VOLVO PENTA **TWD 1643GE**	Document No **21117581**	Issue Index **10**

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
Dry weight	Engine only, excluding cooling system	kg lb	1700 3748
	GenPac	kg lb	2200 4850
Wet weight	Engine only, excluding cooling system	kg lb	1770 3902
	GenPac	kg lb	2370 5225

Performance		**r/min**	**1500**	**1800**
Prime Power	without fan	kW hp	553 752	615 836
	with fan	kW hp	536 729	585 796
Standby Power	without fan	kW hp	613 834	674 917
	with fan	kW hp	596 811	644 876
	without fan	kW hp		
	with fan	kW hp		
Torque at:	Prime Power	Nm lbft	3521 2596	3263 2406
	Standby Power	Nm lbft	3902 2878	3576 2637
Mean piston speed		m/s ft/sec	8,3 27,1	9,9 32,6
Effective mean pressure at:	Prime Power	MPa psi	2,7 398	2,5 369
Effective mean pressure at:	Standby Power	MPa psi	3,0 441	2,8 404
Max combustion pressure at:	Prime Power	MPa psi	18,8 2727	19,6 2843
Max combustion pressure at:	Standby Power	MPa psi	20 2901	19,8 2872
Total mass moment of inertia, J (mR^2)		kgm^2 $lbft^2$	4,20 99,7	
Degree of irregularity at:	Prime Power		1:33	1:55
	Standby Power		1:29	1:51
Friction Power		kW hp	38 51,68	55 74,8

Derating

The engine may be operated up to 1500m without derating.
For operating at higher altitudes the power will be derated according to the graph below.
There is no derating for ambient temperature or humidity.

Engine noise emission

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

Tolerance ± 0.75 dB(A)		**r/min**	**1500**	**1800**
Measured sound power Lw	No load	dB(A)	113	117
	Prime Power	dB(A)	117	120
	Standby Power	dB(A)	117	120
Calculated sound pressure Lp at 1 m	No load	dB(A)	101	105
	Prime Power	dB(A)	105	108
	Standby Power	dB(A)	105	108

Unsilenced exhaust noise

Data calculated as sound pressure Lp.

Assumed microphone distance 1 m	**r/min**	**1500**	**1800**
Prime Power	dB(A)	116	120
Standby Power	dB(A)	117	120

Test conditions for load acceptance data

Warm engine.	**Generator**	**Model**	**Type of AVR**
	Stamford	HCI534F1	MX341

Load acceptance performance can vary due to actual alternator inertia, voltage regulator, type of load and local ambient conditions.

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	2,8		1,8		20-100	11,6		3,7	
0-40	5,6		1,9		40-100	7,3		2,7	
0-48	7,0		2,6		48-100	6,3		2,1	
0-60	8,8		2,8		60-100	5,5		1,9	
0-65	10,0		3,1		65-100	4,6		1,5	
0-80	13,6		4,0		80-100	3,1		1,5	
0-100	18,7		5,5						
100-0	8,8		2,4						
0-20		3,2		1,9	20-98		12,5		9,2
0-40		6,3		2,1	40-98		7,5		9,0
0-44		7,0		2,7	44-98		7,0		7,8
0-59		10,0		3,3	59-98		5,8		4,3
0-60		10,2		3,4	60-98		5,7		3,9
0-80		15,9		4,5	80-98		3,0		1,6
0-98		20,4		8,8					
98-0		9,1		2,4					

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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	1,6		1,4		20-100	7,3		2,2	
0-40	3,6		1,5		40-100	4,8		2,0	
0-60	5,5		1,7		60-100	3,7		1,6	
0-69	7,0		1,8		69-100	2,9		1,3	
0-80	8,6		2,0		80-100	1,8		1,3	
0-86	10,0		2,0		86-100	1,2		1,2	
0-100	11,9		2,0						
100-0	5,8		2,6						
0-20		1,8		1,5	20-99		7,7		14,8
0-40		4,0		1,7	40-99		5,5		11,2
0-60		6,2		1,8	60-99		3,8		4,4
0-64		7,0		1,8	64-99		3,6		4,3
0-79		10,0		1,9	79-99		1,8		1,4
0-80		10,2		1,9	80-99		1,7		1,3
0-99		13,5		8,1					
99-0		6,6		2,6					

