


Design Change Notice (DCN)	Location	Change Description	A = Added W = Was D = Deleted	Document Release Status RELEASED	
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General

In-line four stroke diesel engine with direct injection. Rotation direction, anti-clockwise viewed towards flywheel.
Turbocharged

Number of cylinders			6
Displacement, total		litre in ³	16,12 983,9
Firing order			1-5-3-6-2-4
Bore		mm in	144 5,67
Stroke		mm in	165 6,50
Compression ratio			16.5:1
Wet weight	Engine only	kg lb	1550 3417
	Engine incl. cooling system and air filtration system	kg lb	1751 3860
	Engine incl. cooling system, air filtration system, and frame	kg lb	2020 4453

Performance		rpm	1500	1800
Standby Power	without fan	kW hp	565 768	604 821
	with fan	kW hp	554 753	585 796
Prime Power	without fan	kW hp	514 699	551 749
	with fan	kW hp	503 684	532 724
Torque at:	Standby Power	Nm lbft	3597 2653	3204 2363
	Prime Power	Nm lbft	3272 2413	2923 2156
Mean piston speed		m/s ft/sec	8,3 27,1	9,9 32,6
Effective mean pressure at:	Standby Power	MPa psi	2,8 407	2,5 362
Effective mean pressure at:	Prime Power	MPa psi	2,6 370	2,3 330
Max combustion pressure at:	Standby Power	MPa psi	18,8 2727	18,9 2741
Max combustion pressure at:	Prime Power	MPa psi	17,7 2567	18 2611
Total mass moment of inertia, J (mR ²)		kgm ² lbft ²	4,20 99,7	
Friction Power		kW hp	36 48,96	53 72,08
Derating see Technical Diagrams				

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Engine noise emission

Test Standards: ISO 3744-1981 (E) sound power

Tolerance ± 0.75 dB(A)

		rpm	1500	1800
Measured sound power Lw	No load	dB(A)	114	117
	Standby Power	dB(A)	116	119
	Prime Power	dB(A)	116	118
Calculated sound pressure Lp at 1 m	No load	dB(A)	102	105
	Standby Power	dB(A)	104	107
	Prime Power	dB(A)	104	106

Unsilenced exhaust noise

Data calculated as sound pressure Lp.

Assumed microphone distance 1 m

	rpm	1500	1800
Standby Power	dB(A)	115	120
Prime Power	dB(A)	115	120

Test conditions for load acceptance data

Warm engine.	Generator	Model	Type of AVR
	Stamford	HCI 544 E1	SX 440
AVR Settings	UFRO : Std-setting 47Hz / 57Hz / 400 V		

Load acceptance performance can vary due to actual alternator inertia, voltage regulator, type of load and local ambient conditions. Please note that load step 0-100% is based on calculation.

Single step load performance at 1500 rpm

Load (%)	Speed diff (%)		Recovery time (s)		Remaining load (%)	Speed diff (%)		Recovery time (s)	
	Prime	Standby	Prime	Standby		Prime	Standby	Prime	Standby
0-20	3,2	3,5	1,8	1,8	20-100	26,8	32,5	6,3	8,4
0-38		7,0		2,4	38-100		13,3		6,4
0-40	6,8	7,8	2,3	2,5	40-100	11,2	11,7	5,0	6,1
0-41	7,0		2,3		41-100	10,7		4,5	
0-48		10,0		3,9	48-100		9,5		4,0
0-53	10,0		3,2		53-100	8,0		4,1	
0-60	13,5	17,3	3,6	4,4	60-100	6,6	7,4	4,0	3,8
0-80	26,7	32,6	5,8	6,8	80-100	3,2	3,2	1,1	3,5
0-100*	42,5	52,5	8,3	9,7					
100-0	9,6	10,4	1,6	1,7					

Single step load performance at 1800 rpm

Load (%)	Speed diff %		Recovery time (s)		Remaining load (%)	Speed diff (%)		Recovery time (s)	
	Prime	Standby	Prime	Standby		Prime	Standby	Prime	Standby
0-20	2,2	2,4	1,8	2,0	20-100	9,9	11,4	3,0	3,6
0-40	4,6	5,1	2,0	2,0	40-100	6,3	7,3	2,3	3,0
0-52		7,0		2,0	52-100		6,2		2,7
0-57	7,0		2,0		57-100	4,5		2,1	
0-60	7,7	8,5	2,1	2,2	60-100	4,1	4,8	2,0	2,4
0-67		10,0		2,8	67-100		4,0		2,3
0-73	10,0		2,6		73-100	2,5		2,0	
0-80	11,7	15,2	2,8	3,6	80-100	1,9	2,2	1,9	2,0
0-100*	19,4	22,9	3,9	5,6					
100-0	6,8	7,4	0,9	1,7					

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Cold start performance

	°C	rpm	1500	1800
Time from start to stay within 0.5% of no load speed at ambient temperature:	20	s	6,5	8,4
	5	s	6,7	8,7
	-15*	s	7,3	9,8
	-30**	s		

* With manifold heater 4 kW engaged, lubrication oil 15W/40 and block heater.

