

VOLVO PENTA D13 MH (R1-400)	Document No	Issue Index
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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	1800
Propeller selection range R1	rpm	1770-1870
Dry weight engine BT	kg lb	HE=1520, KC=1480 HE=3351, KC=3263

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

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Performance	Rating	rpm	600	800	1000	1200	1400	1500	1600	1700	1800
Crankshaft power 1), 5)	1	kW	82	146	194	232	267	286	293	294	294
		hp	112	199	264	316	363	389	398	400	400
Propeller shaft power 1) (At full load) With drive Twin Disc 5114	1	kW	78	140	186	222	256	274	281	283	283
		hp	106	190	253	302	349	373	382	384	384
Propellershaft power at prop. load x ^{2.5} With drive Twin Disc 5114	1	kW	18	37	65	103	151	180	211	245	283
		hp	25	51	89	140	205	244	287	333	385
Propellershaft power at prop. load x ³ With drive Twin Disc 5114	1	kW	11	25	49	84	134	164	199	239	283
		hp	15	34	67	115	182	223	271	325	385
Torque at crankshaft 2)	1	Nm	1305	1743	1853	1846	1821	1821	1749	1651	1560
		lbf ft	963	1285	1366	1362	1343	1343	1290	1218	1150
Mean piston speed	1	m/s	3.2	4.2	5.3	6.3	7.4	7.9	8.4	9.0	9.5
		ft/s	10.4	13.8	17.3	20.7	24.2	25.9	27.6	29.4	31.1
Effective mean pressure 2)	1	MPa	1.28	1.71	1.82	1.82	1.79	1.79	1.72	1.62	1.53
		psi	186.2	248.6	264.3	263.3	259.8	259.7	249.4	235.6	222.5
Max combustion pressure 2)	1	MPa	14.8	15.8	15.1	15.2	15.6	16.3	16.4	15.1	14.7
		psi	2147	2292	2190	2205	2263	2364	2379	2190	2132

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

Fuel system	Rating	rpm	600	800	1000	1200	1400	1500	1600	1700	1800
Specific fuel consumption att full load	1	g/kWh	250.3	217.3	196.1	190.0	189.7	190.4	191.6	196.6	198.9
		lb/hph	0.405	0.352	0.318	0.308	0.307	0.308	0.31	0.318	0.322
Fuel consumption at prop. load x ^{2.5}	1	l/h	5.0	10.0	17.0	26.0	37.0	44.0	51.0	60.0	69.0
		US gal/h	1.3	2.6	4.5	6.9	9.8	11.6	13.5	15.9	18.2
Fuel consumption at prop. load x ³	1	l/h	4.0	7.0	13.0	22.0	33.0	41.0	49.0	59.0	69.0
		US gal/h	1.1	1.8	3.4	5.8	8.7	10.8	12.9	15.6	18.2
Fuel consumption at full load	1	l/h	24.6	38.0	45.5	52.7	60.6	65.2	67.2	69.2	70.0
		US gal/h	6.5	10.0	12.0	13.9	16.0	17.2	17.7	18.3	18.5

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Intake and exhaust system	Rating	rpm	600	800	1000	1200	1400	1500	1600	1700	1800	
Specific exhaust heating effect in percent of crankshaft power	1	%	54	50	55	63	69	71	75	72	74	
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.	1	°C	490	534	461	398	367	356	345	388	388	
		°F	914	993	862	748	693	673	653	730	730	
Exhaust back pressure after turbocharger at rated speed during test.		kPa									12	
		psi									1.7	
Permitted exhaust back pressure after turbocharger. (Installed back pressure)		kPa									Max	17
		psi									Max	2.5
		kPa									Min	0
		psi									Min	0.0
Engine air consumption at 25°C / 77°F atmospheric pressure 100kPA	1	m³/min	4.6	7.7	11.5	16.0	20.2	22.5	24.3	23.2	23.8	
		cu.ft./min	162.4	270.2	404.4	565	713.4	794.6	858.1	819.3	840.5	
Charge air pressure Inlet manifold	1	kPa	37	71	106	139	168	181	185	161	155	
		psi	5.4	10.3	15.4	20.2	24.4	26.3	26.8	23.4	22.5	
Exhaust gas flow	1	m³/min	13.6	23.3	30.4	36.7	42.6	45.3	47.2	48.4	49.2	
		cu.ft./min	480.3	822.8	1074	1296	1504	1600	1667	1709	1737	

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Cooling system	Rating	rpm	600	800	1000	1200	1400	1500	1600	1700	1800
Radiated heat (per engine)	1	kW	4	4	5	5	6	6	6	6	7
Heat rejection to charge air coolers	1	kW	3	9	19	32	46	54	60	52	52
Coolant heat rejection to HE, incl. engine oil cooler and excl. charge air coolers.	1	kW	113	148	133	115	107	104	96	131	133
Coolant flow with fully open thermostat and std cooling system		l/min	120	192	246	306	360	384	408	420	450
		cu.ft./min	4.2	6.8	8.7	10.8	12.7	13.6	14.4	14.8	15.9
Max. permissible temperature on coolant in engine outlet		°C	98								
		°F	208								
Coolant volume engine, including heat exchanger and charge air cooler		litres	51								
		US gal.	13.47								
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	42								
		cu.ft./min	1.48								
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	1200	1400	1500	1600	1700	1800
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	1700	1800
Maximum temperature to charge air cooler from external LT-cooling system	1	°C										44
		°F										
Coolant flow through keel cooler, LT-cooling system circuit	1	l/min		33	45	58	70	81	85	90	93	96
		cu.ft./min		1.2	1.6	2.0	2.5	2.9	3.0	3.2	3.3	3.4
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	1700	1800
Design point for keel cooler, engine outlet temperature	1	°C										89
		°F										
Maximum temperature to engine from external HT-cooling system circuit	1	°C										70
		°F										
Coolant flow through keel cooler, HT-cooling system circuit at design point	1	l/min										121
		cu.ft./min										
Maximum coolant flow through keel cooler, HT-cooling system circuit	1	l/min										216
		cu.ft./min										
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	1700	1800
Smoke at prop. load x ^{2.5}	1	*BSU		0.06	0.06	0.26	0.21	0.14	0.17	0.13	0.14	0.14
Smoke at prop. load x ³	1	*BSU		0.11	0.10	0.16	0.21	0.16	0.18	0.14	0.14	0.15
Noise at prop. load x ³ . 4)	1	dBA		100.0	101.5	104.1	107.6	109.2	110.1	111.1	111.9	112.7

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

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Sensors : Control and Monitoring System							Engine protection action
Sensors	Signal	Range	Unit	Warning Initial Delay / Warning Delay	Warning Level	Derating Level	
AUS/DEF concentration	Ultrasonic, 1 Hz	0 - 62.5	%	N/A	<28	N/A	Warning only
AUS/DEF Tank Empty	Ultrasonic 1 Hz	0-100	%	30 sec	0	N/A	Warning only
AUS/DEF Tank Low level	Ultrasonic 1 Hz	0-100	%	30 sec	15	N/A	Warning only
AUS/DEF tank temp High alarm	Resistive	-40 - 125 ±1.5°C	°C	1 sec	70	N/A	Warning only
Coolant level switch	Digital	ON/OFF		30 sec from start / 11 sec	Low	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 after turbine	PT200	-40 - 750 ± 2.5%	°C	30 sec from start / 2 sec	532	550	See derating map
					N/A	532	Engine derate*
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
Exhaust temperature before muffler	PT200	-40 - 750 ± 2.5%	°C	30 sec from start / 2 sec	532	N/A	Warning only
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

* Engine will decrease torque to reduce temperatures in the engine and SCR.