Cold start performance			**r/min**	**1500**	**1800**
Time from start to no load speed at ambient temperature:	°C	20	s	4,2	6,0
		5	s	6,8	7,7
		-15*	s	4,8	5,7
Time from start to stay within 0.5% of no load speed at ambient temperature:	°C	20	s		
		5	s		
		-15*	s		

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

Block heater type	Make	Power kW	Engaged hours	Cooling water temp engine block
	Volvo Penta no:889858	2000W	10h	16°C 61°F

Lubrication system			r/min	1500	1800
Lubricating oil consumption	Prime Power		litre/h US gal/h	0,10 0,026	0,10 0,026
	Standby Power		litre/h US gal/h	0,11 0,029	0,11 0,029
Oil system capacity including filters			litre US gal	48 12,7	
Oil sump capacity:		max	litre US gal	42 11,1	
		min	litre US gal	32 8,5	
Oil change intervals/specifications:	VDS-2/VDS-3*		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 psi	300 - 650 44 - 94	
Oil pressure shut down switch setting			kPa psi		
Lubrication oil temperature in oil sump:		max	°C °F	130 266	
Oil filter micron size			µ	0,040	

* See also general section in the sales guide

Fuel system		r/min	1500	1800
Prime Power Specific fuel consumption at:	25%	g/kWh lb/hph	215 0,349	224 0,363
	50%	g/kWh lb/hph	196 0,318	201 0,326
	75%	g/kWh lb/hph	196 0,318	197 0,319
	100%	g/kWh lb/hph	199 0,323	202 0,327
Standby Power Specific fuel consumption at:	25%	g/kWh lb/hph	210 0,340	220 0,357
	50%	g/kWh lb/hph	195 0,316	200 0,324
	75%	g/kWh lb/hph	196 0,318	198 0,321
	100%	g/kWh lb/hph	200 0,324	204 0,331

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Fuel system	**r/min**	**1500**	**1800**
Fuel to conform to	ASTM-D975-No1 and 2-D JIS KK 2204, EN 590		
System supply flow at:	litre/h US gal/h	190,0 50,2	210,0 55,5
Fuel supply line max restriction	kPa psi	10,0 1,5	10,0 1,5
Fuel supply line max pressure, engine stopped	kPa psi	16,5 2,4	16,5 2,4
System return flow	litre/h US gal/h	25,0 6,6	25,0 6,6
Fuel return line max restriction	kPa psi	20,0 2,9	20,0 2,9
Maximum allowable inlet fuel temp	°C °F	60 140	60 140
Prefilter / Water separator micron size	µ	10	
Fuel filter micron size	µ	5	
Governor type/make, standard	Volvo / EMS 2		
Injection pump type/make	Delphi / E3		
Injection timing std.	°B.T.D.C		
Injection timing	°B.T.D.C		

Intake and exhaust system			**r/min**	**1500**	**1800**
Air consumption at: (+25°C and 100kPa)	Prime Power		m^3/min cfm	43,65 1541	53,07 1874
	Standby Power		m^3/min cfm	46,96 1658	54,85 1937
Max allowable air intake restriction including piping			kPa psi	5 0,7	5 0,7
Air filter type			Single stage paper cartridge		
Air filter cleaning efficiency			%	99,85	
Heat rejection to exhaust at:		Prime Power	kW BTU/min	415 23601	472 26842
		Standby Power	kW BTU/min	463 26330	530 30141
Exhaust gas temperature after Low Pressure turbine at:		Prime Power	°C °F	450 842	422 792
		Standby Power	°C °F	463 865	461 862
Max allowable back pressure in exhaust line			kPa psi	10 1,5	10 1,5
Exhaust gas flow at: (temp and pressure after turbine at the corresponding power setting)		Prime Power	m^3/min cfm	101,6 3588	119,0 4202
		Standby Power	m^3/min cfm	111,8 3948	130,1 4594