** With manifold heater 4 kW engaged, lubrication oil 5W/30 and block heater, Fuel MK-1.

Block heater type	Make	Power kW	Engaged hours	Cooling water temp engine block
	Volvo	2	12	17°C 63°F

Lubrication system

		rpm	1500	1800
Lubricating oil consumption	Standby Power	litre/h	0,11	0,12
		US gal/h	0,029	0,032
	Prime Power	litre/h	0,10	0,11
		US gal/h	0,026	0,029
Oil system capacity including filters		litre		48
		US gal		12,7
Oil sump capacity:	max	litre		42
		US gal		11,1
	min	litre		32
		US gal		8,5
Oil change intervals/specifications:	VDS 2*	h		600
	VDS, ACEA, E3*	h		400
	ACEA E2, API CD, CF, CF-4, CG-4*	h		200
Engine angularity limits:	front up	°		30
	front down	°		30
	side tilt	°		30
Oil pressure at rated speed		kPa		300 - 650
		psi		44 - 94
Lubrication oil temperature in oil sump:	max	°C		130
		°F		266
Oil filter micron size		µ		40,000

* See also general section in the sales guide

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Fuel system		rpm	1500	1800
Standby Power Specific fuel consumption at:	25%	g/kWh lb/hph	210 0,340	220 0,357
	50%	g/kWh lb/hph	196 0,318	203 0,329
	75%	g/kWh lb/hph	196 0,318	204 0,331
	100%	g/kWh lb/hph	200 0,324	212 0,344
Prime Power Specific fuel consumption at:	25%	g/kWh lb/hph	213 0,345	227 0,368
	50%	g/kWh lb/hph	195 0,316	204 0,331
	75%	g/kWh lb/hph	195 0,316	202 0,327
	100%	g/kWh lb/hph	198 0,321	209 0,339

Fuel system		rpm	1500	1800
Fuel to conform to	ASTM-D975-No1 and 2D JIS KK 2204, EN 590			
System supply flow at:	litre/h		180,0	200,0
	US gal/h		47,6	52,8
Fuel supply line max restriction (Measured at fuel inlet connection)	kPa		30,0	30,0
	psi		4,4	4,4
Fuel supply line max pressure, engine stopped	kPa		0,0	0,0
	psi			
System return flow	litre/h		25,0	25,0
	US gal/h		6,6	6,6
Fuel return line max restriction (Measured at fuel return connection)	kPa		20,0	20,0
	psi		2,9	2,9
Maximum allowable inlet fuel temp (Measured at fuel inlet connection)	°C		60	60
	°F		140	140
Prefilter / Water separator micron size	μ		10,000	
Fuel filter micron size	μ		5,000	
Governor type/make, standard	Volvo / EMS 2			
Injection pump type/make	Delphi E1			

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Intake and exhaust system		rpm	1500	1800
Air consumption at: (+25°C and 100kPa)	Standby Power	m ³ /min cfm	41,2 1455	46,6 1646
	Prime Power	m ³ /min cfm	39 1377	45,4 1603
Max allowable air intake restriction including piping		kPa psi	5 0,7	5 0,7
Air filter restriction clean Volvo Penta filter		kPa psi	1,5 0,2	2,0 0,3
Heat rejection to exhaust at:	Standby Power	kW BTU/min	427 24283	500 28435
	Prime Power	kW BTU/min	379 21553	439 24965
Exhaust gas temperature after turbine at:	Standby Power	°C °F	482 900	512 954
	Prime Power	°C °F	456 853	468 874
Max allowable back pressure in exhaust line	Standby Power	kPa psi	10 1,5	10 1,5
	Prime Power	kPa psi	8 1,2	8 1,2
Exhaust gas flow at: (temp and pressure after turbine at the corresponding power setting)	Standby Power	m ³ /min cfm	102,5 3620	117,6 4153
	Prime Power	m ³ /min cfm	94,4 3334	108,9 3846

