

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		18,5
Compression pressure at 240 rpm	MPa psi	3,5 508
Max. static forward inclination:	°	0
Max. static backward inclination:	°	10
Max. intermittent forward inclination while running:	°	35
Max. intermittent backward inclination while running:	°	35
Max. intermittent side inclination while running:	°	35
Idling speed	rpm	550-800
Rated speed R1	rpm	1900
Propeller selection range R1	rpm	1870-1970
Dry weight engine BT	kg lb	HE=1520, KC=1480 HE=3351, KC=3263

Performance	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Crankshaft power 1), 5)	1	kW	81	159	252	327	381	413	436	441	441
		hp	110	216	342	444	519	561	593	599	600
Propeller shaft power 1) (At full load) With drive Twin Disc 5114	1	kW	78	153	242	313	366	396	418	423	424
		hp	105	208	328	426	498	539	569	575	576
Propellershaft power at prop. load x ^{2.5} With drive Twin Disc 5114	1	kW	24	49	86	135	198	235	276	371	424
		hp	33	67	116	183	269	320	376	504	577
Propellershaft power at prop. load x ³ With drive Twin Disc 5114	1	kW	14	32	62	107	170	209	254	304	424
		hp	18	44	84	146	231	284	345	413	577
Torque at crankshaft 2)	1	Nm	1286	1899	2403	2598	2601	2626	2602	2337	2218
		lbf ft	948	1401	1772	1916	1918	1937	1919	1724	1636
Mean piston speed	1	m/s	3,2	4,2	5,3	6,3	7,4	7,9	8,4	9,5	10,0
		ft/s	10,4	13,8	17,3	20,7	24,2	25,9	27,6	31,1	32,8
Effective mean pressure 2)	1	MPa	1,26	1,87	2,36	2,56	2,56	2,58	2,56	2,30	2,18
		psi	183,4	270,9	342,7	370,6	371,0	374,6	371,1	333,3	316,4
Max combustion pressure 2)	1	MPa	13,9	15,1	20,6	19,8	19,6	19,7	20,5	20,4	20,4
		psi	2016	2190	2988	2872	2843	2857	2973	2959	2959

Lubricating system

Specific lubricating oil consumption.	g/kWh	0,06
Max. oil volume including filters for all allowed installation inclinations:	litres	49
	US gal	12,94
Max. oil volume excluding filters for all allowed installation inclinations:	litres	44
	US gal	11,62
Min. oil volume excluding filters for all allowed installation inclinations:	litres	35
	US gal	9,25

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	1200	1400	1500	1600	1800	1900
Specific fuel consumption att full load	1	g/kWh lb/hph	248,8 0,403	219,3 0,355	194 0,314	189,1 0,306	193,4 0,313	194,2 0,315	196,7 0,319	198,6 0,322	200,2 0,324
Fuel consumption at prop. load x ^{2,5}	1	l/h US gal/h	7,0 1,8	13,0 3,4	22,0 5,8	33,0 8,7	47,0 12,4	56,0 14,8	66,0 17,4	91,0 24,0	105,0 27,7
Fuel consumption at prop. load x ³	1	l/h US gal/h	4,0 1,1	9,0 2,4	16,0 4,2	27,0 7,1	41,0 10,8	51,0 13,5	61,0 16,1	88,0 23,2	105,0 27,7
Fuel consumption at full load	1	l/h US gal/h	24,1 6,4	41,8 11,0	58,4 15,4	73,9 19,5	88,2 23,3	95,9 25,3	102,6 27,1	104,7 27,7	105,7 27,9

Intake and exhaust system	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900	
Specific exhaust heating effect in percent of crankshaft power	1	%	55,0	49,7	51,9	59,2	60,9	62,4	61,3	62,6	63,3	
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.	1	°C °F	552 1026	580 1076	505 941	445 833	474 885	463 865	471 880	475 887	475 887	
Exhaust back pressure after turbocharger at rated speed during test.		kPa psi										12 1,7
Permitted exhaust back pressure after turbocharger. (Installed back pressure)		kPa psi										Max 17 2,5
		kPa psi										Min 0 0,0
Engine air consumption at 25°C / 77°F atmospheric pressure 100kPA	1	m³/min cu.ft./min	4,6 162,4	8,2 289,6	13,8 487,3	23,5 829,9	25 882,9	27,7 978,2	28,7 1014	29,6 1045	29,8 1052	
Charge air pressure Inlet manifold	1	kPa psi	37 5,4	85 12,3	151 21,9	216 31,3	231 33,5	250 36,3	247 35,8	230 33,4	220 31,9	
Exhaust gas flow	1	m³/min cu.ft./min	12,1 427,3	21,6 762,8	35,9 1268	53,2 1879	64 2260	70,8 2500	73,6 2599	75,7 2673	76,2 2691	

Cooling system	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Radiated heat (per engine)	1	kW	5	5	5	5	6	6	7	7	7
Heat rejection to charge air coolers	1	kW	3	12	30	57	72	87	92	94	94
Coolant heat rejection to HE, incl. engine oil cooler and excl. charge air coolers.	1	kW	112	167	171	160	195	199	228	233	236
Coolant flow with fully open thermostat and std cooling system		l/min cu.ft./min	120 4,2	192 6,8	246 8,7	306 10,8	360 12,7	384 13,6	408 14,4	450 15,9	480 17,0
Max. permissible temperature on coolant in engine outlet		°C °F	98 208								
Coolant volume engine, including heat exchanger and charge air cooler		litres US gal.	51 13,47								
Max. additional coolant for cabin heater etc. with std. Expansion tank		litres US gal.	15 3,96								
Maximum coolant flow to cabin heater etc.		l/min cu.ft./min	42 1,48								
Thermostat, start open at		°C °F	82 180								
Thermostat, fully open at		°C °F	92 198								

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ISO 8665 (=SAE J 1228=ICOMIA 28-83)
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- 5) At installed back pressure

VOLVO PENTA D13 MH (R2-600)	Document No	Issue Index
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Raw water circuit	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Nominal raw water design flow	l/min	161	216	273	320	368	392	414	436	456
	cu.ft./min	5,7	7,6	9,6	11,3	13,0	13,8	14,6	15,4	16,1
Nominal raw water pump pressure head at design flow. (measured before and after pump)	kPa	19	30	49	66	84	95	107	119	131
	psi	2,8	4,4	7,1	9,6	12,2	13,8	15,5	17,3	19,0
Maximum raw water pump suction head	kPa	-30								
	psi	-4,4								
Maximum raw water temperature entering heat exchanger	°C	32								
	°F	90								

2 circuit keel cooling system, LT	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Maximum temperature to charge air cooler from external LT-cooling system	1	°C									42
		°F									108
Coolant flow through keel cooler, LT-cooling system circuit	1	l/min	33	45	58	70	81	85	90	96	98
		cu.ft./min	1,2	1,6	2,0	2,5	2,9	3,0	3,2	3,4	3,5
Pressure drop in external LT-cooling system circuit, including piping		kPa	85								
		psi	12,3								
Coolant volume charge air cooler		litres	5								
		US gal.	1,32								

2 circuit keel cooling system, HT	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Design point for keel cooler, engine outlet temperature	1	°C									88
		°F									190
Maximum temperature to engine from external HT-cooling system circuit	1	°C									70
		°F									158
Coolant flow through keel cooler, HT-cooling system circuit at design point	1	l/min									182
		cu.ft./min									6,4
Maximum coolant flow through keel cooler, HT-cooling system circuit	1	l/min									295
		cu.ft./min									10,4
Pressure drop in external HT-cooling system circuit, including piping		kPa	85								
		psi	12,3								
Coolant volume engine, excl. heat exchangers		litres	28								
		US gal.	7,40								

Emissions	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Smoke at prop. load x ^{2.5}	1	*BSU	0,06	0,08	0,41	0,24	0,13	0,11	0,07	0,10	0,15
Smoke at prop. load x ³	1	*BSU	0,07	0,07	0,24	0,21	0,16	0,20	0,08	0,10	0,15
Noise at prop. load x ³ . 4)	1	dBA	99,5	101,7	103,8	108,4	109,8	110,2	111,1	113,2	114