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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	1800 rpm	
Charge air pressure	0,5-4,5 V	50-600 ±4.2 kPa	kPa		600 rpm	1000 rpm	1200 rpm	1500 rpm	1800 rpm	<i>From prop curve 2.5 with IPS drive</i>
Warning Level			kPa	30 sec from start / 2.2sec	280	280	280	245	300	
Derating Level			kPa	10% trq. decr. per sec	290	290	290	255	310	
Charge air temperature	50-0 kΩ	-40 - 130 ±4%	°C		600 rpm	1000 rpm	1200 rpm	1500 rpm	1800 rpm	
Warning Level			°C	60 sec from start / 15 sec	80	80	80	80	76	
Derating Level			°C		85	85	85	85	81	See derating map
Coolant pressure	0,5-4,5 V	0-300 ± 3%	kPa		600 rpm	1000 rpm	1200 rpm	1500 rpm	1800 rpm	
Warning Level			kPa	30 sec from start /1.5sec	0	25	35	50	76	
Derating Level			kPa	10% trq. decr. per sec	N/A	20	30	45	71	
Fuel pressure	0,5-4,5 V	0-700 ±2.5%	kPa		600 rpm	1000 rpm	1200 rpm	1500 rpm	1800 rpm	
Warning Level			kPa	60 sec from start / 5 sec	80	80	80	205	280	
Derating Level			kPa	N/A	N/A	N/A	N/A	N/A	N/A	
Oil pressure	0,5-4,5 V	0-700 ±2.5%	kPa		600 rpm	1000 rpm	1200 rpm	1500 rpm	1800 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	1800 rpm	
Warning Level			kPa	30 sec from start /5 sec	N/A	10	18	30	45	
Derating Level			kPa	10% trq. decr. per sec	N/A	0	8	20	35	

Warning = Yellow Lamp active

Derating = Red Lamp active

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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	550°C	560°C	565°C	570°C
Remaining torque in %	600	100%	100%	100%	100%
	1200	100%	97%	95%	93%
	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%

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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)	0.5-4.5V	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 ON= Shutdown	°C	12sec from start/1 sec	105	Shutdown
Eng. overspeed SDM 1800+15%	Frequency	153 puls./rev	rpm / Hz	Instant	2070 rpm/5278 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

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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:

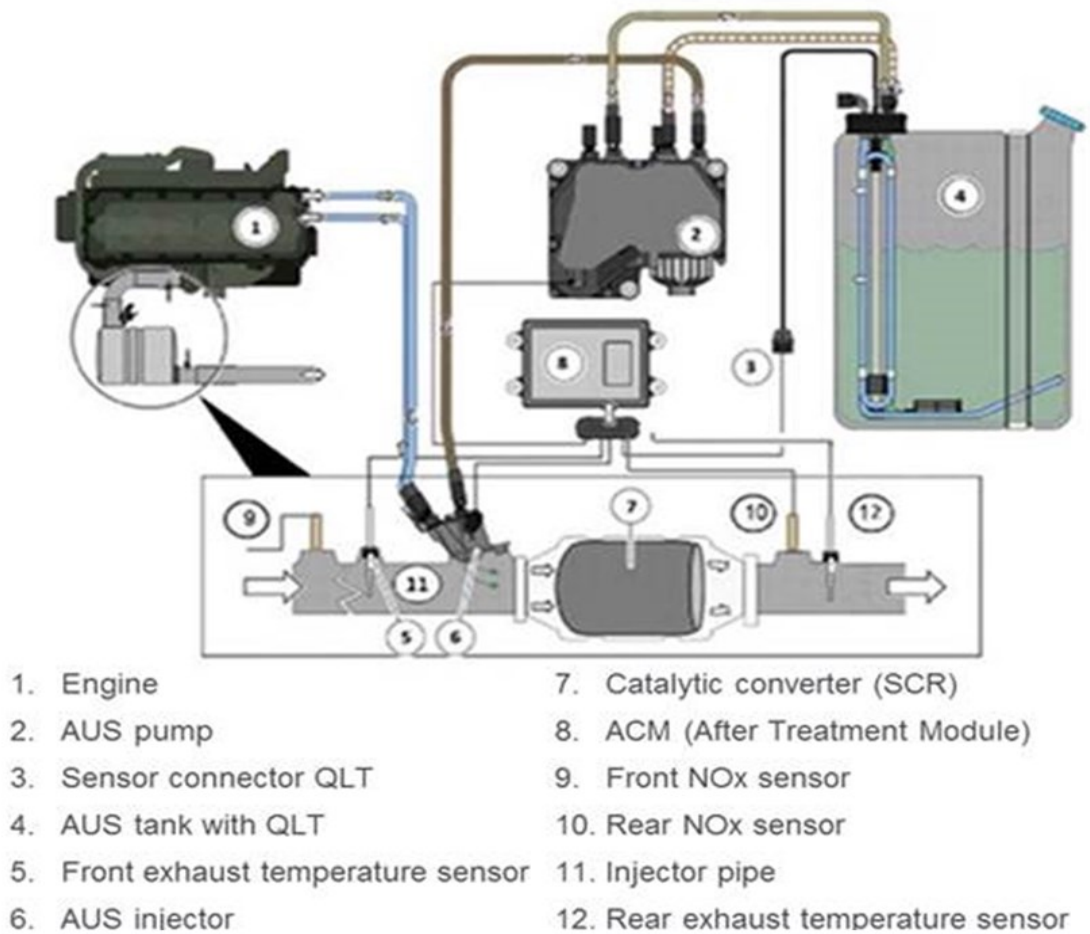
Max AUS flow to injector	l/h	7.9
	US gal/h	2.1
Max collant flow to AUS injector	l/h	6.7
	US gal/h	1.8

Exhaust system	Rating	rpm	600	800	1000	1200	1300	1400	1500	1600	1700	1800
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	2	2	3	5
		psi		0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.4	0.7
SCR muffler pressure drop at Full load		kPa	1	2	2	2	2	3	3	3	4	5
		psi	0.1	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.6	0.7

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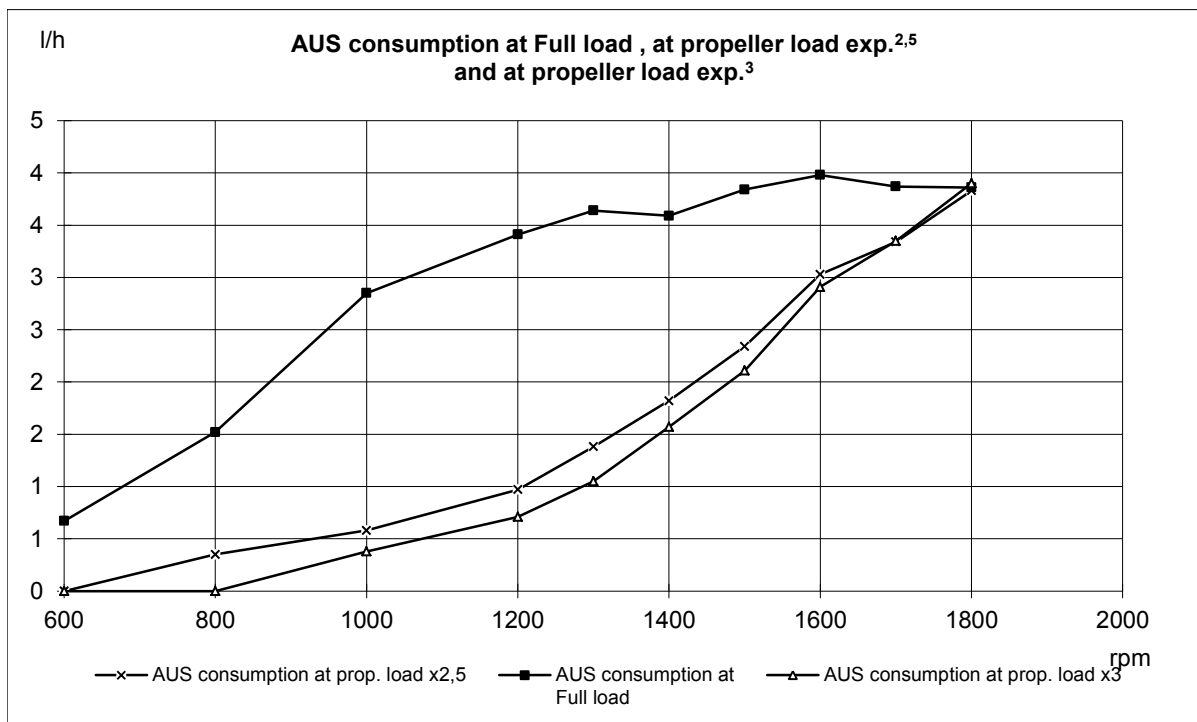
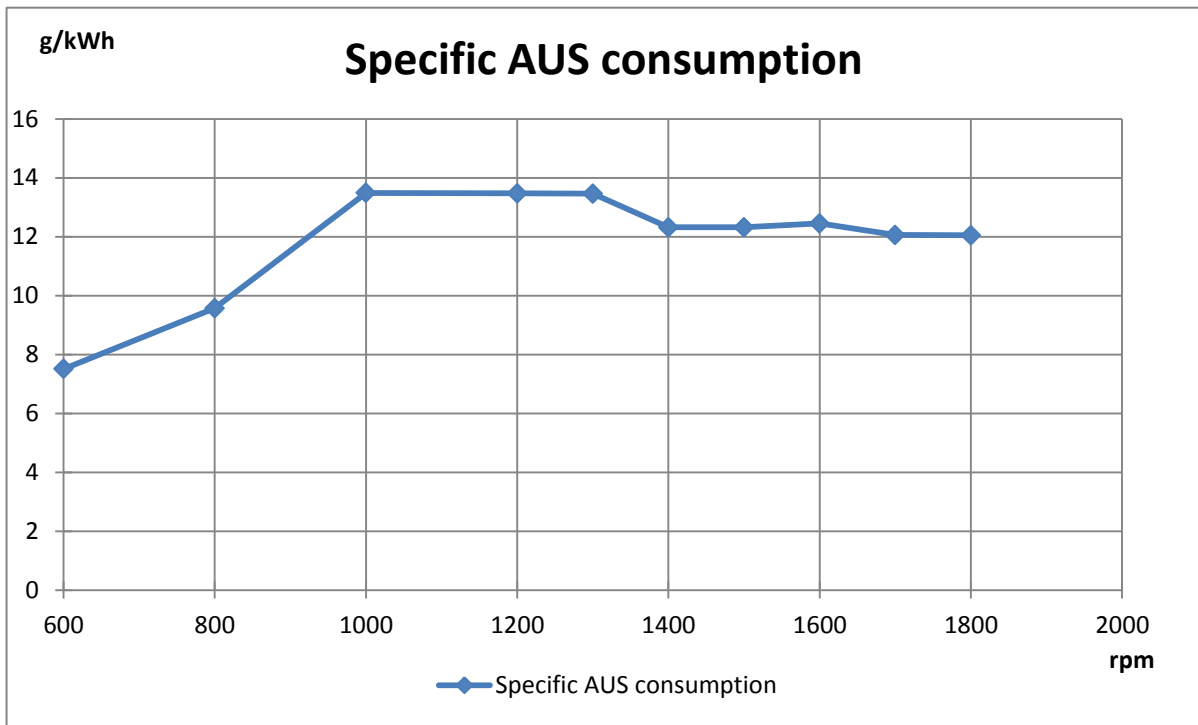
AUS system	Rating	rpm	600	800	1000	1200	1300	1400	1500	1600	1700	1800
Specific AUS consumption		g/kWh	7.51	9.57	13.49	13.47	13.46	12.32	12.32	12.45	12.06	12.05
		lb/hph	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
AUS consumption at prop. load x ^{2.5}		l/h	0.00	0.35	0.58	0.97	1.38	1.82	2.34	3.03	3.34	3.83
		US gal/h		0.09	0.15	0.26	0.36	0.48	0.62	0.80	0.88	1.01
AUS consumption at prop. load x ³		l/h	0.00	0.00	0.38	0.71	1.05	1.57	2.11	2.91	3.35	3.90
		US gal/h			0.10	0.19	0.28	0.41	0.56	0.77	0.88	1.03
AUS consumption at Full load		l/h	0.67	1.52	2.85	3.41	3.64	3.59	3.84	3.98	3.87	3.86
		US gal/h	0.18	0.40	0.75	0.90	0.96	0.95	1.01	1.05	1.02	1.02