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Cooling system		rpm	1500	1800
Heat rejection radiation from engine at:	Standby Power	kW	20	24
		BTU/min	1137	1365
	Prime Power	kW	18	20
		BTU/min	1024	1137
Heat rejection to coolant at:	Standby Power	kW	218	248
		BTU/min	12397	14104
	Prime Power	kW	187	218
		BTU/min	10635	12397
Coolant	Volvo Penta coolant "ready mix" or Volvo Penta coolant mixed with clean fresh water 40 / 60			
Radiator cooling system type	Closed circuit			
Standard radiator core area		m ²	1,32	
		foot ²	14,21	
Fan diameter		mm	890	
		in	35,04	
Fan power consumption		kW	11	19
		hp	15	26
Fan drive ratio	1.04:1			
Coolant capacity,	engine	litre	33	
		US gal	8,72	
	engine with std radiator and hoses	litre	60	
		US gal	15,85	
Coolant pump	drive/ratio	Belt / 1.85:1		
Coolant flow with standard system		l/s	6,4	7,7
		US gal/s	1,69	2,03
Minimum coolant flow		l/s	6,4	7,7
		US gal/s	1,69	2,03
Maximum outer circuit restriction, including piping		kPa	40	60
		psi	5,8	8,7
Thermostat	start to open	°C	82	
		°F	180	
	fully open	°C	92	
		°F	198	
Maximum static pressure head (expansion tank height + pressure cap setting)		kPa	100	
		psi	14,5	
Minimum static pressure head (expansion tank height + pressure cap setting)		kPa	70	
		psi	10,2	
Standard pressure cap setting		kPa	75	
		psi	10,9	
Maximum top tank temperature		°C	103	
		°F	217	
Draw down capacity. The difference between min coolant level in the expansion tank and the lowest level where the engine's coolant system still is functioning		litre	1,8	
		US gal	0,48	

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Charge air cooler system		rpm	1500	1800
Heat rejection to charge air cooler	Standby Power	kW	131	159
		BTU/min	7450	9042
	Prime Power	kW	112	145
		BTU/min	6369	8246
Charge air mass flow	Standby Power	kg/s	0,83	0,92
	Prime Power	kg/s	0,78	0,9
Charge air inlet temp. (Charge air temp after turbo compressor)	Standby Power	°C	226	243
		°F	439	469
	Prime Power	°C	206	228
		°F	403	442
Charge air outlet temp. (Charge air temp after intercooler)	Standby Power	°C	45	45
		°F	113	113
	Prime Power	°C	43	43
		°F	109	109
Maximum pressure drop over charge air cooler incl. piping		kPa	19	
		psi	2,76	
Charge air pressure (After charge air cooler)		kPa	268	
		psi	38,87	
Standard charge air cooler core area		m ²	1,3	
		foot ²	13,99	

Cooling performance

Cooling air flow and external restriction at different radiator air temperatures based on 103°C TTT and 40% coolant. Valid at 1 atm. (radiator and cooling fan, see optional equipment)

Engine speed rpm	Air on temp °C	PRIME POWER		STANDBY POWER	
		Air flow m ³ /s	External restriction Pa	Air flow m ³ /s	External restriction Pa
1500	40	5,9	835	6,5	736
	45	6,5	748	7,2	683
	50	7,4	697	8,2	616
	55	8,4	600	9,4	250
	57			10,0	0
	60	9,9	76		
	63	10,0	0		
1800	40	6,8	1313	7,6	1154
	45	7,6	1182	8,5	1055
	50	8,6	1078	9,7	956
	55	9,8	963	11,1	494
	58			12,3	0
	60	11,5	324		
	61	12,3	0		

Note! External restrictions are calculated for values >0 Pa

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Engine management system

Functionality	Alternatives	Default setting
Governor mode	Isochronus / Droop	Isochronus
Governor droop	0-8 %	4,0
Governor response	Adjustable PID-constants (VODIA)	Standard
Dual speed	1500 / 1800 rpm	According to customer
Idle speed	600-1200 rpm	900 rpm
Fine speed adjustment	± 120 rpm	0,0
Stop function	Energized to Run / Stop	Energized to Stop
Preheating function	On / Off	On
Lamp test	On / Off	On

Engine sensor and switch settings

Parameter	Unit	Alarm level		Engine protection		
		Setting range	Default setting	Level	Action. Default/Alternative	
Oil temp	°C	120 - 130	125	Setting +5	Shut down.	
Oil pressure	Low idle	kPa	-	190,0	160,0	Shut down
	1500 rpm	kPa	-	250,0	220,0	Shut down
	1800 rpm	kPa	-	300,0	270,0	Shut down
Oil level		-	Min level	-	-	
Piston cooling pressure >1000 rpm	kPa	-	150	150,0	Shut down	
Coolant temp	°C	95 - 101	98	Setting +5	Shut down.	
Coolant level		-	On	Low level	Shut down.	
Fuel feed pressure	Low idle	kPa	-	150	-	-
	>1400 rpm		-	300	-	-
Water in fuel		-	High level	-	-	
Crank case pressure	kPa	-	-	-	Shut down	
Air filter pressure droop	kPa	-	5	-	-	
	0,0	Alarm level		Engine protection		
Altitude, above sea	m	-	-	>1500	Automatic derating, see section derating	
Charge air temp	°C	-	80	85,0		
Charge air pressure	kPa	-	290	300,0		
Engine speed	rpm	100 - 120% of rated speed	120%	Alarm level	Shut down.	
Low voltage	V	-	25,5	-	-	

Engine protection can be disabled. For consequences please see VP International Limited Warranty Policy

