

VOLVO PENTA D16 MH 800HP R2 IMO II / III	Document No 24166029	Issue Index 05
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General

4-stroke direct injected, turbocharged and aftercooled diesel engine

Engine Rating		2
Number of cylinders		6
No of valves		24
Displacement, total	litres in ³	16.12 983.9
Firing order		1-5-3-6-2-4
Rotational direction, viewed from the front		Clockwise
Bore	mm in	144 5.67
Stroke	mm in	165 6.50
Compression ratio		16,8:1
Max. static forward inclination:	°	5
Max. static backward inclination:	°	10
Max. intermittent forward inclination while running:	°	10
Max. intermittent backward inclination while running:	°	20
Max. intermittent side inclination while running:	°	30
Idling speed - Inboard	rpm	550 800
Rated speed R2	rpm	1900
Governed speed R2	rpm	1970
Propeller selection range R2		1800-1950
Dry weight engine BT	kg lb	1815 4001

Performance	rpm	600	800	1000	1200	1400	1500	1600	1800	1900	
Crankshaft power 1), 5)	kW	87	163	290	420	517	549	586	588	588	
	hp	118	222	394	571	703	747	797	800	800	
Propeller shaft power 1) (At full load)	kW	84	156	278	403	496	527	563	564	564	
With drive transmission	hp	114	213	379	548	675	717	765	768	768	
Propellershaft power at prop. load x ^{2.5}	kW	32	65	113	179	263	313	367	493	564	
With drive transmission	hp	43	88	154	243	358	425	500	671	768	
Propellershaft power at prop. load x ³	kW	18	42	82	142	226	278	337	480	564	
With drive transmission	hp	24	57	112	193	307	378	458	653	768	
Torque at crankshaft 2)	Nm	1385	1946	2769	3342	3526	3495	3497	3119	2955	
	lbf ft	1021	1435	2043	2465	2601	2578	2580	2301	2180	
Mean piston speed	m/s	3.3	4.4	5.5	6.6	7.7	8.3	8.8	9.9	10.5	
	ft/s	10.8	14.4	18.0	21.7	25.3	27.1	28.9	32.5	34.3	
Effective mean pressure 2)	MPa	1.08	1.52	2.16	2.60	2.75	2.72	2.73	2.43	2.30	
	psi	156.5	219.9	313.0	377.8	398.6	395.1	395.4	352.6	334.1	
Max combustion pressure 2)	MPa	10.95	13.8	17.68	20.05	20.08	19.97	20.17	18.97	18.73	
	psi	1588	2002	2565	2908	2913	2896	2925	2752	2717	

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

Lubricating system

Specific lubricating oil consumption.	g/kWh	0.08
Max. oil volume including filters for all allowed installation inclinations:	litres	51
	US gal	13.47
Max. oil volume excluding filters for all allowed installation inclinations:	litres	46
	US gal	12.15
Min. oil volume excluding filters for all allowed installation inclinations:	litres	38
	US gal	10.04

Fuel system

	rpm	600	800	1000	1200	1400	1500	1600	1800	1900	
Specific fuel consumption 2) (at max torque)	g/kWh	217.4	217	206.5	196.8	195	195.2	196.5	199.2	201	
	lb/hph	0.352	0.352	0.334	0.319	0.316	0.316	0.318	0.323	0.326	
Fuel consumption, Test cycle E3	g/kWh	198.2									
	lb/hph	0.32									
Fuel consumption at prop. load x ^{2.5}	l/h	8.7	16.9	28.7	44.4	64.3	75.8	89.0	121.7	141.5	
	US gal/h	2.3	4.5	7.6	11.7	17.0	20.0	23.5	32.2	37.4	
Fuel consumption at prop. load x ³	l/h	5.5	11.5	21.4	35.7	55.1	67.1	81.9	118.5	141.3	
	US gal/h	1.5	3.0	5.6	9.4	14.6	17.7	21.6	31.3	37.3	
Fuel consumption at full load	l/h	22.6	42.3	71.6	98.9	120.6	128.2	137.8	140.2	141.4	
	US gal/h	6.0	11.2	18.9	26.1	31.9	33.9	36.4	37.0	37.4	

Fuel system

Fuel supply line max. pressure, during engine stand still (measured at fuel inlet connection @ with full tank)	kPa	16.5
	psi	2.39
Fuel supply line min pressure, during engine running (measured at fuel inlet connection @ engine max rated power)	kPa	20
	psi	2.90
Fuel return line max pressure, during engine running (measured at fuel inlet connection @ engine max rated power)	kPa	20
	psi	2.90

Full load performance at rated speed

Fuel inlet temperature	°C	40
	°F	104
Fuel return temperature from engine	°C	64.3
	°F	147.74
Fuel consumption	l/h	141.4
	US gal/h	37.35
Fuel inlet flow to engine	l/h	194.7
	US gal/h	51.43
Fuel return flow from engine	l/h	53.1
	US gal/h	14.03

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Intake and exhaust system	rpm	600	800	1000	1200	1400	1500	1600	1800	1900	
Specific exhaust heating effect	kW	48.77	103	188.5	274.6	339.4	362.2	390.9	400.1	404.7	
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.	°C	415.3	516.3	555.8	518.6	489.8	476.7	469.7	431.9	419.7	
	°F	779	961	1032	965	914	890	877	809	787	
Exhaust back pressure after turbocharger at rated speed during test	kPa									21	
	psi									3.0	
Permitted exhaust back pressure after turbocharger. (Installed back pressure)	kPa							Max		22	
	psi									3.2	
	kPa							Min		0	
										0.0	

Intake and exhaust system	rpm	600	800	1000	1200	1400	1500	1600	1800	1900	
Engine air consumption at 25°C / 77°F atmospheric pressure 100kPa	m³/min	5.064	8.376	14.24	22.66	30.05	33.16	36.47	41.16	43.02	
	cu.ft./min	178.8	295.8	502.7	800.2	1061	1171	1288	1454	1519	
Charge air pressure - relative pressure Inlet manifold	kPa	18	46	101	164	199	210	221	223	221	
	psi	2.6	6.6	14.6	23.7	28.9	30.4	32.0	32.3	32.0	
Exhaust gas flow	m³/min	12.84	24.25	41.93	60.87	73.99	78.42	83.48	86.88	88.34	
	cu.ft./min	453.5	856.4	1481	2150	2613	2769	2948	3068	3120	

Cooling system		rpm	600	800	1000	1200	1400	1500	1600	1800	1900	
Radiated heat at full load.		kW	4.963	9.286	15.41	21.71	26.48	28.15	30.25	30.76	31.04	
Heat rejection to charge air cooler at full load.		kW	1.468	7.038	24.18	54.44	79.71	90.04	101.7	115.5	120.9	
Coolant heat rejection from engine circuit, incl. engine oil cooler and excl. charge air cooler, at full load.		kW	85.87	139.4	202.6	247.4	287.1	298.4	316	314.9	319.7	
Coolant flow with fully open thermostat and std cooling system		l/min	127	270	350	413	476	506	537	595	620	
		cu.ft./min	4.5	9.5	12.4	14.6	16.8	17.9	19.0	21.0	21.9	
Coolant flow with low pump speed, fully open thermostat and std cooling system		l/min	127	148.6	173.6	195.5	214.1	222.2	229.5	241.7	246.6	
		cu.ft./min	4.5	5.2	6.1	6.9	7.6	7.8	8.1	8.5	8.7	
Coolant flow with high pump speed, fully open thermostat and std cooling system		l/min	210.3	270	350	413	476	506	537	595	620	
		cu.ft./min	7.4	9.5	12.4	14.6	16.8	17.9	19.0	21.0	21.9	
Load when changing from low to high pump speed		%	-	36	37	39	39	41	39	39	39	
Max. permissible temperature on coolant in engine outlet		°C	95									
		°F	203									
Coolant volume engine, including heat exchanger and charge air cooler		litres	56									
		US gal.	14.79									
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										
		cu.ft./min										
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	1800	1900	
Nominal raw water design flow	l/min	160	212	265	313	358	378	396	430	444	
	cu.ft/min	5.6	7.5	9.4	11.1	12.6	13.4	14.0	15.2	15.7	
Nominal raw water pump pressure head at design flow.	kPa	8	19	31	46	62	70	77	91	98	
	psi	1.2	2.7	4.5	6.7	9.0	10.1	11.2	13.2	14.2	
Maximum raw water pump suction head	kPa	-30									
	psi	-4.4									
Maximum allowed pressure before engine raw water pump	kPa	-40									
	psi	-5.8									
Maximum additional pressure drop excl. reverse gear oil cooler	kPa	7	10	13	17	21	26	31	33	35	
	psi	1.0	1.5	1.9	2.5	3.0	3.8	4.5	4.8	5.1	
Pressure drop over reverse gear oil cooler (optional equipment)	kPa	4	6	10	14	18	21	23	28	30	
	psi	0.6	0.9	1.5	2.0	2.6	3.0	3.3	4.1	4.4	
Maximum raw water temperature before engine raw water pump	°C	32									
	°F	90									

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- 2) At power according to 1).
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2 circuit keel cooling system, LT	rpm	600	800	1000	1200	1400	1500	1600	1800	1900	
Maximum temperature to charge air cooler from external LT-cooling system	°C									50	
	°F									122	
Coolant flow through keel cooler, LT-cooling system circuit	l/min									92	
	cu.ft./min									3.2	
Pressure drop in external LT-cooling system circuit, including piping	kPa						50				
	psi						7.3				
Coolant volume charge air cooler	litres						5				
	US gal.						1.32				

2 circuit keel cooling system, HT	rpm	600	800	1000	1200	1400	1500	1600	1800	1900	
Design point for keel cooler, engine outlet temperature	°C									90	
	°F									194	
Maximum temperature to engine from external HT-cooling system circuit	°C									67	
Coolant flow through keel cooler, HT-cooling system circuit at design point	°F									153	
	l/min									213	
Maximum coolant flow through keel cooler, HT-cooling system circuit	cu.ft./min									7.5	
	l/min									474	
Pressure drop in external HT-cooling system circuit, including piping	cu.ft./min									16.7	
	kPa						84				
Coolant volume engine	psi						12.2				
	litres						38				
	US gal.						10.04				

Radiator cooling system	rpm	600	800	1000	1200	1400	1500	1600	1800	1900	
Radiator cooling system type		Closed circuit									
Radiator cooling area	m ²						2				
	ft ²						18.1				
Fan diameter	mm						965				
	in						38.0				
Fan power consumption	kW						20		34	40	
	hp						27.2		46.2	54.4	
Fan drive ratio		1.04									
Coolant volume, radiator with hoses	litres	95									
	US gal.	25.1									
Coolant pump. Drive / Ratio		Belt / 1.87:1									
Coolant flow with standard system	l/min						285		345		
	cu.ft./min						10.1		12.2		
Maximum outer circuit restriction incl. Piping	kPa	N/A									
	psi										
Maximum static pressure head (expansion tank height + pressure cap setting)	kPa						100				
	psi						14.5				
Standard static pressure head	kPa						75				
	psi						10.9				
Maximum top tank temperature	°C						103				
	°F						217.4				

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Cooling performance, pushing fan

Cooling air flow and external restriction at different radiator air temperatures based on 107°C TTT and 40% coolant. Valid at 1 atm.

