MAN B&W Stationary Engines and Small Bore GenSets
Programme 2016
All data provided in this document is non-binding. This data serves informational purposes only and is especially not guaranteed in any way.

Depending on the subsequent specific individual projects, the relevant data may be subject to changes and will be assessed and determined individually for each project. This will depend on the particular characteristics of each individual project, especially specific site and operational conditions.

If this document is delivered in another language than English and doubts arise concerning the translation, the English text shall prevail.
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</tr>
</thead>
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MAN Diesel & Turbo Engines
MAN Diesel & Turbo designs MAN B&W two-stroke low speed diesel engines and MAN four-stroke small bore GenSets for stationary application.

The design is based on continuous development to meet the customers’ requirements in the following focus areas:

- Highest fuel efficiency
- Low maintenance costs
- High reliability
- Operational flexibility – from base load to standby
- Wide fuel flexibility
- Wide scope for thermal energy recovery
- Insensitivity to high ambient temperatures and high-altitude locations
- Modular concept for flexible capacity expansion

The MAN Diesel & Turbo engines of our design are characterised by robustness, reliability, simple operation and easy maintenance, which are preconditions for achieving an availability of more than 8,000 hours per year.

The engines of our design are sold and built by licensees (engine builders) placed worldwide.
MAN B&W Two-Stroke Engines

Technical data
All engine types from 35 to 98-bore mentioned in the programme are available as dual fuel engines under the designation ME-GI-S or ME-LGI-S. Power, speed and gross efficiency of the ME-S, ME-GI-S and ME-LGI-S type engines are the same as for the corresponding MC-S engines. Please contact MAN Diesel & Turbo in Copenhagen or the engine builder for technical engine data for your specific project, including project specific emission requirements.
Definitions
MAN B&W two-stroke low speed diesel engines are designed to provide optimum fuel flexibility and are an ideal source of power, whether operating on gas, liquid fuel or liquid biofuel.

Liquid fuels: HFO, diesel, crude biofuel and crude oil.

Gaseous fuels: Natural gas and ethane.

Liquid gas fuels: LPG, DME, methanol and ethanol.

Engine and GenSet power
Engine and generator power figures are stated in kW. Ratings are given according to ISO 3046-1:2002. The electrical power has been calculated based on a standard generator efficiency according to IEC 60034 in the corresponding power range and at a power factor of 0.9. This is for guidance only as it is to be confirmed by the selected generator maker.

Nominal rating
The engine ratings quoted are valid up to tropical conditions:
- Blower inlet temperature 45ºC
- Blower inlet pressure 1,000 mbar
- Charge air coolant temperature 32ºC

If the engine should operate under more demanding ambient conditions, please contact MAN Diesel & Turbo, Copenhagen or the engine builder.

Engine application
The engine ratings and speeds shown are based on generator drive application. For other drives, such as mechanical drive of mills, pumps, compressors, etc., please contact MAN Diesel & Turbo, Copenhagen, or the engine builder. The diesel generating set ratings and heat rates shown depend on the actual generator make and are for guidance only.
Site specified rating
$L_1 \geq \text{site specified rating} \geq L_2$
The engine may be operated without restriction at any load up to site specified rating. Operating at overload rating, i.e. 110% of the site specified rating, is permissible for one hour every 12 consecutive hours.

Engine heat rate
The figures specified in the table refer to mechanical output and to ISO 3046/1-2002 ambient conditions:
- Blower inlet temperature 25°C
- Blower inlet pressure 1,000 mbar
- Charge air coolant temperature 25°C

If the engine should operate under other ambient conditions, please contact MAN Diesel & Turbo, Copenhagen, or the engine builder.

Fuel oil consumption guarantee – MC-S engines
The MCR engine heat rate guaranteed by MAN Diesel & Turbo is subject to a tolerance of ±5% at ISO 3046/1-2002 ambient conditions. If the engine is operated under other ambient conditions or if the engine is equipped with emission control systems, TCS and/or BCST, please contact MAN Diesel & Turbo, Copenhagen, or the engine builder.

Lubricating oil consumption
The system oil consumption varies for the different engine sizes and operational patterns. Typical consumptions are in the range from negligible to 0.1 g/kWh.

Turbocharger selection
Two-stroke low speed engines can be delivered with MAN Diesel & Turbo, ABB Turbo Systems Ltd. or Mitsubishi Heavy Industries, Ltd. turbochargers as standard.
MAN B&W Two-Stroke Engines

Engine design

**MC-S design**
Two-stroke diesel engines provided with a mechanically driven camshaft controlling the fuel oil pumps and exhaust valves. These engines operate on liquid fuels only.

**ME-S design**
Two-stroke diesel engines designed with electronic control of the combustion process, (i.e. fuel injection timing, exhaust valve actuation) and the starting air valves and cylinder lubrication. These engines operate on liquid fuels only.

**ME-GI-S design**
Dual fuel engines operating on high flash point gaseous fuel oil and pilot oil. These engines operate on any high-calorific gas that can be compressed to 300 or 400 bar at 45ºC and be injected into the combustion chamber in a single phase.

