

|                                                                                   |                                  |                 |
|-----------------------------------------------------------------------------------|----------------------------------|-----------------|
|  | Model : <b>16M33G4D2/5</b>       | Date : 30/11/22 |
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## Ratings

| RPM  | Gross Engine Output |        |      |      | Net Engine Output |        |      |      |
|------|---------------------|--------|------|------|-------------------|--------|------|------|
|      | PRP                 |        | ESP  |      | PRP               |        | ESP  |      |
|      | kWm                 | BHP    | kWm  | BHP  | kWm               | BHP    | kWm  | BHP  |
| 1500 | 1390 *              | 1864 * | 1530 | 2052 | 1314 *            | 1763 * | 1454 | 1950 |

1 kWm = 1,34102 BHP

When the engine is used with a cooling system using an electrically driven fan, net engine output data may change and quoted figures should be used for reference only

## Basic data

|                                                                    |                                                 |
|--------------------------------------------------------------------|-------------------------------------------------|
| Engine model                                                       | 16M33G4D2/5                                     |
| N° of Cylinders / Valves                                           | 16 / 64                                         |
| Cylinders arrangement                                              | At Vee                                          |
| Bore x Stroke (mm)                                                 | 150 x 185                                       |
| Displacement (L)                                                   | 52.3                                            |
| Thermodynamic Cycle                                                | Diesel 4 stroke                                 |
| Firing Order                                                       | A1-A7-B4-B6-A4-B8-A2-A8-B3-B5-A3-A5-B2-A6-B1-B7 |
| Mean Piston Speed (m/s)                                            | 9.25                                            |
| BMEP @ ESP (Bar)                                                   | 23.40                                           |
| Cooling System                                                     | Liquid (water + 50% antifreeze)                 |
| Injection System                                                   | Direct                                          |
| Fuel System                                                        | High Pressure Common Rail                       |
| Aspiration                                                         | Turbocharged and Aftercooled                    |
| Compression ratio                                                  | 15 : 1                                          |
| Flywheel housing                                                   | SAE 0                                           |
| Flywheel                                                           | 18"                                             |
| Rotation Viewed from Flywheel...                                   | Counterclockwise                                |
| Allowed static bending moment of the flywheel housing....          | /                                               |
| N° of teeth on flywheel ring gear                                  | 194                                             |
| Inertia of flywheel (kg•m <sup>2</sup> )                           | 7.2                                             |
| Inertia of crankshaft (kg•m <sup>2</sup> )                         | 10.1                                            |
| Emission standard                                                  | EPA Tier2                                       |
| Overall Dimensions with radiator (Length x Width x Height) (mm)    | 3967x 2237 x 2485                               |
| Engine dry weight without radiator and without radiator pipes (kg) | 5200                                            |
| Engine dry weight with radiator and radiator pipes (kg)            | 6470                                            |
| Engine wet weight with radiator (includes oil, coolant) (kg)       | 7171                                            |

\* The indicated PRP Power is for reference only. This engine is designed for emergency standby power (ESP) applications only.

|                                                                                   |                                  |                 |
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## Air intake system

|                                                  |       |
|--------------------------------------------------|-------|
| Air intake temperature rise (°C) .....           | ≤ 5   |
| Air intake restriction clean filter (mBar) ..... | ≤ 30  |
| Air intake restriction dirty filter (mBar) ..... | ≤ 62  |
| Recommended air flow @ PRP (m³/min) .....        | 110.3 |
| Recommended air flow @ ESP (m³/min) .....        | 115.8 |
| Min. diameter of intake pipe (mm) .....          | 140   |

## Aftercooling system

|                                                                               |              |
|-------------------------------------------------------------------------------|--------------|
| Aftercooler system type .....                                                 | Air to Water |
| Max. intake temperature @ 25°C ambient temperature (°C) .....                 | 55           |
| Max. difference between intake temperature and ambient temperature (°C) ..... | 30           |
| Max. intake pressure drop of aftercooler (mBar) .....                         | 80           |