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

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ISO 8665 (=SAE J 1228=ICOMIA 28-83)
- 2) At power according to 1).
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- 4) Acc. to ISO 3744
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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	1500 rpm	1900 rpm	
Charge air pressure	0,5-4,5 V	50-600 ±4.2 kPa	kPa		600 rpm	1000 rpm	1200 rpm	1500 rpm	1900 rpm	<i>From prop curve 2.5 with IPS drive</i>
Warning Level			kPa	30 sec from start / 2.2sec	280	280	280	290	368	
Derating Level			kPa	10% trq. decr. per sec	290	290	290	300	378	
Charge air temperature	50-0 kΩ	-40 - 130 ±4%	°C		600 rpm	1000 rpm	1200 rpm	1500 rpm	1900 rpm	
Warning Level			°C	60 sec from start / 15 sec	80	80	80	80	75	
Derating Level			°C		85	85	85	85	80	See derating map
Coolant pressure	0,5-4,5 V	0-300 ± 3%	kPa		600 rpm	1000 rpm	1200 rpm	1500 rpm	1900 rpm	
Warning Level			kPa	30 sec from start /1.5sec	0	25	35	50	85	
Derating Level			kPa	10% trq. decr. per sec	-5	20	30	45	80	
Fuel pressure	0,5-4,5 V	0-700 ±2.5%	kPa		600 rpm	1000 rpm	1200 rpm	1500 rpm	1900 rpm	
Warning Level			kPa	60 sec from start / 5 sec	80	80	80	205	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	1500 rpm	1900 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	1500 rpm	1900 rpm	
Warning Level			kPa	30 sec from start /5 sec	-5	10	18	30	50	
Derating Level			kPa	10% trq. decr. per sec	-15	0	8	20	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 1900+15%	Frequency	153 puls./rev	rpm / Hz	Instant	2185 rpm/5572 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		IPSxxx
Transmission type		IPSx-y
Gear ratio (total)		1,xx:1 and 1,xx:1
Steering angle, max.		+/- xx
Total weight of drive unit (1)	kg	xxx
Oil capacity, approx.	litres	xx
Oil volume difference MIN-MAX	litres	0,x
Oil type		Volvo Penta API GL5 75W/90
Propeller range		

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

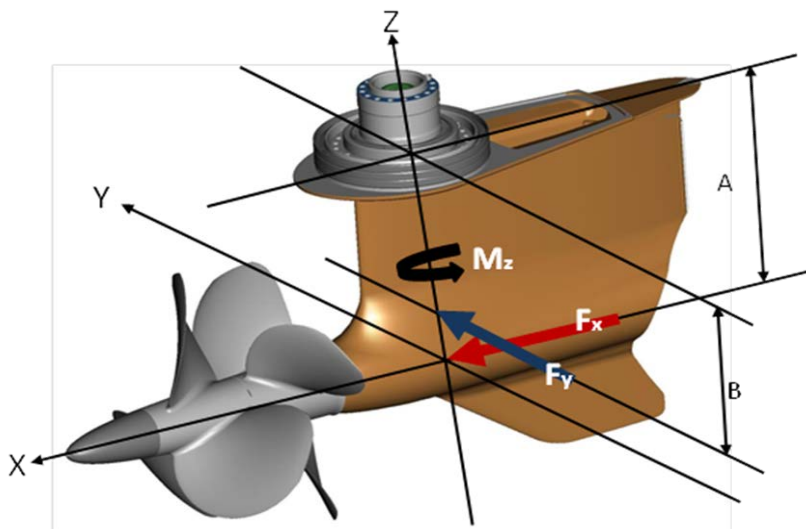
"Generalized maximum load document"for IPS3

Valid products	Drive Unit	Gear Ratio
IPSxxxx	IPSx	1,xx: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	F _x	xx kN
	F _y (+/-)	xx kN
	M _z (+/-)	xx kNm
28-42 kn	F _x	xx kN
	F _y (+/-)	xx kN
	M _z (+/-)	xx kNm

A	xxx mm
B	xxx 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	

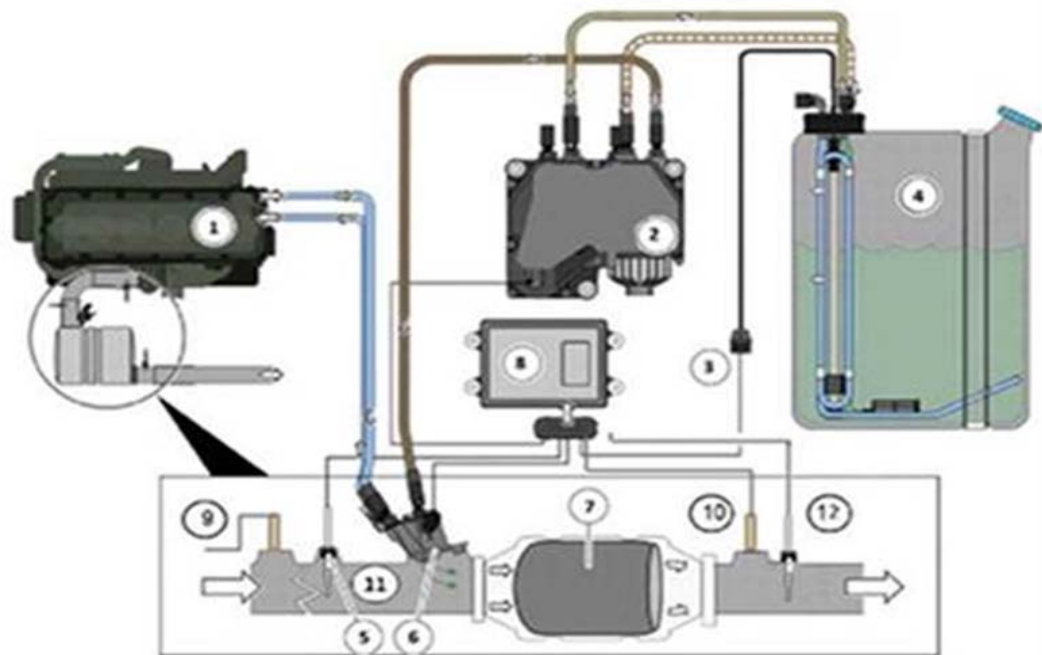
Flow data:

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	1200	1300	1400	1500	1600	1800	1900
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	1	1	1	2	2	3	4	5	8
		psi		0,1	0,1	0,1	0,3	0,3	0,4	0,6	0,7	1,2
SCR muffler pressure drop at Full load		kPa	1	1	3	4	5	5	6	7	7	8
		psi	0,1	0,1	0,4	0,6	0,7	0,7	0,9	1,0	1,0	1,2

AUS system	Rating	rpm	600	800	1000	1200	1300	1400	1500	1600	1800	1900
Specific AUS consumption		g/kWh	8,06	8,96	14,38	12,78	12,93	10,89	11,20	11,03	12,68	13,59
		lb/hph	0,01	0,01	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
AUS consumption at prop. load $x^{2.5}$		l/h	0,31	0,61	1,02	1,64	2,20	2,75	3,09	3,55	5,56	6,50
		US gal/h	0,08	0,16	0,27	0,43	0,58	0,73	0,82	0,94	1,47	1,72
AUS consumption at prop. load x^3		l/h	0,00	0,25	0,57	1,10	1,72	2,21	2,83	3,61	5,46	6,55
		US gal/h		0,07	0,15	0,29	0,45	0,58	0,75	0,95	1,44	1,73
AUS consumption at Full load		l/h	0,71	1,55	3,94	4,55	5,00	4,53	5,04	5,24	6,10	6,54
		US gal/h	0,19	0,41	1,04	1,20	1,32	1,20	1,33	1,38	1,61	1,73

