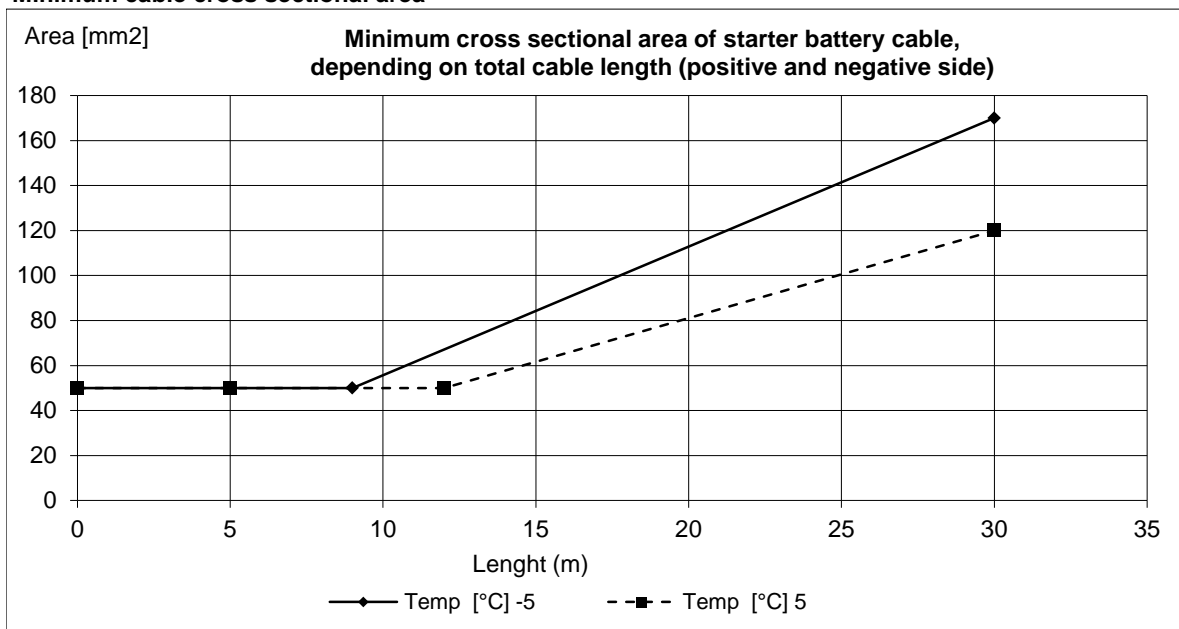




Battery capacity

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) [mm ²]
5					
-5					

Minimum cable cross sectional area



Fuses size:

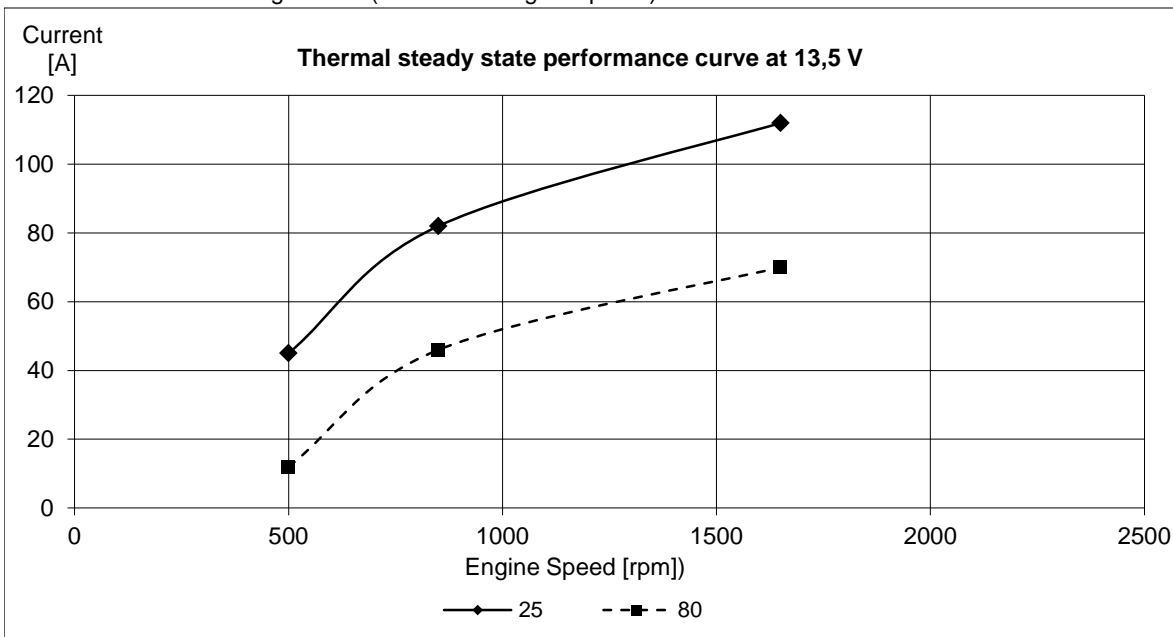
	[A]
Engine:	
Control system:	