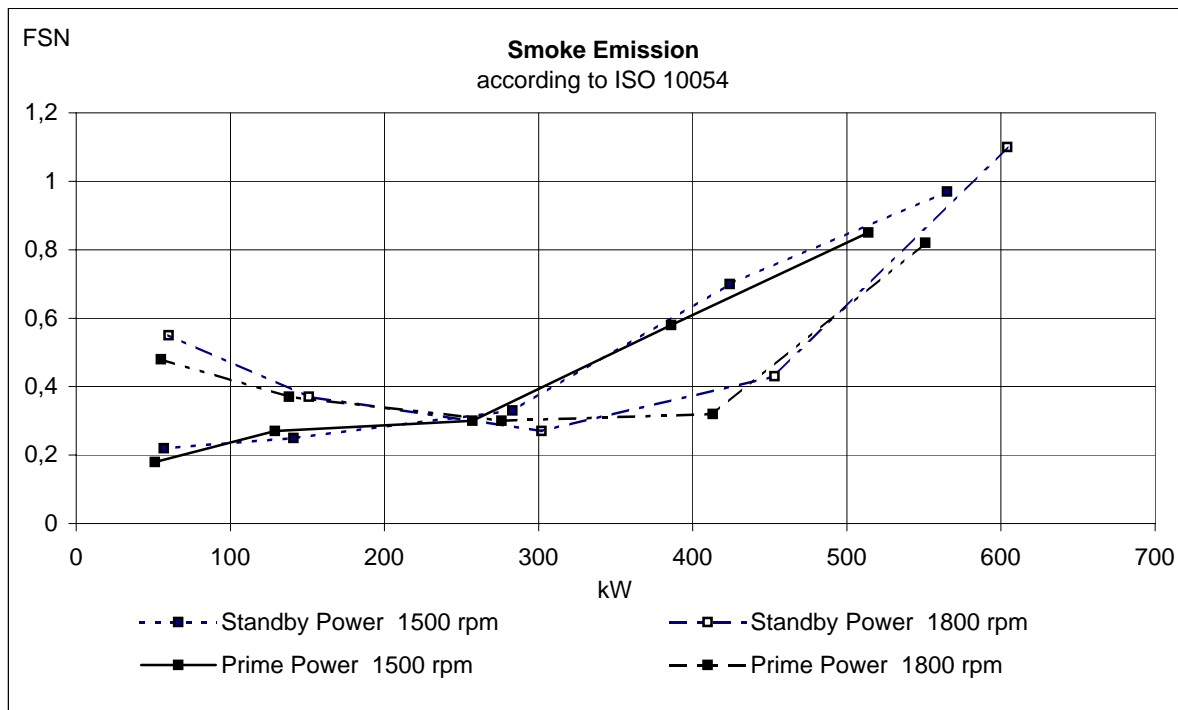
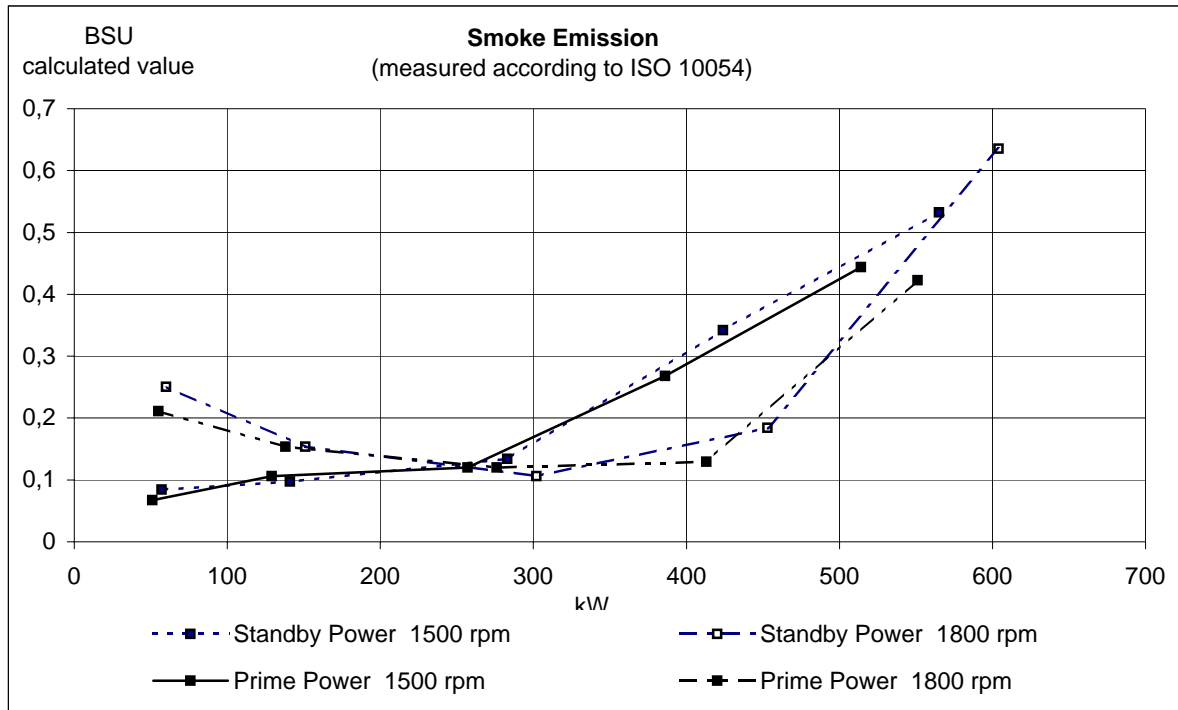
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