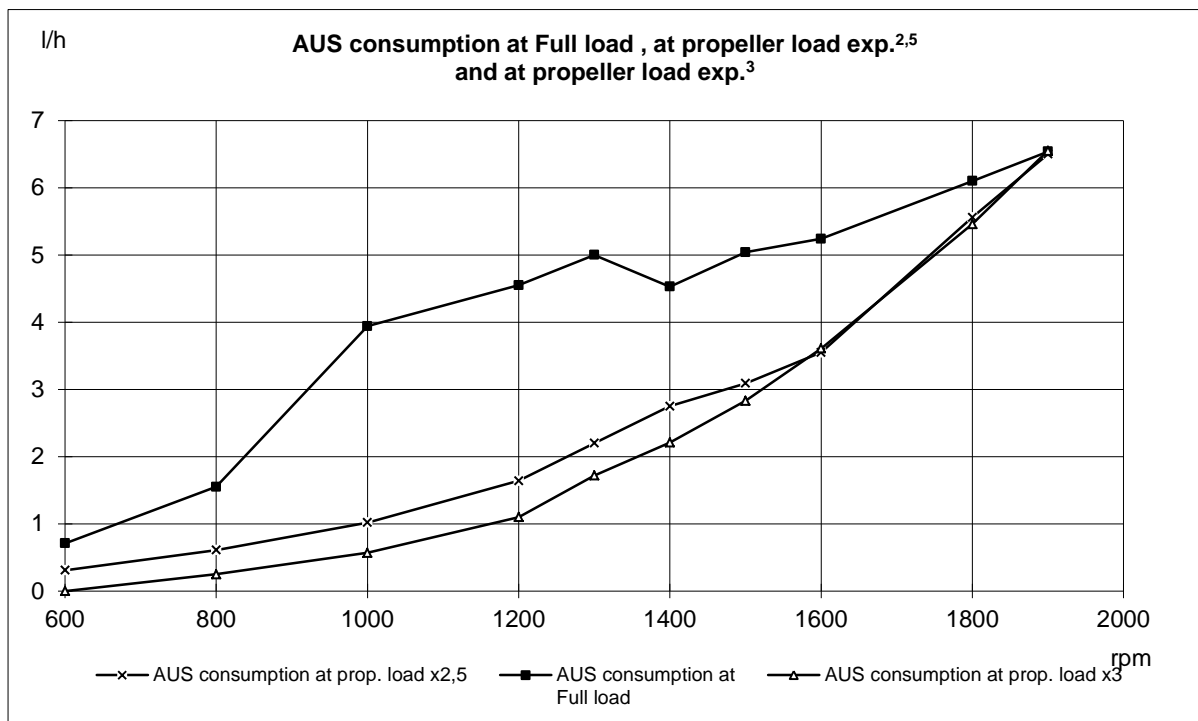
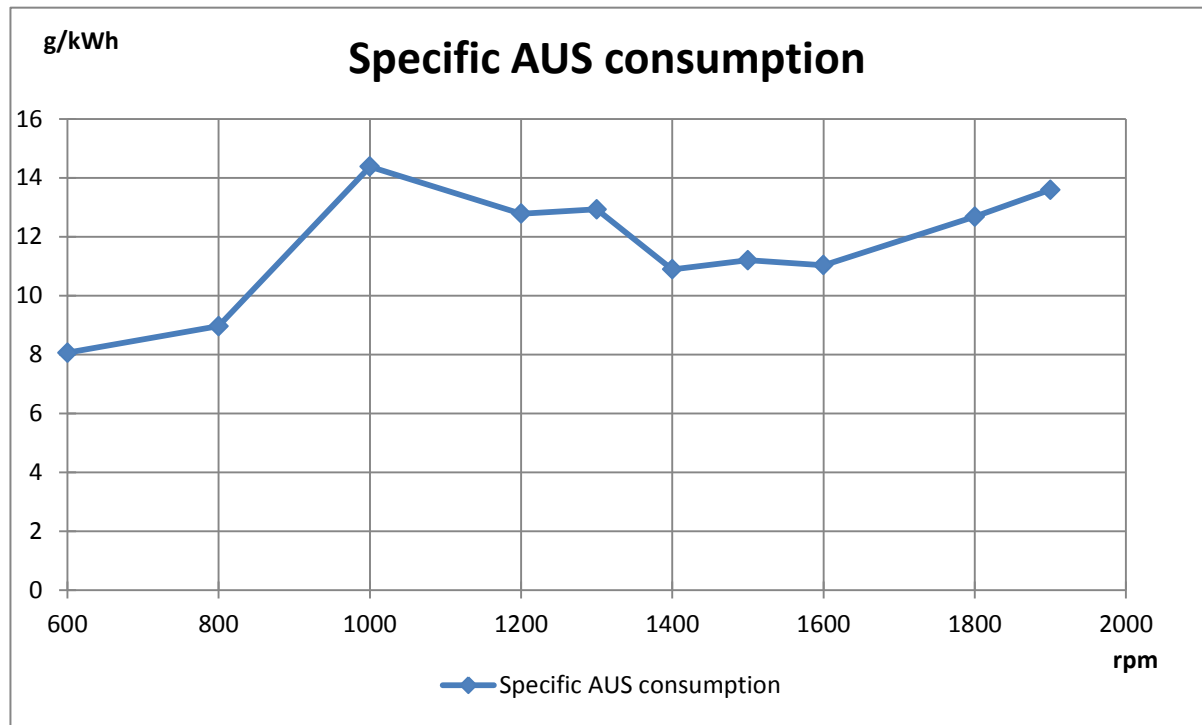
AUS concentration 32.5%

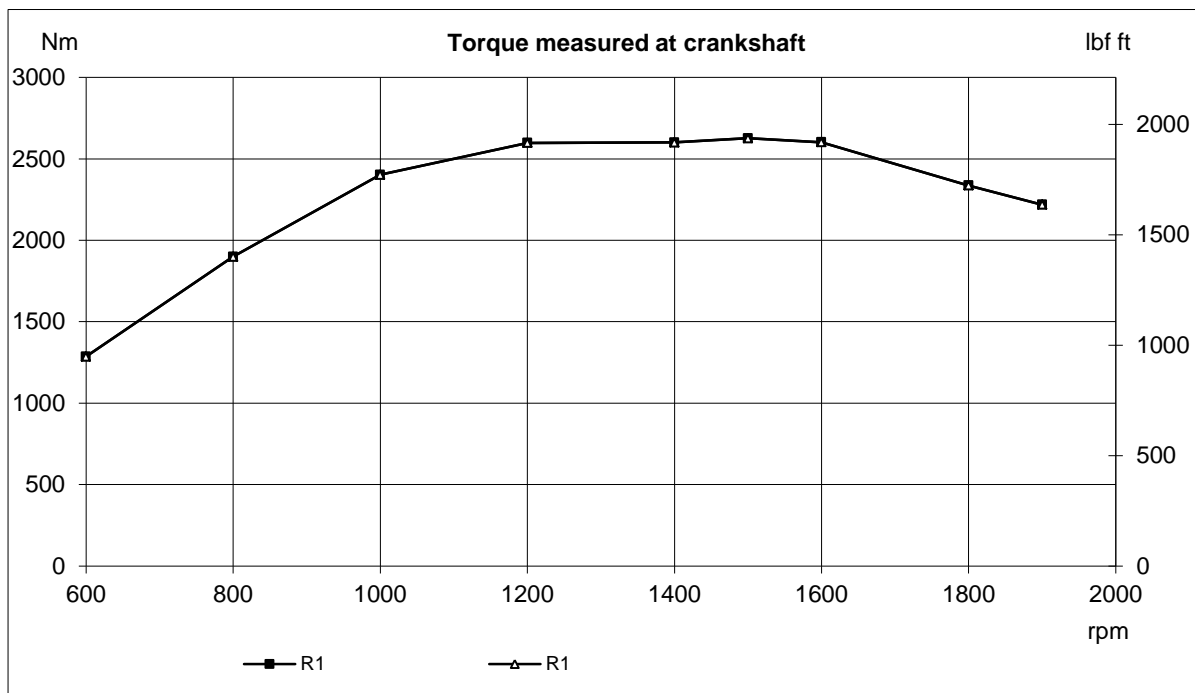
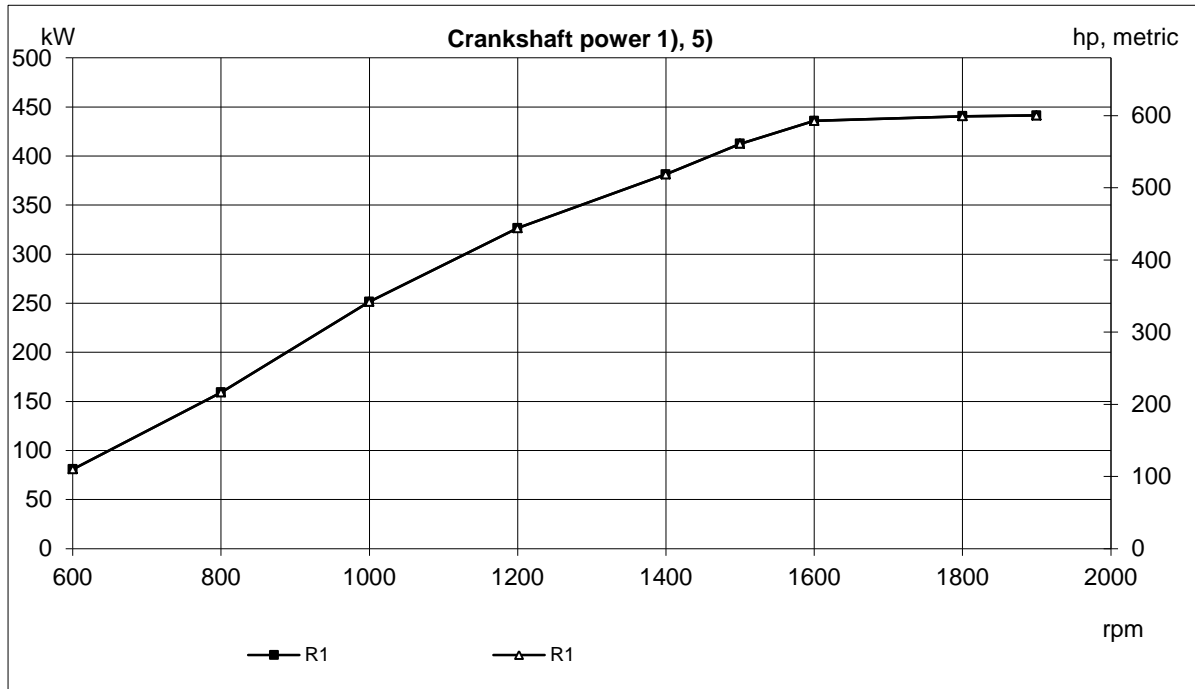


