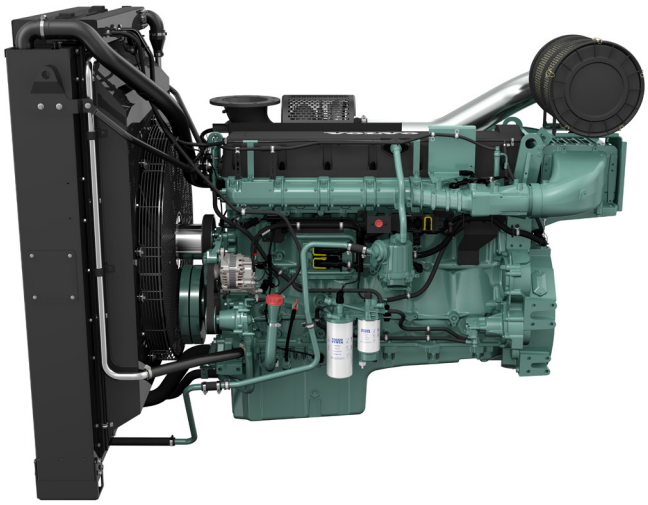
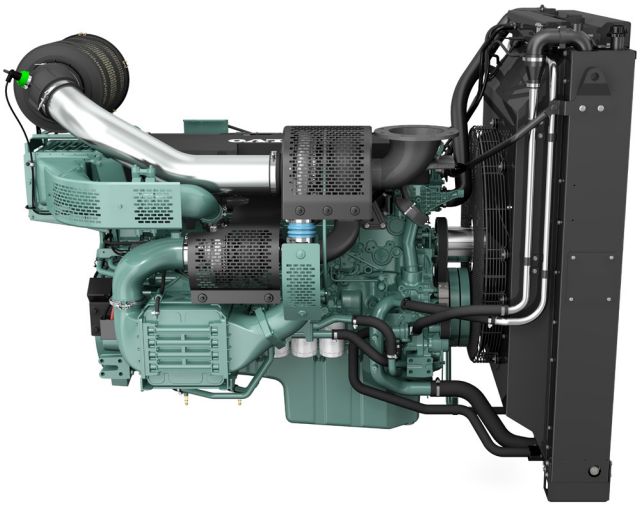
# TWD1645GE

16 litre, in-line 6 cylinder





**TWD1645GE 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 - fulfills UNECE REG 96 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 |
| 595 | 560 | 700 | 655 | 616 | 770 |

## 60 Hz/1800 rpm

| Prime power | | | Standby power | | | Gen.eff. |
|---|---|---|---|---|---|---|
| kWm | kWe | kVa | kWm | kWe | kVa | % |
| 619 | 582 | 727 | 681 | 640 | 800 | 94 |

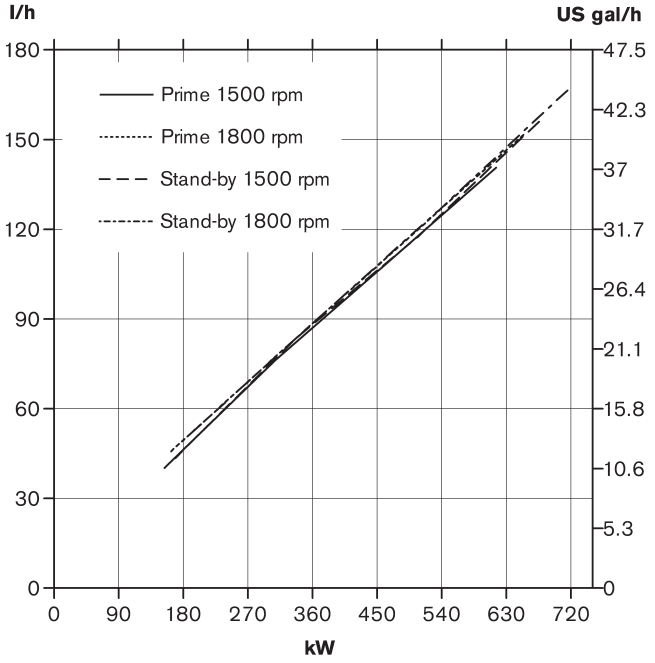
# TWD1645GE

16 litre, in-line 6 cylinder

## Technical Data

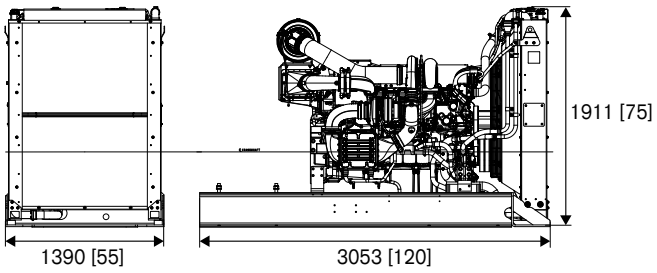
| | |
|---|---|
| Configuration and no. of cylinders | in-line 6 |
| Displacement, l (in³) | 16.12 (983.9) |
| Method of operation | 4-stroke |
| Bore, mm (in.) | 144 (5.67) |
| Stroke, mm (in.) | 165 (6.50) |
| Compression ratio | 16.8:1 |
| Wet weight, engine only, kg (lb) | 1810 (3390) |
| Wet weight, 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 DCU2 control panel features engine control, monitoring, alarm, parameter settings and diagnostic functions. It also presents error codes in clear text.