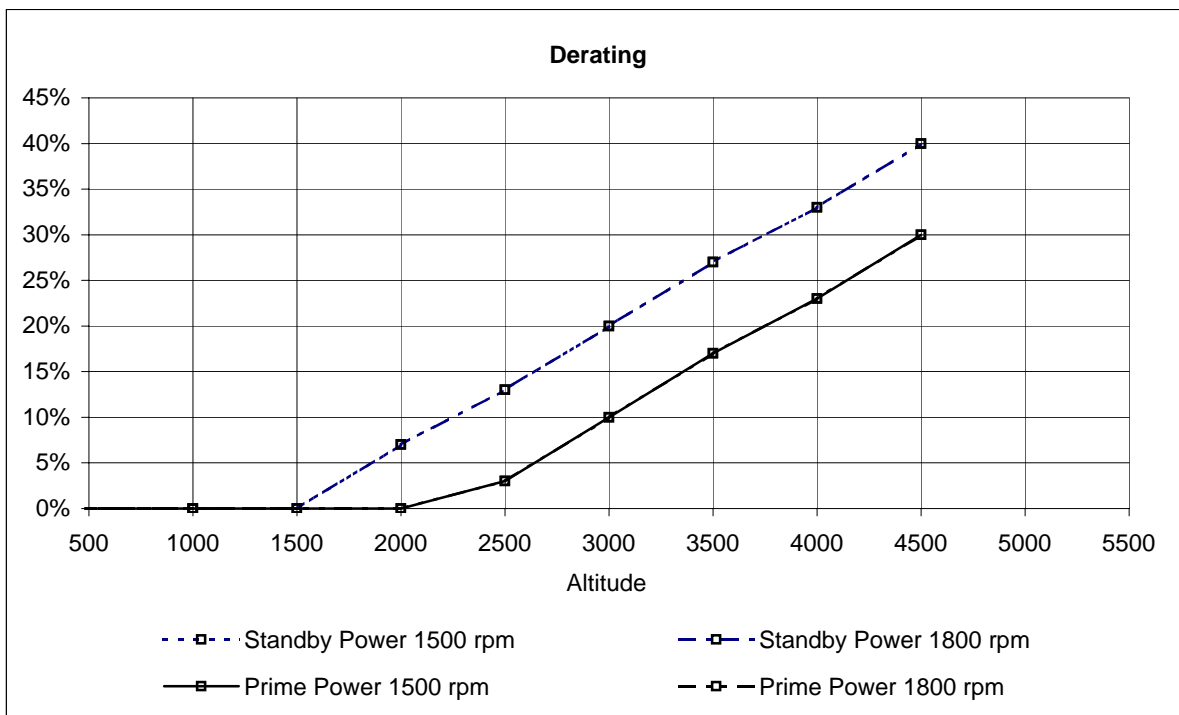
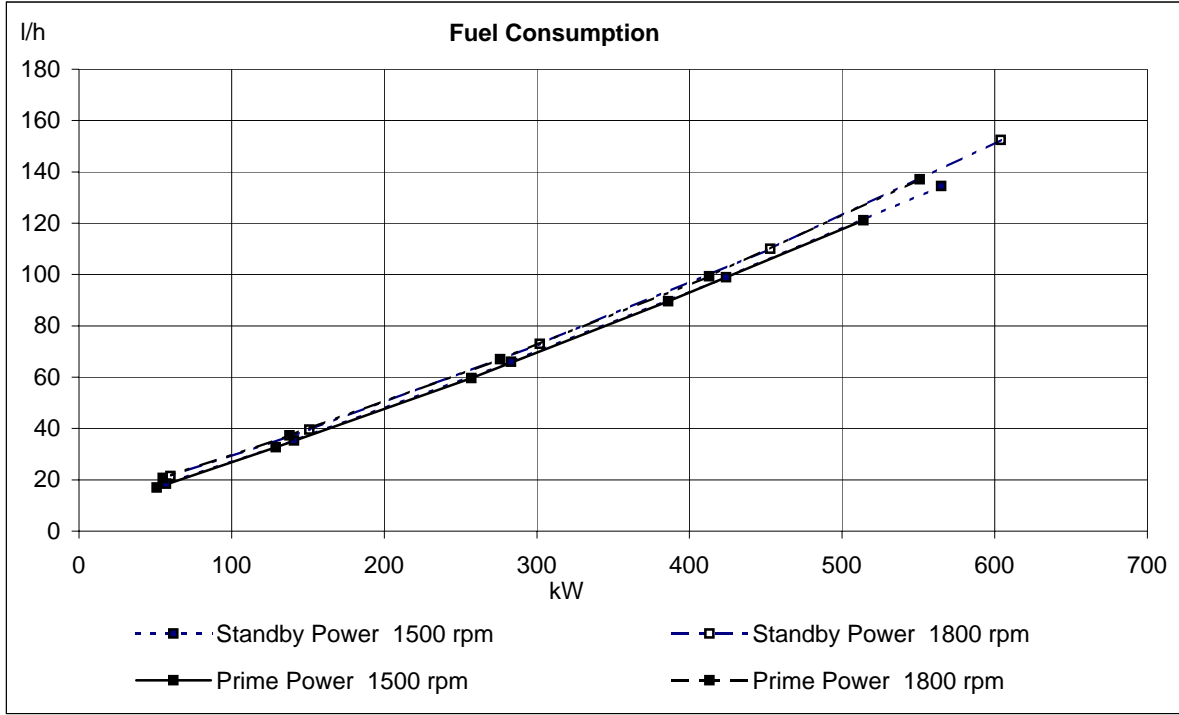
Electrical system

