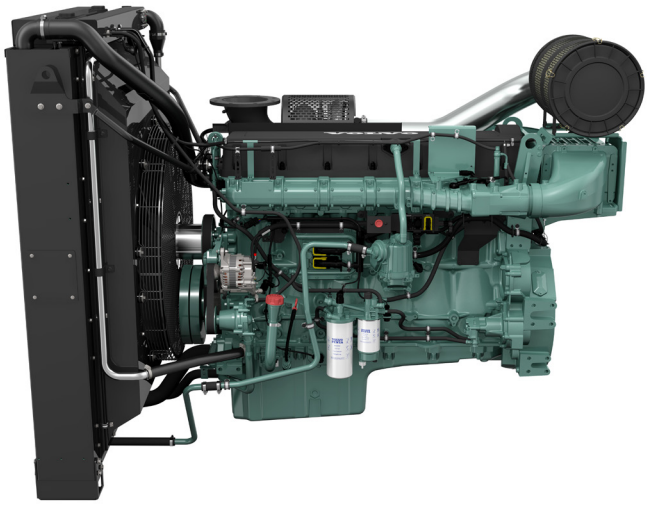
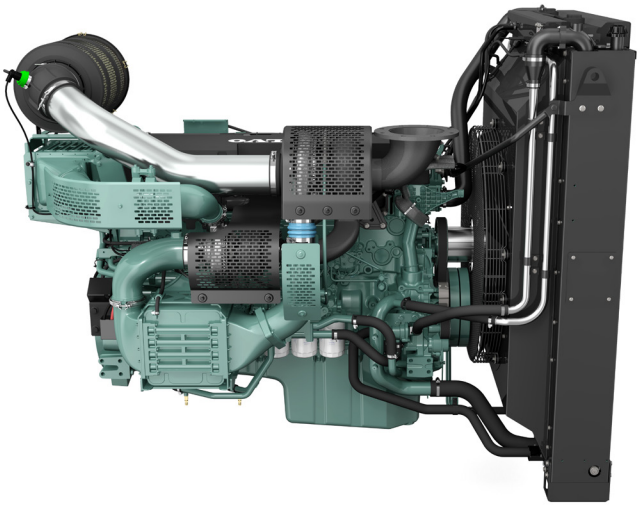
TWD1644GE

16 litre, in-line 6 cylinder





TWD1644GE is a reliable, powerful and compact in-line 6 cylinder diesel engine. It´s designed to power a wide range of stand-by and prime power generator sets.

This 16 litre diesel engine utilizes dual-stage turbochargers and heavy-duty steel pistons to provide excellent power density. It features a proven combustion technology with high-pressure unit injectors, resulting in high fuel efficiency and low exhaust emission levels.

The engine also features a compact and low weight design that is well-balanced, providing smooth operation with low noise and vibration. It´s designed for easily accessible service points.

A wide range of options is available, including a heavy-duty frame, cooling package and air-filter that will suit a variety of installations.

- **High power density**
- **High fuel efficiency**
- **Low exhaust emissions - equal to EU stage II**
- **Compact and low weight design**
- **Switchable between 1500/1800 rpm**
- **Suitable for a wide range of applications**

50 Hz/1500 rpm

Prime power			Standby power		
kWm	kWe	kVa	kWm	kWe	kVa
554	521	652	609	573	717

60 Hz/1800 rpm

Prime power			Standby power			Gen.eff.
kWm	kWe	kVa	kWm	kWe	kVa	%
582	547	684	640	602	752	94

Technical Data applies to an engine with fan.

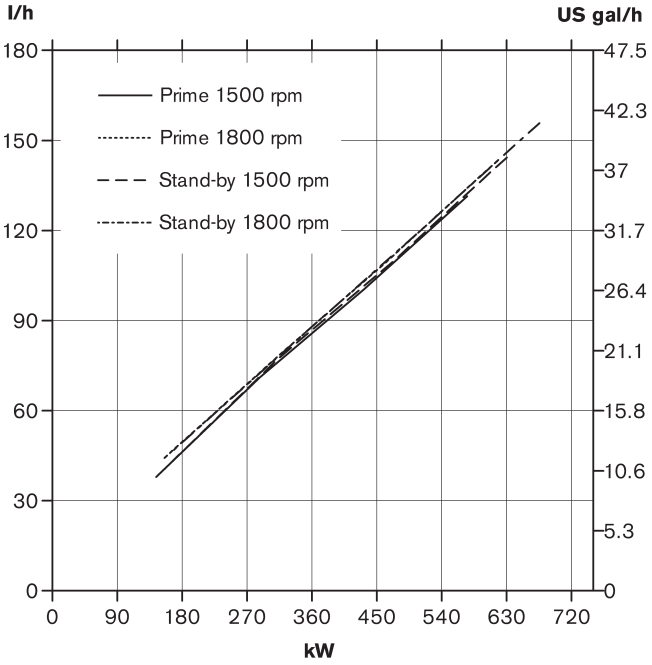
TWD1644GE

16 litre, in-line 6 cylinder

Technical Data

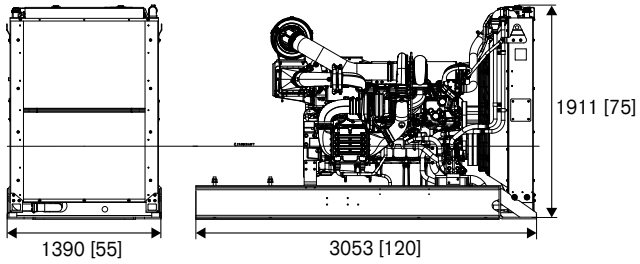
Configuration and no. of cylinders	in-line 6
Displacement, l (in³)	16.12 (983.9)
Method of operation	4-stroke
Bore, mm (in.)	144 (5.67)
Stroke, mm (in.)	165 (6.50)
Compression ratio	16.8:1
Wet weight, engine only, kg (lb)	1810 (3390)
Wet weight, engine incl. cooling system, air filtration system and frame kg (lb)	2767(6100)

Fuel consumption



Dimensions

Not for installation. Dimensions in mm [inch].