AUS concentration 32.5%



Abbreviations:

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



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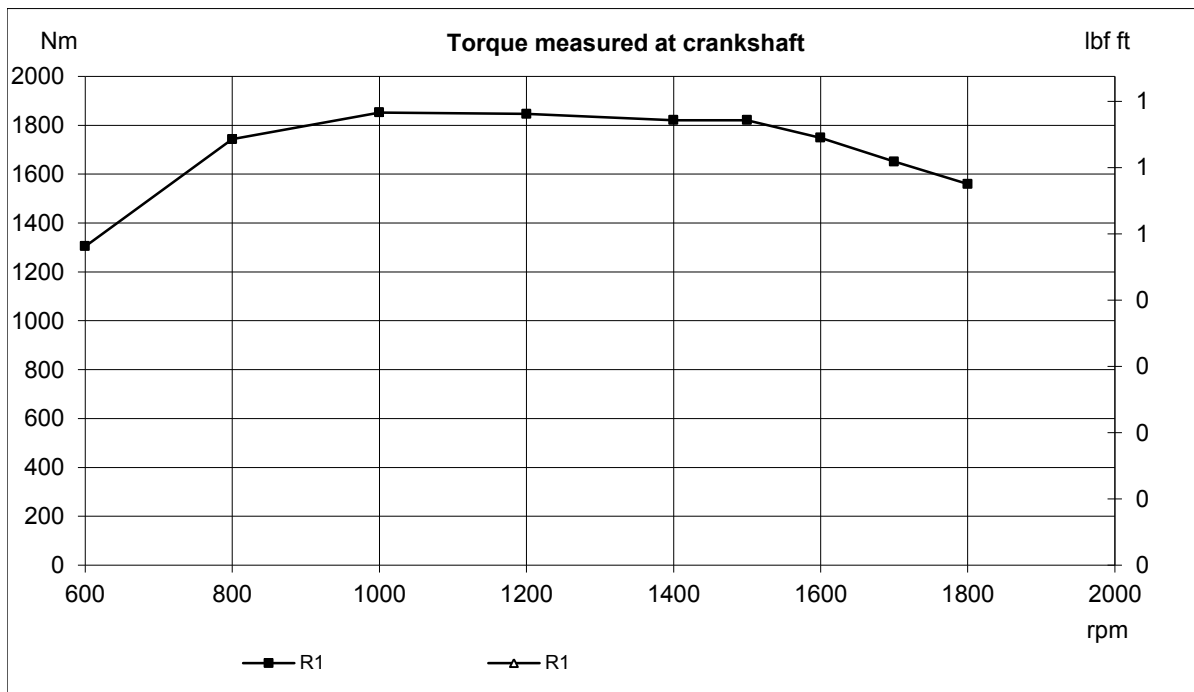
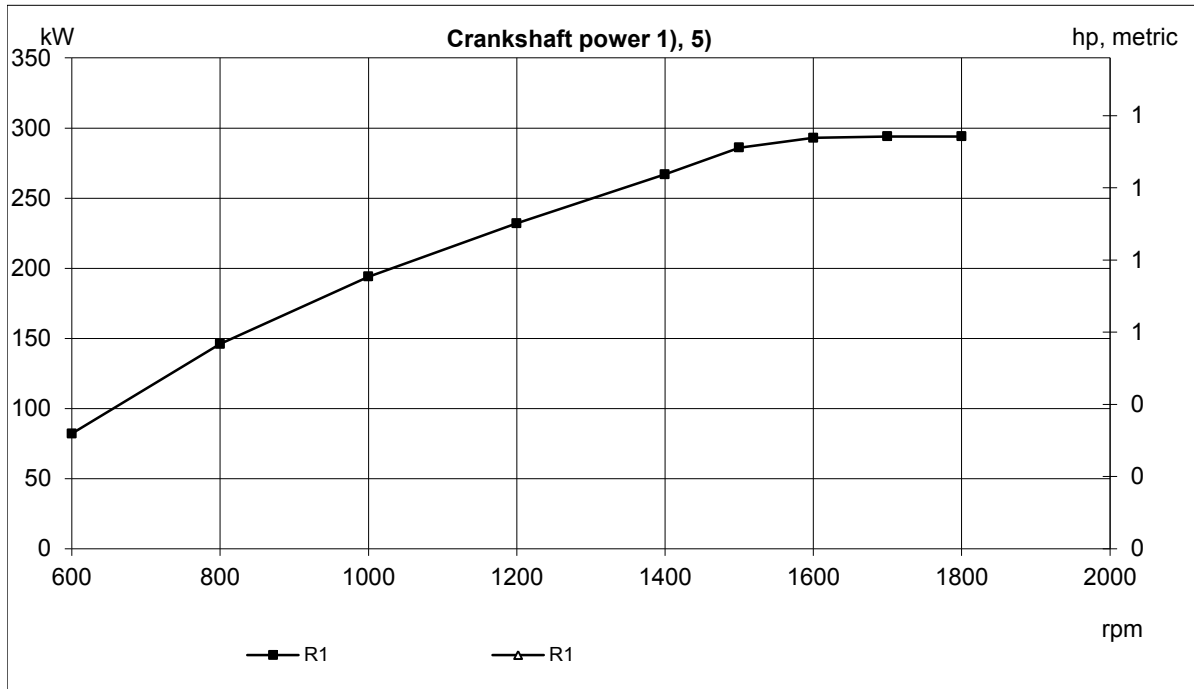
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