Engine speed rpm	Air on	Air flow	External restriction
		m ³ /s	
1500 Engine brake power: 529 kW	57.0	10.8	0
	55.0	10.1	150
	52.0	9.4	300
	50.0	8.6	450
Rated speed (1900) Engine brake power: 548 kW	58.0	13.9	0
	57.0	13.3	150
	56.0	12.7	300
	55.0	12.2	450

Note! Calculated values >0 Pa

Charge air cooler system	rpm	600	800	1000	1200	1400	1500	1600	1800	1900	
Heat rejection to charge air cooler	kW	1	7	24	54	80	90	102	115	121	
	BTU/min	84	400	1375	3096	4533	5120	5785	6566	6877	
Charge air mass flow	kg/s	0.1	0.2	0.3	0.5	0.6	0.7	0.8	0.8	0.9	
Charge air inlet temp (Charge air temp after turbo compressor)	°C	53	79	122	157	173	177	182	185	186	
	°F	127.7	173.4	250.7	315.3	343.0	350.8	360.4	364.2	366.1	
Charge air outlet temp (Charge air temp after charge air cooler)	°C	27	29	32	35	38	40	41	43	44	
	°F	81.2	84.7	90.1	95.0	101.1	103.6	106.5	109.7	111.3	
Charge air pressure - relative pressure at sea level (After charge air cooler)	kPa	18	46	101	164	199	210	221	223	221	
	psi	2.6	6.6	14.6	23.7	28.9	30.4	32.0	32.3	32.0	

Emissions	rpm	600	800	1000	1200	1400	1500	1600	1800	1900	
Smoke at prop. load x ^{2.5}	*BSU	0.1	0.2	0.5	1.0	0.5	0.3	0.2	0.1	0.1	
Smoke at prop. load x ³	*BSU	0.0	0.1	0.5	0.8	0.5	0.4	0.2	0.1	0.1	
Noise at prop. load x ^{2.5} . 4)	dBA	104.4	108	109.9	111.9	113.2	114	114.9	117.2	118.3	
Noise at prop. load x ³ . 4)	dBA	104	107.8	109.4	111.1	113	113.7	114.3	117.5	118.3	

*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	<25%	N/A	Warning only
AUS/DEF Tank Empty	Ultrasonic 1 Hz	0-100	%	N/A	0.1	N/A	Warning only
AUS/DEF Tank Low level	Ultrasonic 1 Hz	0-100	%	0.15	6%	N/A	Warning only
AUS/DEF High temp	Resistive	-40 - 125 ±1.5°C	°C	N/A	70°C	N/A	Warning only
Coolant level switch	Digital	ON/OFF		5 sec from start / 11.25 sec	Low (ON / Closed)	N/A	Warning only
Engine speed cam	Frequency		rpm	Instant	Lost signal	N/A	Warning only
Engine speed crank	Frequency		rpm	Instant	Lost signal	N/A	Warning only
Coolant temperature							
Warning Level Yellow Alarm	50-0 kΩ	-40 - 140 ±1.5°C	°C	30 sec from start / 2.25 sec	98	N/A	Warning only
Warning Level Red Alarm					101	Soft 2	Engine derate
Exhaust gas temperature after turbine							
Warning Level Yellow Alarm	PT200	-40 - 750 ± 2.5%	°C	30 sec from start / 2.25 sec	542	N/A	* IMO II / **IMO III
Warning Level Red Alarm					560	Soft 3	Engine derate
Oil temperature							
Warning Level Yellow Alarm	50-0 kΩ	-40 - 140 ± 1.5°C	°C	30 sec from start / 1.5 sec	125	N/A	Warning only
Warning Level Red Alarm					130	Soft 4	Engine derate
Wet Exhaust temp							
Warning Level Yellow Alarm	PT200	0 - 850	°C	30 sec from start / 2.25 sec	192	N/A	Warning only
Warning Level Red Alarm					200	Soft 5	Engine derate
Exhaust temperature before muffler	PT200	-40 - 750 ± 2.5%	°C	30 sec from start / 2.25 sec	542	N/A	Warning only
Oil level sensor	Digital	± 1.9 mm		Instant	Low level	N/A	Warning only
Water In fuel switch	Digital	ON/OFF		Instant	Water in fuel	N/A	Warning only

* Warning only.

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** Warning and decrease of torque to reduce temperatures in the engine and SCR.

Sensors (rpm dependent)	Signal	Range	Unit	Initial Delay / Delay	Warning Level / Derating Level / Shutdown Level					Engine protection action
Charge air pressure - deviation from target **					0 rpm	600 rpm	1000 rpm	1500 rpm	1800 rpm	
Warning Level	0,5-4,5 V	50-600 ±4.2 kPa	kPa	30 sec from start / 5.6 sec	102	102	102	35	35	
Derating Level (Max 1000rpm)					107	107	107	40	40	10% trq. decr. per sec
Charge air temperature - deviation from target					0 rpm	600 rpm	1000 rpm	1500 rpm	1800 rpm	
Warning Level	50-0 kΩ	-40 - 130 ±4%	°C	60 sec from start / 15 sec	75	75	75	75	70	10% trq. decr. per sec
Derating Level					80	80	80	80	75	Soft 1
Coolant pressure - with twin speed water pump					0 rpm	600 rpm	1000 rpm	1500 rpm	1800 rpm	
Warning Level - Low Pump speed	0,5-4,5 V	0-300 ± 3%	kPa	30 sec from start / 6 sec	N/A	0	10	25	35	
Derating Level - Low Pump speed					N/A	N/A	5	20	30	Warning only
Warning Level - High Pump speed					N/A	5	65	125	155	
Derating Level - High Pump speed					N/A	0	60	120	150	Warning only
Fuel pressure after filter					0 rpm	600 rpm	1000 rpm	1500 rpm	1800 rpm	
Warning Level	0,5-4,5 V	0-700 ±2.5%	kPa	60 sec from start / 7.5 sec	N/A	80	80	205	280	
Derating Level					N/A	N/A	N/A	N/A	N/A	N/A
Oil pressure					0 rpm	600 rpm	1000 rpm	1500 rpm	1800 rpm	
Warning Level	0,5-4,5 V	0-700 ±2.5%	kPa	30 sec from start / 3 sec	N/A	70	190	243	265	
Derating Level (Max 1000rpm)					N/A	45	165	218	240	1.25% trq. decr. per sec
Seawater pressure - Only HE and KC					0 rpm	600 rpm	1000 rpm	1500 rpm	1800 rpm	
Warning Level	0,5-4,5 V	0-300 ± 3%	kPa	30 sec from start / 3 sec	N/A	N/A	11	28	40	
Derating Level					N/A	N/A	1	18	30	35% trq. reduction

Warning = Yellow Lamp active

Derating = Red Lamp active

** Activated >1500Nm

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Remarks

Charge Air Temp [°C]	rpm	80°C	85°C	95°C
Remaining torque in %	600	100%	100%	100%
	1200	100%	98%	96%
	1900	50%	0%	0%

Coolant temp [°C]	rpm	101°C	103°C	106°C
Remaining torque in %	600	100%	100%	100%
	1200	100%	98%	96%
	1900	100%	50%	0%

Exhaust Temp [°C]	rpm	560°C	570°C	575°C	580°C	580°C
Remaining torque in %	600	100%	100%	100%	100%	100%
	1200	100%	98%	97%	96%	max 1000rpm
	1900	100%	50%	25%	0%	max 1000rpm

Oil temp [°C]	rpm	130°C	132°C	134°C
Remaining torque in %	600	100%	100%	100%
	1200	100%	98%	96%
	1900	100%	50%	0%

Wet exhaust temp [°C]	rpm	200°C	210°C	215°C	220°C
Remaining torque in %	600	100%	100%	100%	100%
	1200	100%	98%	97%	96%
	1900	100%	50%	25%	0%

Transmission: Control and Monitoring System							Engine protection action
Sensors	Signal	Range	Unit	Warning Initial Delay / Warning Delay	Warning Level	Derating Level	
Gear oil temperature (EVC)	50-0 kΩ	-30 - 130 ± 4%	°C	N/A	95	N/A	Warning only
Gear oil pressure (EVC)	0.5-4.5V	0-3000 ±3%	kPa	60 sec from start/7sec	700	N/A	Warning only

For SDM only

Sensors: Control and Monitoring System						Engine protection action
Sensors	Signal	Range	Unit	Initial Delay / Delay	Shutdown Level	
Coolant temperature	Digital	ON/OFF	°C	12 sec from start/ 1 sec	105 (±2°C) SDU Ch. S1	Shutdown
Eng. overspeed SDM 1900+15%	Frequency	153 puls./rev.	rpm / Hz	Instant	2185 rpm / 5572 Hz	Shutdown
Oil pressure	Digital	ON/OFF	kPa	12 sec from start / 1 sec	120 ±20	Shutdown

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Technical data - Exhaust AfterTreatment System data (EATS)

EATS type	SCR HD52
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Weight data:

SCR system weight: (incl SCR unit, AUS injector pipe, AUS sensor and bracket)			kg	247.6
			lb	546
AUS pump			kg	3.1
			lb	6.8
AUS cabinet 20l weight: (incl tank, pump,UQS, ACM)			kg	36.4
			lb	80
AUS tank 160l weight:			kg	45
			lb	99
UQS - Lenght/Weight	mm	439	kg	1.2
	in	17.283	lb	2.6
UQS - Lenght/Weight	mm	597	kg	1.4
	in	23.504	lb	3.1
UQS - Lenght/Weight	mm	715	kg	1.6
	in	28.15	lb	3.5