### Frame
- Heavy duty frame 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 standby 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. Average power output over 24 h of operation shall not exceed 70% of emergency stand-by power. Engine operation up to 200 h of operation per year.

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.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English 02-2017

## 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 | 616 | 653 |
| | | | hp | 838 | 889 |
| | | with fan | kW | 595 | 619 |
| | | | hp | 809 | 842 |
| Standby Power | | without fan | kW | 675 | 715 |
| | | | hp | 919 | 973 |
| | | with fan | kW | 654 | 681 |
| | | | hp | 890 | 927 |
| Torque at: | Prime Power | | Nm | 3922 | 3467 |
| | | | lbft | 2892 | 2557 |
| | Standby Power | | Nm | 4300 | 3795 |
| | | | lbft | 3171 | 2799 |
| | | | | | |
| Mean piston speed | | | m/s | 8,3 | 9,9 |
| | | | ft/sec | 27,1 | 32,6 |
| Effective mean pressure at: | Prime Power | | MPa | 3,1 | 2,7 |
| | | | psi | 443 | 392 |
| Effective mean pressure at: | Standby Power | | MPa | 3,4 | 3,0 |
| | | | psi | 486 | 429 |
| Max combustion pressure at: | Prime Power | | MPa | 21,7 | 21,0 |
| | | | psi | 3152 | 3041 |
| Max combustion pressure at: | Standby Power | | MPa | 22,9 | 22,2 |
| | | | psi | 3314 | 3220 |
| 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**

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

Tolerance ± 0.75 dB(A)

| | | | rpm | 1500 | 1800 |
|---|---|---|---|---|---|
| Measured sound power Lw (with fan) | No load | | dB(A) | 115,6 | 119,1 |
| | Prime Power | | dB(A) | 118,2 | 120,7 |
| | Standby Power | | dB(A) | 118,9 | 120,3 |
| Calculated sound pressure Lp at 1 m (with fan) | No load | | dB(A) | 103,6 | 107,1 |
| | Prime Power | | dB(A) | 106,2 | 108,7 |
| | Standby Power | | dB(A) | 106,9 | 108,3 |

**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 | 4,2 | 1,1 | 0,0 | - | - | 20-100 | 19,4 | 2,3 | 18,5 | 1,6 | 1,4 |
| 0-40 | 8,0 | 1,3 | 3,0 | 0,7 | - | 40-100 | 11,0 | 1,4 | 7,5 | 0,9 | 0,7 |
| 0-50 | 10,9 | 1,6 | 6,8 | 1,1 | 0,9 | 50-100 | 9,0 | 1,3 | 4,8 | 0,8 | - |
| 0-60 | 14,7 | 1,9 | 11,8 | 1,4 | 1,3 | 60-100 | 7,8 | 1,2 | 3,0 | 0,6 | - |
| 0-38 (G3) | 6,9 | 1,3 | 0,0 | - | - | 38-100 | 12,5 | 1,4 | 9,3 | 1,0 | 0,8 |
| 0-51 (G2) | 9,9 | 1,4 | 5,5 | 1,0 | 0,7 | 51-100 | 9,7 | 1,3 | 5,8 | 0,8 | 0,6 |
| 0-80* | 23,6 | 2,7 | 23,3 | 2,0 | 1,9 | | | | | | |
| 0-100* | 31,9 | 3,8 | 34,5 | 3,0 | 2,8 | | | | | | |
| 100-0 | 7,1 | 1,1 | 0,0 | | | | | | | | |

**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 | 4,5 | 1,0 | 0,0 | - | - | 20-100 | 21,5 | 2,8 | 21,5 | 2,0 | 1,8 |
| 0-40 | 9,0 | 1,3 | 4,3 | 0,9 | - | 40-100 | 12,1 | 1,8 | 9,3 | 1,1 | 0,9 |
| 0-50 | 12,5 | 1,7 | 9,0 | 1,3 | 1,1 | 50-100 | 10,1 | 1,5 | 6,3 | 0,9 | 0,6 |
| 0-60 | 17,3 | 2,1 | 15,0 | 1,6 | 1,5 | 60-100 | 8,7 | 1,3 | 4,3 | 0,7 | - |
| 0-35 (G3) | 7,1 | 1,3 | 0,0 | - | - | 35-100 | 15,1 | 2,0 | 13,0 | 1,3 | 1,1 |
| 0-46 (G2) | 9,7 | 1,3 | 5,0 | 1,0 | - | 46-100 | 11,4 | 1,7 | 8,0 | 1,0 | 0,8 |
| 0-80* | 27,2 | 2,9 | 28,3 | 2,3 | 2,2 | | | | | | |
| 0-100* | 35,5 | 4,6 | 39,8 | 3,8 | 3,5 | | | | | | |
| 100-0 | 7,5 | 1,0 | 3,5 | 0,6 | - | | | | | | |

**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 | 3,0 | 0,8 | 0,0 | - | - | 20-100 | 21,8 | 4,2 | 2,3 | 0,8 | - |
| 0-40 | 5,8 | 1,2 | 2,3 | 0,2 | - | 40-100 | 10,4 | 1,9 | 0,0 | - | - |
| 0-50 | 7,6 | 1,2 | 2,8 | 0,2 | - | 50-100 | 7,7 | 1,4 | 0,0 | - | - |
| 0-60 | 11,7 | 1,5 | 3,3 | 0,3 | - | 60-100 | 6,0 | 1,1 | 0,0 | - | - |
| 0-50 (G3) | 7,6 | 1,2 | 2,8 | 0,2 | - | 50-100 | 7,7 | 1,4 | 0,0 | - | - |
| 0-60 (G2) | 11,7 | 1,5 | 3,3 | 0,3 | - | 60-100 | 6,0 | 1,1 | 0,0 | - | - |
| 0-80* | 30,6 | 3,0 | 9,3 | 1,5 | 1,3 | | | | | | |
| 0-100* | 40,7 | 5,3 | 25,0 | 2,4 | 2,2 | | | | | | |
| 100-0 | 5,0 | 0,9 | 3,0 | 0,8 | - | | | | | | |