**ME-LGI-S design**
Dual fuel engines operating on low flash point liquid gas fuels and pilot oil.
### Guiding biofuel specification

The engine data stated are valid using liquid biofuel according to the guiding specification (maximum values at the inlet to the centrifuging plant):

<table>
<thead>
<tr>
<th>Designation</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density at 15°C</td>
<td>kg/m³</td>
<td>1,010</td>
</tr>
<tr>
<td>Kinematic viscosity at 50°C</td>
<td>cSt</td>
<td>55</td>
</tr>
<tr>
<td>Flash point</td>
<td>°C</td>
<td>≥60</td>
</tr>
<tr>
<td>Carbon residue</td>
<td>% (m/m)</td>
<td>22</td>
</tr>
<tr>
<td>Ash</td>
<td>% (m/m)</td>
<td>0.15</td>
</tr>
<tr>
<td>Water</td>
<td>% (m/m)</td>
<td>1.0</td>
</tr>
<tr>
<td>Sulphur</td>
<td>% (m/m)</td>
<td>5.0</td>
</tr>
<tr>
<td>Vanadium</td>
<td>ppm (m/m)</td>
<td>600</td>
</tr>
<tr>
<td>Aluminium/silicon</td>
<td>mg/kg</td>
<td>60</td>
</tr>
<tr>
<td>Sodium plus potassium</td>
<td>ppm (m/m)</td>
<td>200</td>
</tr>
<tr>
<td>Calcium</td>
<td>ppm (m/m)</td>
<td>200</td>
</tr>
<tr>
<td>Lead</td>
<td>ppm (m/m)</td>
<td>10</td>
</tr>
<tr>
<td>TAN (total acid number)</td>
<td>mg KOH/g</td>
<td>&lt;25</td>
</tr>
<tr>
<td>SAN (strong acid number)</td>
<td>mg KOH/g</td>
<td>0</td>
</tr>
</tbody>
</table>

*Iodine, phosphorus and sulphur content according to agreement with the manufacturer of the emission control system.*

For other biofuel qualities, please contact MAN Diesel & Turbo, Copenhagen, or the engine builder.
## Guiding fuel specification

The engine data stated are valid using marine diesel oil or heavy fuel oil according to the guiding specification (maximum values at inlet to centrifuging plant):

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density at 15°C</td>
<td>1,010 kg/m³</td>
</tr>
<tr>
<td>Kinematic viscosity at 50°C</td>
<td>700 cSt</td>
</tr>
<tr>
<td>Flash point</td>
<td>≥60 °C</td>
</tr>
<tr>
<td>Carbon residue % (m/m)</td>
<td>20</td>
</tr>
<tr>
<td>Ash % (m/m)</td>
<td>0.15</td>
</tr>
<tr>
<td>Water % (m/m)</td>
<td>0.50</td>
</tr>
<tr>
<td>Sulphur % (m/m)</td>
<td>5</td>
</tr>
<tr>
<td>Vanadium mg/kg</td>
<td>450</td>
</tr>
<tr>
<td>Aluminium/silicon mg/kg</td>
<td>60</td>
</tr>
<tr>
<td>API gravity (min) °API</td>
<td>*</td>
</tr>
<tr>
<td>Sodium mg/kg</td>
<td>100</td>
</tr>
<tr>
<td>Calcium ppm (m/m)</td>
<td>200</td>
</tr>
<tr>
<td>Lead ppm (m/m)</td>
<td>10</td>
</tr>
</tbody>
</table>

*Free from used lube oil and calcium > 30 and zink > 15 mg/kg - or calcium > 30 and phosphorus > 15 mg/kg.*

For operation on other fuel qualities, please contact MAN Diesel & Turbo, Copenhagen, or the engine builder.
### MAN B&W Two-Stroke Engines

#### Guiding gas specification

The engine data stated are valid using liquid gas or gaseous gas according to the guiding specification.

<table>
<thead>
<tr>
<th>Designation</th>
<th>Unit</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower calorific value (LCV)</td>
<td>MJ/kg</td>
<td>Minimum 38 MJ/kg if operation on maximum gas fuel is to be obtained. Below 38 a higher pilot fuel oil amount might be required.</td>
</tr>
<tr>
<td>Gas methane number</td>
<td></td>
<td>No limit</td>
</tr>
<tr>
<td>Methane content</td>
<td>(% volume)</td>
<td>No limit</td>
</tr>
<tr>
<td>Hydrogen sulphide (H₂S)</td>
<td>(% volume)</td>
<td>Max. 0.05</td>
</tr>
<tr>
<td>Hydrogen (H₂)</td>
<td>(% volume)</td>
<td>No limit</td>
</tr>
<tr>
<td>Water and hydrocarbon condensates</td>
<td>(% volume)</td>
<td>0</td>
</tr>
<tr>
<td>Ammonia</td>
<td>(mg/Nm³)</td>
<td>Max. 25</td>
</tr>
<tr>
<td>Chlorine + flourines</td>
<td>(mg/Nm³)</td>
<td>Max. 50</td>
</tr>
<tr>
<td>Particles or solid content</td>
<td>(mg/Nm³)</td>
<td>Max. 50</td>
</tr>
<tr>
<td>Particles or solid size</td>
<td>(μm)</td>
<td>Max. 5</td>
</tr>
<tr>
<td>Gas inlet temperature</td>
<td>(°C)</td>
<td>45 ± 10</td>
</tr>
<tr>
<td>Gas pressure</td>
<td></td>
<td>According to MAN Diesel &amp; Turbo specification</td>
</tr>
</tbody>
</table>