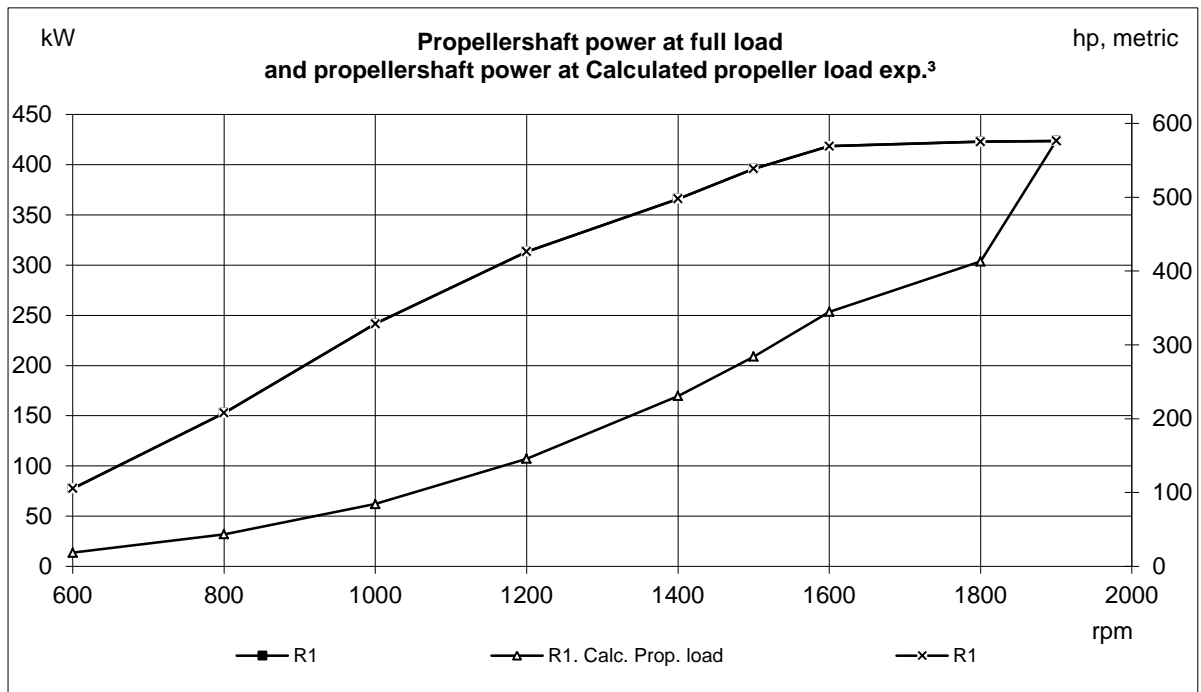
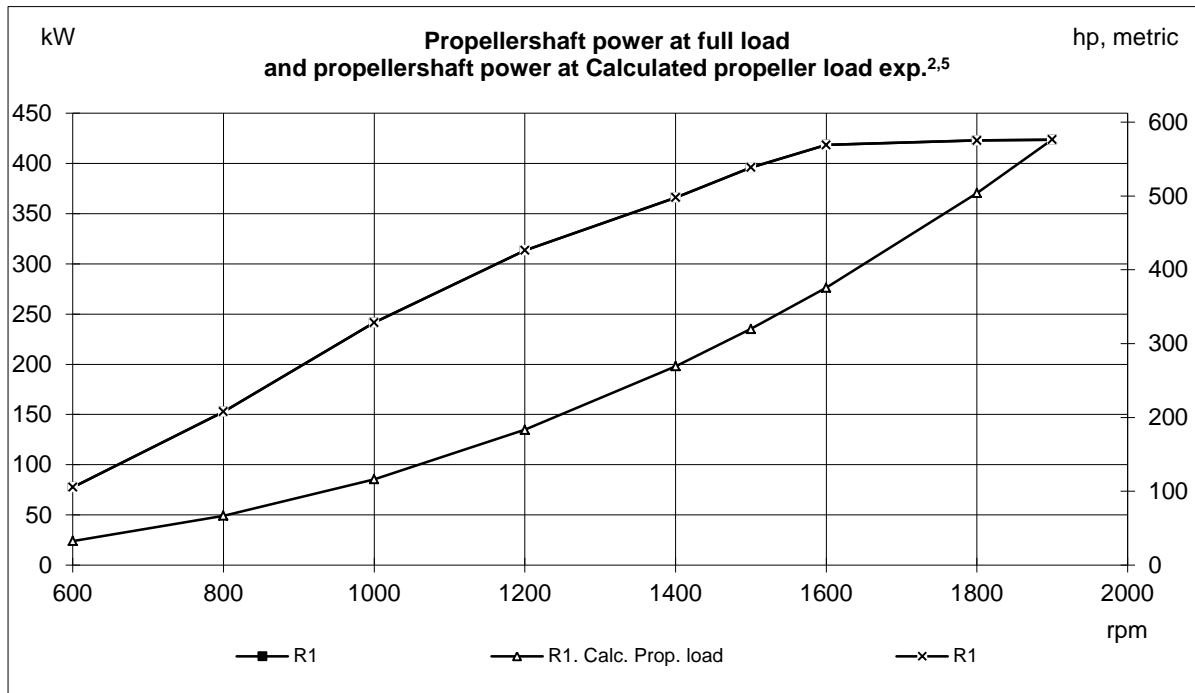
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|-------------------------------------|-------------------------------------|
| 1. Engine | 7. Catalytic converter (SCR) |
| 2. AUS pump | 8. ACM (After Treatment Module) |
| 3. Sensor connector QLT | 9. Front NOx sensor |
| 4. AUS tank with QLT |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