**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 | 3,2 | 0,9 | 0,0 | - | - | 20-100 | 12,0 | 2,3 | 12,5 | 1,3 | |
| 0-40 | 6,2 | 1,2 | 2,5 | 0,2 | - | 40-100 | 8,4 | 2,0 | 6,5 | 1,0 | |
| 0-50 | 8,1 | 1,2 | 5,3 | 0,8 | 0,6 | 50-100 | 7,4 | 1,7 | 4,3 | 0,8 | |
| 0-60 | 11,3 | 1,6 | 10,5 | 1,1 | 1,0 | 60-100 | 6,4 | 1,8 | 2,5 | 0,7 | |
| 0-46 (G3) | 7,2 | 1,2 | 3,5 | 0,8 | - | 46-100 | 8,0 | 1,7 | 5,5 | 0,8 | |
| 0-58 (G2) | 10,6 | 1,5 | 9,3 | 1,1 | 0,9 | 58-100 | 6,6 | 1,8 | 3,0 | 0,7 | |
| 0-80* | 16,9 | 2,2 | 20,5 | 1,6 | 1,4 | | | | | | |
| 0-100* | 22,8 | 2,8 | 30,3 | 2,1 | 1,8 | | | | | | |
| 100-0 | 5,6 | 0,8 | 3,5 | 0,9 | - | | | | | | |

| 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 / VDS-4 | | 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 | 218 | 234 |
| Specific **fuel** consumption at: | | lb/hph | 0,353 | 0,379 |
| | 50% | g/kWh | 206 | 208 |
| | | lb/hph | 0,335 | 0,337 |
| | 75% | g/kWh | 196 | 198 |
| | | lb/hph | 0,317 | 0,321 |
| | 100% | g/kWh | 191 | 194 |
| | | lb/hph | 0,309 | 0,314 |
| **Standby Power** | 25% | g/kWh | 215 | 229 |
| Specific **fuel** consumption at: | | lb/hph | 0,348 | 0,372 |
| | 50% | g/kWh | 207 | 206 |
| | | lb/hph | 0,335 | 0,333 |
| | 75% | g/kWh | 194 | 197 |
| | | lb/hph | 0,314 | 0,319 |
| | 100% | g/kWh | 193 | 194 |
| | | lb/hph | 0,313 | 0,315 |

| Fuel system | rpm | 1500 | 1800 |
|---|---|---|---|
| Fuel to conform to | ASTM-D975-NO 1 and 2-D<br>JIS KK 2204, EN590 | | |
| System supply flow at: | litre/h | 177 | 195 |
| | US gal/h | 46,8 | 51,5 |
| Fuel supply line max restriction | kPa | -10 | -10 |
| (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 | 25 |
| | US gal/h | 6,6 | 6,6 |
| Fuel return line max restriction | kPa | 20 | 20 |
| (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:<br>(+25°C and 100kPa) | Prime Power | | $m^3$/min<br>cfm | 41,2<br>1455 | 44,5<br>1571 |
| | Standby Power | | $m^3$/min<br>cfm | 43,53<br>1537 | 47,63<br>1682 |
| ⚠<br>**See front page for important information** | | | | | |
| **Max allowable air intake restriction including piping with a clean air filter** | | | kPa<br>psi | -3,0<br>-0,4 | -3,0<br>-0,4 |
| **Measured pressure drop standard Penta air inlet installation & clean filter**<br>**Measured at standard inlet depression sensor position. Stand-by rating** | | | kPa<br>psi | -2,0<br>-0,3 | -2,4<br>-0,3 |
| Heat rejection to exhaust at: | Prime Power | | kW<br>BTU/min | 415<br>23578 | 463<br>26302 |
| | Standby Power | | kW<br>BTU/min | 473<br>26876 | 513<br>29174 |
| Exhaust gas temperature after LP turbine at: | Prime Power | | °C<br>°F | 470<br>878 | 483<br>901 |
| | Standby Power | | °C<br>°F | 501<br>934 | 497<br>927 |
| ⚠<br>**See front page for important information** | | | | | |
| Max allowable back pressure in exhaust line | Prime Power | | kPa<br>psi | 9<br>1,3 | 9<br>1,3 |
| | Standby Power | | kPa<br>psi | 10<br>1,5 | 10<br>1,5 |
| Exhaust gas flow at:<br>(temp and pressure after LP turbine at the corresponding power setting) | Prime Power | | $m^3$/min<br>cfm | 98<br>3447 | 107<br>3786 |
| | Standby Power | | $m^3$/min<br>cfm | 106<br>3754 | 115<br>4075 |