Dimension data:

SCR Flange:	Standard type	EN 1092-1 PN6	
	Diameter:	in/mm	6 / 152
	Number of Inlet / Outlet:	1 / 2	

Flow data:

Max AUS flow to injector	l/h	11.0
	US gal/h	2.9
Max coolant flow to AUS injector	l/h	400.0
	US gal/h	105.7

Pressure data:

Max AUS pressure	bar	9.0
	psi	2.4

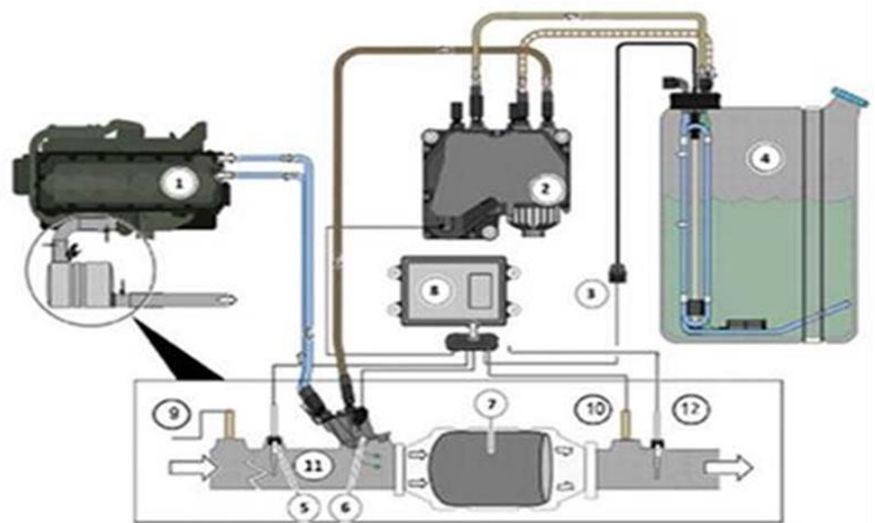
Exhaust system	rpm	600	800	1000	1200	1400	1500	1600	1800	1900	
Max allowable temperature drop between turbine and SCR muffler inlet.	°C	10	10	10	10	10	10	10	10	10	
	°F	50	50	50	50	50	50	50	50	50	
SCR muffler pressure drop at prop. load x ^{2.5}	kPa	2	2	3	4	5	5	6	9	12	
	psi	0.3	0.3	0.4	0.5	0.7	0.8	0.9	1.4	1.7	
SCR muffler pressure drop at prop. load x ³	kPa	2	2	3	3	5	5	6	9	12	
	psi	0.3	0.3	0.4	0.5	0.7	0.7	0.9	1.3	1.7	
SCR muffler pressure drop at Full load	kPa	2	3	4	6	8	9	10	11	11	
	psi	0.3	0.4	0.6	0.9	1.2	1.3	1.5	1.6	1.7	

AUS system - IMO3 mode		rpm	600	800	1000	1200	1400	1500	1600	1800	1900	
Specific AUS consumption at Full load	g/kWh		10.8	9.7	10.7	11.3	10.9	11.0	11.1	11.5	11.9	
	lb/hph		0.018	0.016	0.017	0.018	0.018	0.018	0.018	0.019	0.019	
AUS consumption at prop. load $x^{2.5}$	l/h		0.2	0.7	1.6	2.0	2.7	3.4	4.0	5.4	6.4	
	US gal/h		0.05	0.17	0.41	0.53	0.72	0.89	1.05	1.44	1.68	
AUS consumption at prop. load x^3	l/h		0.0	0.3	0.9	1.6	2.4	3.0	3.7	5.2	6.4	
	US gal/h			0.08	0.23	0.42	0.64	0.80	0.96	1.38	1.69	
AUS consumption at Full load	l/h		0.9	1.4	2.8	4.3	5.2	5.5	5.9	6.2	6.4	
	US gal/h		0.23	0.38	0.73	1.15	1.36	1.46	1.56	1.64	1.69	

AUS concentration 32,5%

AUS consumption - IMO2 mode	3 g/h	0,1 oz/h
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1. Engine
2. AUS pump
3. Sensor connector QLT
4. AUS tank with temperature sensor
5. Front exhaust temperature sensor
6. AUS injector
7. Catalytic converter (SCR)
8. ACM (After Treatment Module)
9. Front Nox sensor
10. Rear NOx sensor
11. Injector pipe
12. Rear exhaust temperature sensor



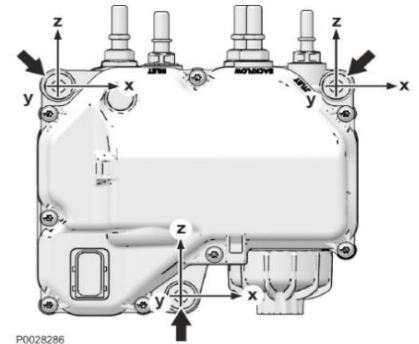
Abbreviations:

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

Vibration demands for pump unit

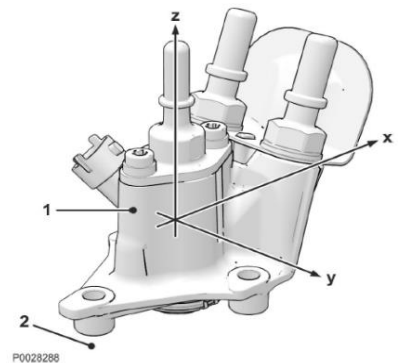
Maximum permissible PSD acceleration	Frequency [Hz]	PSD [(m/s ²) ² /Hz]
	30	16
	70	3.111
	215	3.111
	320	0.444
	2000	0.444
Maximum permissible peak-hold acceleration	Frequency [Hz]	Acceleration (m/s ²)
	5	2
	10	46.667
	20	46.667
	30	73.333
	100	73.333

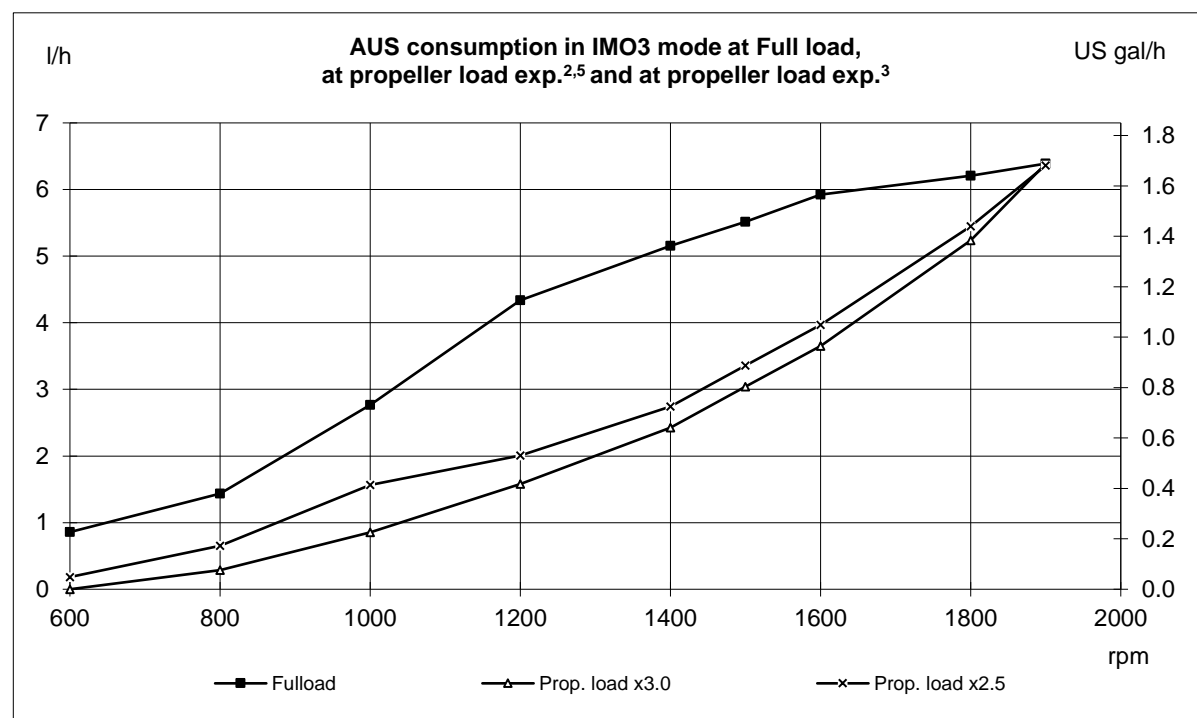
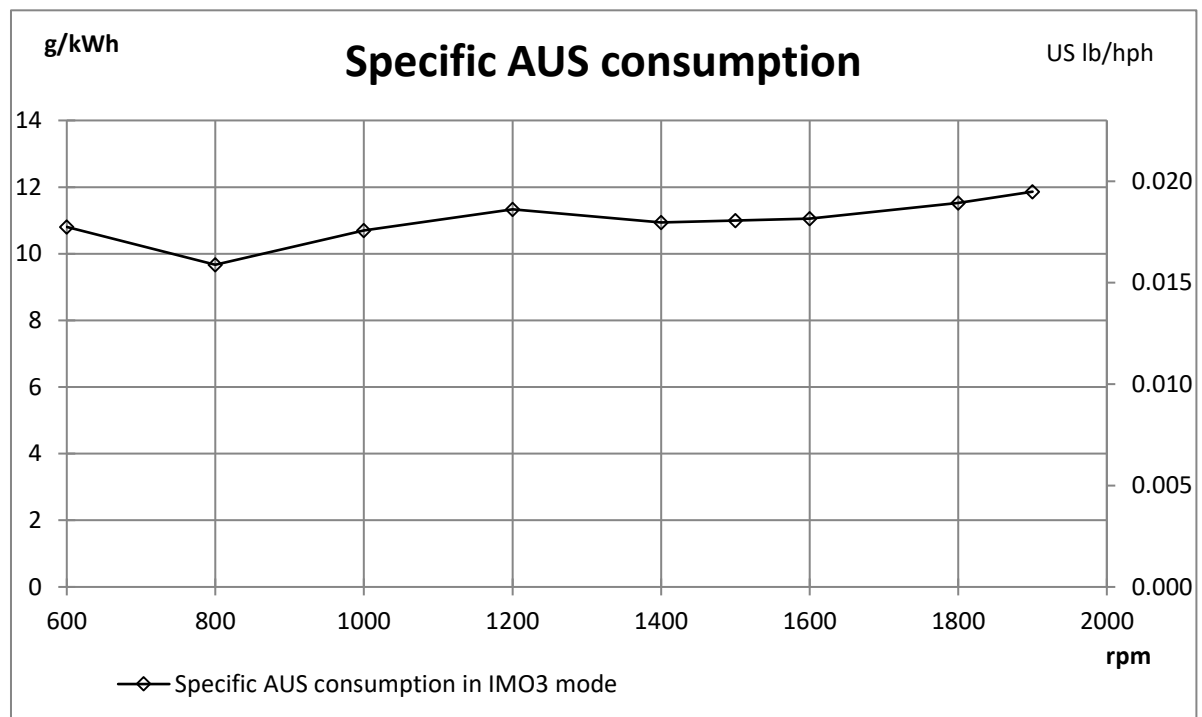
Accelerometers (3D) shall be located at the three pump attachment points