Technical description

Engine and block
- Wet, replaceable cylinder liners
- Steel pistons for high durability
- Crankshaft induction hardened bearing surfaces and fillets with seven main bearings
- Case hardened and Nitrocarburized transmission gears for heavy duty operation
- Viscous type crankshaft vibration dampers to withstand single bearing alternator torsional vibrations
- Replaceable valve guides and valve seats
- Overhead camshaft and 4 valves per cylinder

Lubrication system
- Full flow oil cooler
- Full flow disposable spin-on oil filter
- Bypass filter with extra high filtration

Fuel system
- Electronic high pressure unit injectors
- Fuel prefilter with water separator and water-in-fuel indicator / alarm
- Fine fuel filter with manual feed pump and fuel pressure sensor

Cooling system
- Efficient cooling with accurate coolant control through a water distribution duct in the cylinder block.
- Dual-circuit
- Belt driven coolant pumps with high degree of efficiency
- Water-cooled charge air coolers

Turbo charger
- Efficient and reliable dual stage turbo chargers
- Dual charge air coolers
- Waste gate system for the high pressure turbo charger

Electrical system
- Engine Management System 2.3 (EMS 2.3), an electronically controlled processing system which optimizes engine performance. It also includes advanced facilities for diagnostics and fault tracing
- The instruments and controls connect to the engine via the CAN SAE J1939 interface.
- Sensors for inputs such as: oil pressure, oil temp, boost pressure, boost temp, coolant temp, fuel temp, air filter pressure, water in fuel, fuel pressure and two speed sensors.

Control and monitoring
- The optional DCU2 control panel features engine control, monitoring, alarm, parameter settings and diagnostic functions. It also presents error codes in clear text.

Frame
- Optional heavy duty frames for minimized noise and vibration.

Rating guidelines

PRIME POWER rating corresponds to ISO Standard Power for continuous operation. It is applicable for supplying electrical power at variable load for an unlimited number of hours instead of commercially purchased power. A10 % overload capability for govering purpose is available for this rating.

STAND-BY POWER rating corresponds to ISO Standard Fuel Stop Power. It is applicable for supplying stand-by electrical power at variable load in areas with well established electrical networks in the event of normal utility power failure. No overload capability is available for this rating.

1 kW = 1 hp x 1.36
1 hp = 1 kW x 0.7355

Power standards

The engine performance corresponds to ISO 3046, BS 5514 and DIN 6271. The technical data applies to an engine without cooling fan and operating on a fuel with calorific value of 42.7 MJ /kg (18360 BTU/lb) and a density of 0.84 kg/liter (7.01 lb/US gal), also where this involves a deviation from the standards. Power output guaranteed within 0 to +2% att rated ambient conditions at delivery. Ratings are based on ISO 8528. Engine speed governing in accordance with ISO 8528-5.

AB Volvo Penta
SE-405 08 Göteborg, Sweden
www.volvopenta.com

English 11-2017

Important

This Technical Data Sheet and the corresponding Installation Instructions provide important information to ensure the installed engine will operate according to the design specification in the Volvo Penta application for certification.

Requirements marked with ⚠ are considered as critical for exhaust emissions compliance according to the design specification in the Volvo Penta application for certification.

Failing to follow and meet these instructions and requirements when installing a certified engine in a piece of nonroad equipment for use in the United States violates U.S. federal law (40 CFR 1068.105(b)), subject to fines or other penalities as described in the Clean Air Act.

General

In-line four stroke diesel engine with direct injection. Rotation direction, anti-clockwise viewed towards flywheel. 2 - stage turbocharged with intercooling and aftercooling.

Number of cylinders			6
Displacement, total		litre	16,12
		in^3	983,9
Firing order			1-5-3-6-2-4
Bore		mm	144
		in	5,67
Stroke		mm	165
		in	6,50
Compression ratio			16,8
Wet weight (Not including after treatment system)	Engine only	kg	1810
		lb	3990
	Engine incl. cooling system and air filtration system	kg	2217
		lb	4888
	Engine incl. cooling system, air filtration system, and frame	kg	2767
		lb	6100

Performance		**rpm**	**1500**	**1800**
Prime Power	without fan	kW	575	616
		hp	783	838
	with fan	kW	554	582
		hp	754	792
Standby Power	without fan	kW	630	674
		hp	857	917
	with fan	kW	609	640
		hp	828	870
Torque at:	Prime Power	Nm	3663	3268
		lbft	2702	2410
	Standby Power	Nm	4011	3576
		lbft	2958	2637
		%		
Mean piston speed		m/s	8,3	9,9
		ft/sec	27,1	32,6
Effective mean pressure at:	Prime Power	MPa	2,86	2,55
		psi	414	369
Effective mean pressure at:	Standby Power	MPa	3,13	2,79
		psi	453	404
Max combustion pressure at:	Prime Power	MPa	18,8	17,5
		psi	2727	2538
Max combustion pressure at:	Standby Power	MPa	21,2	19,5
		psi	3075	2828
Total mass moment of inertia, SAE 1 14" flywheel J (mR^2)		kgm^2	4,40	
		$lbft^2$	104,3	
Total mass moment of inertia, SAE 0 18" flywheel J (mR^2) (an adapter is used to convert 14" flywheel to 18")		kgm^2	6,10	
		$lbft^2$	144,8	
Friction Power		kW	39	57
		hp	53,6	76,8
Derating due to altitude - see Technical Diagrams				

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)	115,9	119,1
	Prime Power		dB(A)	118,3	120,6
	Standby Power		dB(A)	118,5	120,5
Calculated sound pressure Lp at 1 m	No load		dB(A)	103,9	107,1
	Prime Power		dB(A)	106,3	108,6
	Standby Power		dB(A)	106,5	108,5

Unsilenced exhaust noise

Data calculated as sound pressure Lp.

Assumed microphone distance 1 m	**rpm**	**1500**	**1800**
Prime Power	dB(A)		
Standby Power	dB(A)		

Test conditions for load acceptance data

Warm engine.	**Generator**		**Model**		**Type of AVR**	
	ABB		AMG 0355CC04 DBPM		Basler Electric DECS - 150	
AVR Settings	UFRO (Hz):	3	DIP *:	1,4	DWELL *:	1,4
			Voltage (V):	400	Load factor:	1.0

Applies to Stamford nomenclature,

* (V/Hz) :

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

Abbreviation:	**Full name:**	**Descriptions**
AVR	Automatic Voltage Regulator	Generator performance and safty control unit
UFRO	Under Frequency Roll Off	Overheating protection at under frequency
DIP		Controls the slope of voltage drop when the UFRO is active
DWELL		Controls the slope of voltage recovery when the UFRO is active.