## Lubrication system

|                                                                        |           |
|------------------------------------------------------------------------|-----------|
| Oil capacity Low / High (L) .....                                      | 114 / 171 |
| Oil pressure in normal condition idle speed (Bar) .....                | ≥ 2       |
| Oil pressure in normal condition at 1500 Rpm @ PRP (Bar) .....         | 4 - 6.5   |
| Lowest oil pressure alarm (shutdown) (Bar) .....                       | 2         |
| High Oil Pressure Warning .....                                        | 10        |
| Max. oil temperature (°C) .....                                        | 105       |
| Oil flow at 1500 Rpm (L/min) .....                                     | ≥ 640     |
| Oil fuel consumption ratio based on engine fuel consumption data ..... | ≤ 0.3 %   |
| Total system capacity (including filters) (L) .....                    | 175       |

## Heat balance test data (with ambient temperature 32 °C)

|                                                                |        |
|----------------------------------------------------------------|--------|
| Total heat dissipation @ ESP (kJ/s) .....                      | 2414.0 |
| - Heat Rejection to Jacket Water @ ESP (kJ/s) .....            | 600.3  |
| - Heat Rejection to Low temperature circuit @ ESP (kJ/s) ..... | 353.2  |
| - Radiated Heat to Ambient @ ESP (kJ/s) .....                  | 23.8   |
| - Heat Rejected to Exhaust @ ESP (kJ/s) .....                  | 1436.7 |

## Exhaust system

|                                                           |       |
|-----------------------------------------------------------|-------|
| Max. exhaust back pressure (mBar) .....                   | 75    |
| Max. exhaust temperature before turbocharger (°C) .....   | 750   |
| Max. exhaust temperature after turbocharger (°C) .....    | 550   |
| Exhaust flow @ PRP (m³/min) .....                         | 342.1 |
| Exhaust flow @ ESP (m³/min) .....                         | 376.3 |
| Min. diameter of exhaust pipe (mm) .....                  | 200   |
| Max. bending moment of exhaust gas exit flange (Nm) ..... | 10    |

|                                                                                   |                                  |                 |
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## Cooling system with standard radiator

|                                                                 |                    |
|-----------------------------------------------------------------|--------------------|
| System designed for ambient temperature up to (°C) <sup>1</sup> | 50                 |
| Radiator type                                                   | Mechanical         |
| Fan type                                                        | Belt driven pusher |
| Min. inside diameter of coolant outlet pipe (mm)                | 100                |
| Coolant capacity of radiator and pipes (L)                      | 412                |
| Coolant alarm (shutdown) temperature (°C)                       | 108                |
| Thermostat opening temperature / full open temperature (°C)     | 80 / 92            |
| Max. additional restriction for external cooling circuit (Bar)  | 0.38               |
| Coolant capacity of the engine (L)                              | 130                |
| Cooling fan airflow (m³/min)*                                   | 2340               |
| Fan absorbed power (kW)                                         | 74                 |
| Additional restriction (for reference) - Duct allowance (Pa)    | 150                |

\* Air flow figure assumes the presence of the standard radiator provided, taking into consideration the backpressure caused

## Fuel system

|                                                                                           |             |
|-------------------------------------------------------------------------------------------|-------------|
| Governor                                                                                  | ECU         |
| Governor steady state speed stability at constant load (ISO 8528-5 Class G3) <sup>2</sup> | ≤ +/- 0.5 % |
| Max. restriction at fuel inlet (Bar)                                                      | 0.5         |
| Max. pressure at fuel inlet (Bar)                                                         | 0.5         |
| Max. fuel return restriction (Bar)                                                        | 0.2         |
| Max. fuel inlet temperature (°C)                                                          | 50          |
| Fuel supply flow (L/hr)                                                                   | 1900        |
| Min. internal diameter of inlet pipe (mm)                                                 | 19          |
| Min. internal diameter of return pipe (mm)                                                | 19          |