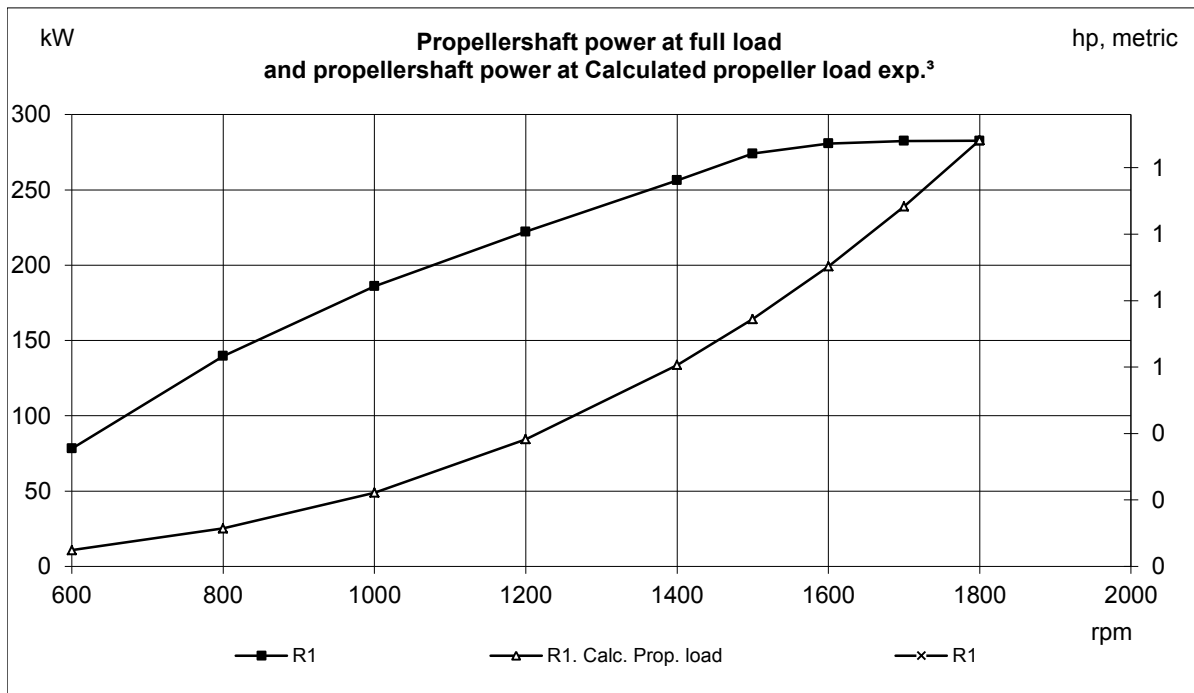
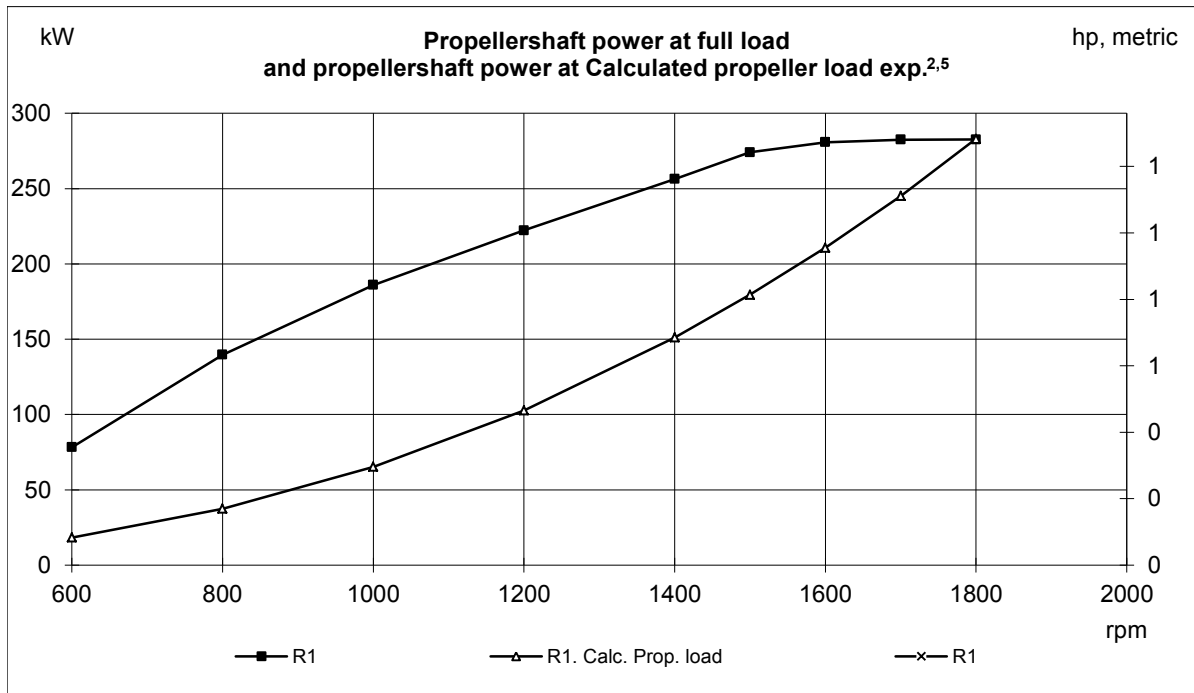
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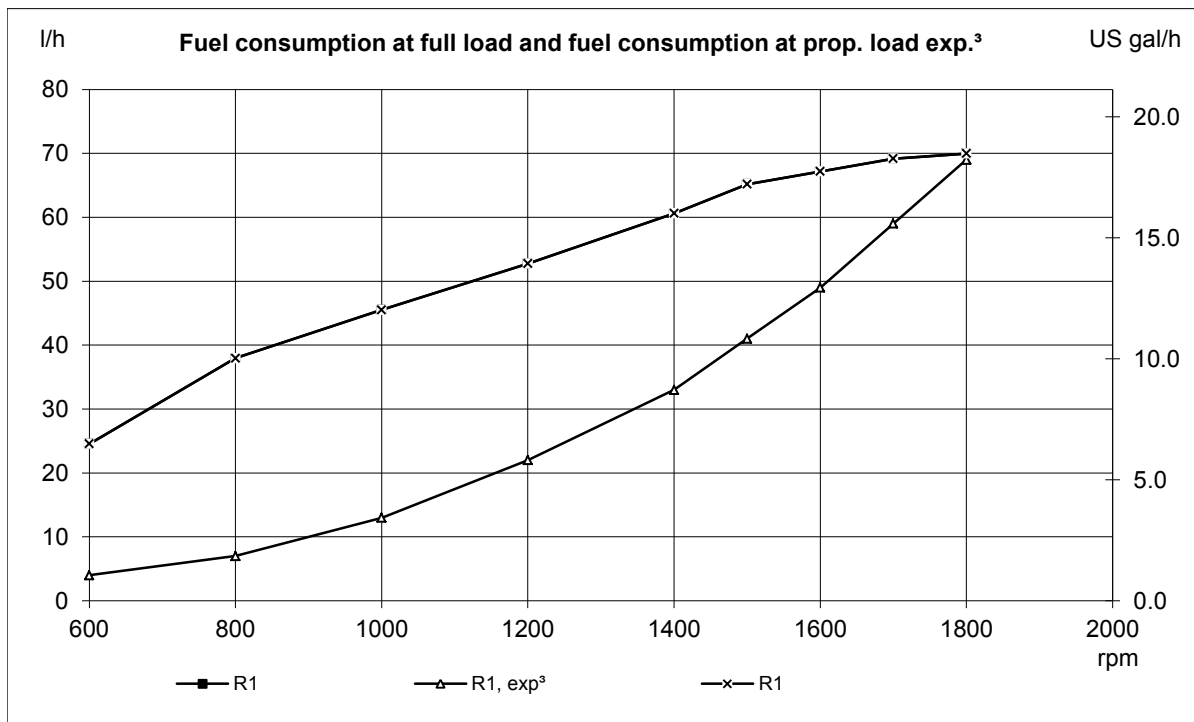
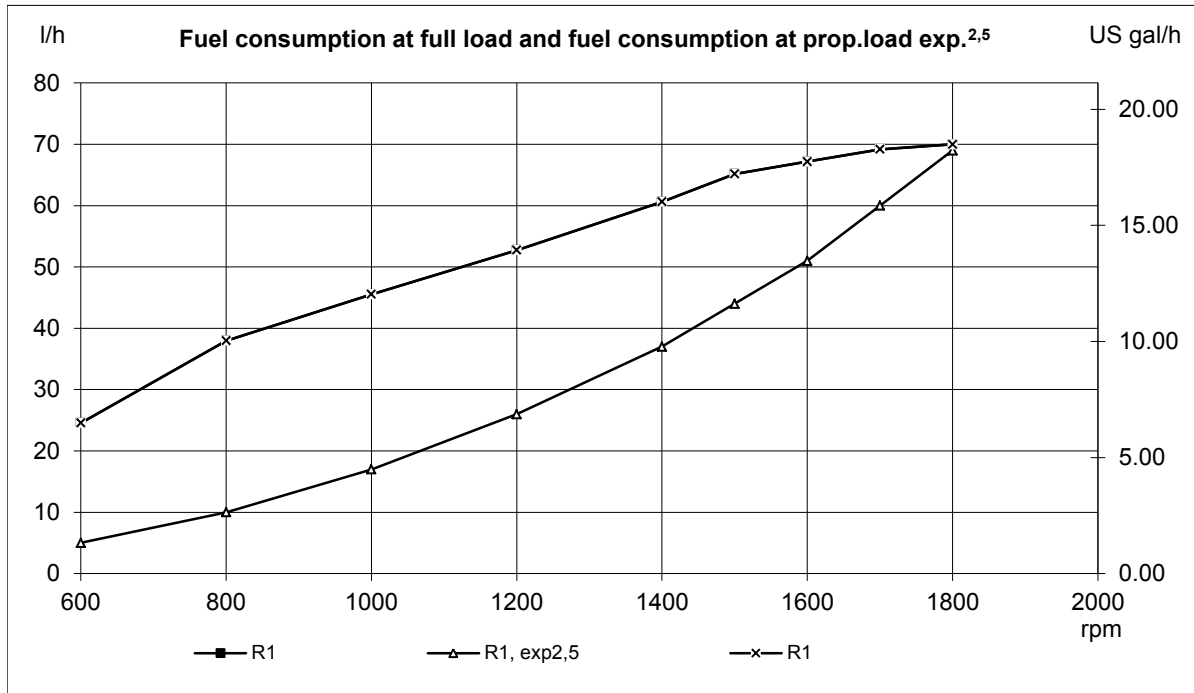
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VOLVO PENTA