For other gas qualities, please contact MAN Diesel & Turbo, Copenhagen, or the engine builder.
MAN B&W Two-Stroke Engines

Two-stroke low speed diesel engine of MAN B&W design in combined cycle

Part load behaviour

![Efficiency % vs Load % graph]

- Combined cycle with TCS
- Single cycle with TCS
- Single cycle
MAN B&W Two-Stroke Engines

Engine emissions
The data are valid for engines without emission control. For information on emission controlled engines, please contact MAN Diesel & Turbo, Copenhagen, or the engine builder.

Turbo compound system (TCS)
The turbo compound system, subject to the use of high-efficiency turbochargers, can be applied on the, K98, K90, K80, K60MC/ME-S engine types as well as on the K80MC/ME-S9 engine types. The use of a TCS system allows a reduction of up to 4% of the combined heat rate, depending on the site ambient conditions.

For detailed information, please contact MAN Diesel & Turbo, Copenhagen, or the engine builder.

Utilisation of the energy sources of the diesel engine
MAN B&W two-stroke low speed stationary diesel engines can be optimised to the following fields of energy production:
- District heating/cooling
- Freshwater

The diesel engine can provide energy for district heating/cooling or freshwater production utilising:
- Heat from scavenge air cooling
- Heat from jacket cooling
- Heat from lube oil cooling

For further technical information about this topic, please contact MAN Diesel & Turbo, Copenhagen, or the engine builder.
MAN B&W Two-Stroke Engines

Extent of delivery
The final and binding extent of delivery of MAN B&W two-stroke diesel engines is to be supplied by our licensees, the engine builders, who are to be contacted in order to plan the execution of the actual project.

In order to facilitate negotiations between the end-user, contractor and engine maker, a guiding ‘Extent of Delivery’ (EoD), ref. publication no. 2030-0001-07ppr Jan 2014, is available. This publication specifies the recommendations for MAN Diesel & Turbo’s basic and optional executions for the engine proper, and it is subject to modification without notice in the interest of the technical progress.

Please note that the licensees may select a different extent of delivery as their standard.
MAN B&W Two-Stroke Engines

Engine type designation

7 K 80 M E -GI -S 9

Mark number

Design

Fuel injection concept

Concept

Engine programme series

Diameter of piston in cm

Stroke/bore ratio

Number of cylinders

- S  Stationary

(blank) Fuel oil only

GI  Gas injection high flash point gas fuel

LGI  Gas injection for low flash point gas fuel

E  Electronically controlled

C  Camshaft controlled

L  Long stroke

K  Short stroke
Site Rating

- $L_1$: Power optimised
- $L_2$: Fuel economy optimised

**Speed**

Bore 980 mm, Stroke 2,400 mm

**Power and Heat Rate**

<table>
<thead>
<tr>
<th>Speed r/min</th>
<th>103.4</th>
<th>102.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Hz</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Layout points</th>
<th>9 K98MC-S</th>
<th>10 K98MC-S</th>
<th>11 K98MC-S</th>
<th>12 K98MC-S</th>
<th>14 K98MC-S</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$L_1$</td>
<td>$L_2$</td>
<td>$L_1$</td>
<td>$L_2$</td>
<td>$L_1$</td>
</tr>
<tr>
<td></td>
<td>kW$_m$</td>
<td>kW$_e$</td>
<td>kW$_m$</td>
<td>kW$_e$</td>
<td>kW$_m$</td>
</tr>
<tr>
<td>10 K98MC-S</td>
<td>56,800</td>
<td>55,380</td>
<td>45,400</td>
<td>44,265</td>
<td>56,500</td>
</tr>
<tr>
<td>11 K98MC-S</td>
<td>62,480</td>
<td>60,920</td>
<td>49,940</td>
<td>48,690</td>
<td>62,150</td>
</tr>
<tr>
<td>12 K98MC-S</td>
<td>68,160</td>
<td>66,455</td>
<td>54,480</td>
<td>53,120</td>
<td>67,800</td>
</tr>
<tr>
<td>14 K98MC-S</td>
<td>79,520</td>
<td>77,530</td>
<td>63,560</td>
<td>61,970</td>
<td>79,100</td>
</tr>
</tbody>
</table>

**Heat Rate at MCR**

<table>
<thead>
<tr>
<th></th>
<th>kW$_m$</th>
<th>kW$_e$</th>
<th>kW$_m$</th>
<th>kW$_e$</th>
<th>kW$_m$</th>
<th>kW$_e$</th>
<th>kW$_m$</th>
<th>kW$_e$</th>
</tr>
</thead>
<tbody>
<tr>
<td>kJ/kWh$_m$</td>
<td>7,390</td>
<td>7,130</td>
<td>7,390</td>
<td>7,130</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>kJ/kWh$_e$</td>
<td>7,580</td>
<td>7,310</td>
<td>7,580</td>
<td>7,310</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**With TCS**

Up to 4% heat rate reduction is obtainable depending on actual site ambient conditions.