Single step load performance at 1500 rpm - PRIME (Resistiv load)

Load (%)	Speed diff (%)	Speed Recovery time (s)	Voltage diff (%)	Voltage Recovery time G3 +/- 8 V (s)	Voltage Recovery time G2 +/- 20 V (s)	Remaining load (%)	Speed diff (%)	Speed Recovery time (s)	Voltage diff (%)	Voltage Recovery time G3 +/- 8 V (s)	Voltage Recovery time G2 +/- 20 V (s)
0-20	2,0	0,0	-	-	-	20-100	18,8	2,1	-	-	-
0-40	18,8	1,0	-	-	-	40-100	9,7	1,1	-	-	-
0-50	-	-	-	-	-	50-100	-	-	-	-	-
0-60	12,9	1,5	-	-	-	60-100	5,1	0,8	-	-	-
0-45 (G3)	7,0	1,1	-	-	-	38-100	-	-	-	-	-
0-52 (G2)	10,0	1,4	-	-	-	51-100	-	-	-	-	-
0-80	20,3	2,2	-	-	-	80-100	1,9	0,0	-	-	-
0-100	27,5	2,9	-	-	-						
100-0	3,1	0,4	-	-							

Single step load performance at 1500 rpm - STAND BY (Resistiv load)

Load (%)	Speed diff (%)	Speed Recovery time (s)	Voltage diff (%)	Voltage Recovery time G3 +/- 8 V (s)	Voltage Recovery time G2 +/- 20 V (s)	Remaining load (%)	Speed diff (%)	Speed Recovery time (s)	Voltage diff (%)	Voltage Recovery time G3 +/- 8 V (s)	Voltage Recovery time G2 +/- 20 V (s)
0-20	2,2	0,5	-	-	-	20-100	19,5	2,4	-	-	-
0-40	4,5	1,0	-	-	-	40-100	10,9	1,5	-	-	-
0-50	-	-	-	-	-	50-100	-	-	-	-	-
0-60	12,9	1,5	-	-	-	60-100	7,3	1,1	-	-	-
0-41 (G3)	7,0	1,1	-	-	-	41-100	-	-	-	-	-
0-47 (G2)	10,0	1,4	-	-	-	47-100	-	-	-	-	-
0-80	24,1	2,4	-	-	-	80-100	1,9	0,0	-	-	-
0-100	27,5	2,9	-	-	-						
100-0	6,7	1,0	-	-							

Single step load performance at 1800 rpm - PRIME (Resistiv load)

Load (%)	Speed diff (%)	Speed Recovery time (s)	Voltage diff (%)	Voltage Recovery time G3 +/- 8 V (s)	Voltage Recovery time G2 +/- 20 V (s)	Remaining load (%)	Speed diff (%)	Speed Recovery time (s)	Voltage diff (%)	Voltage Recovery time G3 +/- 8 V (s)	Voltage Recovery time G2 +/- 20 V (s)
0-20	1,5	0,0	-	-	-	20-100	11,1	1,5	-	-	-
0-40	4,2	0,7	-	-	-	40-100	7,9	1,1	-	-	-
0-50	-	-	-	-	-	50-100	-	-	-	-	-
0-60	8,8	1,1	-	-	-	60-100	5,0	0,9	-	-	-
0-52 (G3)	6,8	1,0	-	-	-	53-100	-	-	-	-	-
0-62 (G2)	9,8	1,2	-	-	-	67-100	-	-	-	-	-
0-80	14,3	1,5	-	-	-	80-100	1,6	0,0	-	-	-
0-100	19,6	2,1	-	-	-						
100-0	2,7	0,3	-	-	-						

Single step load performance at 1800 rpm - STAND BY (Resistiv load)

Load (%)	Speed diff (%)	Speed Recovery time (s)	Voltage diff (%)	Voltage Recovery time G3 +/- 8 V (s)	Voltage Recovery time G2 +/- 20 V (s)	Remaining load (%)	Speed diff (%)	Speed Recovery time (s)	Voltage diff (%)	Voltage Recovery time G3 +/- 8 V (s)	Voltage Recovery time G2 +/- 20 V (s)
0-20	1,7	0,0	-	-	-	20-100	12,9	2,2	-	-	-
0-40	5,0	1,0	-	-	-	40-100	9,4	1,0	-	-	-
0-50	-	-	-	-	-	50-100	-	-	-	-	-
0-60	10,3	1,5	-	-	-	60-100	5,8	1,2	-	-	-
0-47 (G3)	6,8	1,0	-	-	-	47-100	-	-	-	-	-
0-56 (G2)	9,8	1,2	-	-	-	56-100	-	-	-	-	-
0-80	16,7	1,7	-	-	-	80-100	1,9	0,0	-	-	-
0-100	22,4	2,6	-	-	-						
100-0	3,7	0,4	-	-							

Cold start performance		Ambient temperature deg C	Cooling water temp engine block with heater deg C	1500	1800
Time from start to stay within 0.5% of no load speed at ambient temperature:	°C	20			5,5
		5			7
		-15 *			9
		-30 **	4,2		7,2
		Min start temp*	°C		

* With air inlet pre-heater 4 kW engaged, lubrication oil 10W/30.

** With air inlet pre-heater 4 kW engaged, lubrication oil 10W/30 and block heater 2 kW (230 V), Fuel SD10

Block heater type	Heater on / off (Deg C)	Power kW 230 V / 110 V	Engaged hours	Cooling water temp engine block
Calix PH	**30 / 50**	**2 / 1,5**	10 h 1,5 kW at - 30 C	-2°C

Lubrication system			rpm	1500	1800
Lubricating oil consumption		Prime Power	litre/h	0,10	0,10
			US gal/h	0,026	0,026
		Standby Power	litre/h	0,11	0,11
			US gal/h	0,029	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 / VDS-3		h	500	
	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 - 500	
			psi	44 - 73	
Main Oil filter; cleaning efficiency 99% at particle size			µm	38	
By-pass Oil filter; cleaning efficiency 99% at particle size			µm	11	

* See also general section in the sales guide

Fuel system		rpm	1500	1800
Prime Power	25%	g/kWh	225	235
Specific **fuel** consumption at:		lb/hph	0,364	0,380
	50%	g/kWh	196	204
		lb/hph	0,318	0,331
	75%	g/kWh	194	199
		lb/hph	0,315	0,323
	100%	g/kWh	194	199
		lb/hph	0,314	0,322

Standby Power	25%	g/kWh	221	227
Specific **fuel** consumption at:		lb/hph	0,359	0,367
	50%	g/kWh	195	202
		lb/hph	0,317	0,327
	75%	g/kWh	195	199
		lb/hph	0,317	0,323
	100%	g/kWh	193	198
		lb/hph	0,312	0,320