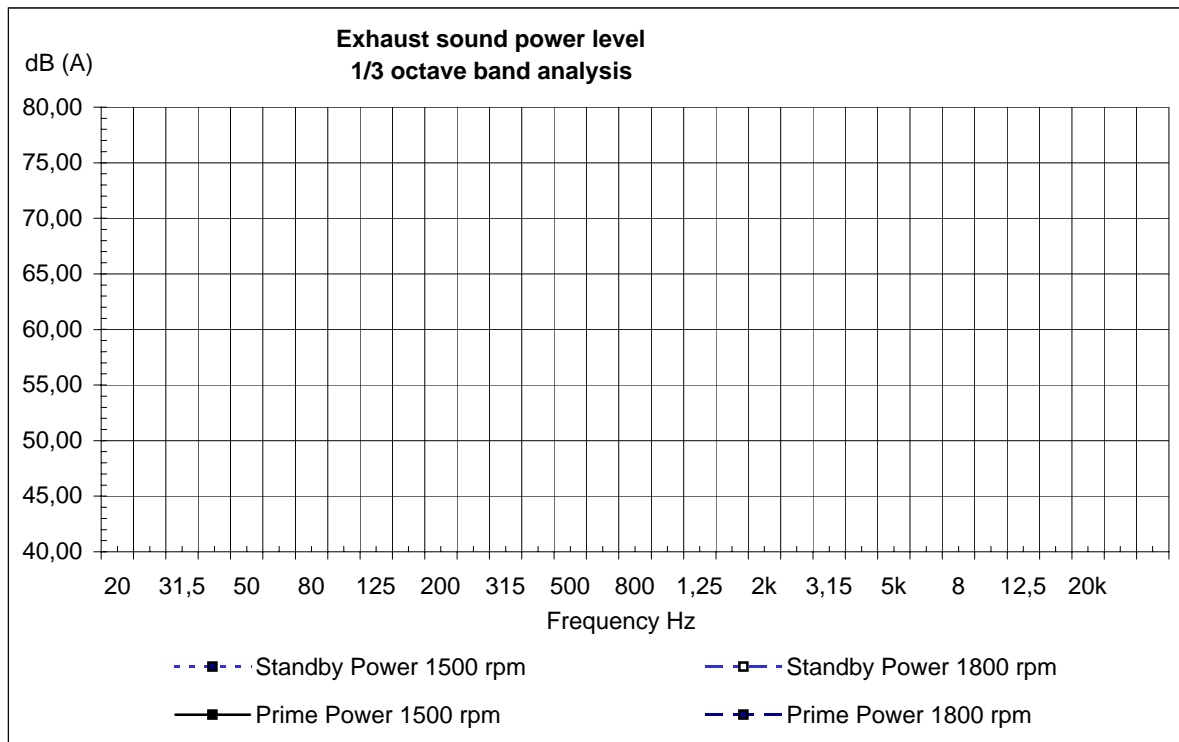
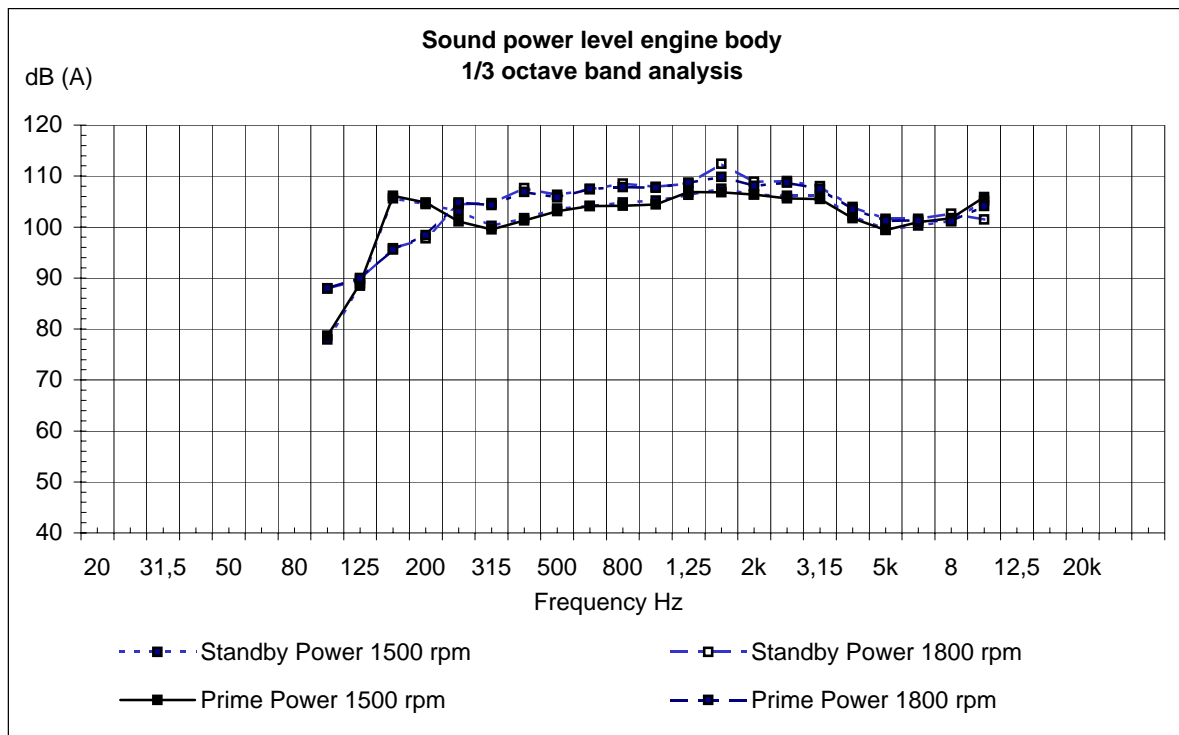
Voltage and type		24 V / insulated from earth	
Alternator:	make/output	A	Bosch / 80
	tacho output	Hz/alt. Rev	6
	drive ratio		3.9 : 1
Starter motor	make	Melco	
	type	105 P70	
	kW	7,0	
Number of teeth on:	flywheel		153
	starter motor		12
Max wiring resistance main circuit		mΩ	2
Cranking current at +20°C		A	280
Crank engine speed at 20°C		rpm	150
Starter motor battery capacity:	max	Ah/A	2x225
	min at +5°C	Ah/A	-
Inlet manifold heater (at 20 V)		kW	4,0
Power relay for the manifold heater		A	1