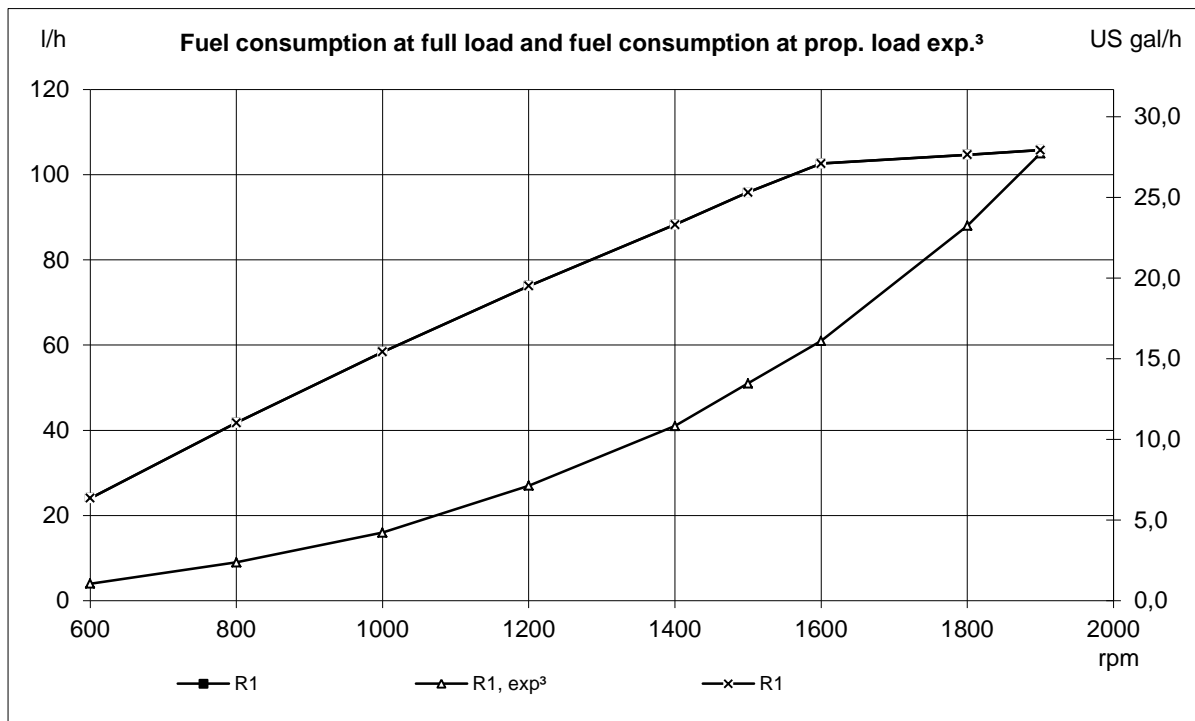
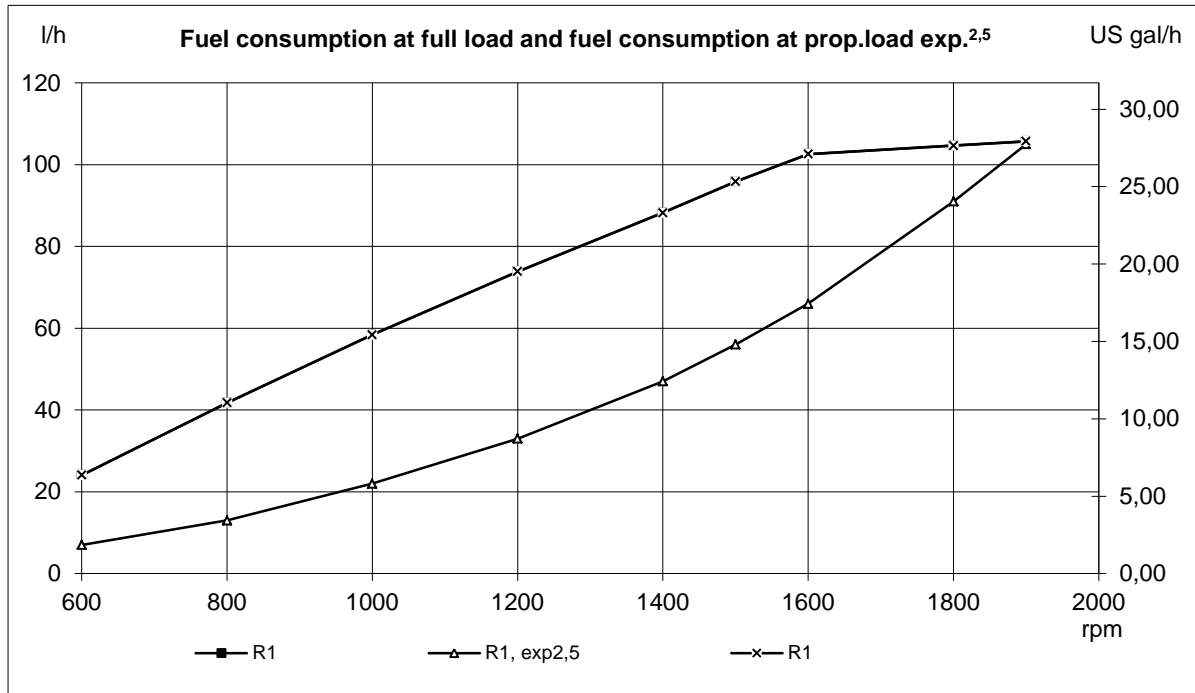
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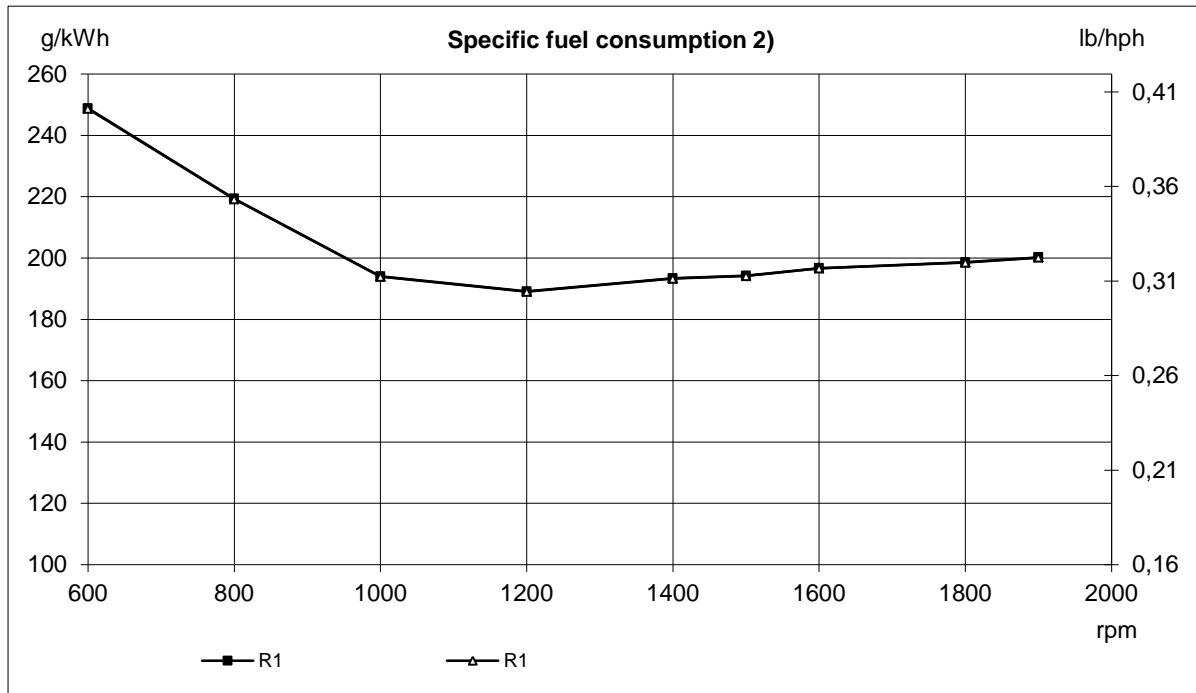
ACM	Aftertreatment Control Module
AUS	Aqueous Urea Solution
EATS	Exhaust Aftertreatment System
SCR	Selective Catalytic Reduction
UDS	Urea Dosing System
UQS	Urea Quality Sensor