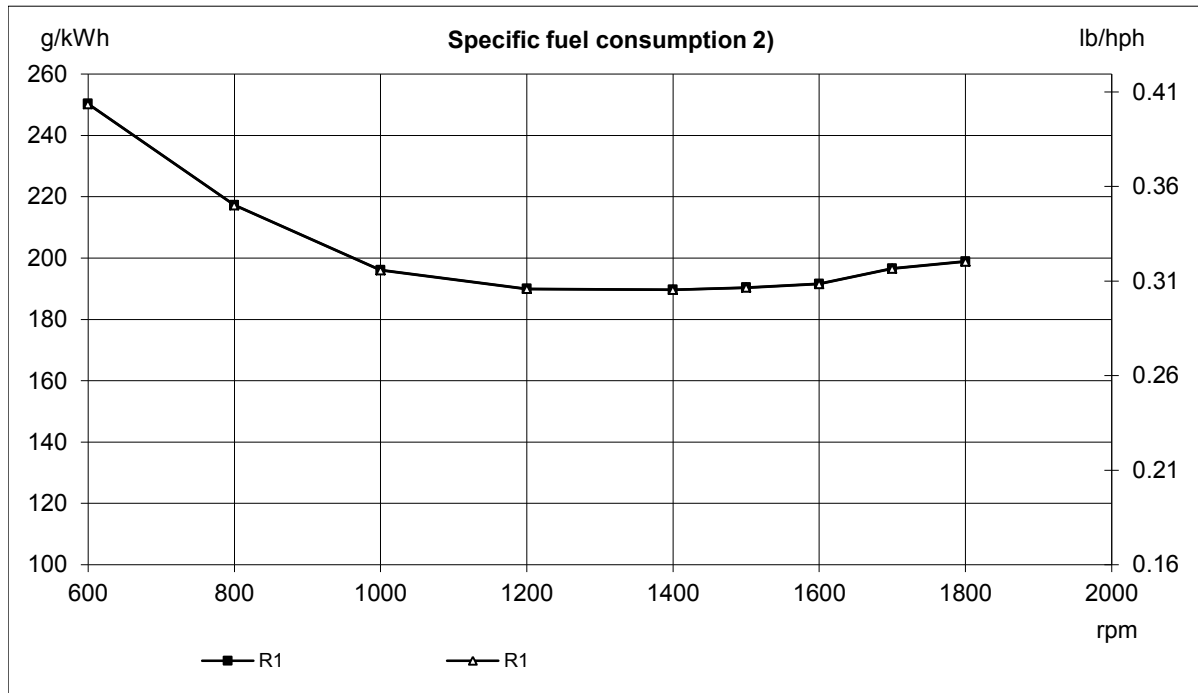
D13 MH (R1-400)

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23432747

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VOLVO PENTA

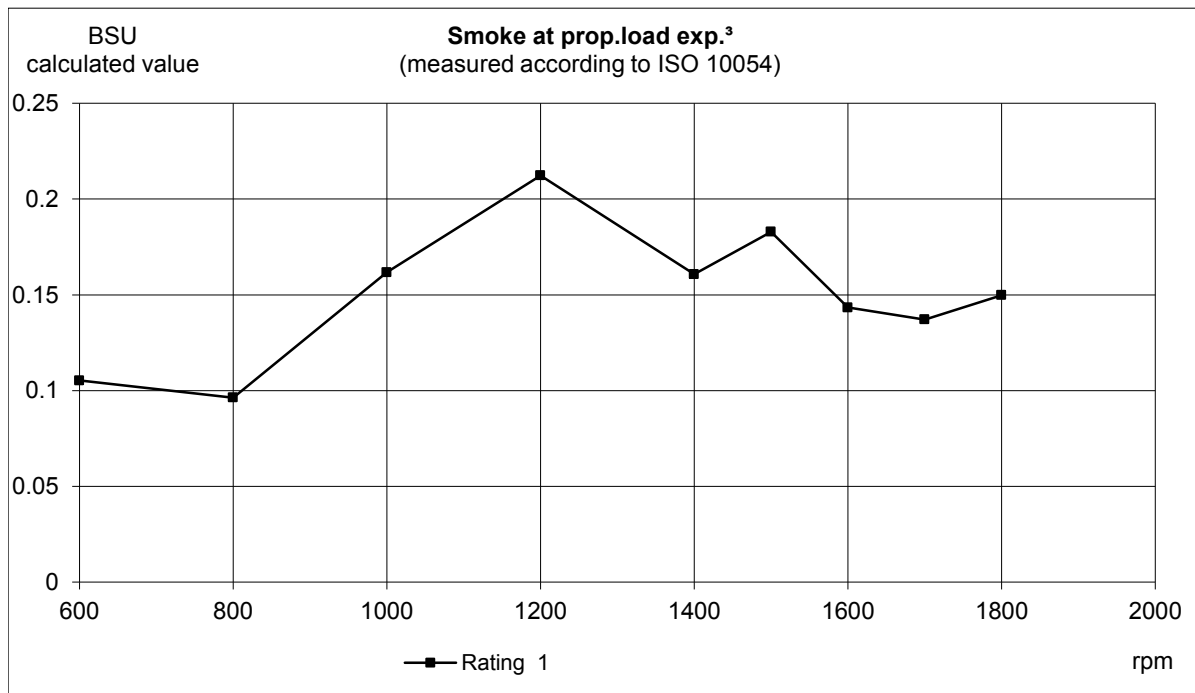
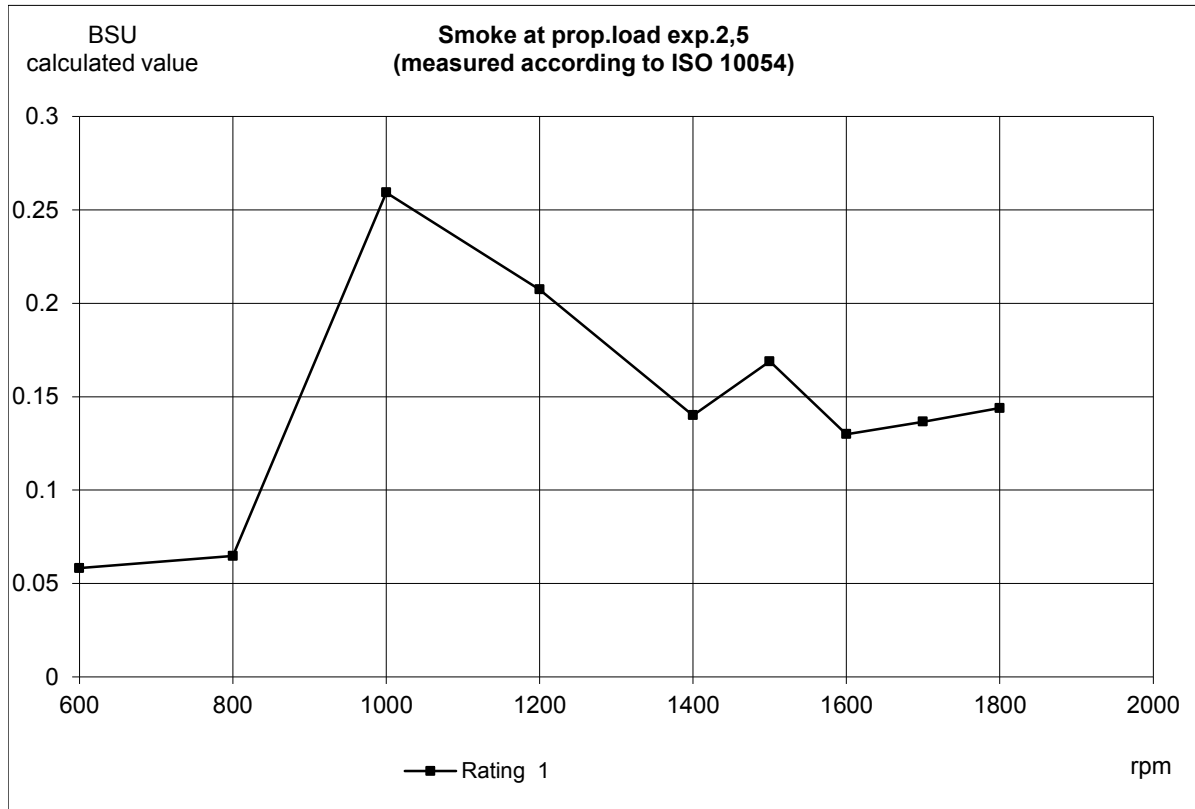
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VOLVO PENTA