Cooling system			r/min	1500	1800
Heat rejection radiation from engine at:		Prime Power	kW	23	26
			BTU/min	1308	1479
		Standby Power	kW	26	29
			BTU/min	1479	1649
Heat rejection to coolant engine radiator at:		Prime Power	kW	203	223
			BTU/min	11544	12682
		Standby Power	kW	215	245
			BTU/min	12227	13933
Heat rejection to coolant CAC radiator at:		Prime Power	kW	163	208
			BTU/min	9270	11829
		Standby Power	kW	170	216
			BTU/min	9668	12284
Coolant		Volvo Penta coolant "ready mix" or Volvo Penta coolant mixed with clean fresh water 40 / 60.			
Radiator cooling system type			Closed circuit		
Engine radiator core area			m²	1,68	
			foot²	18,08	
CAC radiator core area			m²	1,68	
			foot²	18,08	
Fan diameter			mm	965	
			in	37,99	
Fan power consumption			kW	17	30
			hp	23	41
Fan drive ratio				1,04:1	
Coolant capacity,	engine only		litre	33	
			US gal	8,72	
	CACs (Charge Air Coolers)		litre	10	
			US gal	2,64	
	coolant radiators incl piping, engine circuit		litre	48	
			US gal	12,68	
	coolant radiators incl piping, CAC-circuit		litre	48	
			US gal	12,68	
	expansion tank, engine circuit		litre	20	
			US gal	5,28	
	expansion tank, CAC circuit		litre	7	
			US gal	1,85	
Coolant pump, engine circuit			drive/ratio	Belt / 1,85:1	
Coolant pump, CAC circuit			drive/ratio	Belt / 2,29:1	
Coolant flow, engine radiator (at fully open thermostat)			l/s	4,8	6,0
			US gal/s	1,27	1,59
Coolant flow, CAC radiator (at fully open thermostat)			l/s	2	2,5
			US gal/s	0,53	0,66
Coolant pressure drop over engine-radiator incl. piping (at coolant flow above)			kPa	45	65
			psi	6,5	9,4
Coolant pressure drop over CAC-radiator incl. piping (at coolant flow above)			kPa	40	70
			psi	5,8	10,2
Coolant pressure drop over complete engine circuit cooling system (at coolant flow above)			kPa	110	160
			psi	16,0	23,2
Coolant pressure drop over complete CAC circuit cooling system (at coolant flow above)			kPa	87	135
			psi	12,6	19,6
Thermostat, engine circuit		start to open	°C	82	
			°F	180	
		fully open	°C	92	
			°F	198	
Thermostat, CAC circuit		start to open	°C	40	
			°F	104	
		fully open	°C	52	

		°F	126
Maximum static pressure head (expansion tank height + pressure cap setting)		kPa psi	100 14,5
Minimum static pressure head (expansion tank height + pressure cap setting)		kPa psi	70 10,2
Standard pressure cap setting		kPa psi	75 10,9
Maximum top tank temperature, engine circuit		°C °F	103 217
Draw down capacity	4% of total cooling system capacity		

Charge air cooler system		r/min	1500	1800
Heat rejection to charge air coolers	Prime Power	kW	163	208
		BTU/min	9270	11829
	Standby Power	kW	170	216
		BTU/min	9668	12284
		kW		
		BTU/min		
Charge air mass flow	Prime Power	kg/s	0,86	10,5
	Standby Power	kg/s	0,93	10,9
		kg/s		
Charge air inlet temp.	Prime Power	°C	N/A	N/A
(Charge air temp after turbo compressor)		°F	N/A	N/A
	Standby Power	°C	N/A	N/A
		°F	N/A	N/A
		°C		
		°F		
Charge air temperature.	Prime Power	°C	45	45
Inlet manifuld, max allowed.		°F	113	113
(At air inlet temp. 25 degr. C)	Standby Power	°C	50	50
		°F	122	122
		°C		
		°F		
Maximum pressure drop over charge air cooler incl. piping		kPa		
		psi		
Charge air pressure		kPa	462	462
(After charge air coolers)		psi	67,01	67,01
Standard charge air cooler core area		m²		
		foot²		

Cooling performance

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

Engine speed	Air on	PRIME POWER		STANDBY POWER	
rpm	temp	Air flow	External restriction	Air flow	External restriction
	°C	kg/s	Pa	kg/s	Pa
1500	64	12,0	0		
	62	11,3	100	11,9	0
	61	10,7	200		
	60	10,0	300	11,3	100
	59			10,4	200
	58			10,0	300
1800	63	15,2	0		
	62	14,5	100	15,2	0
	61	14,1	200		
	60	13,6	300		
	59			14,5	100
	58			13,9	200
	57			13,6	300