Fuel system	rpm	1500	1800
Fuel to conform to	ASTM-D975-NO 1 and 2-D JIS KK 2204, EN590		
System supply flow at: Standy Power	litre/h	170	185
	US gal/h	44,9	48,9
Fuel supply line max restriction	kPa	-10,0	-10,0
(Measured at fuel inlet connection at full engine load)	psi	-1,5	-1,5
Fuel supply line max pressure when engine is stopped. To avoid lube oil dilution by fuel.	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	kPa	20,0	20,0
(Measured at fuel return connection)	psi	2,9	2,9
Maximum allowable inlet fuel temp	°C	60	60
(Measured at fuel inlet connection)	°F	140	140
Prefilter - Water separator efficiency (minimum)	%	98	
Prefilter - cleaning efficiency with new filter 98% at particulate size	µm	30	
Fuel filter - cleaning efficiency with new filter 98% at particulate size	µm	5	
Governor type/make, standard	Volvo / EMS 2.3		
Injection pump type/make	Unit Injector Delphi E3		

Intake and exhaust system			rpm	1500	1800
Air consumption at: (+25°C and 100kPa)	Prime Power		m^3/min	39,1	42,3
			cfm	1381	1495
	Standby Power		m^3/min	42,1	46,7
			cfm	1486	1649
⚠ **See front page for important information**					
Max allowable air intake restriction including piping with a clean air filter			kPa	-3,0	-3,0
			psi	-0,4	-0,4
Measured pressure drop standard Penta air inlet installation & clean filter Measured at standard inlet depression sensor position. Stand-by rating			kPa	-1,8	-2,1
			psi	-0,3	-0,3
Heat rejection to exhaust at:	Prime Power		kW	406	464
			BTU/min	23089	26387
	Standby Power		kW	432	495
			BTU/min	24567	28150
Exhaust gas temperature after LP turbine at:	Prime Power		°C	485	509
			°F	905	948
	Standby Power		°C	480	495
			°F	896	923
⚠ **See front page for important information**					
Max allowable back pressure in exhaust line	Prime Power		kPa	9	9
			psi	1,3	1,3
	Standby Power		kPa	10	10
			psi	1,5	1,5
Exhaust gas flow at: (temp and pressure after LP turbine at the corresponding power setting)	Prime Power		m^3/min	93,5	105,6
			cfm	3302	3729
	Standby Power		m^3/min	100,0	114,5
			cfm	3532	4044

Cooling system	Cooling system		1500	1800
Heat rejection radiation & convection from engine at:	Prime Power	kW	21	23
		BTU/min	1177	1297
	Standby Power	kW	24	24
		BTU/min	1365	1342
Heat rejection to coolant HT circuit **engine radiator** at:	Prime Power	kW	211	233
		BTU/min	11999	13250
	Standby Power	kW	228	246
		BTU/min	12966	13990
Heat rejection to coolant LT circuit **CAC radiator** at:	Prime Power	kW	116	122
		BTU/min	6574	6910
	Standby Power	kW	133	147
		BTU/min	7564	8360
Radiator cooling system type		Two circuits, HT & LT		
Coolant	Volvo Penta coolant "ready mix" or Volvo Penta coolant mixed with clean fresh water 40 / 60			
Engine radiator core area		m²	1,77	
		foot²	19,05	
CAC radiator core area		m²	1,77	
		foot²	19,05	
Fan diameter		mm	965	
		in	37,99	
Fan power consumption		kW	21	34
		hp	29	46
Fan drive ratio			1,04	
Coolant capacity	Engine only	litre	25	
		US gal	6,60	
	Charge air coolers (HP + LP CAC)	litre	10	
		US gal	2,64	
	Coolant radiators incl piping, Engine circuit, (HT)	litre	50	
		US gal	13,21	
	Coolant radiators incl piping, CAC circuit, LT	litre	50	
		US gal	13,21	
	Expansion tank, Engine circuit, water volume	litre	11,8	
		US gal	3,12	
	Expansion tank, Engine circuit, air volume	litre	6,5	
		US gal	1,72	
	Expansion tank, CAC circuit water volume	litre	4,3	
		US gal	1,14	
	Expansion tank, CAC circuit air volume	litre	2,4	
		US gal	0,63	
Coolant pump, HT		drive/ratio	Belt / 1,85	
Coolant pump, CAC circuit, LT		drive/ratio	Belt / 2,29	
Thermostat	start to open	°C	82	
		°F	180	
	fully open	°C	92	
		°F	198	
Maximum static pressure head, at water pump inlet (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	107	
		°F	225	
Charge air pressure (Prime power) (measured in inlet manifold, absolute pressure)		kPa (a)	395	366
		psi (abs)	57,3	53,1
Charge air pressure (Stand-by power) (measured in inlet manifold, absolute pressure)		kPa (a)	427	402
		psi (abs)	61,9	58,3
⚠ **See front page for important information**				
Charge air temp. Measured in inlet manifold, at 25 deg ambient temp	Prime Power	°C	46	46
		°F	115	115
	Standby Power	°C	47	45
		°F	117	113

OEM cooling system design:

- move of standard radiators		**rpm**	**1500**	**1800**
Maximum additional coolant with standard expansion tank		litre US gal	15 3,96	
Maximum additional coolant, CAC with standard expansion tank		litre US gal	5 1,32	
Maximum distance in vertical direction with standard pressure cap (75 kPa)		m ft	2,5 8,20	
Maximum additional pressure drop due to move		KPa psi	10 1,5	
Heat rejection to coolant HT circuit **engine radiator** at:	Prime Power	kW BTU/min	211 11999	233 13250
	Standby Power	kW BTU/min	228 12966	246 13990
Heat rejection to coolant LT circuit **CAC radiator** at:	Prime Power	kW BTU/min	116 6574	122 6910
	Standby Power	kW BTU/min	133 7564	147 8360
Minimum coolant flow **engine radiator** (at fully open thermostat)		litre/s US gal/s	4,8 1,27	6 1,59
Minimum coolant flow **CAC radiator** (at fully open thermostat)		litre/s US gal/s	1,7 0,45	2,1 0,55
Maximum coolant pressure drop over **engine- radiator incl. Piping** (at coolant flow above)		kPa psi	45 6,5	65 9,4
Maximum coolant pressure drop over **CAC - radiator incl. piping** (at coolant flow above)		kPa psi	40 5,8	70 10,2
Maximum coolant pressure drop over **complete engine cooling system** (at coolant flow above)		kPa psi	110 16,0	160 23,2
Maximum coolant pressure drop over **complete CAC cooling circuit** (at coolant flow above)		kPa psi	87 12,6	135 19,6
Nominal coolant pressure before CAC circuit coolant pump		kPa psi	50 7,3	50 7,3
Nominal coolant pressure before engine circuit coolant pump		kPa psi	50 7,3	50 7,3