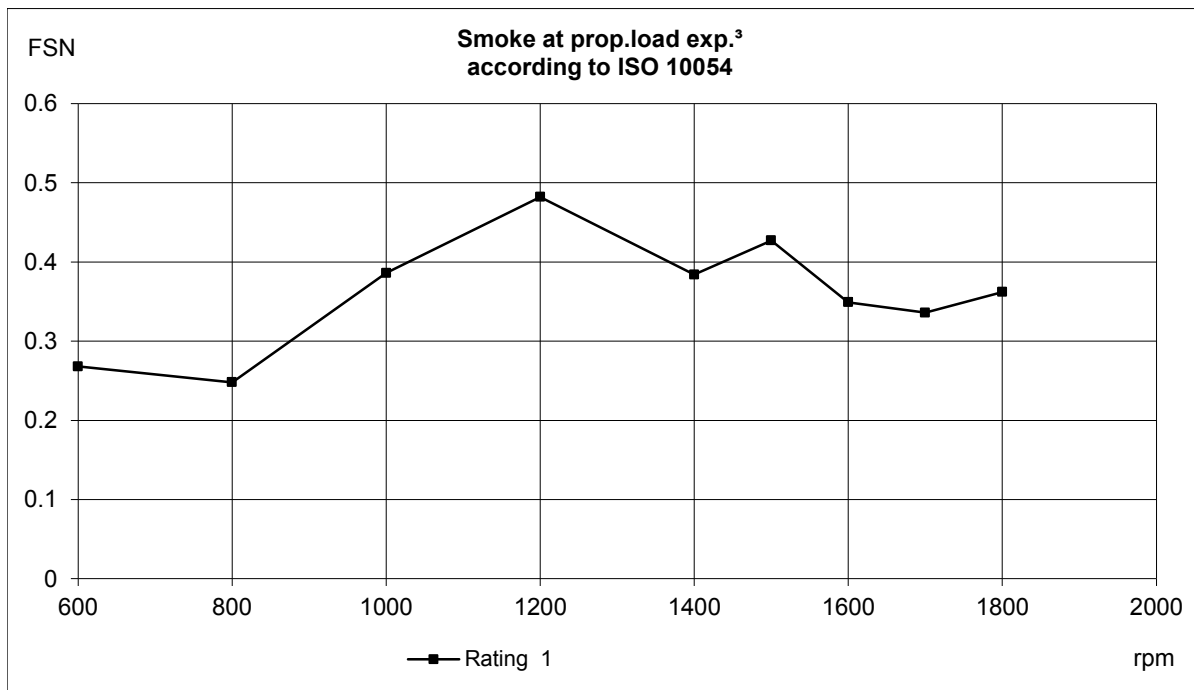
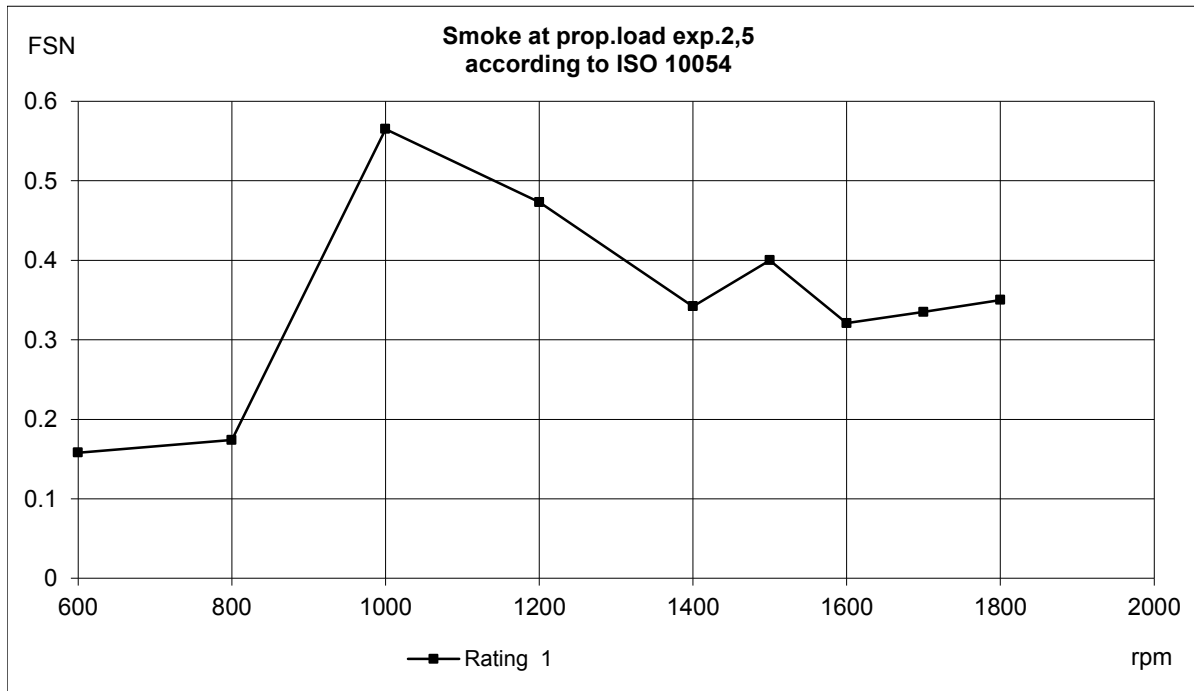
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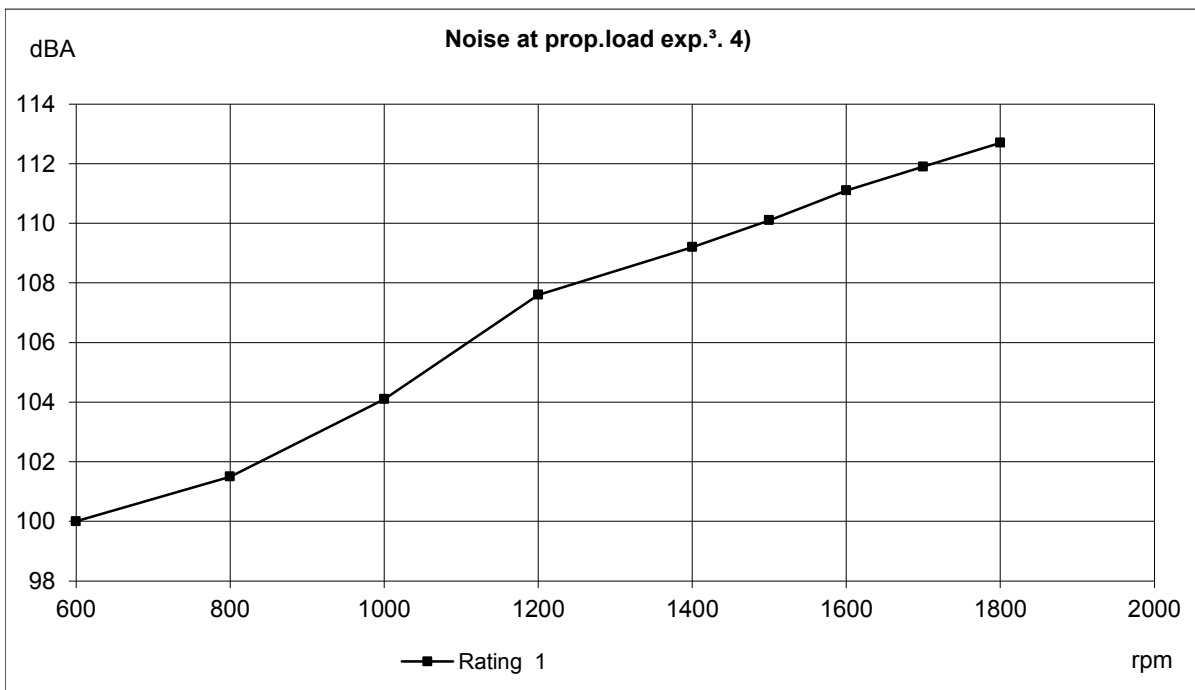
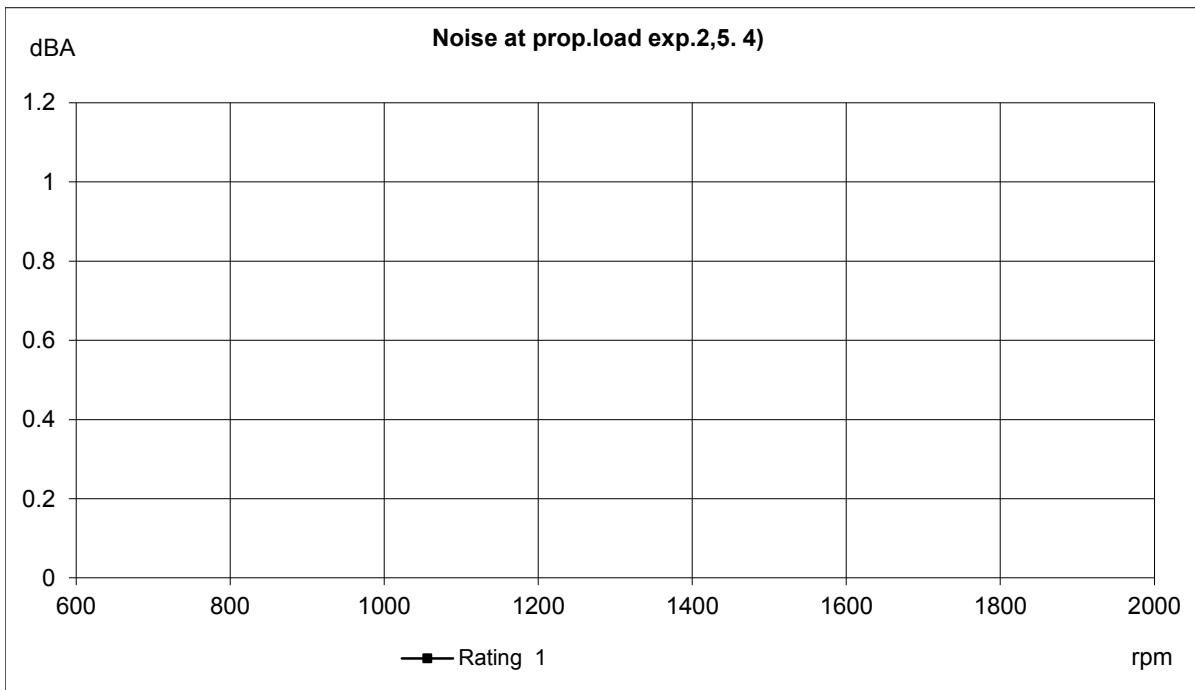
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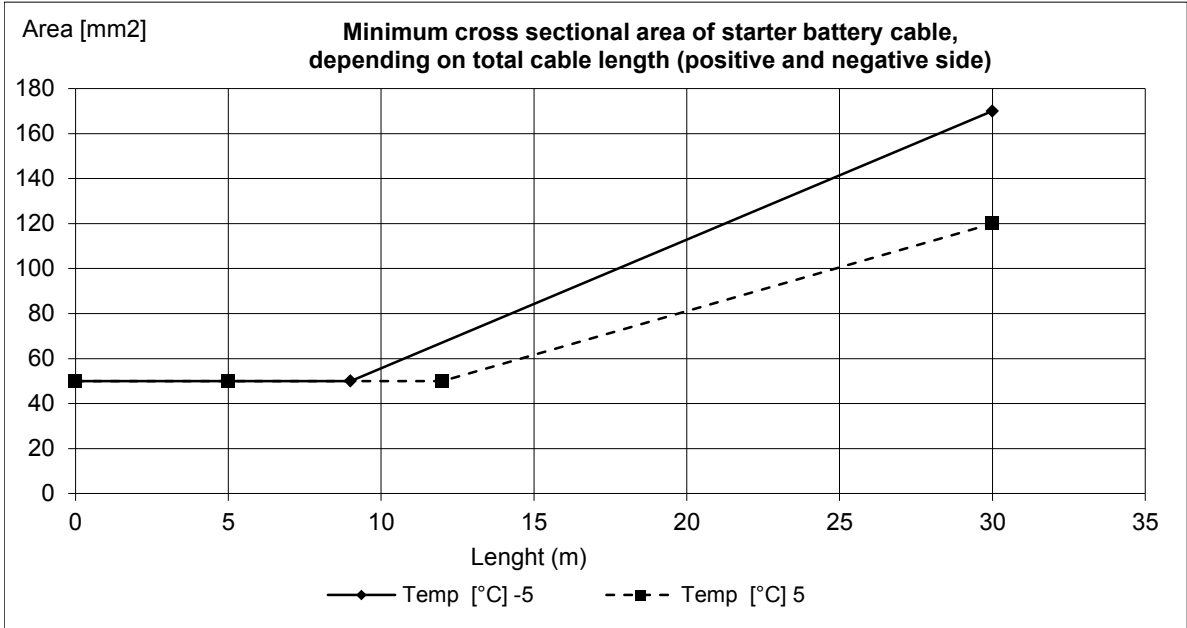
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Battery capacity