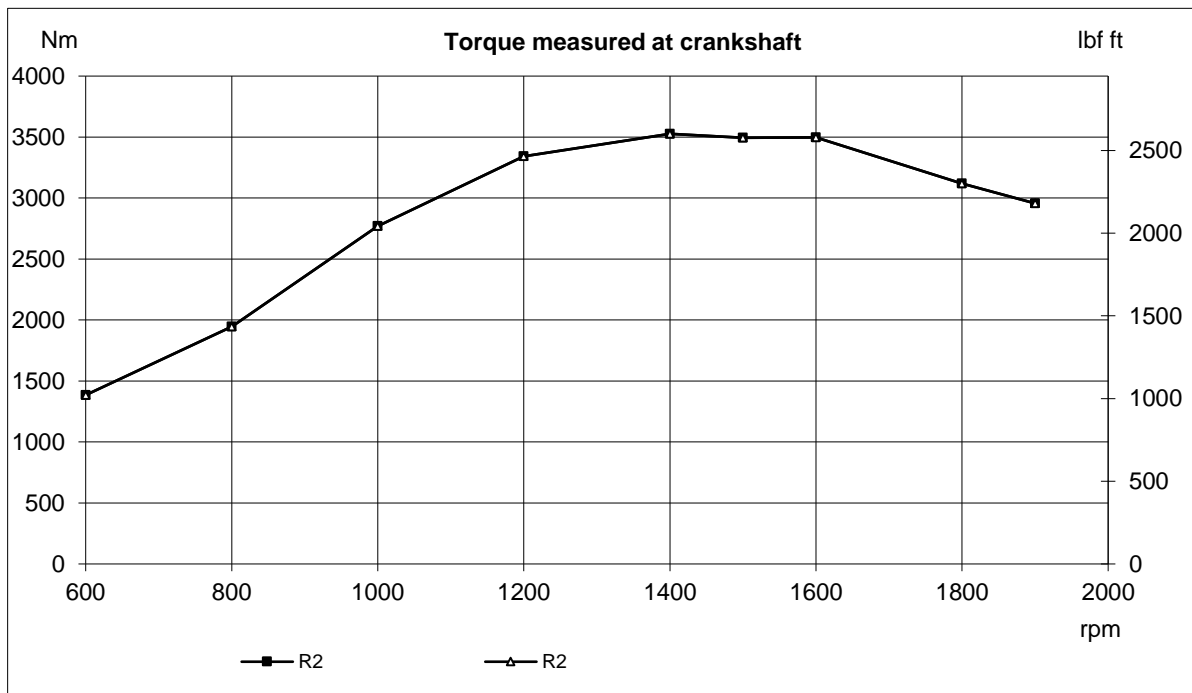
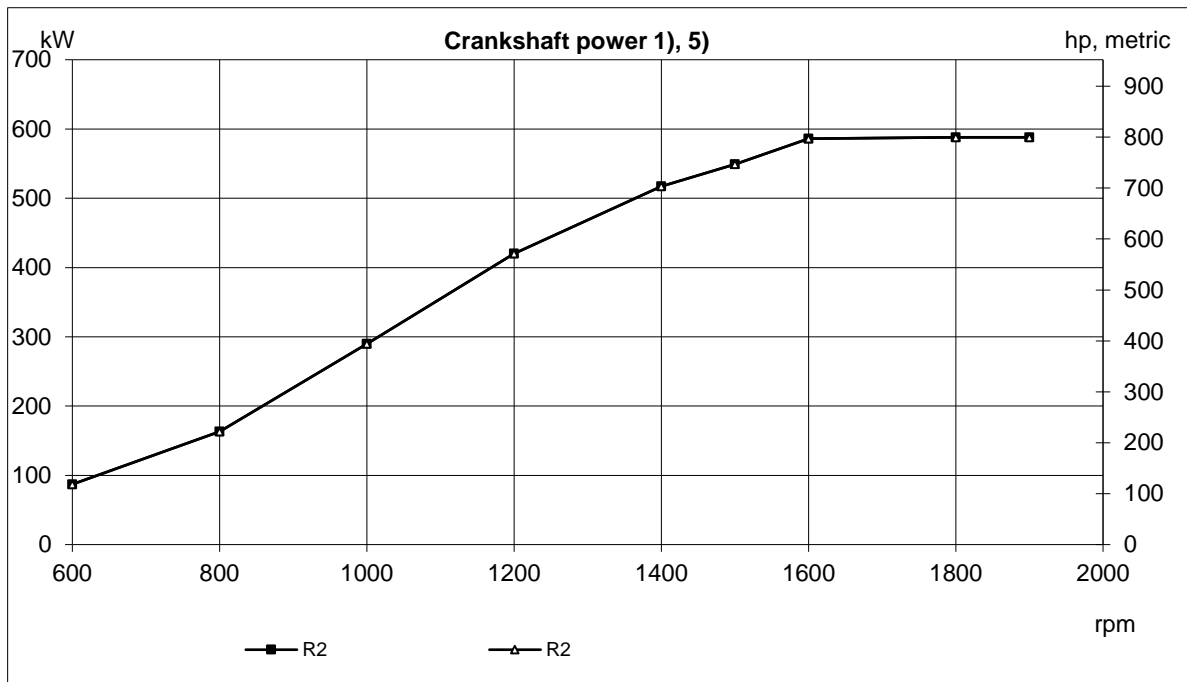
**Vibration demands for dosage valve**

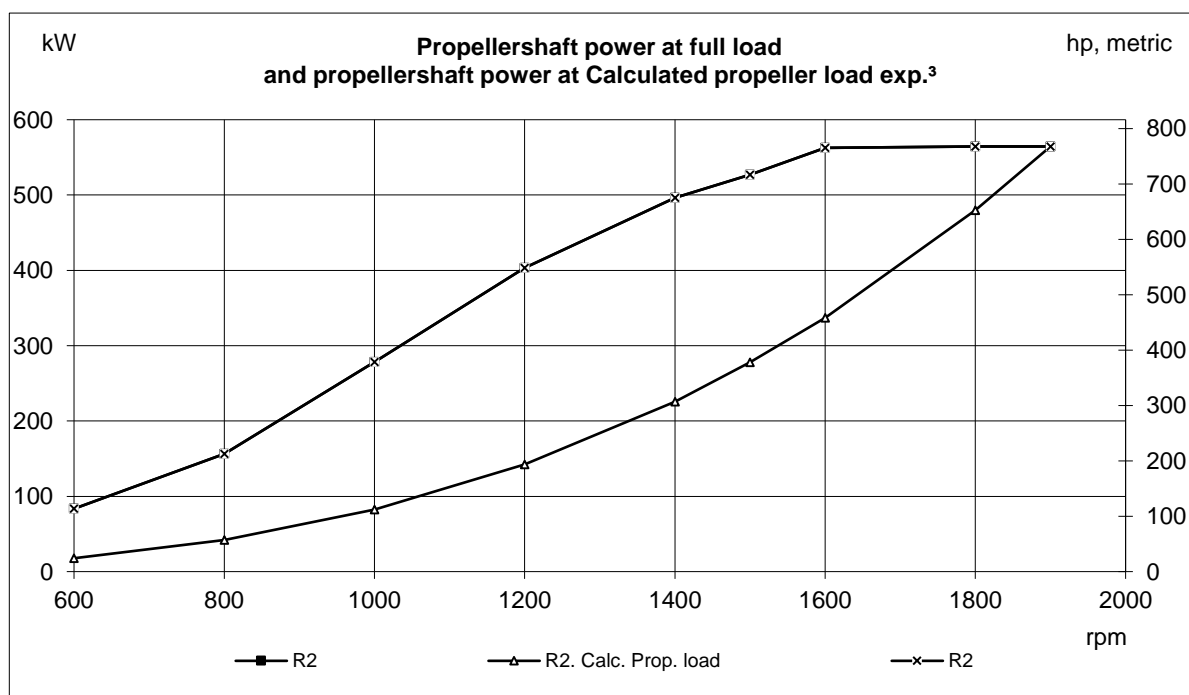
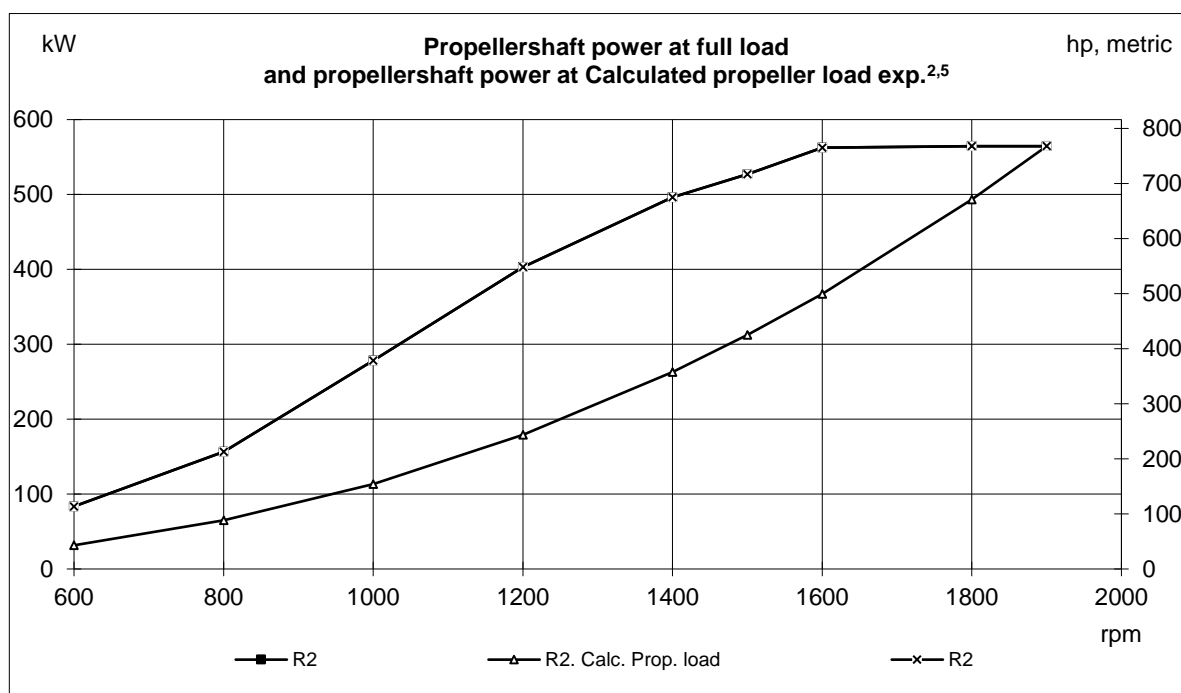
Maximum permissible PSD acceleration (lin-lin average value):	Frequency [Hz]	PSD [(m/s ²) ² /Hz]
	10	6.222
	20	12.444
	30	12.444
	180	0.333
	300	0.333
	600	8.889
	2000	8.889
Maximum permissible peak-hold acceleration	Frequency [Hz]	Acceleration (m/s ²)
	20	7.58
	65	80
	260	80
	260	60
	350	60
	350	40
	520	40