**Lubricating and Cylinder Oil Consumption**

Cylinder oil consumption 0.6 - 1.2 g/kWh
MAN B&W K90MC-S

Site Rating

- L₁: Power optimised
- L₂: Fuel economy optimised

Bore 900 mm, Stroke: 2,300 mm

Power and Heat Rate

<table>
<thead>
<tr>
<th>Speed r/min</th>
<th>107.1</th>
<th>109.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Hz</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>L₁, kWₘ</td>
<td>L₁, kWₑ</td>
<td>L₂, kWₘ</td>
</tr>
<tr>
<td>7 K90MC-S</td>
<td>31,080</td>
<td>30,300</td>
</tr>
<tr>
<td>8 K90MC-S</td>
<td>35,520</td>
<td>34,630</td>
</tr>
<tr>
<td>10 K90MC-S</td>
<td>44,400</td>
<td>43,290</td>
</tr>
<tr>
<td>11 K90MC-S</td>
<td>48,840</td>
<td>47,620</td>
</tr>
</tbody>
</table>

Speed r/min 103.4 102.9
12 K90MC-S 51,480 50,193 41,160 40,131 51,240 49,959 40,920 39,897

Heat Rate at MCR

7-12 cyl:

<table>
<thead>
<tr>
<th>kJ/kWhₘ</th>
<th>kJ/kWhₑ</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,340</td>
<td>7,090</td>
</tr>
<tr>
<td>7,530</td>
<td>7,270</td>
</tr>
</tbody>
</table>

With TCS

Up to 4% heat rate reduction is obtainable depending on actual site ambient conditions.

Lubricating and Cylinder Oil Consumption

Cylinder oil consumption 0.6 - 1.2 g/kWh
Site Rating

- L₁: Power optimised
- L₂: Fuel economy optimised

Speed

Bore 800 mm, Stroke 2,600 mm

### Power and Heat Rate

<table>
<thead>
<tr>
<th>Speed r/min</th>
<th>103.4</th>
<th>102.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Hz</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Layout points</th>
<th>L₁</th>
<th>L₂</th>
<th>L₁</th>
<th>L₂</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kWₘ</td>
<td>kWₑ</td>
<td>kWₘ</td>
<td>kWₑ</td>
</tr>
<tr>
<td>7 K80MC-S9</td>
<td>28,070</td>
<td>27,370</td>
<td>25,200</td>
<td>24,570</td>
</tr>
<tr>
<td>8 K80MC-S9</td>
<td>32,080</td>
<td>31,280</td>
<td>28,800</td>
<td>28,080</td>
</tr>
<tr>
<td>9 K80MC-S9</td>
<td>36,090</td>
<td>35,190</td>
<td>32,400</td>
<td>31,590</td>
</tr>
<tr>
<td>10 K80MC-S9</td>
<td>40,100</td>
<td>39,100</td>
<td>36,000</td>
<td>35,100</td>
</tr>
<tr>
<td>11 K80MC-S9</td>
<td>44,110</td>
<td>43,010</td>
<td>39,600</td>
<td>38,610</td>
</tr>
<tr>
<td>12 K80MC-S9</td>
<td>48,120</td>
<td>46,920</td>
<td>43,200</td>
<td>42,120</td>
</tr>
</tbody>
</table>

### Heat Rate at MCR

<table>
<thead>
<tr>
<th>kW/m</th>
<th>kW/e</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,130</td>
<td>7,000</td>
</tr>
<tr>
<td>7,130</td>
<td>7,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>kW/m</th>
<th>kW/e</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,310</td>
<td>7,180</td>
</tr>
<tr>
<td>7,310</td>
<td>7,180</td>
</tr>
</tbody>
</table>

### With TCS

Up to 4% heat rate reduction is obtainable depending on actual site ambient conditions.