Max current consumption during normal operation:

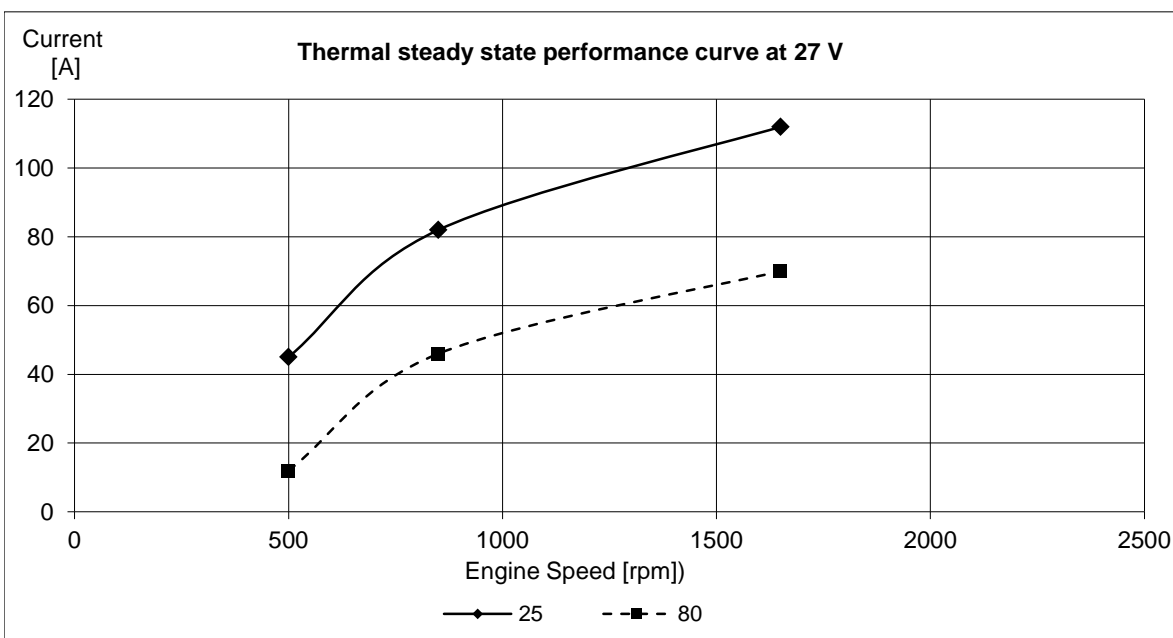
	[A]
Engine :	

Alternator data:

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



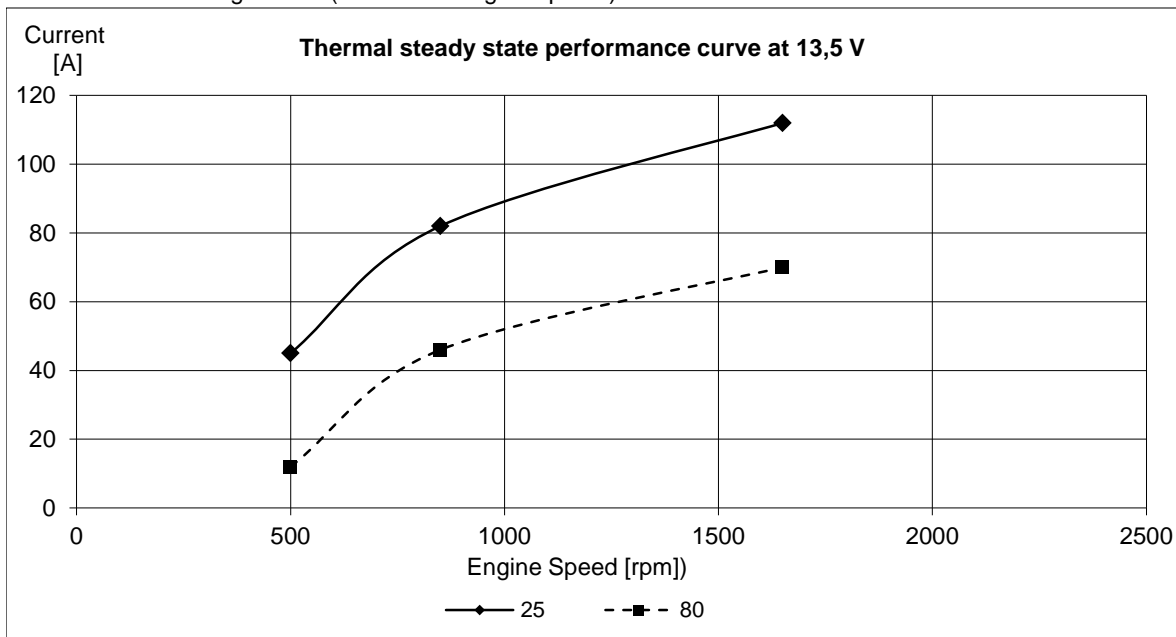
Constant charge voltage: [V]	14,3	+/- 0,3
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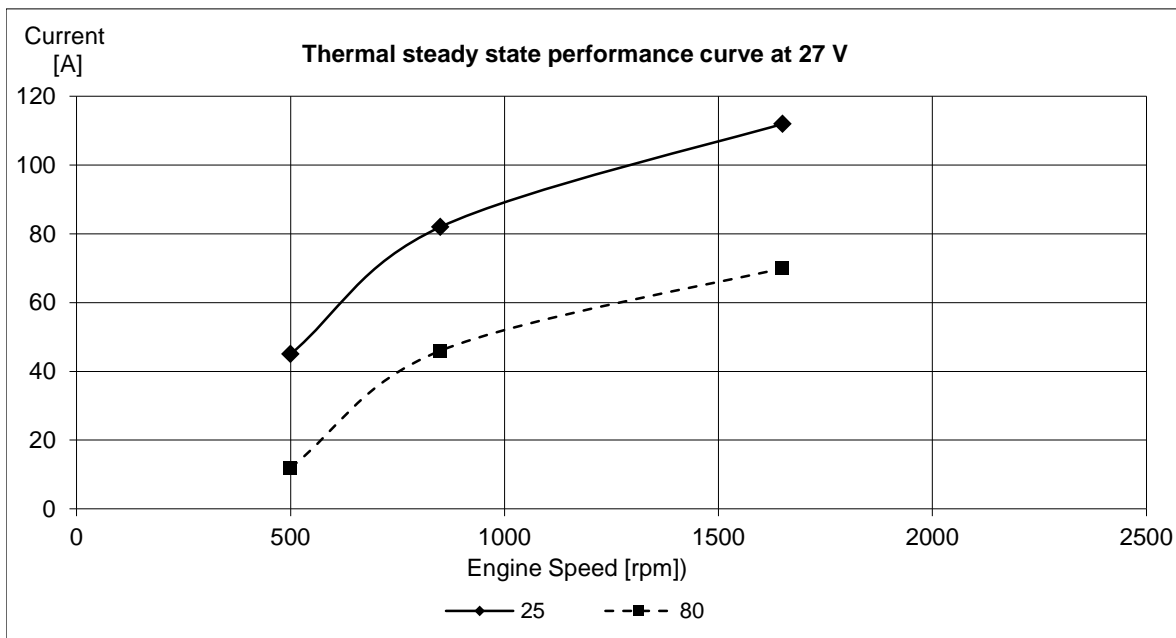
Constant charge voltage: [V]	28,3	+/- 0,3
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Alternator data:

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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