## Cooling system

| | | | rpm | 1500 | 1800 |
|---|---|---|---|---|---|
| **Heat rejection radiation** & convection from engine at: | Prime | | kW | 23 | 24 |
| | | | BTU/min | 1308 | 1336 |
| | Stand-by | | kW | 26 | 27 |
| | | | BTU/min | 1479 | 1535 |
| Heat rejection to coolant HT circuit **engine radiator** at: | Prime Power | | kW | 239 | 234 |
| | | | BTU/min | 13592 | 13307 |
| | Standby Power | | kW | 259 | 247 |
| | | | BTU/min | 14729 | 14047 |
| Heat rejection to coolant LT circuit **CAC radiator** at: | Prime Power | | kW | 131 | 136 |
| | | | BTU/min | 7450 | 7734 |
| | Standby Power | | kW | 146 | 156 |
| | | | BTU/min | 8303 | 8872 |
| 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 | | | $m^2$ | 1,77 | |
| | | | $foot^2$ | 19,05 | |
| CAC radiator core area | | | $m^2$ | 1,77 | |
| | | | $foot^2$ | 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 / Boost pressure (measured in inlet manifold, absolute pressure) | | Prime power | kPa (a) | 419 | 390 |
| | | | psi (abs) | 60,7 | 56,5 |
| power (measured in inlet manifold, absolut pressure ) | | | kPa (a) | 442 | 417 |
| | | | psi (abs) | 64,1 | 60,5 |
| ⚠ **See front page for important information** | | | | | |
| Charge air temp. Measured in inlet manifold, at 25 deg ambient temp | Prime Power | | °C | 52 | 52 |
| | | | °F | 125 | 125 |
| | Standby Power | | °C | 52 | 53 |
| | | | °F | 126 | 127 |

**OEM cooling system design:**

| **- move of standard radiatorts** | | **rpm** | **1500** | **1800** |
|---|---|---|---|---|
| Maximum additional coolant with standard expansion tank | | litre | 15 | |
| | | US gal | 3,96 | |
| Maximum additional coolant, CAC with standard expansion tank | | litre | 5 | |
| | | US gal | 1,32 | |
| Maximum distans in vertikal direction with standard pressure cap | | m | 2,5 | |
| (75 kPa) | | ft | 8,20 | |
| Maximum additional pressure drop due to move | | KPa | 10 | |
| | | psi | 1,5 | |
| Heat rejection to coolant HT circuit | Prime Power | kW | 239 | 234 |
| **engine radiator** at: | | BTU/min | 13592 | 13307 |
| | Standby Power | kW | 259 | 247 |
| | | BTU/min | 14729 | 14047 |
| Heat rejection to coolant LT circuit | Prime Power | kW | 131 | 136 |
| **CAC radiator** at: | | BTU/min | 7450 | 7734 |
| | Standby Power | kW | 146 | 156 |
| | | BTU/min | 8303 | 8872 |
| Minimum coolant flow **engine radiator** (at fully open thermostat) | | litre/s | 4,8 | 6 |
| | | US gal/s | 1,27 | 1,59 |
| Minimum coolant flow **CAC radiator** (at fully open thermostat) | | litre/s | 1,7 | 2,1 |
| | | US gal/s | 0,44 | 0,55 |
| Maximum coolant pressure drop over **engine- radiator incl. Piping** (at coolant flow | | kPa | 45 | 65 |
| above) | | psi | 6,5 | 9,4 |
| Maximum coolant pressure drop over **CAC - radiator incl. piping** | | kPa | 40 | 70 |
| (at coolant flow above) | | psi | 5,8 | 10,2 |
| Maximum coolant pressure drop over **complete engine cooling system** (at coolant | | kPa | 110 | 160 |
| flow above) | | psi | 16,0 | 23,2 |
| Maximum coolant pressure drop over **complete CAC cooling circuit** (at coolant | | kPa | 87 | 135 |
| flow above) | | psi | 12,6 | 19,6 |
| | | kPa | 50 | 50 |
| Nominal coolant pressure before CAC circuit coolant pump | | psi | 7,3 | 7,3 |
| | | kPa | 50 | 50 |
| Nominal coolant pressure before engine circuit coolant pump | | psi | 7,3 | 7,3 |

**Cooling performance**

Standard fan 965 mm  Fan ratio: 1,04  Fan type: FIX  Top Tank temperatur TTT 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 | 67,2 | 11,4 | 0 | | |
| | 61,1 | | | 11,4 | 0 |
| | 58,4 | | | 11,0 | 150 |
| | 56 | | | 10,3 | 300 |
| | 53,2 | | | 9,4 | 450 |
| 1800 | 64,8 | 13,4 | 0 | | |
| | 62,6 | | | 13,4 | 0 |
| | 61,9 | | | 13,0 | 150 |
| | 59,7 | | | 12,3 | 300 |
| | 57,9 | | | 11,6 | 450 |