### Lubricating and Cylinder Oil Consumption

Cylinder oil consumption: 0.6 - 1.2 g/kWh
MAN B&W K80MC-S

Site Rating

- L₁: Power optimised
- L₂: Fuel economy optimised

Bore 800 mm, Stroke 2,300 mm

Power and Heat Rate

<table>
<thead>
<tr>
<th>Speed r/min</th>
<th>107.1</th>
<th>109.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Hz</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Layout points</th>
<th>L₁</th>
<th>L₂</th>
<th>L₁</th>
<th>L₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>L₁</td>
<td>kWₘ</td>
<td>kWₑ</td>
<td>kWₘ</td>
<td>kWₑ</td>
</tr>
<tr>
<td>7 K80MC-S</td>
<td>24,570</td>
<td>23,955</td>
<td>19,670</td>
<td>19,180</td>
</tr>
<tr>
<td>8 K80MC-S</td>
<td>28,080</td>
<td>27,380</td>
<td>22,480</td>
<td>21,920</td>
</tr>
<tr>
<td>9 K80MC-S</td>
<td>31,590</td>
<td>30,800</td>
<td>25,290</td>
<td>24,660</td>
</tr>
<tr>
<td>10 K80MC-S</td>
<td>35,100</td>
<td>34,225</td>
<td>28,100</td>
<td>27,400</td>
</tr>
<tr>
<td>11 K80MC-S</td>
<td>38,610</td>
<td>37,645</td>
<td>30,910</td>
<td>30,135</td>
</tr>
<tr>
<td>12 K80MC-S</td>
<td>42,120</td>
<td>41,065</td>
<td>33,720</td>
<td>32,875</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>L₂</th>
<th>kWₘ</th>
<th>kWₑ</th>
<th>kWₘ</th>
<th>kWₑ</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 K80MC-S</td>
<td>24,990</td>
<td>24,365</td>
<td>20,020</td>
<td>19,520</td>
</tr>
<tr>
<td>8 K80MC-S</td>
<td>28,560</td>
<td>27,845</td>
<td>22,880</td>
<td>22,310</td>
</tr>
<tr>
<td>9 K80MC-S</td>
<td>32,130</td>
<td>31,325</td>
<td>25,740</td>
<td>25,095</td>
</tr>
<tr>
<td>10 K80MC-S</td>
<td>35,700</td>
<td>34,810</td>
<td>28,600</td>
<td>27,885</td>
</tr>
<tr>
<td>11 K80MC-S</td>
<td>38,290</td>
<td>37,460</td>
<td>31,460</td>
<td>30,675</td>
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<tr>
<td>12 K80MC-S</td>
<td>42,840</td>
<td>41,770</td>
<td>34,320</td>
<td>33,460</td>
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</tbody>
</table>

Heat Rate at MCR

<table>
<thead>
<tr>
<th>kWₘ</th>
<th>kWₑ</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,340</td>
<td>7,090</td>
</tr>
<tr>
<td>7,340</td>
<td>7,090</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>kWₑ</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,530</td>
</tr>
<tr>
<td>7,530</td>
</tr>
</tbody>
</table>

With TCS

Up to 4% heat rate reduction is obtainable depending on actual site ambient conditions.

Lubricating and Cylinder Oil Consumption

Cylinder oil consumption

0.6 - 1.2 g/kWh
### Site Rating

- **L₁**: Power optimised
- **L₂**: Fuel economy optimised

### Speed

**Bore 600 mm, Stroke 1,740 mm**

### Power and Heat Rate

<table>
<thead>
<tr>
<th>Layout points</th>
<th>7 K60MC-S</th>
<th>8 K60MC-S</th>
<th>9 K60MC-S</th>
<th>10 K60MC-S</th>
<th>11 K60MC-S</th>
<th>12 K60MC-S</th>
<th>14 K60MC-S</th>
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</thead>
<tbody>
<tr>
<td>Speed r/min</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
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<tr>
<td>Frequency Hz</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>L₁ kW</td>
<td>13,860</td>
<td>15,840</td>
<td>17,820</td>
<td>19,800</td>
<td>21,780</td>
<td>23,760</td>
<td>27,720</td>
</tr>
<tr>
<td>L₁ kWₑ</td>
<td>13,515</td>
<td>15,445</td>
<td>17,375</td>
<td>19,305</td>
<td>21,235</td>
<td>23,165</td>
<td>27,025</td>
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<tr>
<td>L₁ kWₑ</td>
<td>12,460</td>
<td>14,240</td>
<td>16,020</td>
<td>17,800</td>
<td>19,580</td>
<td>21,360</td>
<td>24,920</td>
</tr>
<tr>
<td>L₂ kW</td>
<td>12,150</td>
<td>13,885</td>
<td>15,620</td>
<td>17,355</td>
<td>19,090</td>
<td>20,825</td>
<td>24,295</td>
</tr>
<tr>
<td>L₂ kWₑ</td>
<td>12,460</td>
<td>14,240</td>
<td>16,020</td>
<td>17,800</td>
<td>19,580</td>
<td>21,360</td>
<td>24,920</td>
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</table>

### Heat Rate at MCR

<table>
<thead>
<tr>
<th>kW/m</th>
<th>7,170</th>
<th>7,050</th>
<th>7,170</th>
<th>7,050</th>
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</thead>
<tbody>
<tr>
<td>kWₑ</td>
<td>7,360</td>
<td>7,230</td>
<td>7,360</td>
<td>7,230</td>
</tr>
</tbody>
</table>

### With TCS

Up to 4% heat rate reduction is obtainable depending on actual site ambient conditions.