Note! Calculated values >0 Pa

Engine management system

Functionality	Alternatives	Default setting
Governor mode	Isochronous / droop	Isochronous
Governor droop	0-8%	4%
Governor response	Adjustable PID-constants (VODIA)	Not adjusted
Dual speed	1500 / 1800	According to customer
Idle speed	600-1200	900
Fine speed adjustment	±120	0,0
Stop function	Energized to Run / Stop	Energized to Stop
Preheating function	On / Off	Off
Lamp test	On / Off	On

Engine protection			Alarm level		Engine protection	
Parameter		Unit	Setting range	Default setting	Level	Action. Default/Alternative
Oil temp		°C	120 - 130	125	Setting +5	Shut down. ON/OFF*
Oil pressure	Low idle	kPa	-	190	160	Shut down. ON/OFF*
	1500 rpm	kPa	-	250	220	Shut down. ON/OFF*
	1800 rpm	kPa	-	300	270	Shut down. ON/OFF*
Oil level			-	Min level	-	
Piston cooling pressure >1000 rpm		kPa	-	150	150	Shut down. ON/OFF*
Coolant temp		°C	95 - 103	98	Setting +5	Shut down. ON/OFF*
Coolant level			See cooling system	On	Low level	Shut down. ON/OFF*
Fuel feed pressure	Low idle	kPa		150		-
	>1400 rpm			250		-
Water in fuel			-	High level	-	-
Crank case pressure		kPa	-	Increased pressure	Increased pressure	Shut down. ON/OFF*
Air filter pressure droop		kPa	-	5,0	-	-
Engine protection			Alarm level		Engine protection	
Altitude, above sea		m	-	-	1500	Automatic derating, see section derating
Charge air temp		°C	-	80	85	Shut down. ON/OFF*
Charge air pressure		kPa	-	500 (absolute)	510 (absolute)	Shut down. ON/OFF*
Engine speed		rpm	100 - 120% of rated speed	115% of rated speed	Alarm level	Shut down. ON/OFF*
Exhaust temp**		°C	-	610	640	Shut down. ON/OFF*
Low voltage		V	-	25,5	-	-

* Off means no shut down, alarm only

** Between high pressure turbin and low pressure turbin

Electrical system		r/min	1500	1800
Voltage and type		24V / insulated from earth		
Alternator:	make/output	Amp	Bosch / 80	
	tacho output	Hz/alt. Rev	6	
	drive ratio		3,9 : 1	
Starter motor		make	Melco	
		type	105P70	
		kW	7,0	
Starter motor solenoid:	pull current	Amp	-	
	hold current	Amp	2,3	
Number of teeth on:	flywheel		153	
	starter motor		12	
Max wiring resistance main circuit		mΩ	-	
Inrush current at +20°C		Amp	750	
Cranking current at +20°C		Amp	300	
Crank engine speed at 20°C		rpm	155	
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		Amp	1	

Power take off		r/min	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/ anti-clockwise		
Timing gear at servo pump PTO max:		Nm lbft	100 74	
Speed ratio direction of rotation viewed from flywheel side				
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	NA	