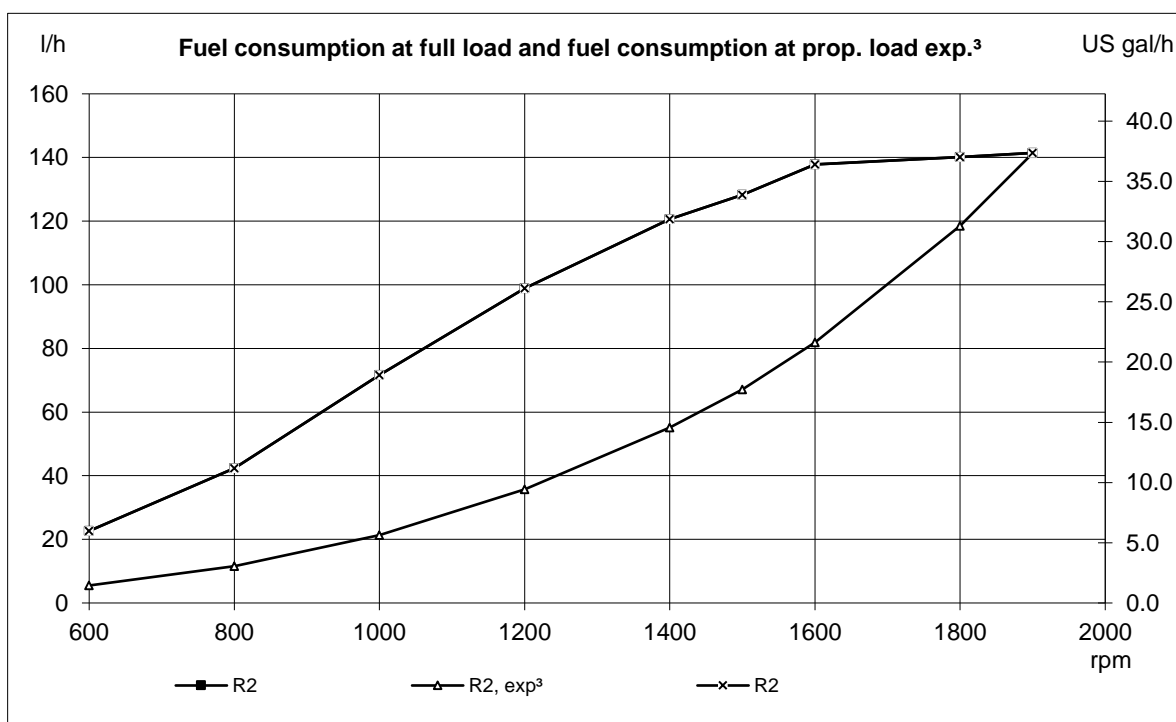
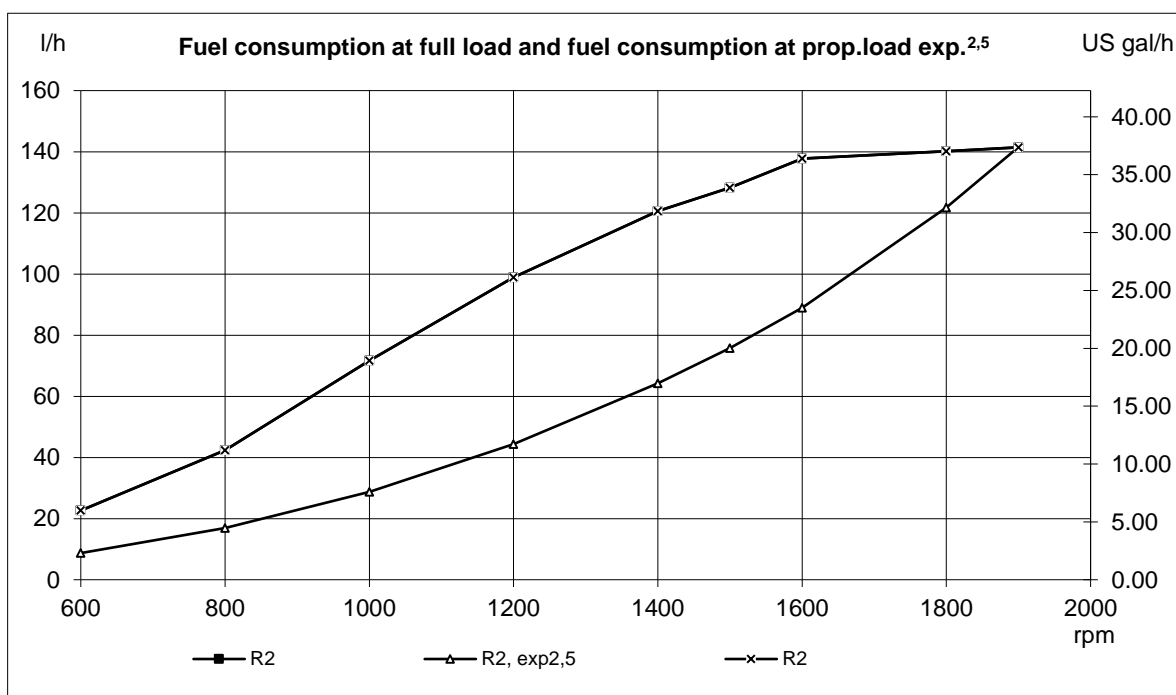
Accelerometer (3D) shall be located on the dosage valve (1). The second measuring point (2) is a reference point on injector pipe.