OEM cooling system design: 2-circuit system - engine coolant circuit		**rpm**	**1500**	**1800**
Heat rejection to coolant **engine coolant circuit:**		kW BTU/min		
	Standby Power	kW BTU/min		
Min coolant flow **engine coolant circuit** (at fully open thermostat)		litre/s US gal/s		
Maximum coolant temperature entering engine		°C F		
Maximum external **engine coolant circuit** restriction, including piping		kPa psi		
Nominal coolant pressure		kPa psi		
- charge air cooler (CAC) coolant circuit				
Heat rejection to coolant **CAC coolant circuit:**	Prime Power	kW BTU/min		
	Standby Power	kW BTU/min		
Minimum coolant flow **CAC coolant circuit**:		litre/s US gal/s		
Maximum coolant temperature entering CAC (at air inlet temperature 25°C)		°C F		
Coolant pressure drop over charge air coolers (at Minimum coolant flow CAC coolant circuit above)		kPa psi		
Nominal CAC coolant pressure		kPa psi		

Cooling performance

Standard far 965 mm Fan ratio: 1,04 Fan type: FIX Top Tank temperatur TT˚ 107°C

Antifreeze content: 40%, Temperature inlet air at filter; 40°C

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	65	11,4	0		
	62,5			11,4	0
	60,6			11,0	150
	58,1			10,3	300
	55,1			9,4	450
1800	65,1	13,4	0		
	63			13,3	0
	63,1			13,0	150
	61			12,3	300
	59,5			11,6	450

Note! External restrictions are calculated for values >0 Pa

Engine management system

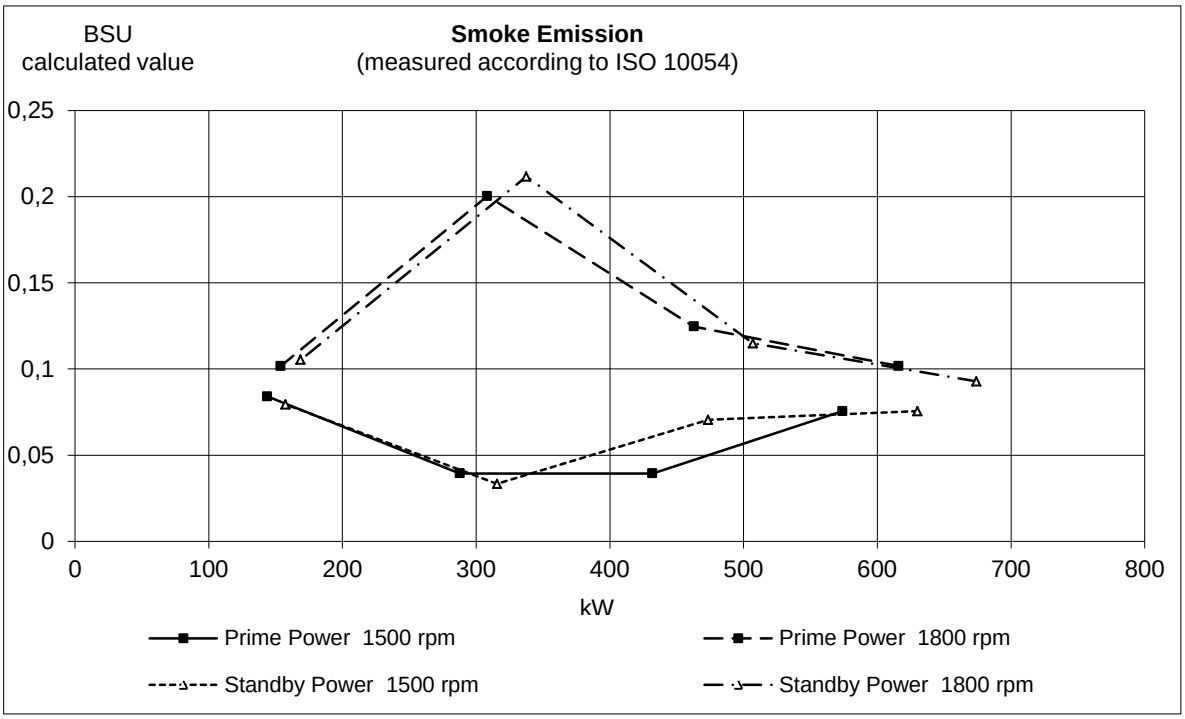
Functionality	Alternatives			Default setting
Governor mode	Droop		Isochronous	Isochronous
Governor droop	4%		0	N/A
Governor response	Adjustable PID-constants (VODIA)			
Dual speed	1500 rpm, 50 Hz / 1800 rpm, 60 Hz			1500 rpm, 50 Hz / 1800 rpm, 60 Hz
Idle speed	600 - 1200			900
Fine speed adjustment	+/- 90 rpm			0
Preheating function	Ignition	Request	Request + temp	If preheat avaliable, preheat will be active at ignition on if temp low or demanded.
Ignition off stop engine	Yes		No	No