### Lubricating and Cylinder Oil Consumption

Cylinder oil consumption 0.6 - 1.2 g/kWh
MAN B&W K50MC-S

Site Rating

- L₁: Power optimised
- L₂: Fuel economy optimised

Bore 500 mm, Stroke 1,370 mm

Power and Heat Rate

<table>
<thead>
<tr>
<th>Speed r/min</th>
<th>176.5</th>
<th>180.0</th>
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<tr>
<td>Frequency Hz</td>
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<td>60</td>
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</table>

<table>
<thead>
<tr>
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<th>L₂</th>
<th>L₁</th>
<th>L₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>kWₘ</td>
<td>kWₑ</td>
<td>kWₘ</td>
<td>kWₑ</td>
<td>kWₘ</td>
</tr>
<tr>
<td>7 K50MC-S</td>
<td>9,940</td>
<td>9,690</td>
<td>7,980</td>
<td>7,780</td>
</tr>
<tr>
<td>8 K50MC-S</td>
<td>11,360</td>
<td>11,075</td>
<td>9,120</td>
<td>8,890</td>
</tr>
<tr>
<td>9 K50MC-S</td>
<td>12,780</td>
<td>12,460</td>
<td>10,260</td>
<td>10,005</td>
</tr>
<tr>
<td>10 K50MC-S</td>
<td>14,200</td>
<td>13,845</td>
<td>11,400</td>
<td>11,115</td>
</tr>
<tr>
<td>11 K50MC-S</td>
<td>15,620</td>
<td>15,230</td>
<td>12,540</td>
<td>12,225</td>
</tr>
<tr>
<td>12 K50MC-S</td>
<td>17,040</td>
<td>16,615</td>
<td>13,680</td>
<td>13,340</td>
</tr>
<tr>
<td>14 K50MC-S</td>
<td>19,880</td>
<td>19,385</td>
<td>15,960</td>
<td>15,560</td>
</tr>
</tbody>
</table>

Heat Rate at MCR

| kWₑ | 7,430 | 7,170 | 7,430 | 7,170 |
| kWₑ | 7,620 | 7,360 | 7,620 | 7,360 |

Lubricating and Cylinder Oil Consumption

Cylinder oil consumption 0.6 - 1.2 g/kWh
MAN B&W L35MC-S

Site Rating

- L₁: Power optimised
- L₂: Fuel economy optimised

Bore 350 mm, Stroke 1,050 mm

Power and Heat Rate

<table>
<thead>
<tr>
<th>Speed r/min</th>
<th>L₁</th>
<th>L₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 L35MC-S</td>
<td>5,200</td>
<td>5,070</td>
</tr>
<tr>
<td>9 L35MC-S</td>
<td>5,850</td>
<td>5,705</td>
</tr>
<tr>
<td>10 L35MC-S</td>
<td>6,500</td>
<td>6,340</td>
</tr>
<tr>
<td>11 L35MC-S</td>
<td>7,150</td>
<td>6,970</td>
</tr>
<tr>
<td>12 L35MC-S</td>
<td>7,800</td>
<td>7,605</td>
</tr>
</tbody>
</table>

Heat Rate at MCR

<table>
<thead>
<tr>
<th></th>
<th>kW/m</th>
<th>kW/e</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 L35MC-S</td>
<td>7,390</td>
<td>7,130</td>
</tr>
<tr>
<td>8 L35MC-S</td>
<td>7,580</td>
<td>7,310</td>
</tr>
</tbody>
</table>

Lubricating and Cylinder Oil Consumption

Cylinder oil consumption: 0.6 - 1.2 g/kWh
Scan the code to download the app from App Store, Google Play or Windows Store.
MAN Four-Stroke Small Bore GenSets

Engineering the Future – since 1758.
MAN Diesel & Turbo
## MAN Four-Stroke Small Bore GenSets

<table>
<thead>
<tr>
<th>Speed rpm</th>
<th>Engine type</th>
<th>Electric power range</th>
<th>Speed range</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>720-750</td>
<td>V28/32S</td>
<td>3,517 – 4,133 kW</td>
<td>720 – 750 rpm</td>
<td>30</td>
</tr>
<tr>
<td>720-750</td>
<td>L28/32S</td>
<td>1,008 – 1,921 kW</td>
<td>720 – 750 rpm</td>
<td>31</td>
</tr>
<tr>
<td>720-750</td>
<td>L28/32S-DF</td>
<td>950 – 1,710 kW</td>
<td>720 – 750 rpm</td>
<td>32</td>
</tr>
<tr>
<td>720-750</td>
<td>L27/38S</td>
<td>1,455 – 2,881 kW</td>
<td>720 – 750 rpm</td>
<td>33</td>
</tr>
<tr>
<td>720-750-900</td>
<td>L23/30S</td>
<td>682 – 1,344 kW</td>
<td>720 – 750 – 900</td>
<td>34</td>
</tr>
<tr>
<td>900-1,000</td>
<td>L21/31S</td>
<td>1,056 – 1,921 kW</td>
<td>900 – 1,000 rpm</td>
<td>35</td>
</tr>
<tr>
<td>1,000-1,200</td>
<td>L16/24S</td>
<td>432 – 950 kW</td>
<td>1,000 – 1,200 rpm</td>
<td>36</td>
</tr>
</tbody>
</table>

### Engine type designation

**9L28/32S-DF**
- Dual fuel
- Type of application
- Stroke in cm
- Bore in cm
- L or V version
- Number of cylinders
MAN Four-Stroke Small Bore GenSets

Engine programme
These well-established engine types are used in various applications all around the world. Based on long-term experience, the engines are subject to continuous development to improve power, emissions, fuel consumption and reliability, making them the ‘work horse’ in your power house.