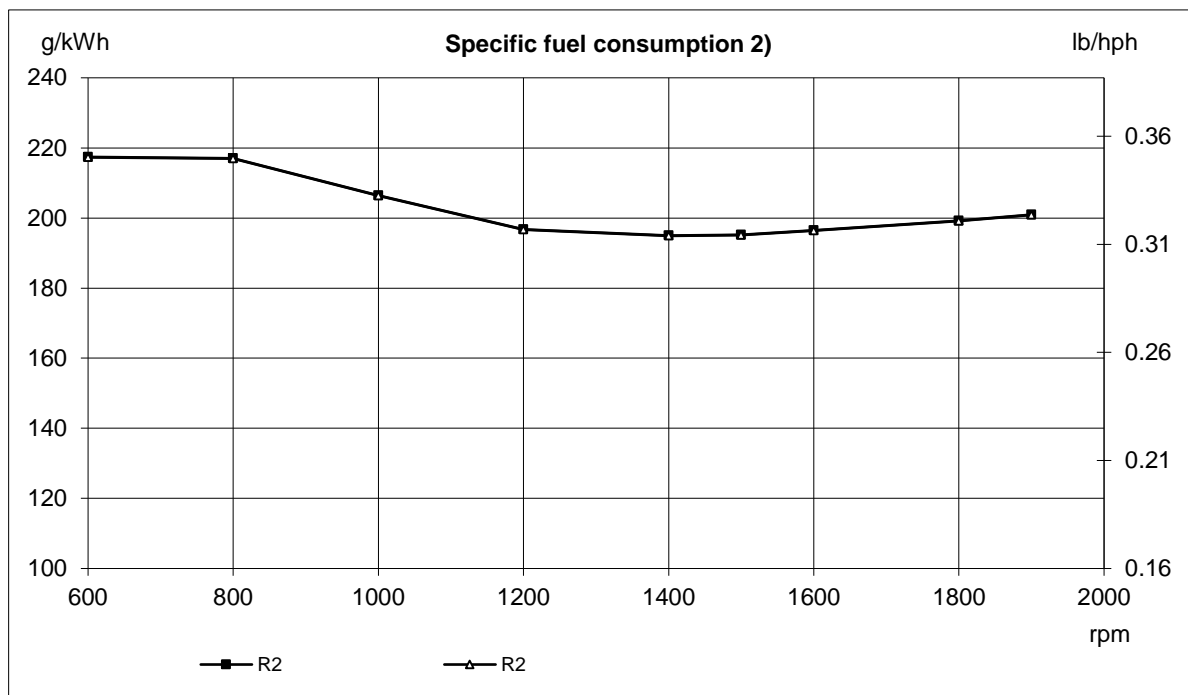


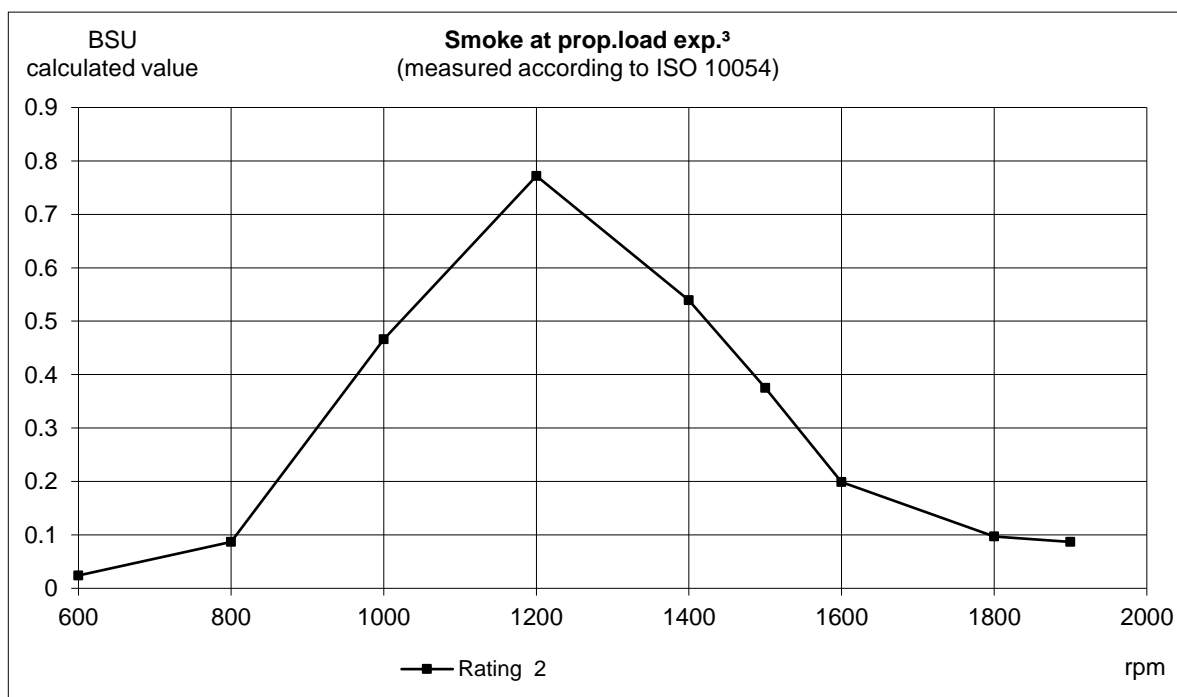
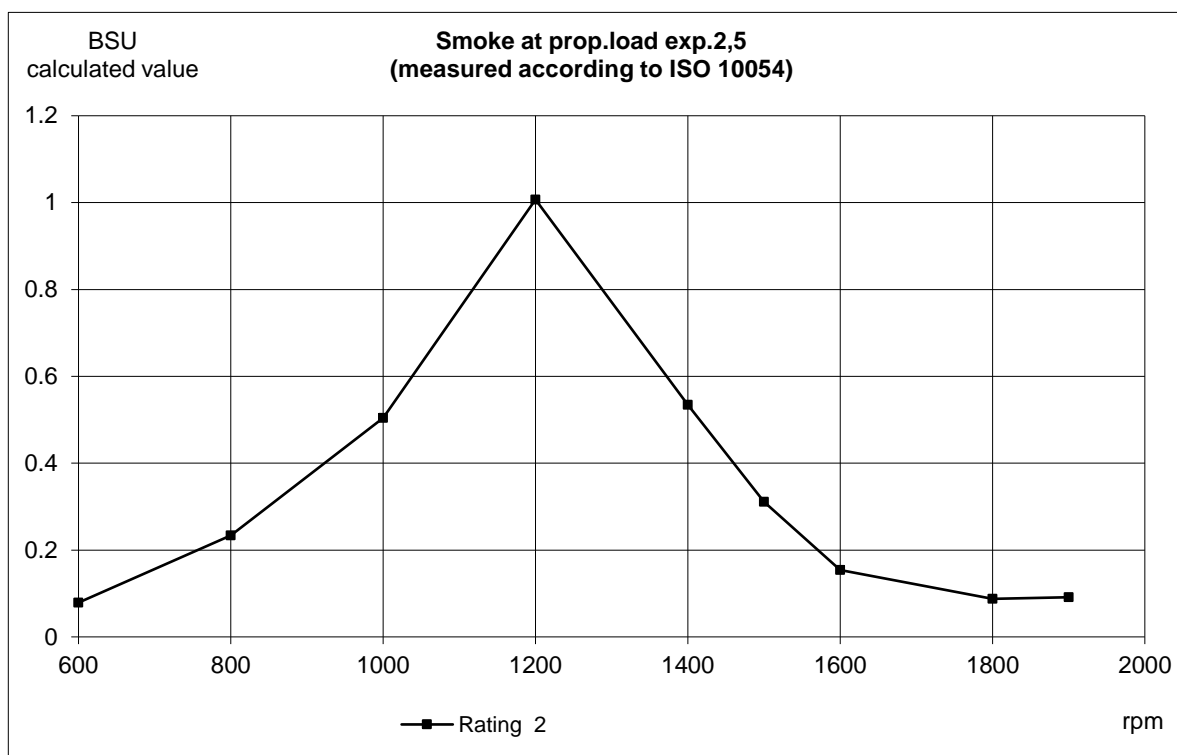


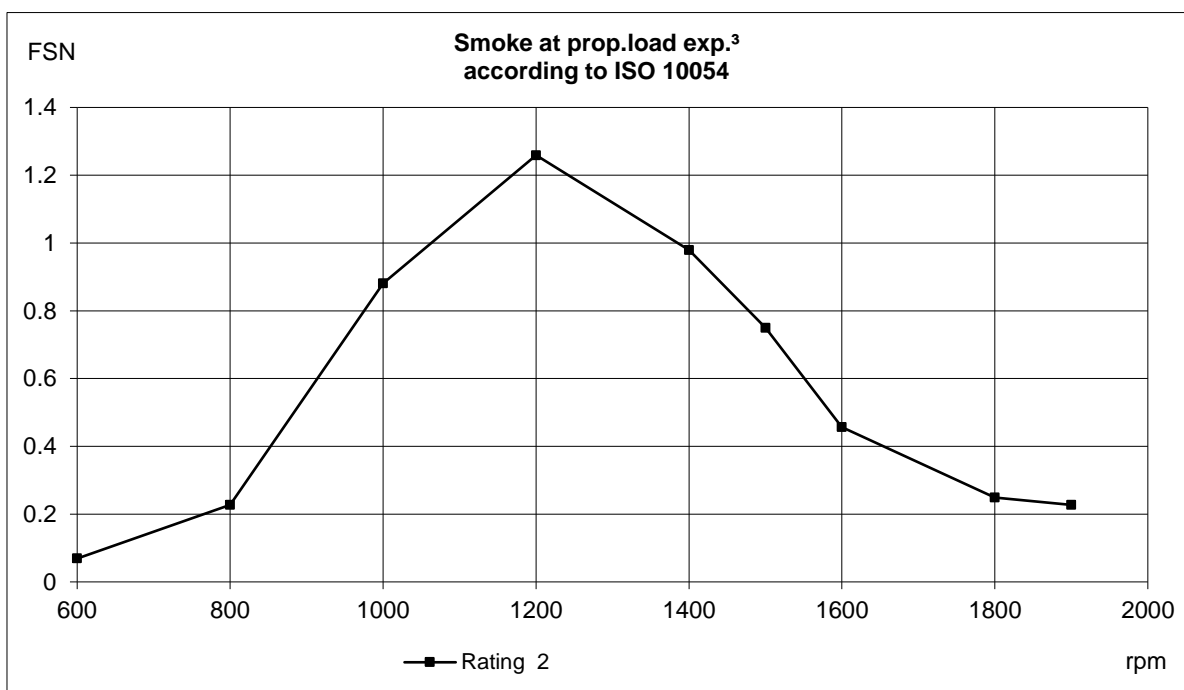
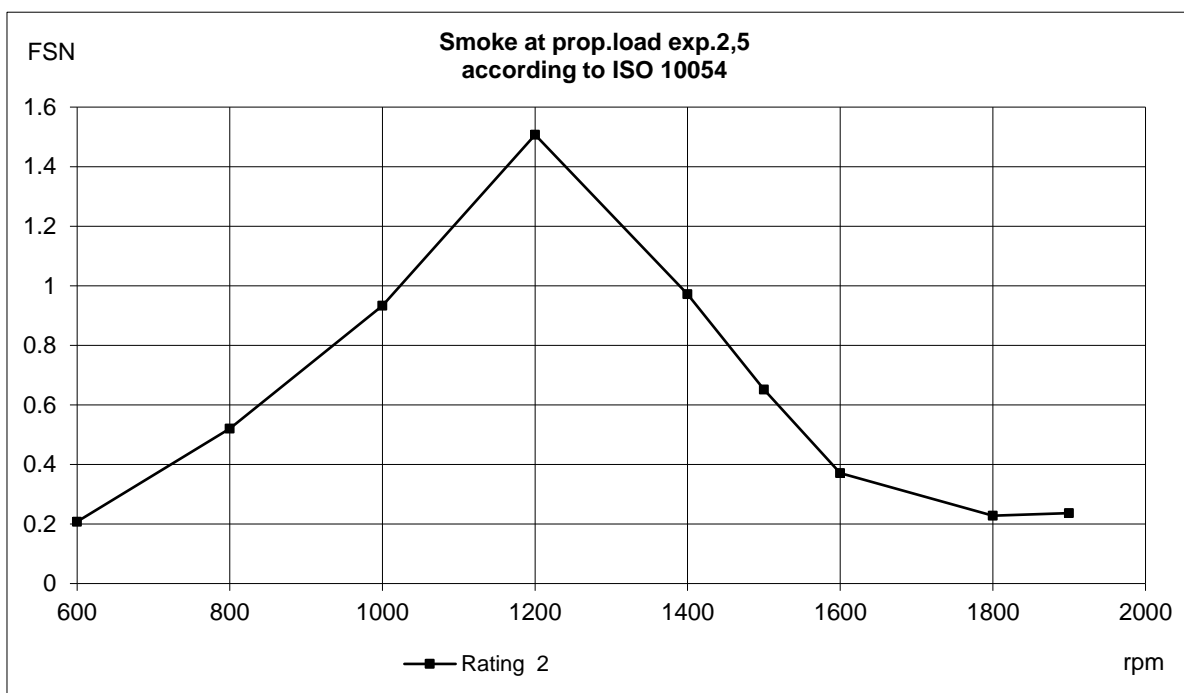