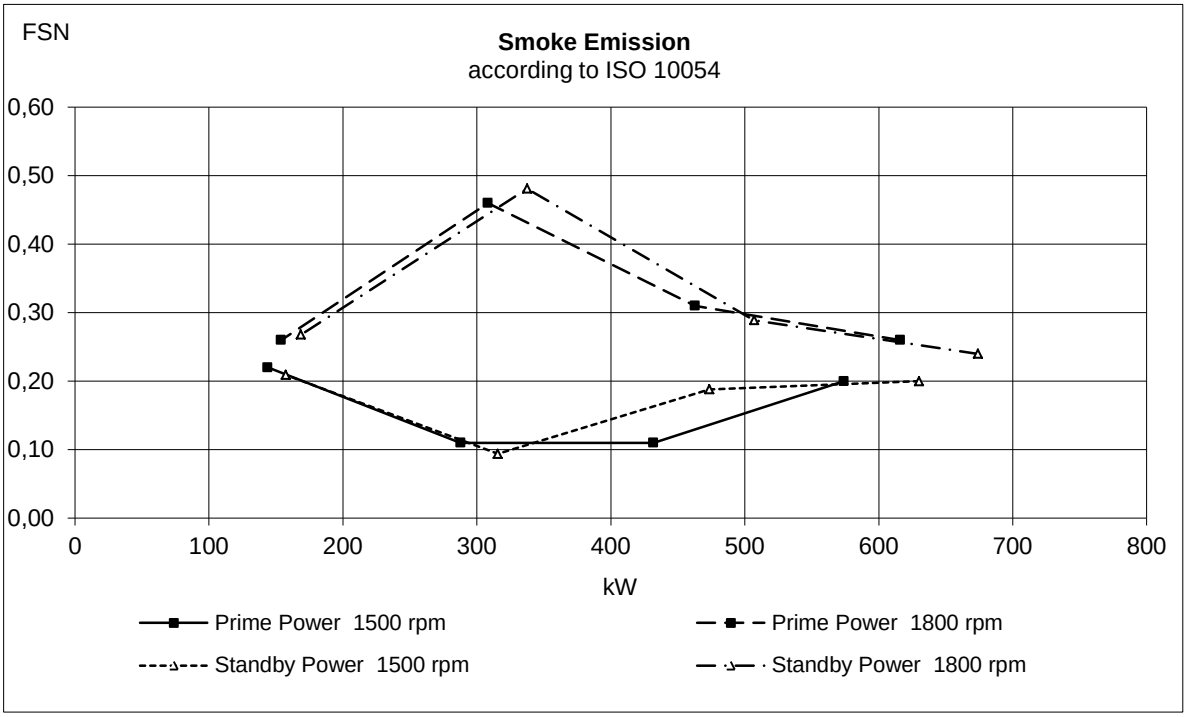
Engine sensor and switch settings				Engine protection action		
Parameter		**Unit**	**Warning level (Yellow)**	**Alarm level (Red)**	**Default**	**Optional**
Oil temp		°C	125	127,5	Shut down after 10s	N/A
Oil pressure	900 rpm	kPa	170	145	Shut down	N/A
	1500 rpm		300	275	Shut down	N/A
	1800 rpm		300	275	Shut down	N/A
Oil level			Low level	N/A	Fault code only	N/A
Coolant temp		°C	103	107	Shut down after 10s	N/A
Coolant level			N/A	Low level	Shut down after 10s	N/A
Fuel feed pressure	900 rpm	kPa	100	N/A	Fault code only	N/A
	1500 rpm		225	N/A	Fault code only	N/A
	1800 rpm		300	N/A	Fault code only	N/A
Water in fuel			Alarm when closed	N/A	Fault code only	N/A
Crank case pressure		kPa	N/A	Alarm at high peaks	Shut down	N/A
Air filter pressure droop		kPa	5	N/A	Fault code only	N/A
Altitude, above sea		m	N/A	N/A	Automatic derating, see section derating	N/A
Charge air temp		°C	80	82,5	Shut down after 10s	N/A
Charge air pressure		kPa	30 above demand	40 above demand	Shut down after 1s	N/A
Engine overspeed		rpm	1900	N/A	Fault code only	N/A