Note! External restrictions are calculated for values >0 Pa

**Engine management system**

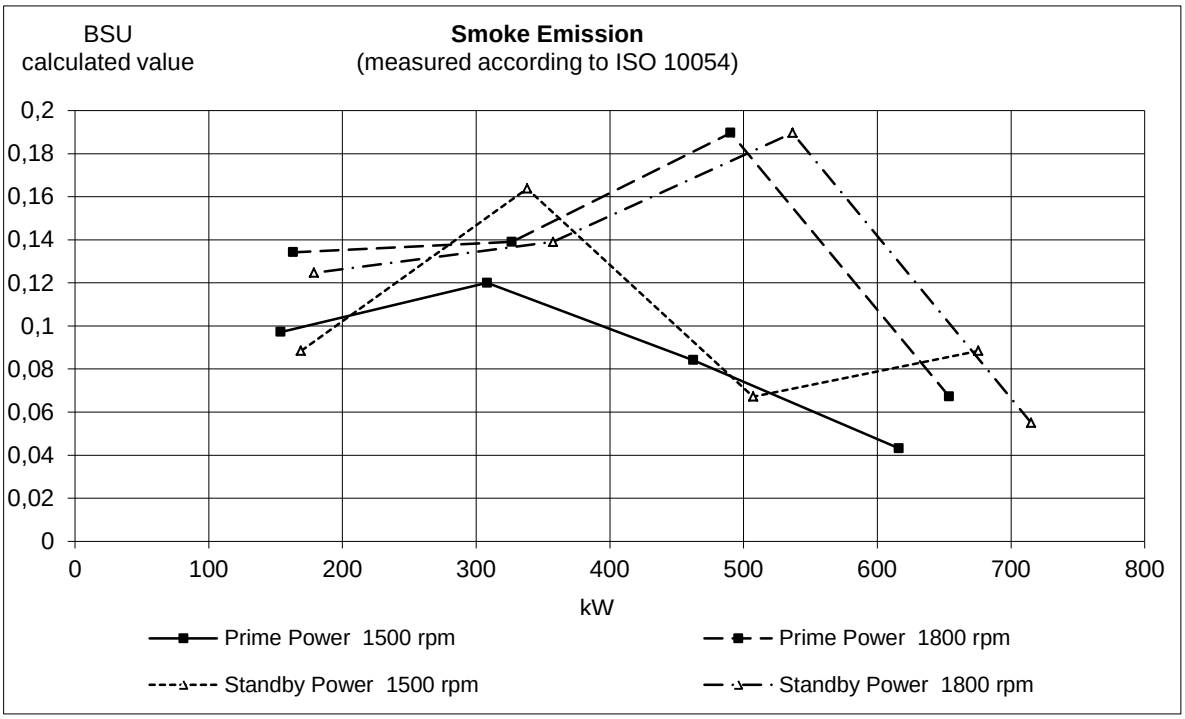
| Functionality | Alternatives | | | Default setting |
|---|---|---|---|---|
| Governor mode | Droop | | Isochronous | Isochronous |
| Governor droop | 4% | | 0 | N/A |
| Governor response | Adjustable PID-constants (VODIA) | | | |
| Dual speed | 1500 rpm, 50 Hz / 1800 rpm, 60 Hz | | | 1500 rpm, 50 Hz / 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 |

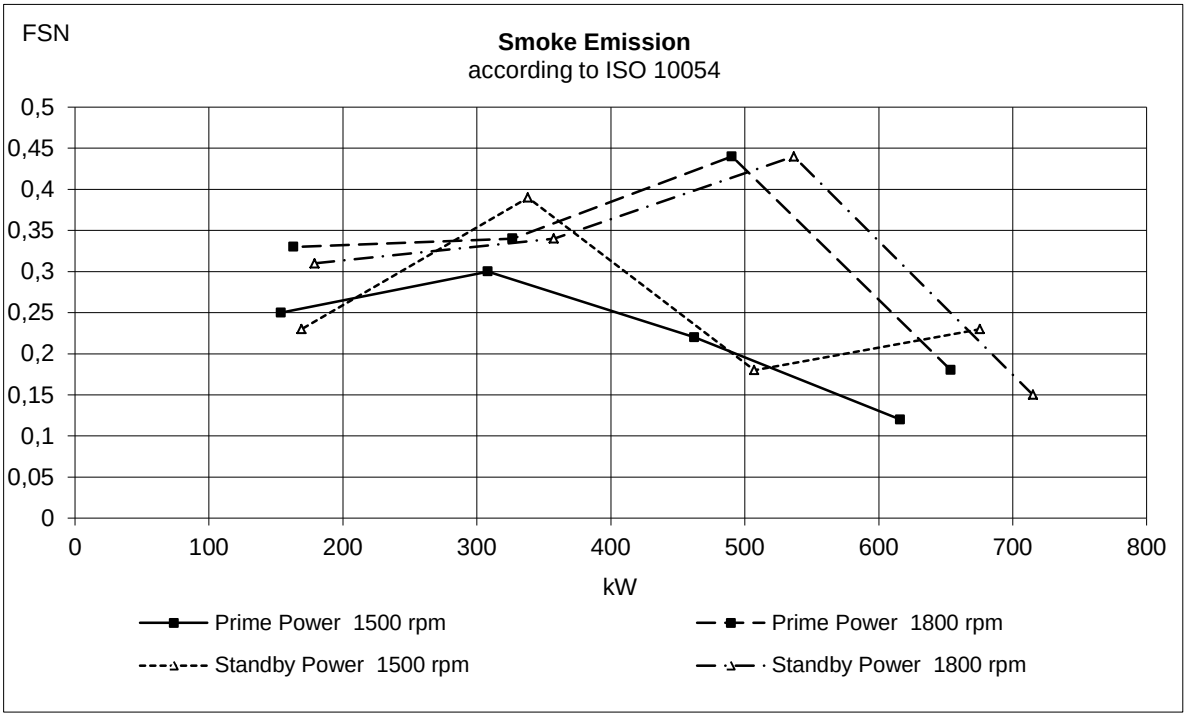
| Engine sensor and switch settings | | | | Engine protection action | | |
|---|---|---|---|---|---|---|
| Parameter | | Unit | Warning level (Yellow) | Alarm level (Red) | Default | Optional |
| Oil temp | | °C | 125 | 127,5 | Shut down after 10s | N/A |
| Oil pressure | 900 rpm | kPa | 170 | 145 | 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 |