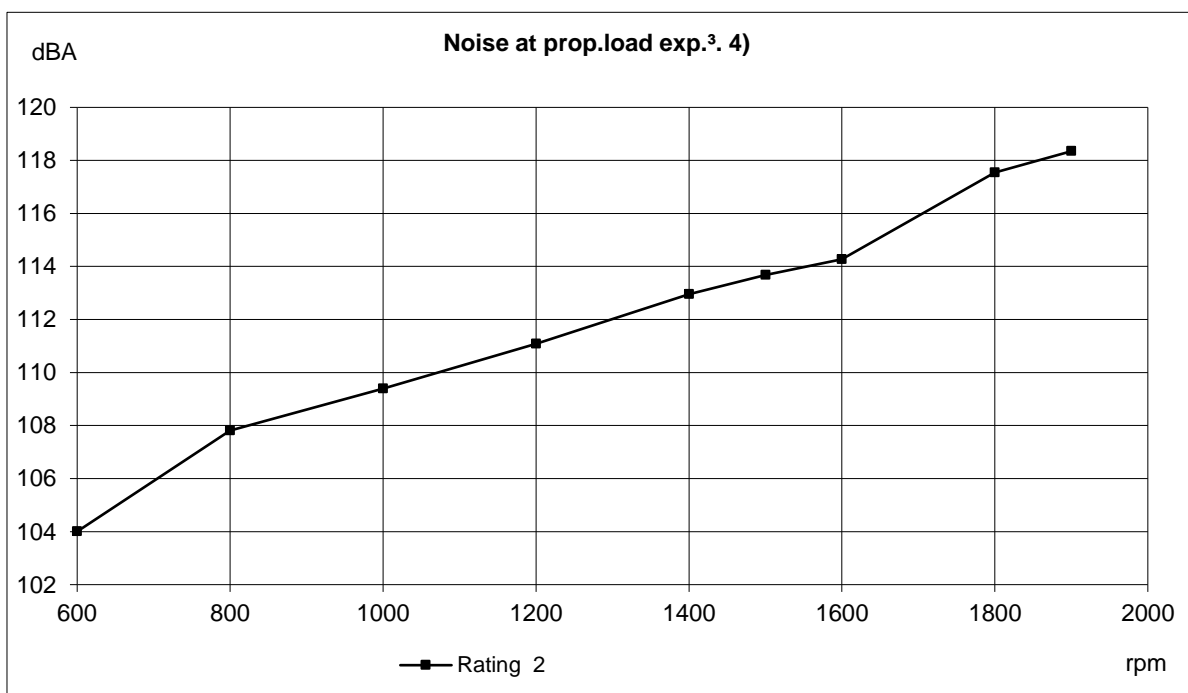
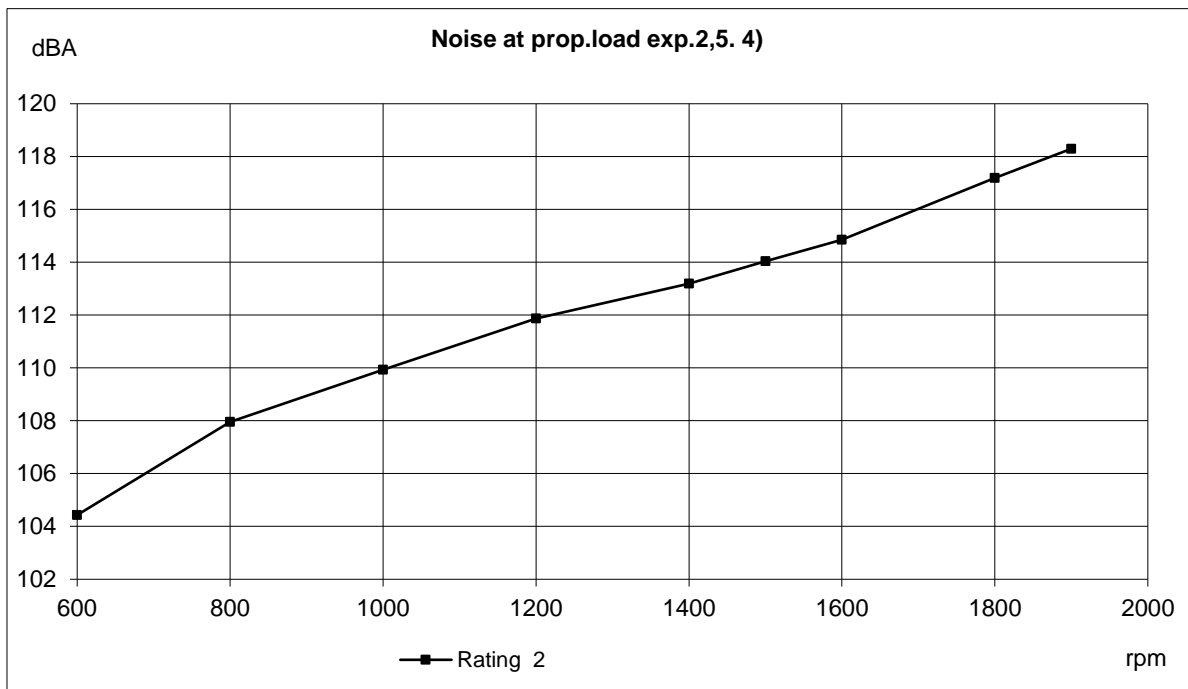


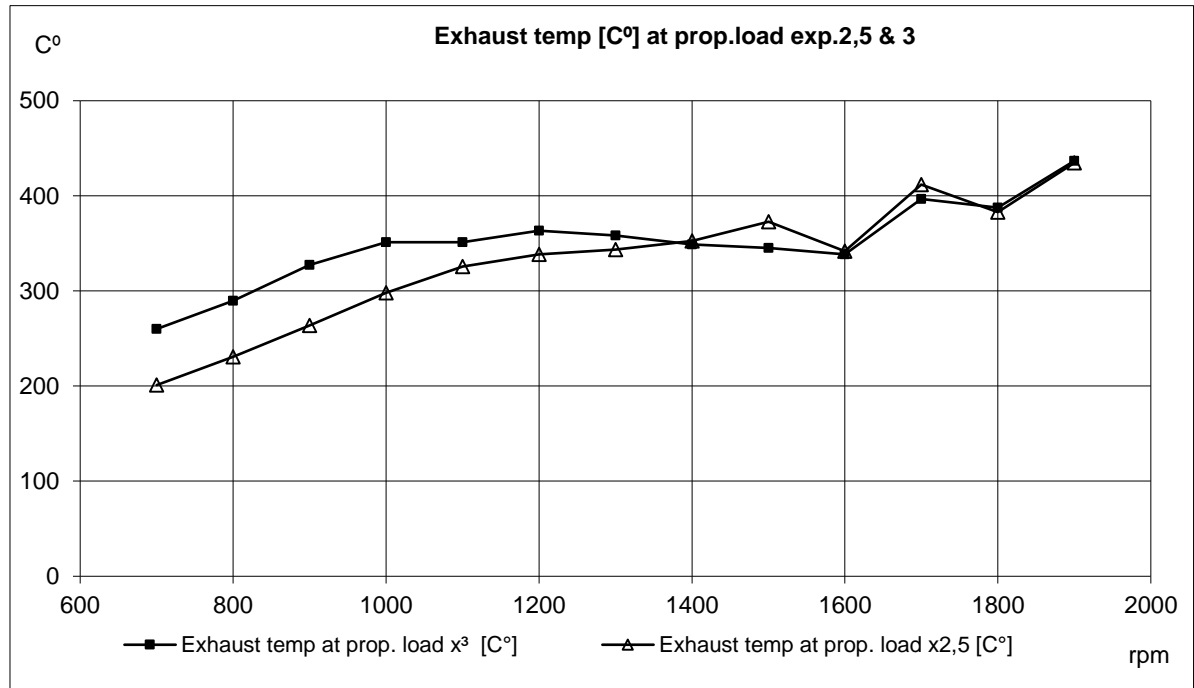








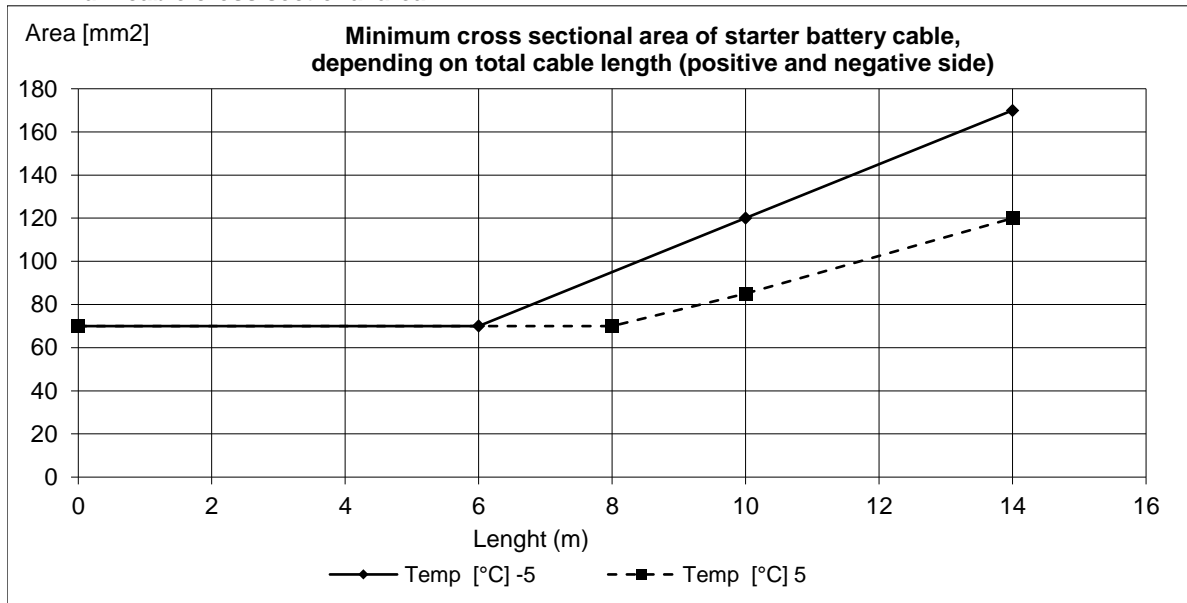




Battery capacity

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	140	900	5	2	70
-5	185	1150	5	2	70