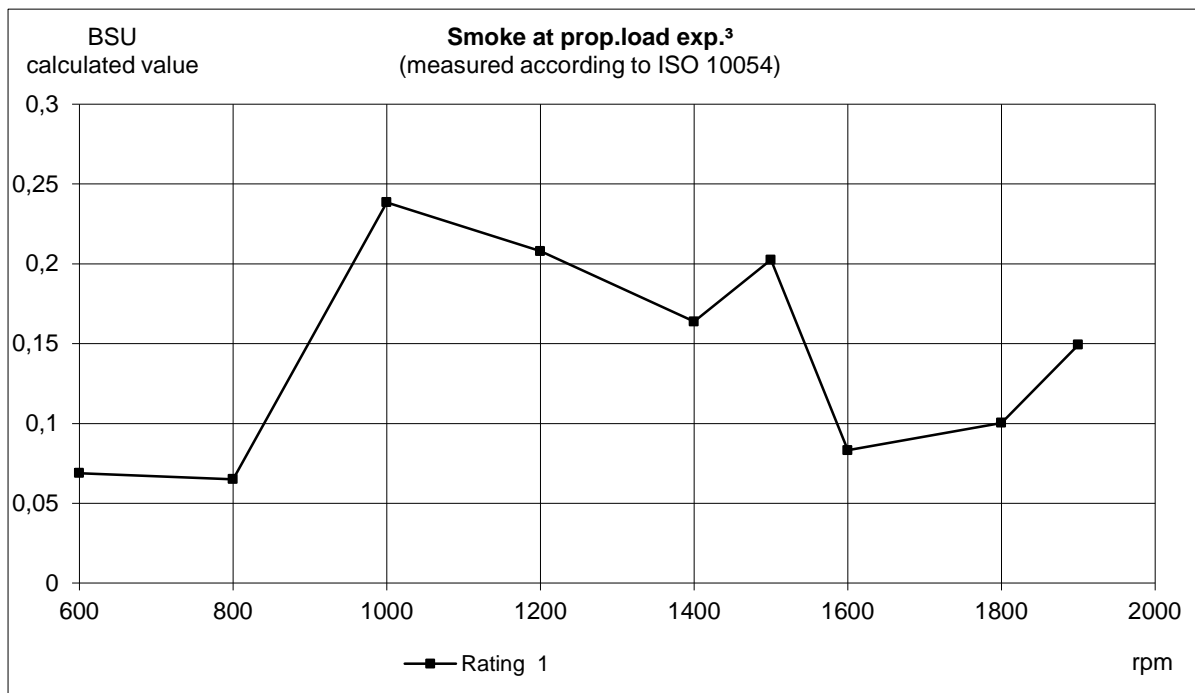
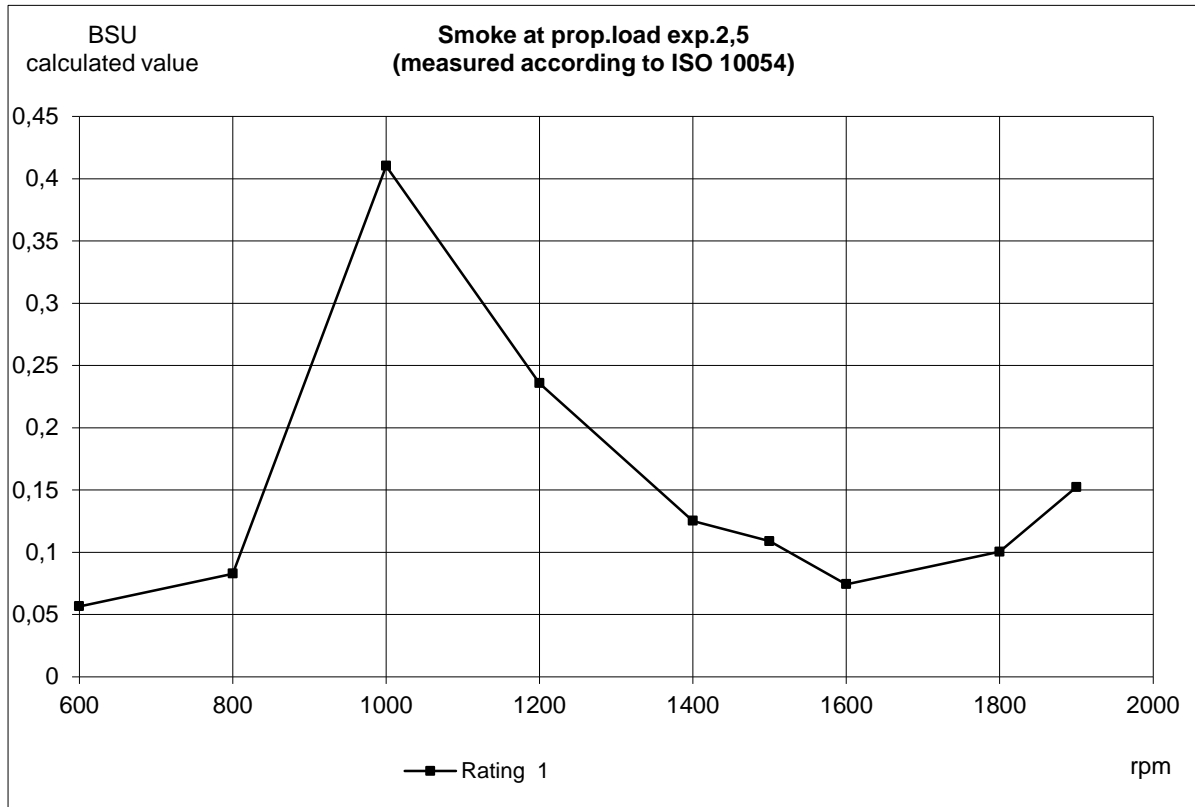


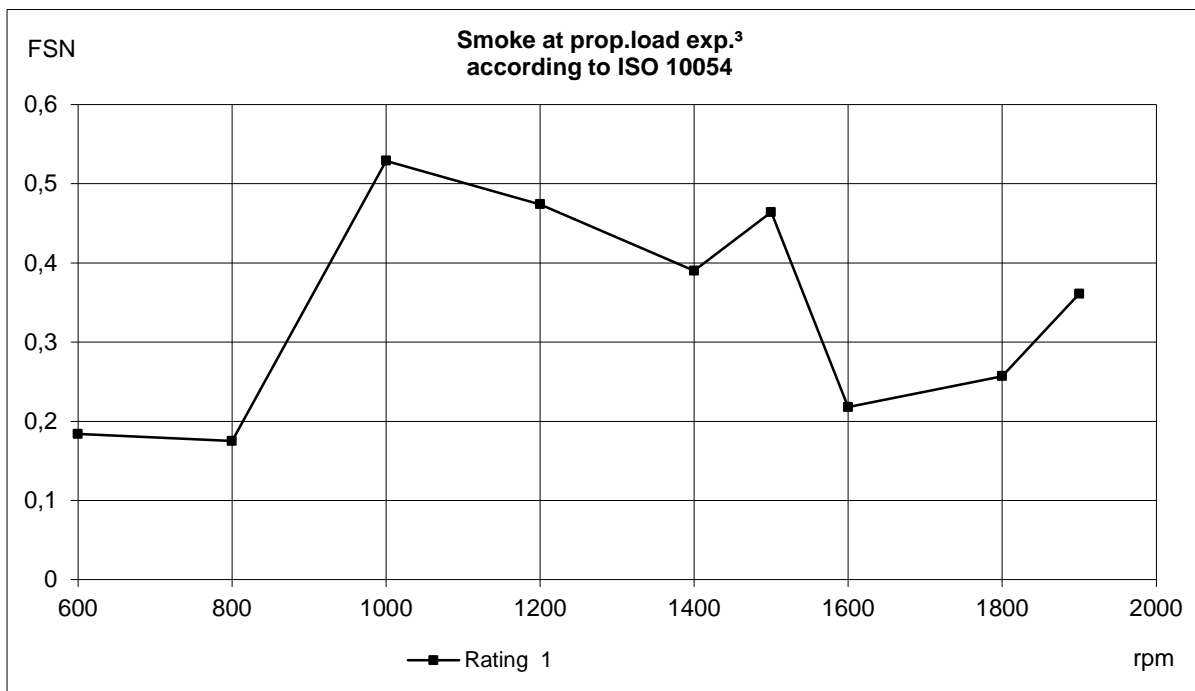
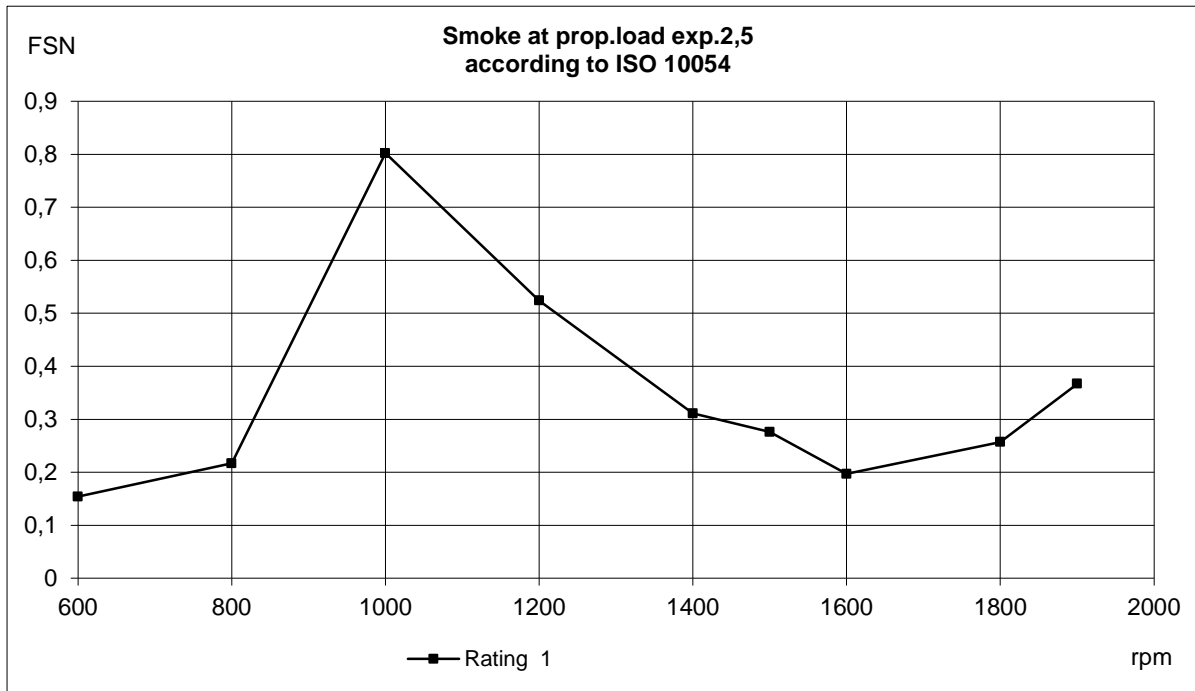