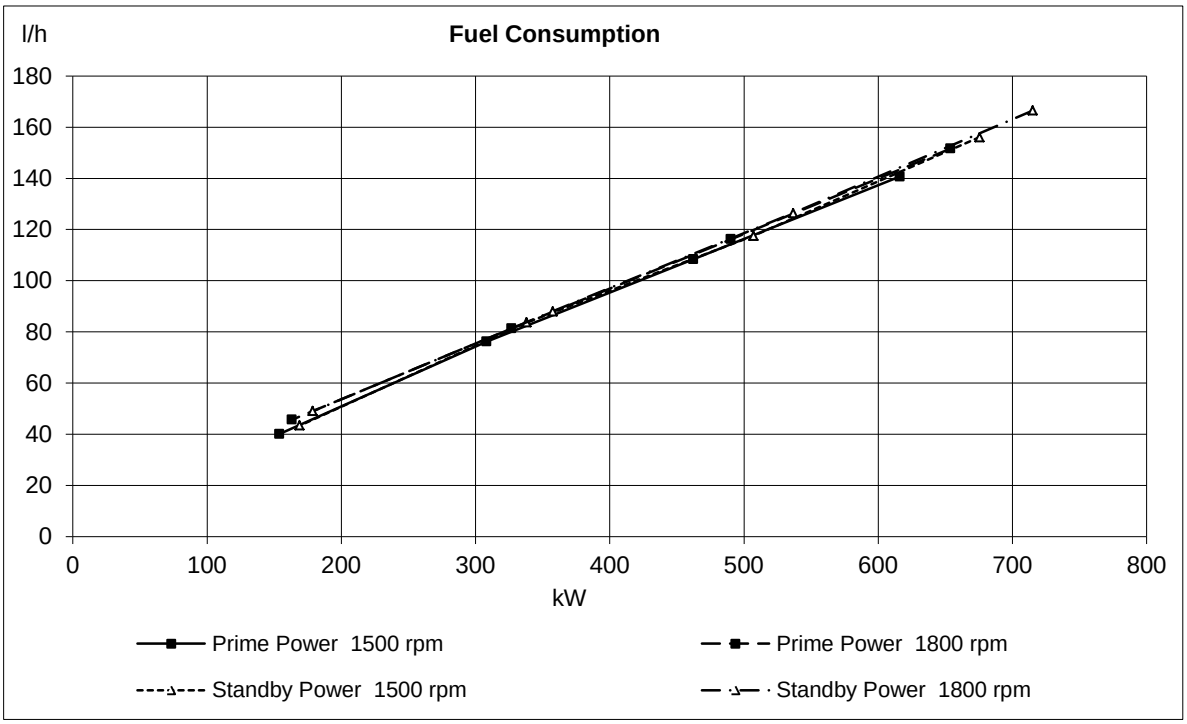
**Electrical system**

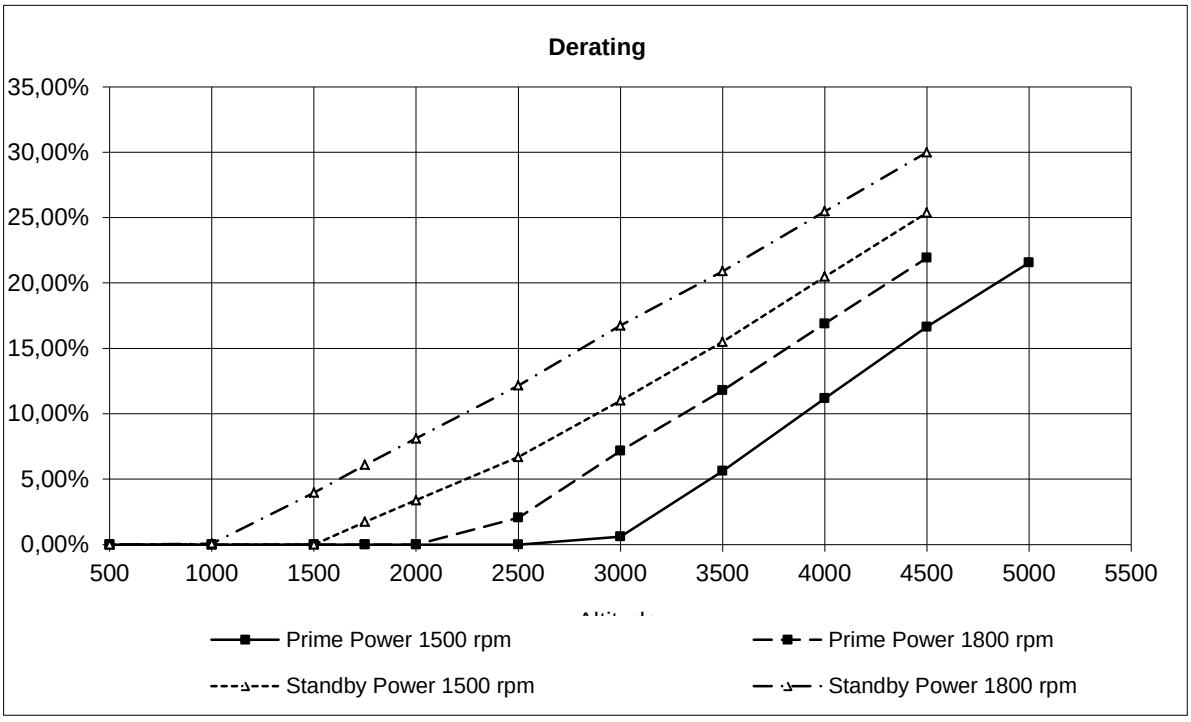
| | | | |
|---|---|---|---|
| Voltage and type | | 24 V / insulated from earth | |
| Alternator: | make/output | A | Bosch / 80 |
| | tacho output | Hz/alt. Rev | 6 |
| | drive ratio | | 3,94 : 1 |
| Starter motor | | make | Misubishi Electric |
| | | type | 24V 7 kW 12/3. 17F |
| | | kW | 7,0 |
| Number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