Minimum cable cross sectional area



Fuses size:

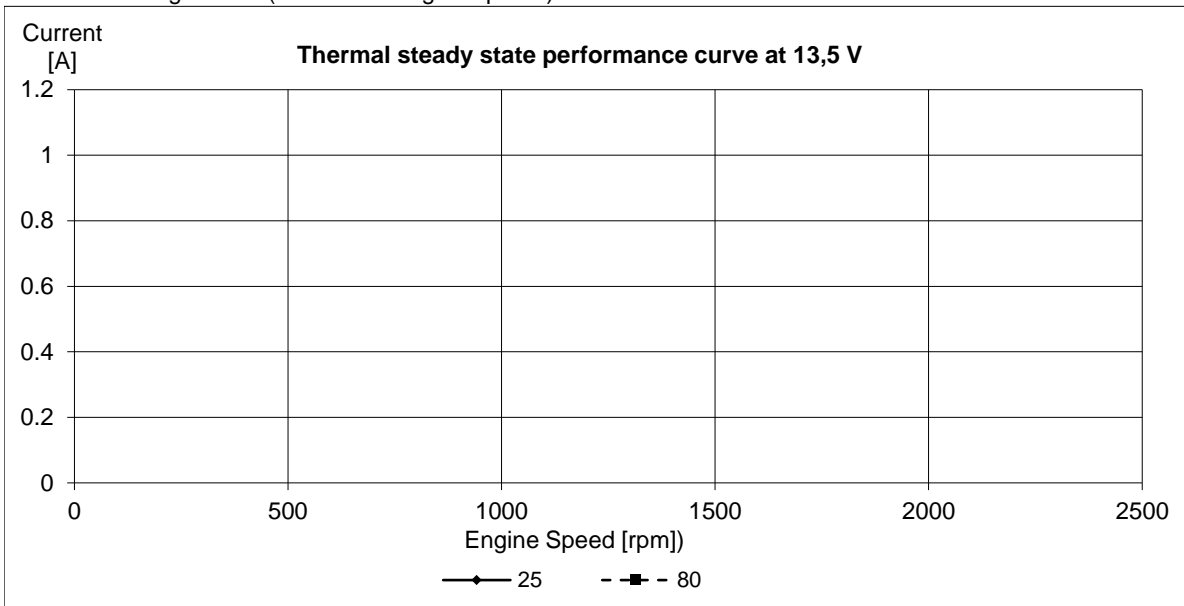
	[A]
Engine:	10
Control system:	10

Max current consumption during normal operation:

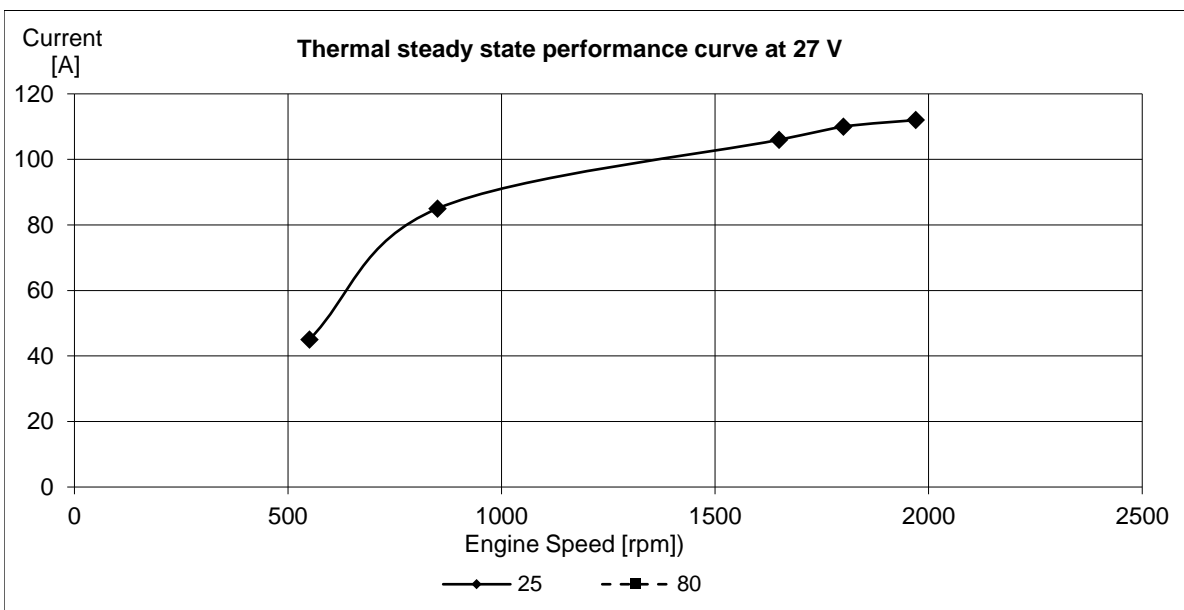
	[A]
Engine :	4-6

Standard alternator data:

Alternator charge curve (current vs. engine speed.)



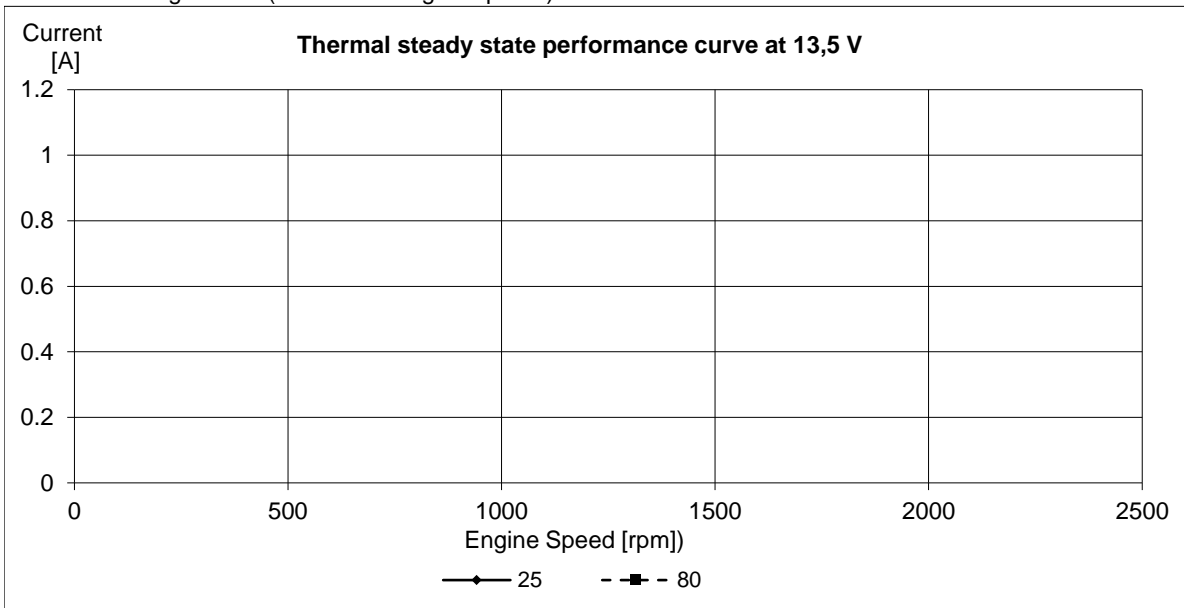
Constant charge voltage: [V]	14.3	+/- 0,3
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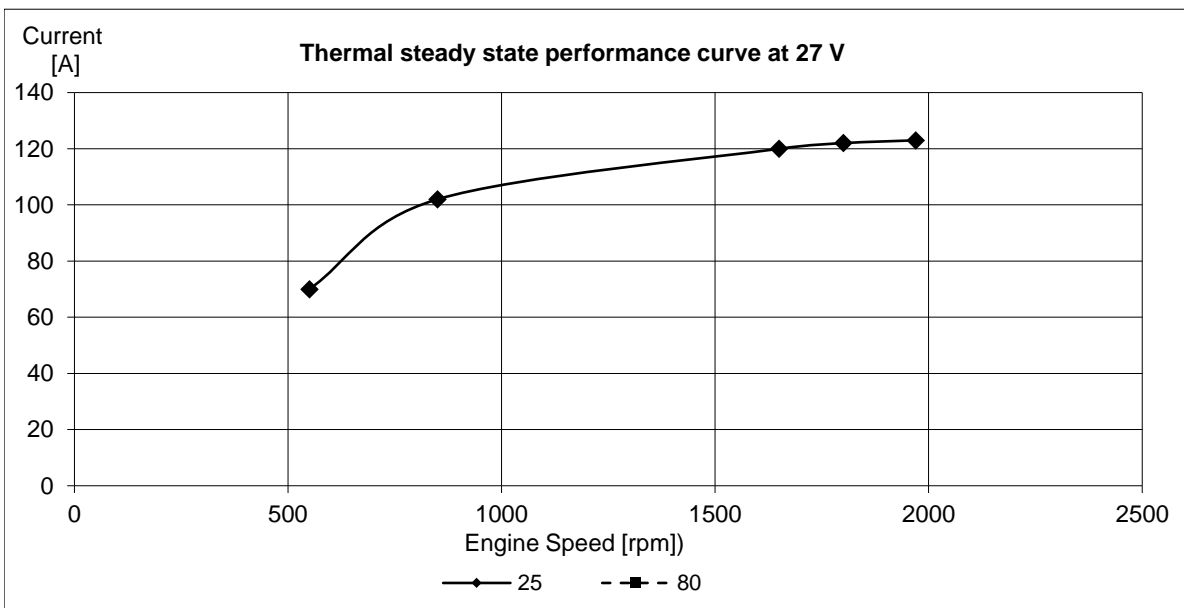
Constant charge voltage: [V]	28.3	+/- 0,3
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Extra alternator data:

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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