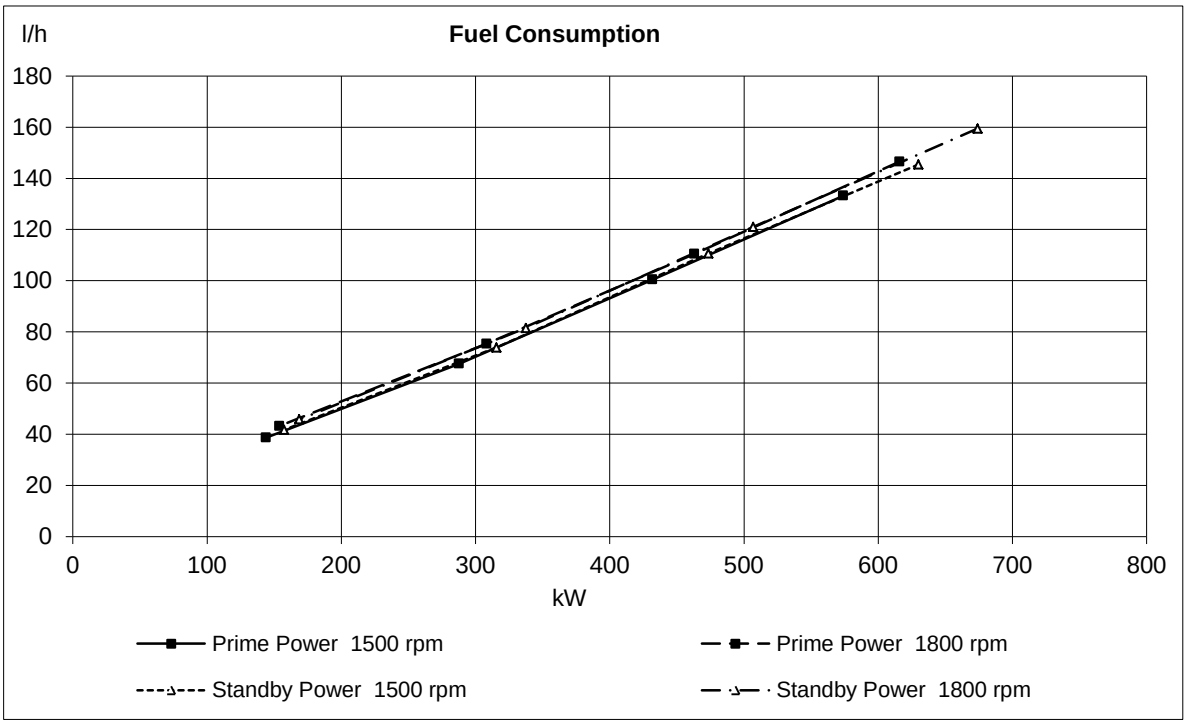
Electrical system

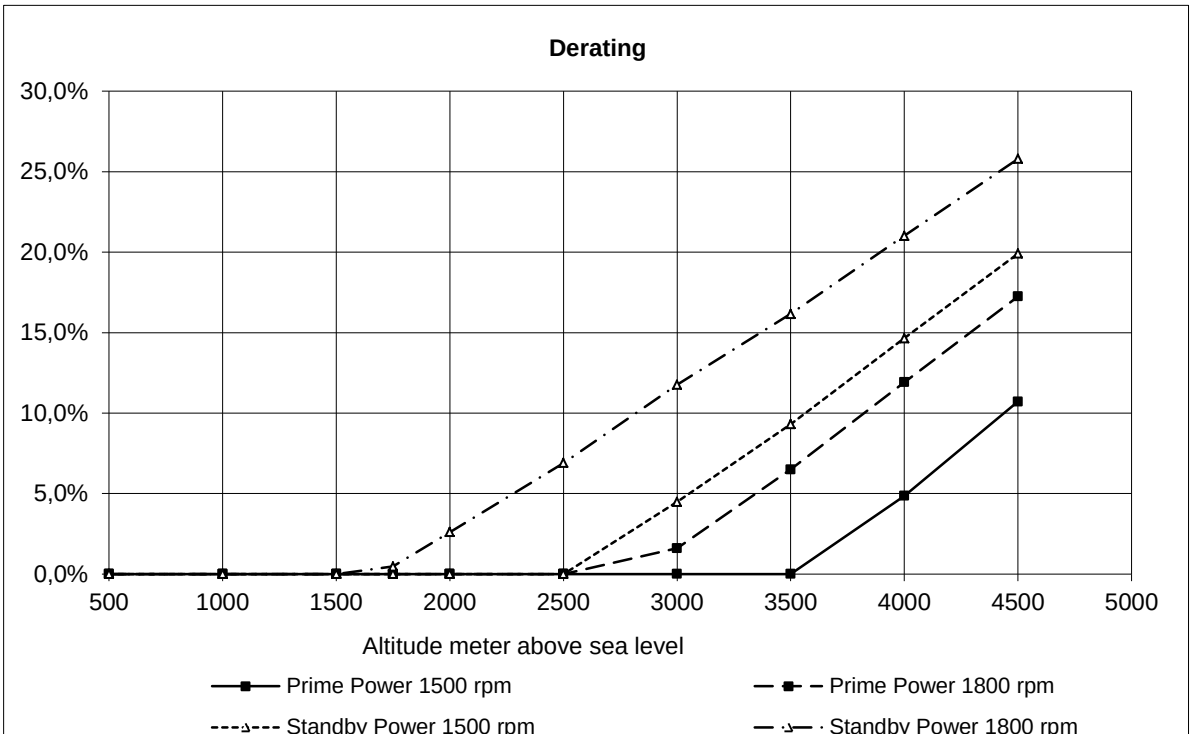
Voltage and type		24 V / insulated from earth	
Alternator:	make/output	A	Bosch / 80
	tacho output	Hz/alt. Rev	6
	drive ratio		3,94 : 1
Starter motor		make	Misubishi Electric
		type	24V 7 kW 12/3. 17F
		kW	7,0
Number of teeth on:	flywheel		153
	starter motor		12
Max wiring resistance starter circuit (harness, main switch, connectors, etc), at 20°C		mΩ	3
Cranking current at +20°C		A	300
Crank engine speed at 20°C		rpm	155
Starter motor battery capacity:	min	Ah/A	2 x 145
	CCA at -18°C	A	900
Inlet manifold heater (at 20 V)		kW	4,0
Power relay for the manifold heater		A	1

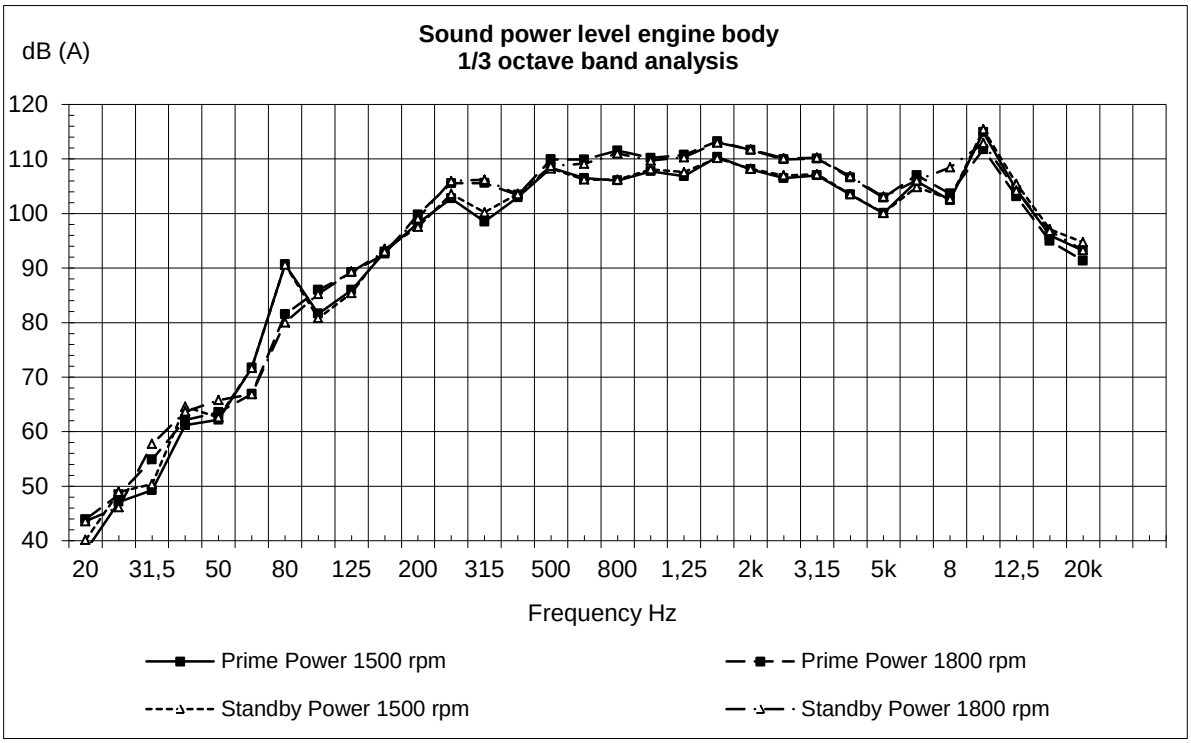
Power take off		**rpm**	**1500**	**1800**
Front end in line with crank shaft max:		Nm	N/A	
		lbft	N/A	
Front end belt pulley load. Direction of load viewed from flywheel side:	max left	kW hp	N/A	N/A
	max down	kW hp	N/A	N/A
	max right	kW hp	N/A	N/A
Timing gear at compressor PTO max:		Nm	600	
		lbft	443	
Speed ratio / direction of rotation viewed from flywheel side		0,91:1 / clockwise		
Timing gear at servo pump PTO max:		Nm	100	
		lbft	74	
Speed ratio / direction of rotation viewed from flywheel side		1,58:1 / clockwise		
Max allowed bending moment in flywheel housing		Nm	15000	
		lbft	11063	
Max. rear main bearing load		N	N/A	
		lbf		