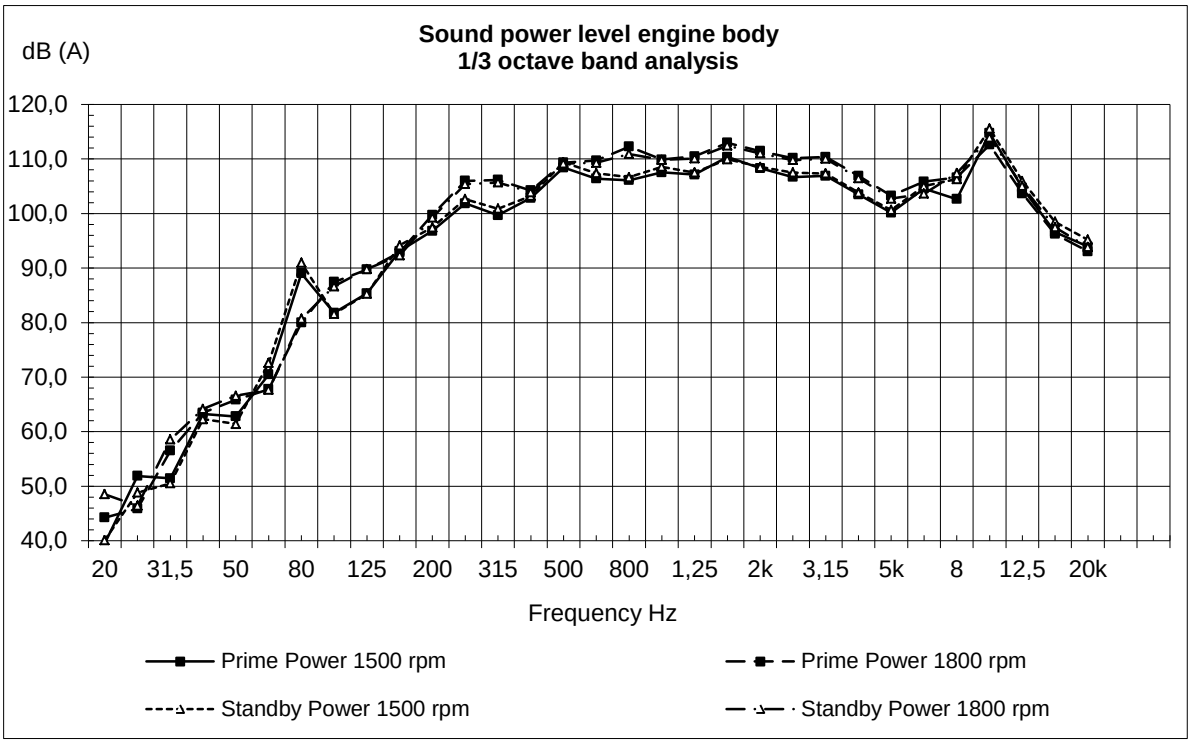
| **Power take off** | | **rpm** | **1500** | **1800** |
|---|---|---|---|---|
| Front end in line with crank shaft max: | | Nm<br>lbft | | |
| Front end belt pulley load. Direction of load viewed from flywheel side: | max left | kW<br>hp | | |
| | max down | kW<br>hp | | |
| | max right | kW<br>hp |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