## Electrical system

|                                                                                 |         |
|---------------------------------------------------------------------------------|---------|
| Electrical system voltage (negative to ground) (Vdc)                            | 24      |
| Starter power (kW)                                                              | 2 x 8.5 |
| Battery charger current (A)                                                     | 55      |
| Battery charger absorbed power (kW)                                             | 1.6     |
| Max. electric resistance of starting circuit (Ω)                                | 0.008   |
| Min. sectional area of wire (mm²)                                               | 95      |
| Min. cold start temperature without auxiliary starting device (°C) <sup>3</sup> | - 10    |
| Min. cold start temperature with auxiliary starting device (°C) <sup>3</sup>    | - 25    |

<sup>1</sup> The indicated value is based on the AOT value of 50°C for an engine tested at 100% of the ESP Power, reflecting temperature in an open condition, without an enclosure or container, without any airflow obstruction in the front of the radiator, without air recirculation, with free exhaust gas exit and with the engine thermostatic valve in its full open condition, without a closing plate present. The reference air restriction is equal to 50Pa. For the equivalent ATB (Air-to-Boil) performance in a customer or project basis, please consult Baudouin Application Engineering.

<sup>2</sup> This refers only to the frequency response of the engine and should not be confused with the performance class of the Generator Set, which is subject to additional contributing factors such as alternator selection and control settings.

<sup>3</sup> Engines used in emergency standby application or applications that require immediate start under load, they must be equipped with coolant heaters. Baudouin recommend heaters installation to be executed by providing constant coolant circulation across all the engine components. Two heaters are required for V-type engines, one per each side.

|                                                                                   |                                  |                 |
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## Noise

|                                                          |       |
|----------------------------------------------------------|-------|
| Diesel engine noise (Acoustic power level) (dB(A)) ..... | 118.9 |
| Noise - upper side (dB(A)) .....                         | 101.5 |
| Noise - right side (view from flywheel) (dB(A)) .....    | 99.8  |
| Noise - left side (view from flywheel) (dB(A)) .....     | 102.8 |
| Noise – front (radiator) side (dB(A)) .....              | 101.5 |
| Noise – rear (flywheel) side (dB(A)) .....               | 101.1 |

### Notes :

- Noise test made at 100% of the ESP power, at 1 mt. distance, on engine without radiator, without cooling fan and without silencer.
- Noise test refers to ISO 6798 norm : “Reciprocating internal combustion engines. Measurement of emitted airborne noise. Engineering method and survey method”.

## Fuel consumption

| Rating                            | gr/kWh | L/hr  |
|-----------------------------------|--------|-------|
| 100% ESP                          | 216.2  | 393.9 |
| 100% PRP                          | 225.9  | 370.4 |
| 75% PRP                           | 224.4  | 306.6 |
| 50% PRP                           | 221.2  | 201.5 |
| 25% PRP                           | 236.5  | 107.7 |
| Fuel consumption tolerance +/- 5% |        |       |

### Notes:

This engine is designed for ESP (Emergency Standby) applications only, the values shown above at PRP levels refer to the Referenced Power ( 1390 kWm).

## Ratings definitions

### Emergency Standby Power (ESP)

Emergency Standby Power is the maximum power available for a varying load for the duration of a main power network failure. The average load factor over 24 hours of operation should not exceed 70% of the engine's ESP power rating. Typical operational hours of the engine is 200 hours per year, with a maximum usage of 500 hours per year. This includes an annual maximum of 25 hours per year at the ESP power rating. No overload capability is allowed. The engine is not to be used for sustained utility paralleling applications.

### Prime Power (PRP)

Prime Power is the maximum power available for unlimited hours of usage in a variable load application. The average load factor should not exceed 70% of the engine's PRP power rating during any 24 hour period. An overload capability of 10% is available, however, this is limited to 1 hour within every 12 hour period.

- All ratings are based on operating conditions under ISO 8528-1, ISO 3046, DIN6271. Performance tolerance of  $\pm 5\%$ .
- Test conditions : 100 kPa, 25°C air inlet temperature, relative humidity of 30%, with fuel density 0.84 kg/L. Derating may be required for conditions outside these; please contact the factory for details.
- Power output curves are based on the engine operating with fuel system, water pump and lubricating oil pump; not included are battery charging alternator, fan and optional equipment.