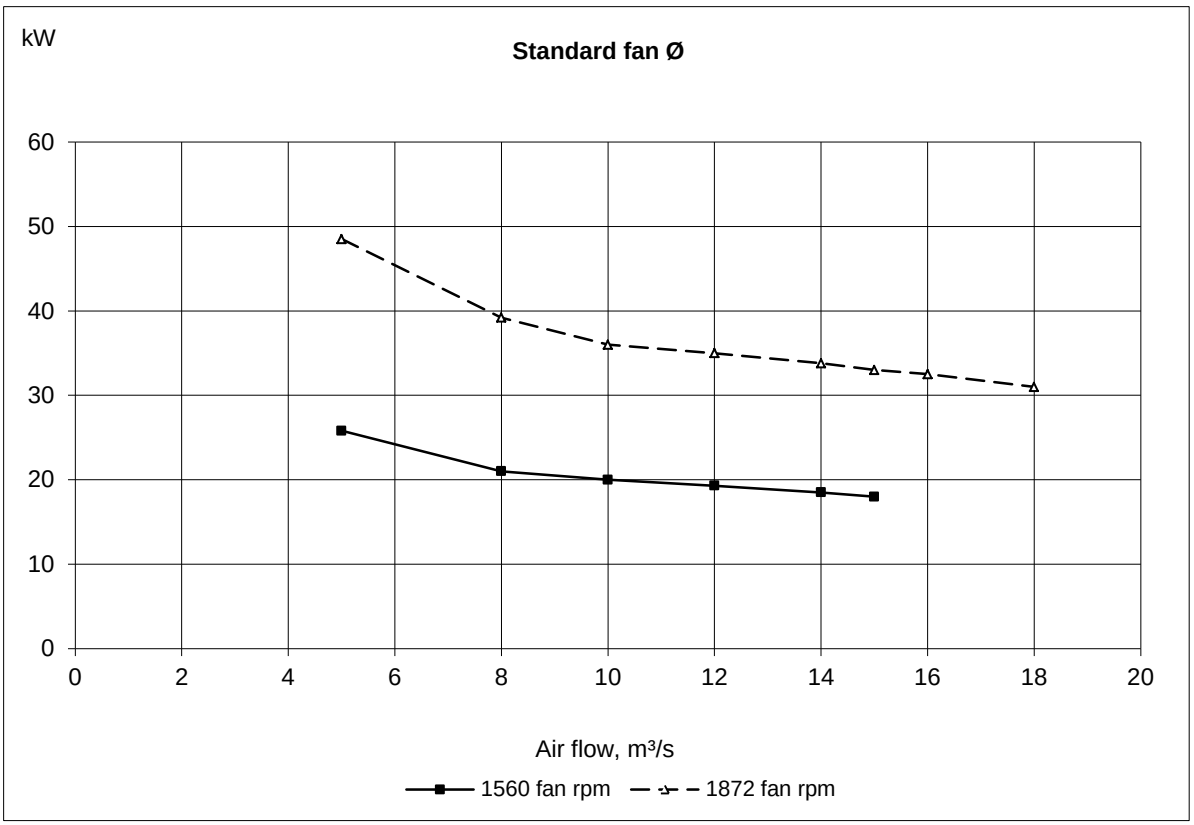

BSU
calculated value
Smoke Emission
(measured according to ISO 10054)
0,25
0,2
0,15
0,1
0,05
0
0
100
200
300
400
500
600
700
800
kW
Prime Power 1500 rpm
Prime Power 1800 rpm
Standby Power 1500 rpm
Standby Power 1800 rpm

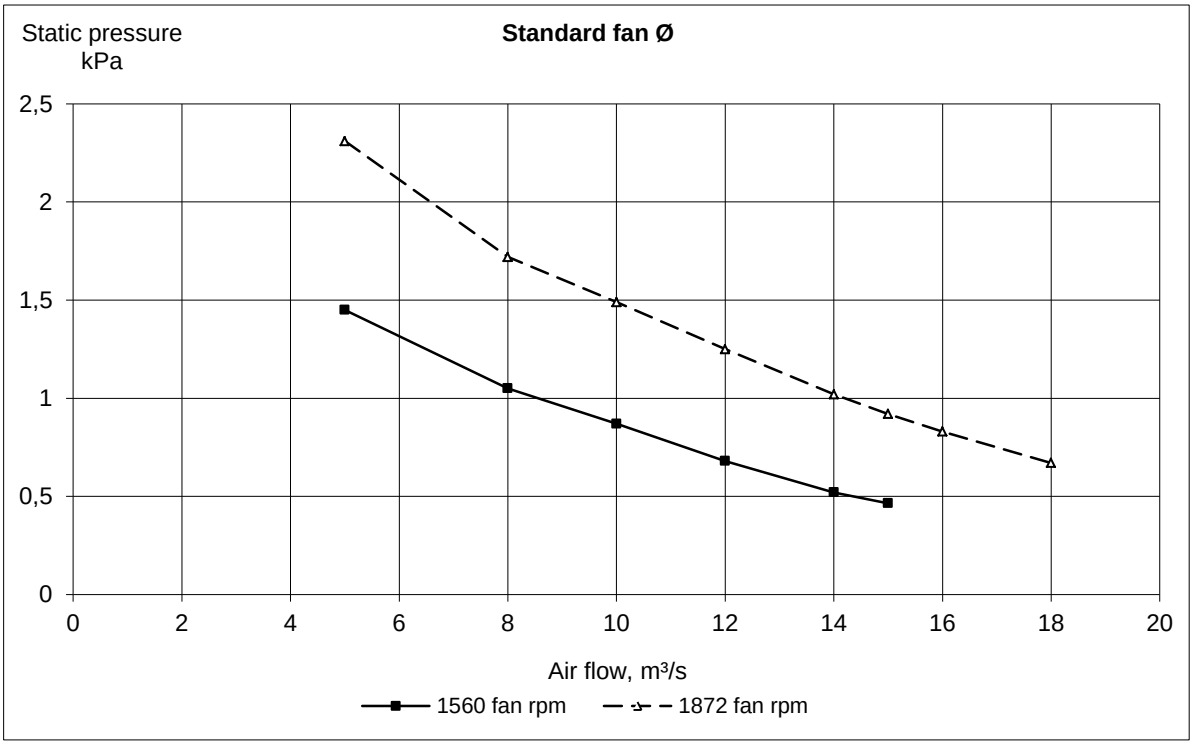

FSN
Smoke Emission
according to ISO 10054
0,60
0,50
0,40
0,30
0,20
0,10
0,00
0
100
200
300
400
500
600
700
800
kW
Prime Power 1500 rpm
Prime Power 1800 rpm
Standby Power 1500 rpm
Standby Power 1800 rpm


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
30,0%
25,0%
20,0%
15,0%
10,0%
5,0%
0,0%
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
Altitude meter above sea level
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


kW
Standard fan Ø
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14
16
18
20
Air flow, m³/s
1560 fan rpm
1872 fan rpm


Static pressure
kPa
Standard fan Ø
2,5
2
1,5
1
0,5
0
0
2
4
6
8
10
12
14
16
18
20
Air flow, m³/s
1560 fan rpm
1872 fan rpm