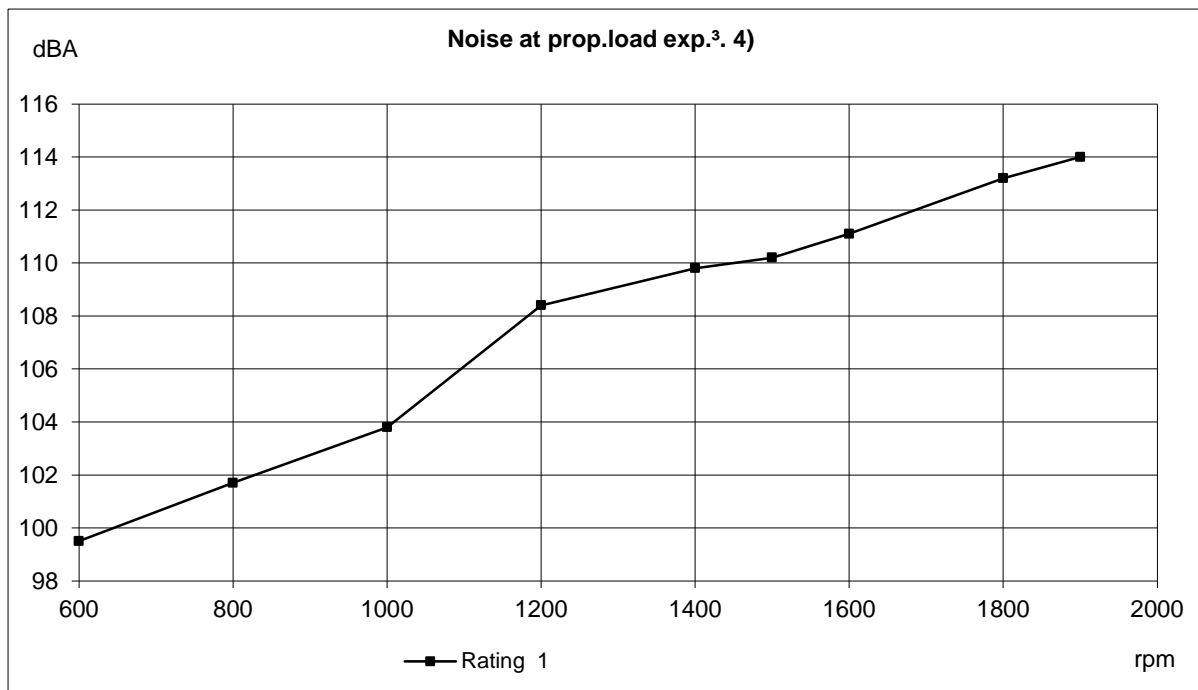
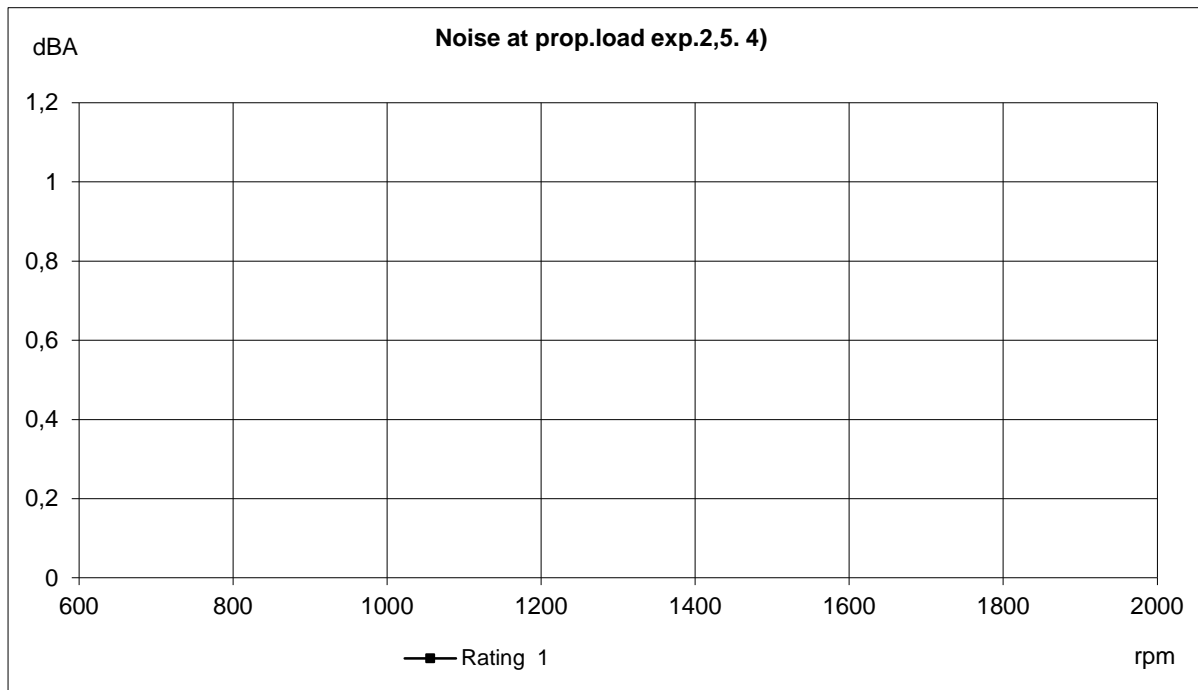








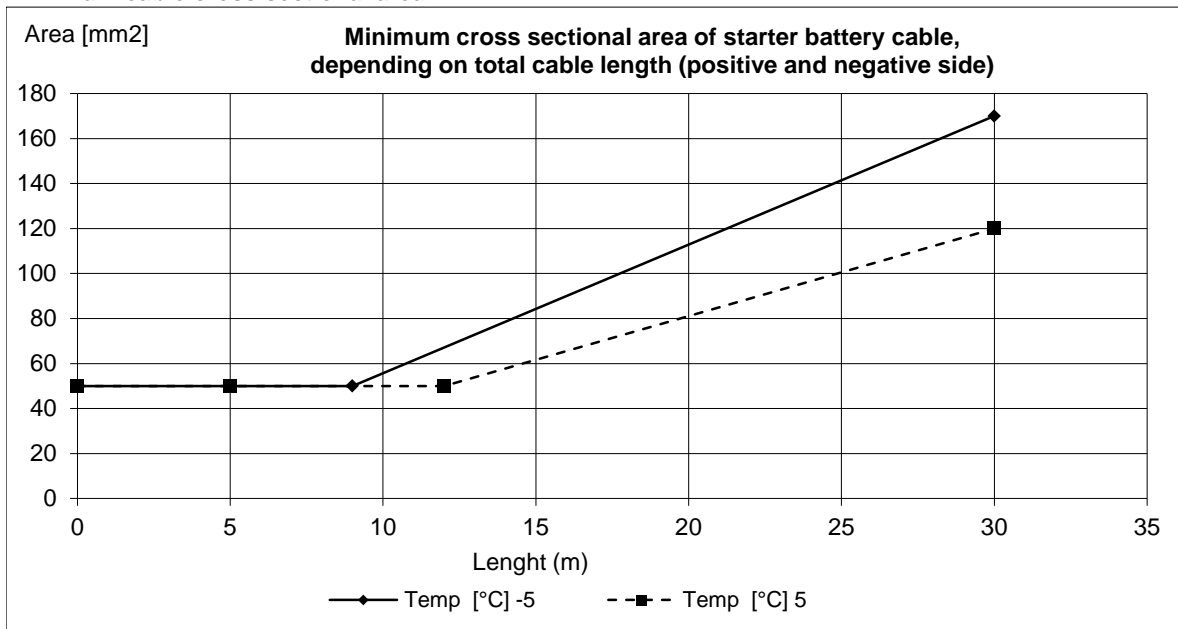




Battery capacity

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:

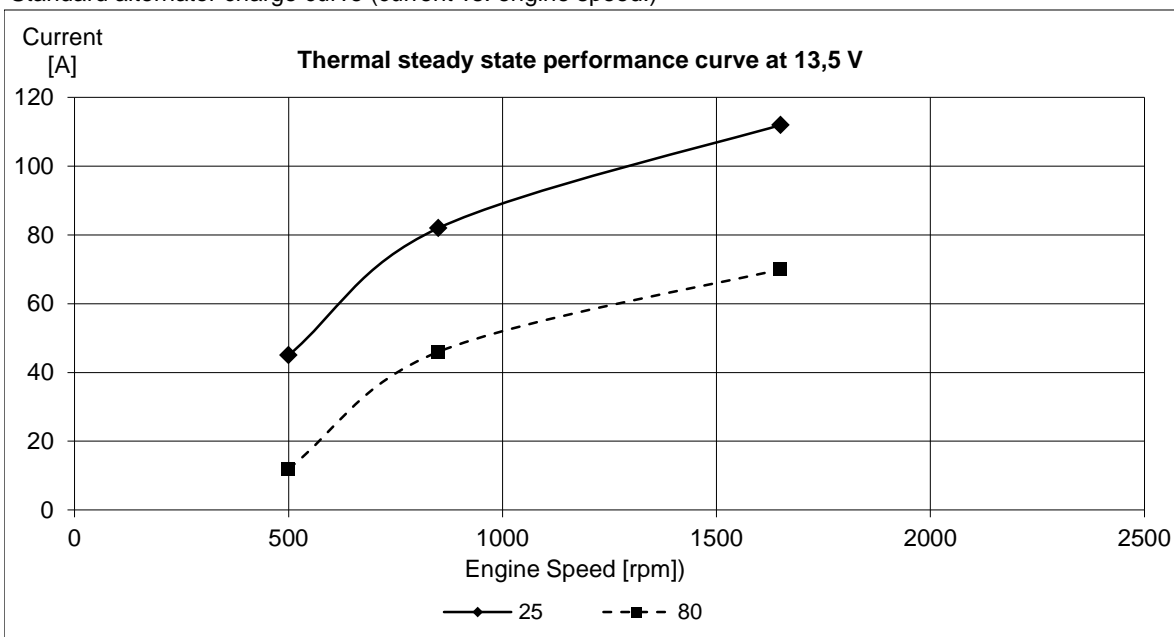
	[A]
Engine:	
Control system:	