Power take off

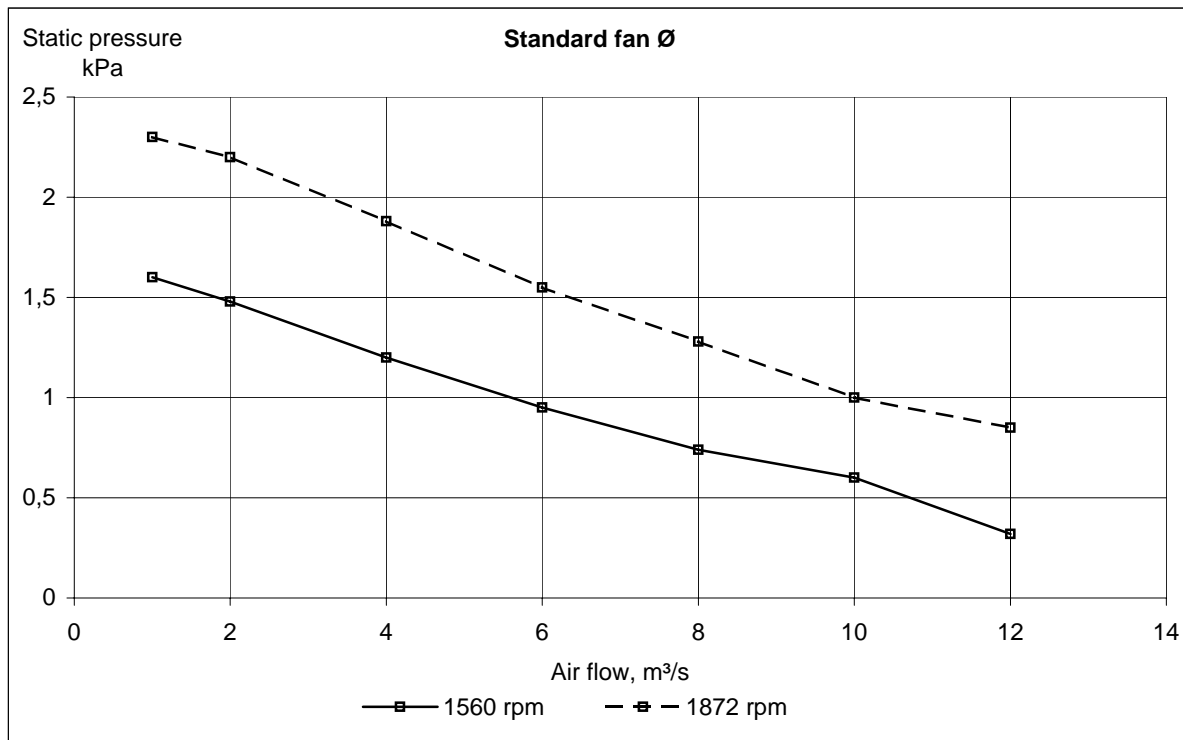
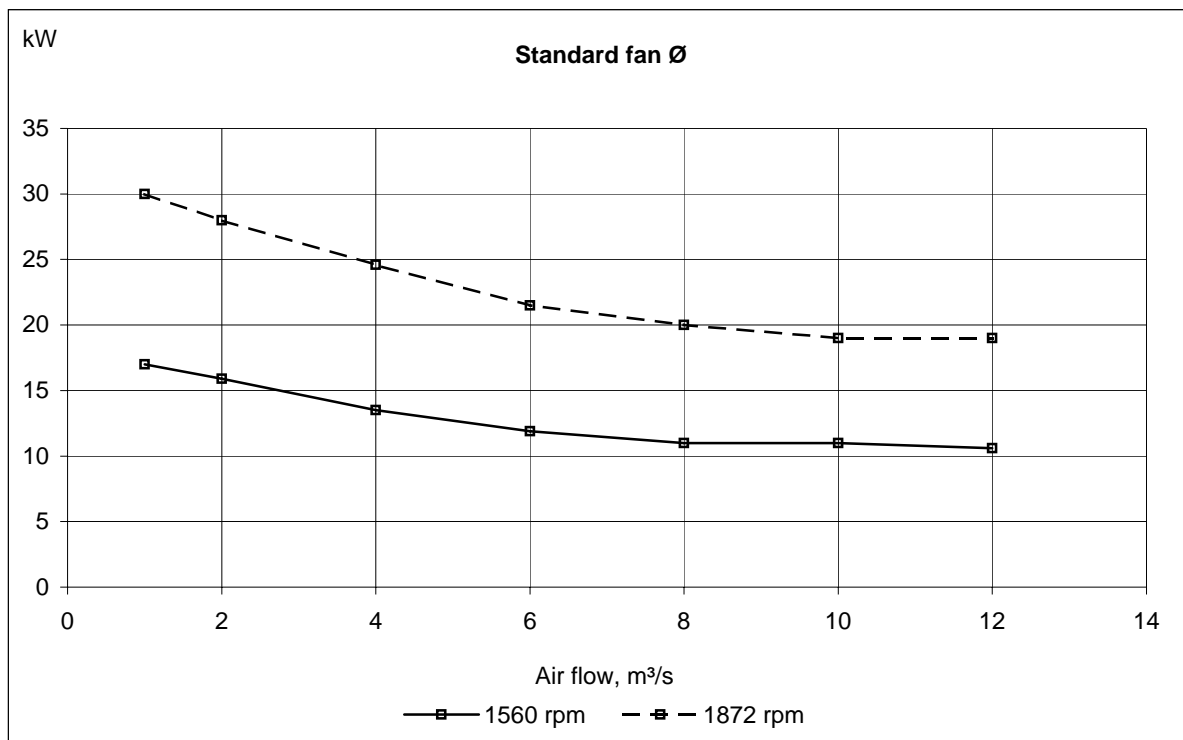
		rpm	1500	1800
Front end in line with crank shaft max:		Nm lbft	-	
Front end belt pulley load. Direction of load viewed from flywheel side:	max left	kW hp	-	-
	max down	kW hp	-	-
	max right	kW hp	-	-
Timing gear at compressor PTO max:		Nm lbft	160 118	
Speed ratio direction of rotation viewed from flywheel side		1,31:1/clockwise		
Timing gear at servo pump PTO max:		Nm lbft	100 74	
Speed ratio direction of rotation viewed from flywheel side		1,58:1/clockwise		
Timing gear at hydraulic pump PTO max:		Nm lbft	-	
Speed ratio direction of rotation viewed from flywheel side				
Max allowed bending moment in flywheel housing		Nm lbft	15000 11063	
Max. rear main bearing load		N lbf	5000 1124,0	







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