Full fuel flexibility
MAN four-stroke small bore diesel engines are designed to offer the optimum in fuel flexibility. The engines are the ideal source of power whether you want to build a ‘green power plant’ burning liquid bio fuels or you need power from crude oil. Please contact MAN Diesel & Turbo for further information.

Liquid fuels: diesel, HFO, liquid bio fuel and crude oil

GenSet power
The GenSet power is stated in kW on alternator. Ratings are given according to ISO 3046-1:2002.

The electrical power quoted is based on a normal alternator efficiency in the corresponding power range and a power factor of 1.0. The maximum output varies according to the site conditions.

Emission control
All small bore engines in this booklet comply with the World Bank 1998 & 2007/2008 guidelines for power plants < 300 MW\textsubscript{th} thermal fuel input. All small bore four-stroke engines comply with the latest World Bank guidelines. Engines with even lower NO\textsubscript{x} values are available on request. MAN Diesel & Turbo is prepared to deliver NO\textsubscript{x} as well as SO\textsubscript{x} and particle reduction systems.
Heat rate
The figures are given for 100% load and without engine driven pumps. Attached pumps will result in an increased fuel consumption. The tolerance for guarantee is +5%. Please note that the increase in fuel consumption must be considered before the tolerance for guarantee is taken into account. Basis for reference conditions, see section: ‘Ambient conditions according to ISO 3046-1:2002’

Conversion between heat rate and specific fuel oil consumption (SFOC) is found by applying the following formular:

\[
SFOC \, [g/kWh] = \frac{\text{Heat Rate \, [kJ/Kwh]} \times 1000}{\text{LCV \, [kJ/kg]}}
\]

The SFOC figures for engines in diesel operation are based on a lower calorific value (LCV) of the fuel of 42,700 kJ/kg.

Ambient conditions according to ISO 3046-1:2002
The stated consumption figures refer to the following reference conditions according to ISO 3046-1:

- Ambient air pressure: 100 kPa (1,000 mbar)
- Ambient air temperature: 298 K (25°C)
- Charge air temperature: According to engine type, corresponding to 25°C cooling water temperature before charge air cooler.

Masses and dimensions
The masses stated correspond to the complete unit (including alternator). The total weight varies depending on the alternator make. All masses given are without lube oil and cooling water. Dimensions and weights are given for guidance only and are subject to change without notice. The length of the GenSet unit depends on the alternator make.
MAN Four-Stroke Small Bore GenSets

Small power plant development – partner concept
MAN Diesel & Turbo has more than 20 years of experience in building small power plants with our worldwide partners. A small power plant usually means a plant with single or multiple units of approximately 1-4 MW/unit. The basic idea of the concept is to keep overall costs as low as possible by working with a high degree of standardisation and using as much local equipment and manpower as possible.

‘Low costs for us – low costs for you’

The partner concept is basically a concept where we work with local or international partners, who then build power plants based on our GenSets and our basic documentation and engineering. The remaining plant equipment and civil works are then delivered either by the partner or the customer, as the case may be.

MAN Diesel & Turbo has a great interest in maintaining the relevant standard and quality of all plants equipped with our GenSets.

For this reason, we provide partners and customers with our standard documentation, enabling the builder to complete the plant and the user to operate the plant successfully.

Ambatovy power plant with 9 × 7L27/38 is located on Madagascar.
### MAN V28/32S

**Bore 280 mm, Stroke 320 mm**

<table>
<thead>
<tr>
<th></th>
<th>16V</th>
<th>18V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine speed</td>
<td>rpm</td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>Hz</td>
<td></td>
</tr>
<tr>
<td>Electr. GenSet power</td>
<td>kW</td>
<td></td>
</tr>
<tr>
<td><strong>Engine speed</strong></td>
<td>750</td>
<td>720</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td><strong>Electr. GenSet power</strong></td>
<td>3,674</td>
<td>3,517</td>
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</table>

**Electr. GenSet Heat Rate at 100% Load**

<table>
<thead>
<tr>
<th></th>
<th>16V</th>
<th>18V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid fuel</td>
<td>kW</td>
<td></td>
</tr>
<tr>
<td><strong>Electr. GenSet Heat Rate at 100% Load</strong></td>
<td>8,142</td>
<td>8,134</td>
</tr>
</tbody>
</table>

**Lube Oil Consumption**

<table>
<thead>
<tr>
<th></th>
<th>kg/h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lube Oil Consumption</strong></td>
<td>1.5-3.0</td>
</tr>
</tbody>
</table>

*Nominal generator efficiency 97.7%*

**GenSet Dimensions**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>W</th>
<th>H</th>
<th>Dry mass</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
<td>t</td>
</tr>
<tr>
<td><strong>A</strong></td>
<td>6,116</td>
<td>3,822</td>
<td>9,938</td>
<td>2,470</td>
<td>3,574</td>
<td>62.2</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>6,626</td>
<td>4,081</td>
<td>10,707</td>
<td>2,470</td>
<td>3,574</td>
<td>70.8</td>
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Weights and dimensions are subject to final application.
**MAN L28/32S**