Max current consumption during normal operation:

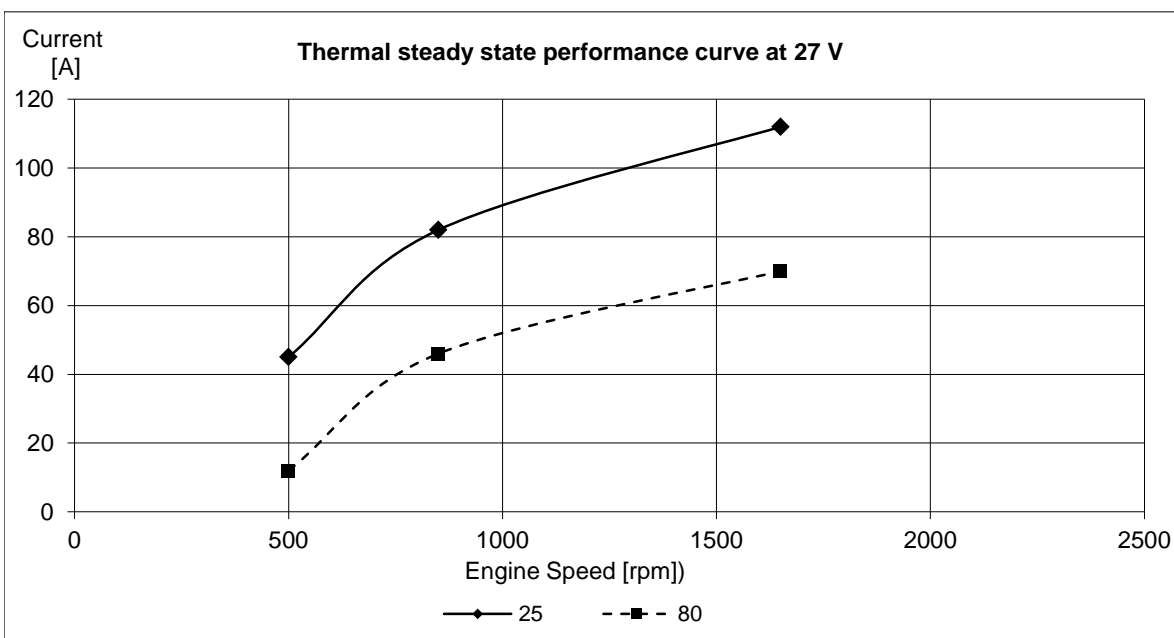
	[A]
Engine :	

Alternator data:

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



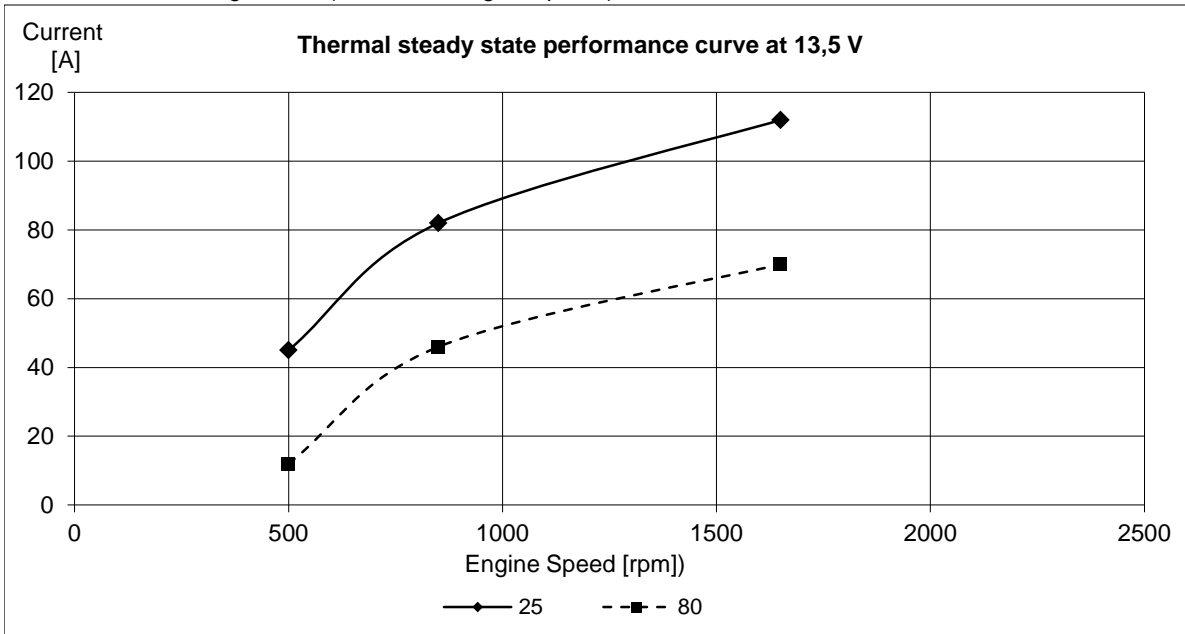
Constant charge voltage: [V]	14,3	+/- 0,3
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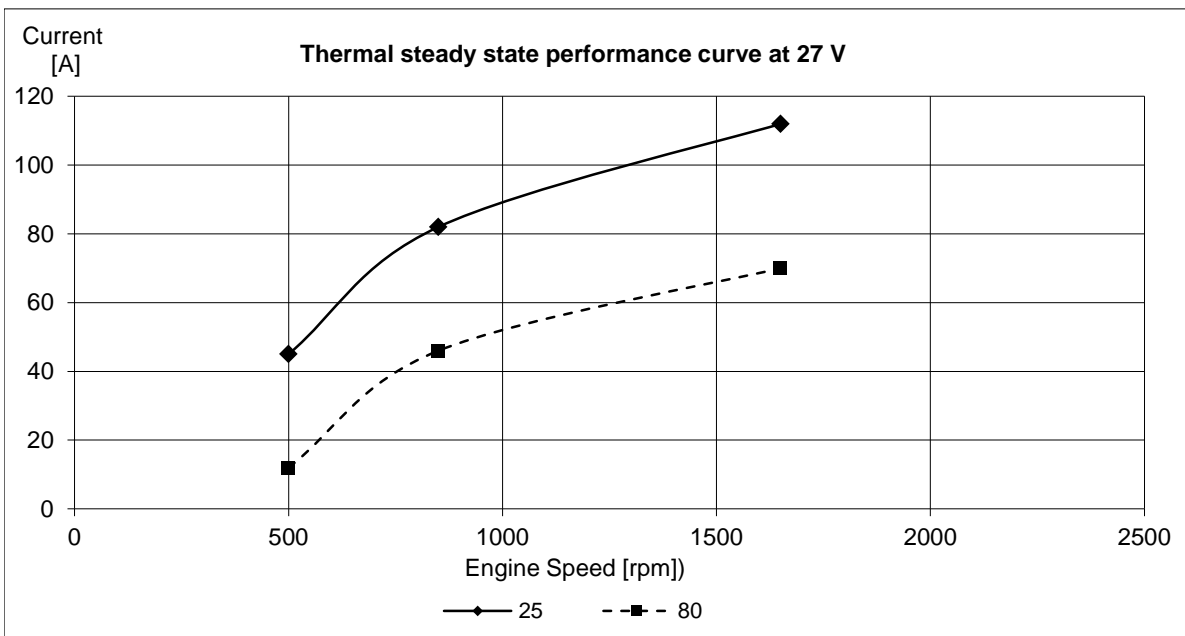
Constant charge voltage: [V]	28,3	+/- 0,3
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Alternator data:

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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