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:

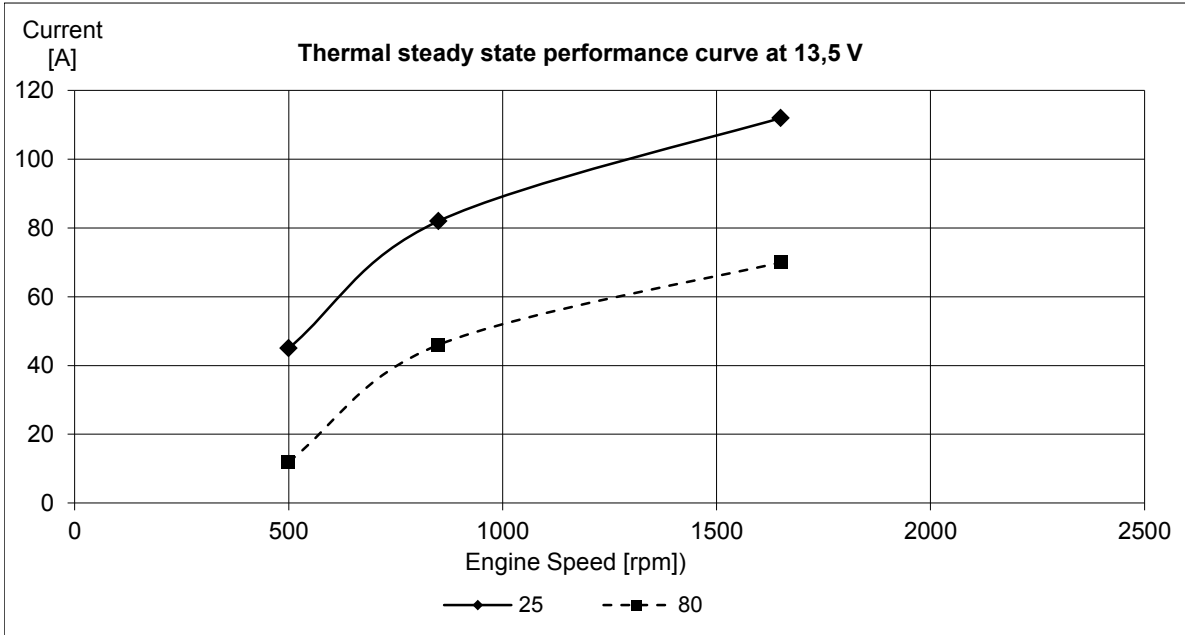
	[A]
Engine:	
Control system:	