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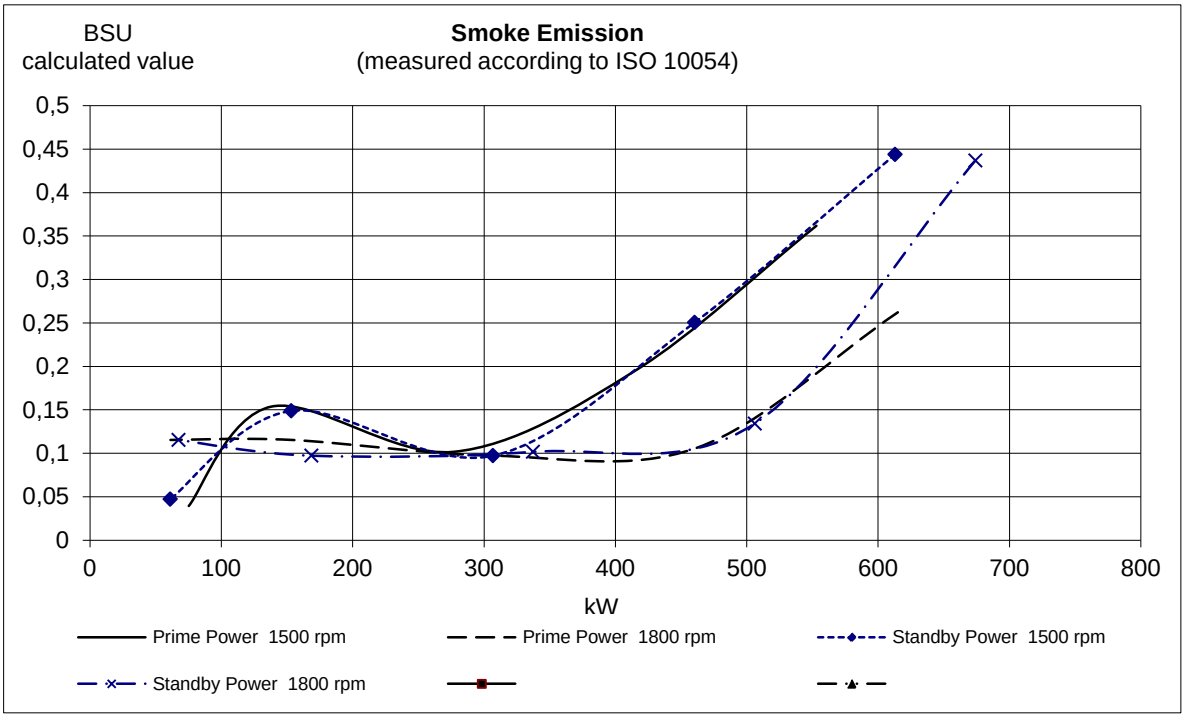
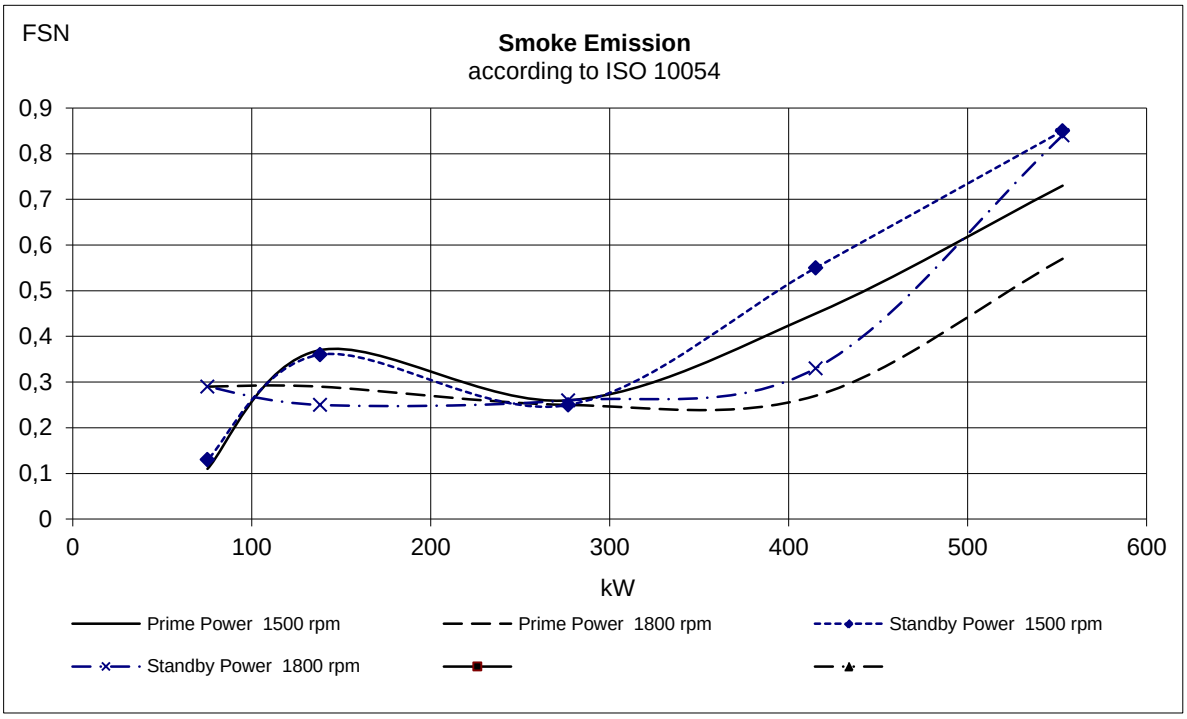
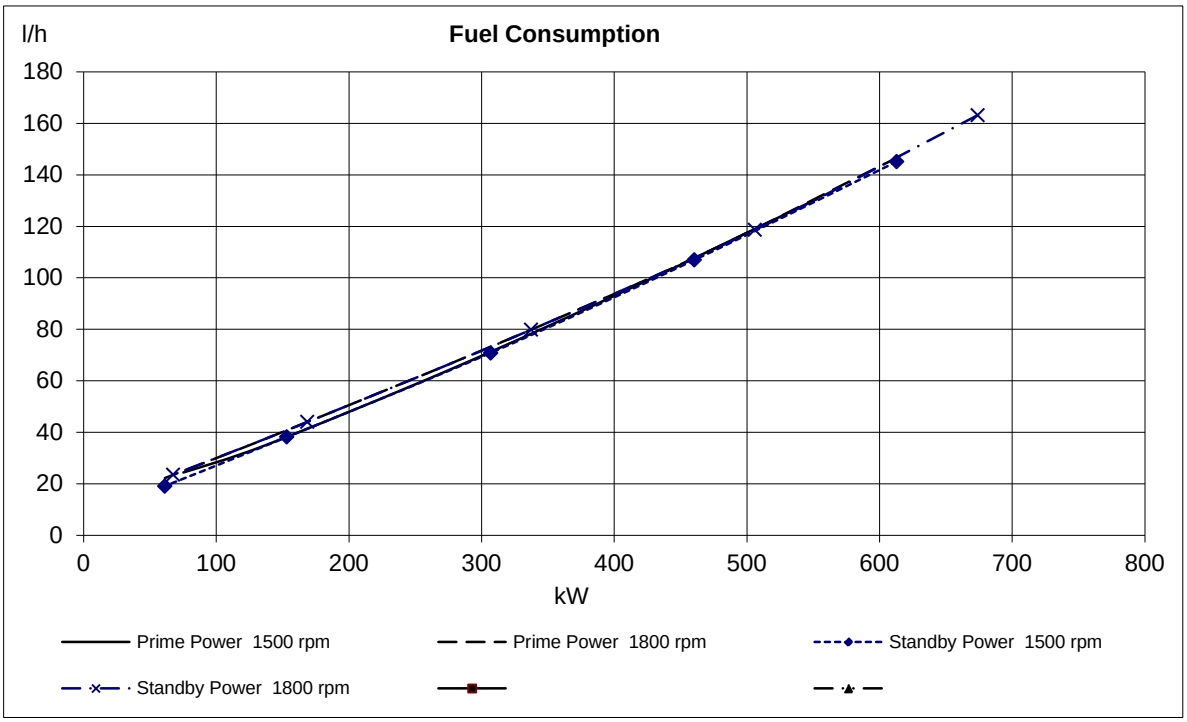
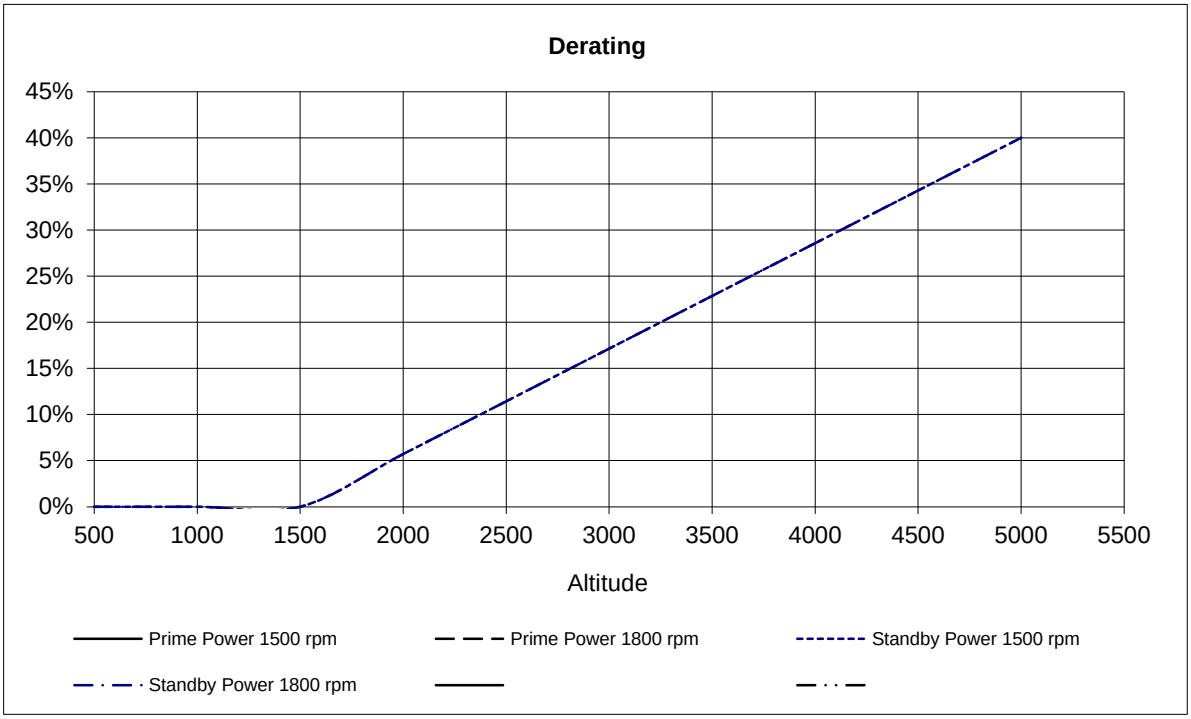
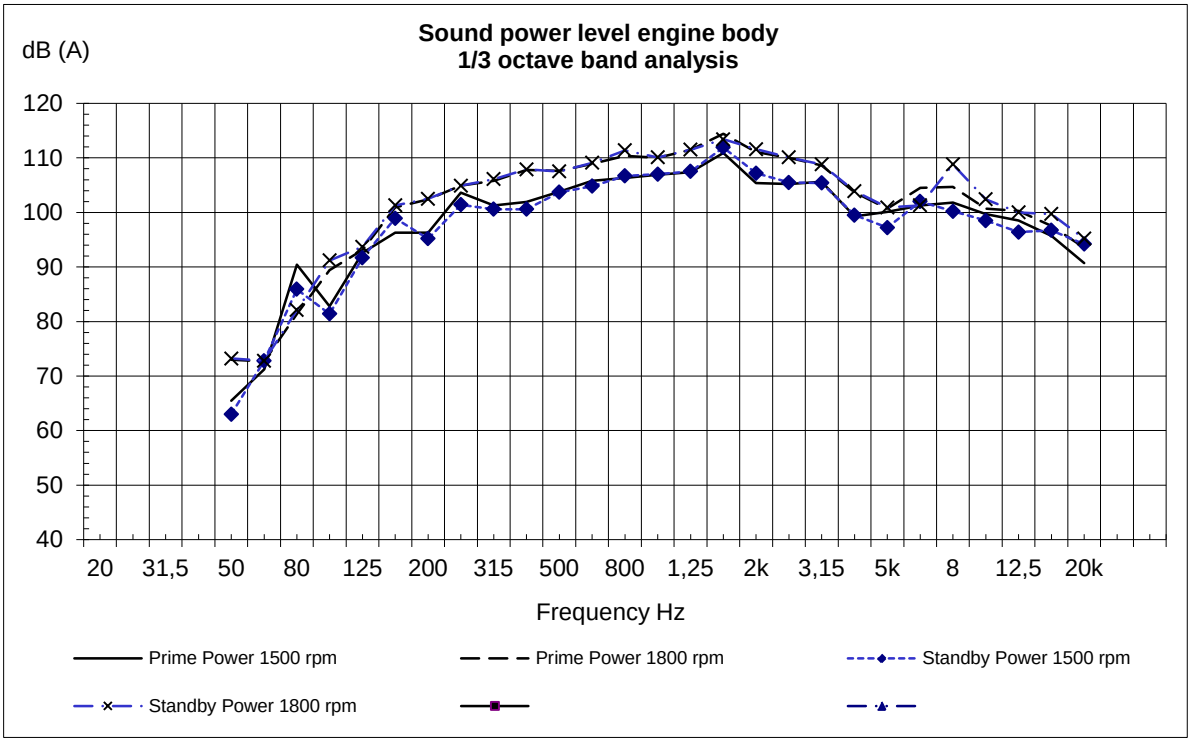
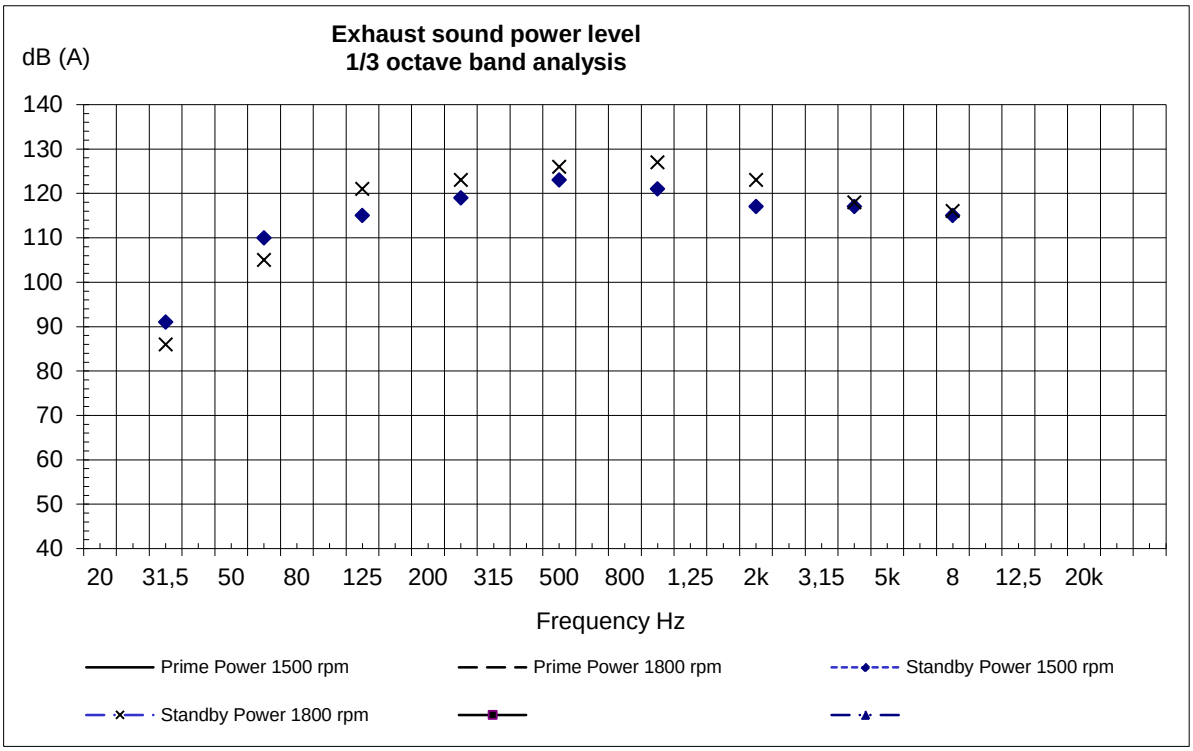





Fuel Consumption
l/h
180
160
140
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
800
kW
Prime Power 1500 rpm
Prime Power 1800 rpm
Standby Power 1500 rpm
Standby Power 1800 rpm


Derating
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
Altitude
Prime Power 1500 rpm
Prime Power 1800 rpm
Standby Power 1500 rpm
Standby Power 1800 rpm


Sound power level engine body
1/3 octave band analysis
dB (A)
120
110
100
90
80
70
60
50
40
20
31,5
50
80
125
200
315
500
800
1,25
2k
3,15
5k
8
12,5
20k
Frequency Hz
Prime Power 1500 rpm
Prime Power 1800 rpm
Standby Power 1500 rpm
Standby Power 1800 rpm


Exhaust sound power level
1/3 octave band analysis
dB (A)
140
130
120
110
100
90
80
70
60
50
40
20
31,5
50
80
125
200
315
500
800
1,25
2k
3,15
5k
8
12,5
20k
Frequency Hz
Prime Power 1500 rpm
Prime Power 1800 rpm
Standby Power 1500 rpm
Standby Power 1800 rpm

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