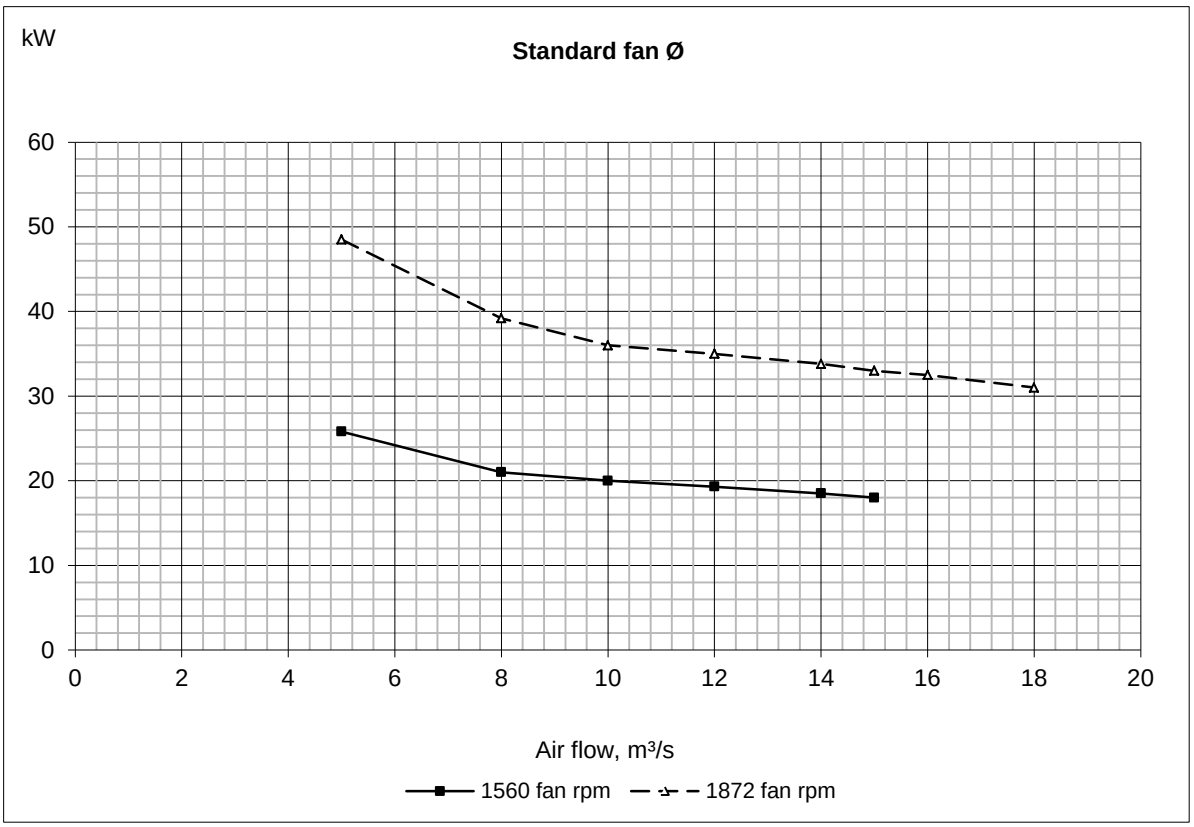

BSU
calculated value
Smoke Emission
(measured according to ISO 10054)
0,2
0,18
0,16
0,14
0,12
0,1
0,08
0,06
0,04
0,02
0
0
100
200
300
400
500
600
700
800
kW
Prime Power 1500 rpm
Prime Power 1800 rpm
Standby Power 1500 rpm
Standby Power 1800 rpm

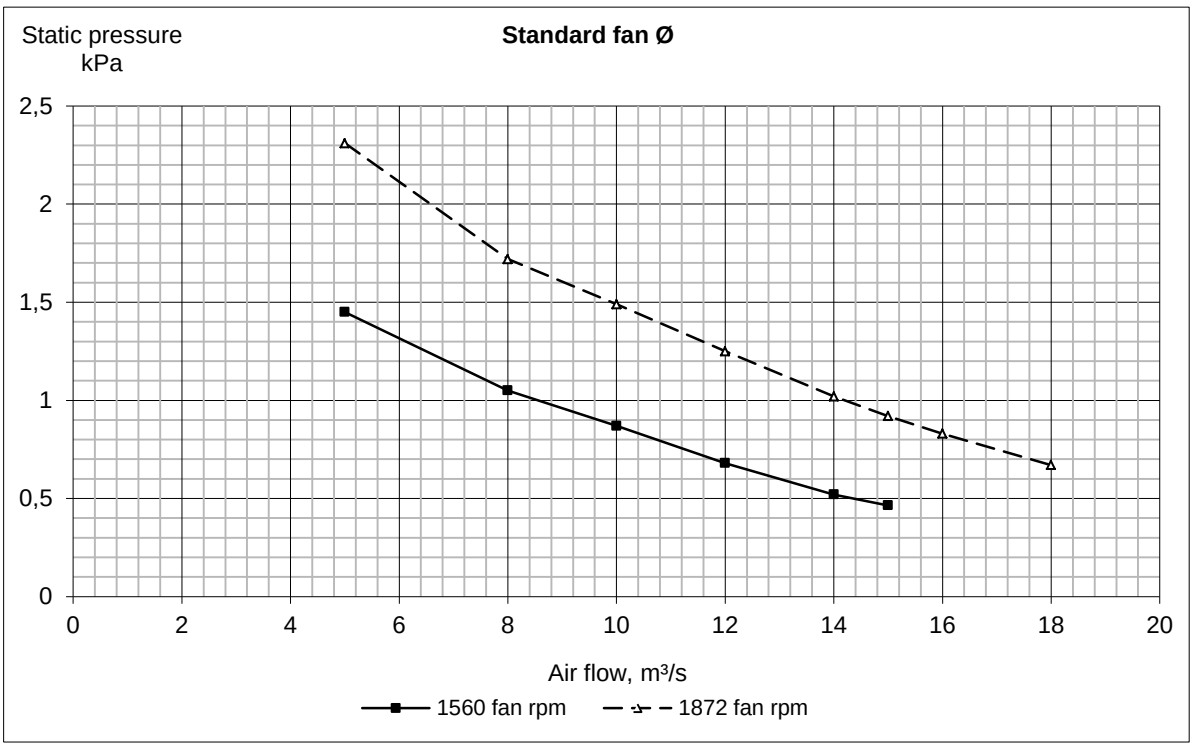

FSN
Smoke Emission
according to ISO 10054
0,5
0,45
0,4
0,35
0,3
0,25
0,2
0,15
0,1
0,05
0
0
100
200
300
400
500
600
700
800
kW
Prime Power 1500 rpm
Prime Power 1800 rpm
Standby Power 1500 rpm
Standby Power 1800 rpm


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
35,00%
30,00%
25,00%
20,00%
15,00%
10,00%
5,00%
0,00%
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
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)
120,0
110,0
100,0
90,0
80,0
70,0
60,0
50,0
40,0
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