Max current consumption during normal operation:

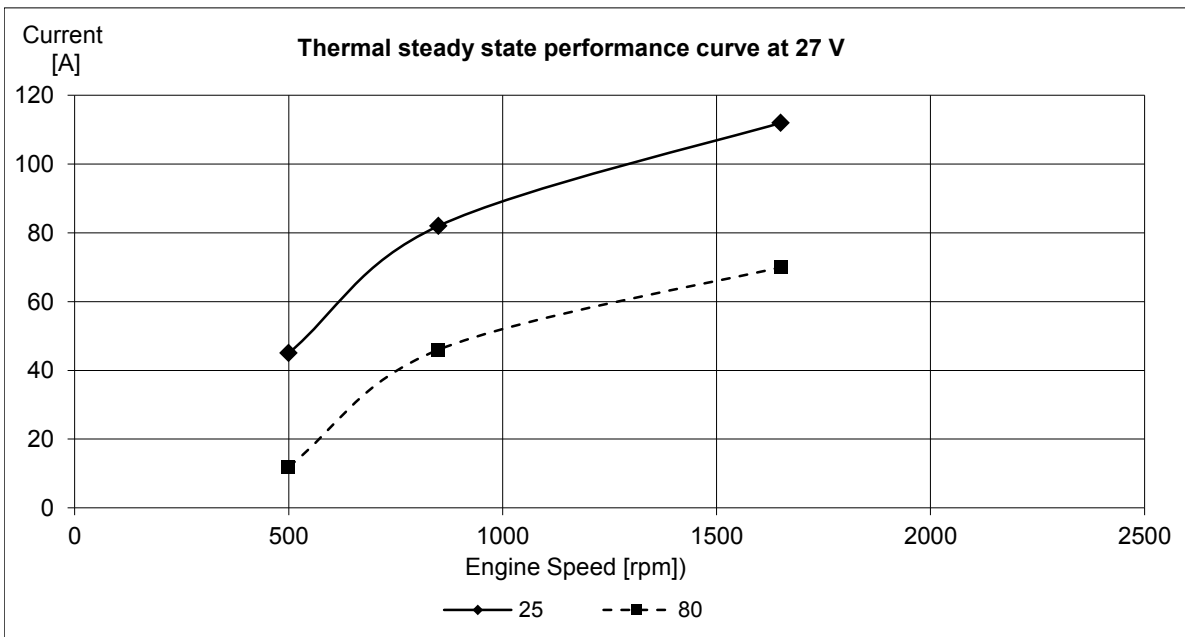
	[A]
Engine :	

Alternator data:

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



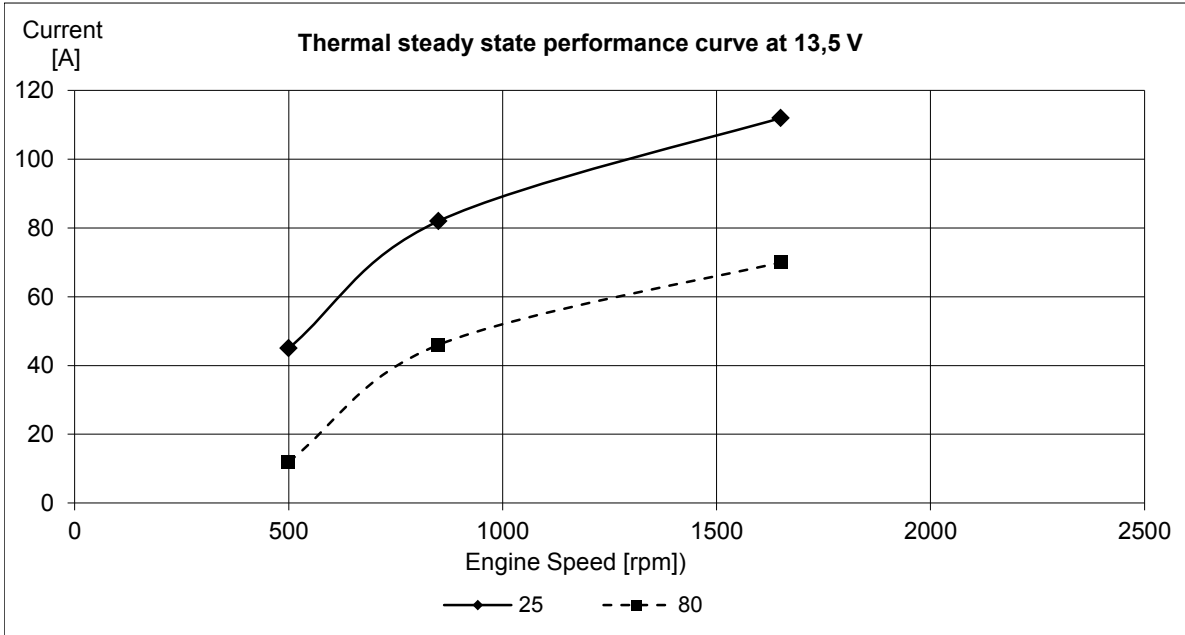
Constant charge voltage: [V]	14.3	+/- 0,3
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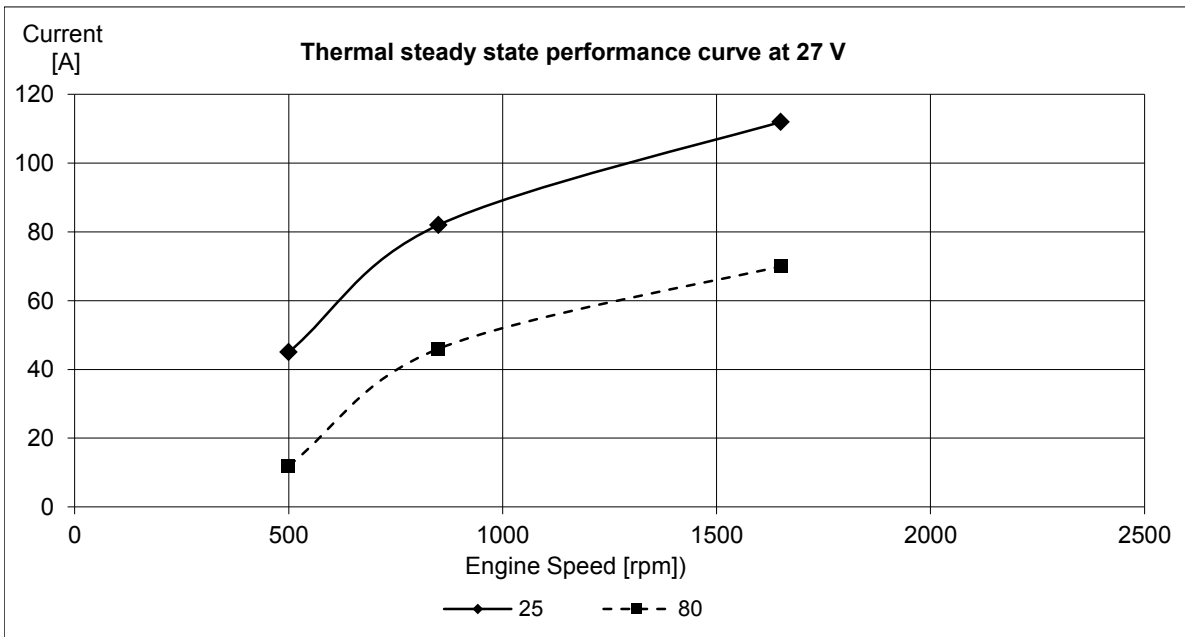
Constant charge voltage: [V]	28.3	+/- 0,3
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Alternator data:

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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