**Bore 280 mm, Stroke 320 mm**

<table>
<thead>
<tr>
<th></th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
<th>9L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine speed</td>
<td>rpm</td>
<td>750</td>
<td>720</td>
<td>750</td>
<td>720</td>
</tr>
<tr>
<td>Frequency</td>
<td>Hz</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>Electr. GenSet power</td>
<td>kW</td>
<td>1,056</td>
<td>1,008</td>
<td>1,267</td>
<td>1,210</td>
</tr>
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</table>

**Electr. GenSet Heat Rate at 100% Load**

<table>
<thead>
<tr>
<th></th>
<th>kW</th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
<th>9L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid fuel (WB2007/2008)</td>
<td>kJ/kWh</td>
<td>8,460</td>
<td>8,429</td>
<td>8,460</td>
<td>8,429</td>
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</tr>
<tr>
<td>Lube Oil Consumption</td>
<td>kg/h</td>
<td>0.7-1.1</td>
<td>0.8-1.3</td>
<td>0.9-1.5</td>
<td>1.0-1.8</td>
<td>1.2-2.0</td>
</tr>
</tbody>
</table>

*Nominal generator efficiency is 96% for 5L, 6L, 7L and 97% for 8L, 9L*

**GenSet Dimensions**

<table>
<thead>
<tr>
<th></th>
<th>mm</th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
<th>9L</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
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<td>4,759</td>
<td>5,499</td>
<td>5,979</td>
<td>6,199</td>
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<tr>
<td>B</td>
<td>mm</td>
<td>2,400</td>
<td>2,510</td>
<td>2,680</td>
<td>2,770</td>
<td>2,690</td>
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<tr>
<td>C</td>
<td>mm</td>
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<td>7,269</td>
<td>8,179</td>
<td>8,749</td>
<td>8,889</td>
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<td>W</td>
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<td>2,370</td>
<td>2,390</td>
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<td>H</td>
<td>mm</td>
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<td>2,684</td>
<td>2,874</td>
<td>2,874</td>
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<td>Dry mass</td>
<td>t</td>
<td>32.6</td>
<td>36.3</td>
<td>39.4</td>
<td>40.7</td>
<td>47.1</td>
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Weights and dimensions are subject to final application.
### MAN L28/32S-DF

**Bore 280 mm, Stroke 320 mm**

<table>
<thead>
<tr>
<th></th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
<th>9L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine speed</td>
<td>rpm</td>
<td>rpm</td>
<td>rpm</td>
<td>rpm</td>
<td>rpm</td>
</tr>
<tr>
<td>Frequency</td>
<td>Hz</td>
<td>Hz</td>
<td>Hz</td>
<td>Hz</td>
<td>Hz</td>
</tr>
<tr>
<td>Electr. GenSet power</td>
<td>kW</td>
<td>kW</td>
<td>kW</td>
<td>kW</td>
<td>kW</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
<th>9L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine speed</td>
<td>750</td>
<td>700</td>
<td>750</td>
<td>700</td>
<td>750</td>
</tr>
<tr>
<td>Frequency</td>
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<tr>
<td>Electr. GenSet power</td>
<td>950</td>
<td>950</td>
<td>1,140</td>
<td>1,140</td>
<td>1,140</td>
</tr>
</tbody>
</table>

**Lube Oil Consumption** kg/h

<table>
<thead>
<tr>
<th></th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
<th>9L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.6-1.0</td>
<td>0.7-1.2</td>
<td>0.8-1.4</td>
<td>1.0-1.6</td>
<td>1.0-1.8</td>
</tr>
</tbody>
</table>

*Nominal generator efficiency 95%*

**GenSet Dimensions**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>W</th>
<th>H</th>
<th>Dry mass</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
<td>t</td>
</tr>
<tr>
<td></td>
<td>4,321</td>
<td>4,801</td>
<td>5,281</td>
<td>5,761</td>
<td>6,241</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2,400</td>
<td>2,510</td>
<td>2,680</td>
<td>2,770</td>
<td>2,690</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6,721</td>
<td>7,311</td>
<td>7,961</td>
<td>8,531</td>
<td>8,931</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2,835</td>
<td>3,009</td>
<td>3,009</td>
<td>3,009</td>
<td>3,009</td>
<td></td>
</tr>
<tr>
<td></td>
<td>32.6</td>
<td>36.3</td>
<td>39.4</td>
<td>40.7</td>
<td>47.1</td>
<td></td>
</tr>
</tbody>
</table>

Weights and dimensions are subject to final application.
### MAN L27/38S

**Bore 270 mm, Stroke 380 mm**

<table>
<thead>
<tr>
<th>Engine speed</th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
<th>9L</th>
</tr>
</thead>
<tbody>
<tr>
<td>rpm</td>
<td>750</td>
<td>750</td>
<td>750</td>
<td>750</td>
<td>750</td>
</tr>
<tr>
<td>Frequency</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Electr. GenSet power</td>
<td>kW</td>
<td>1,552</td>
<td>1,921</td>
<td>2,241</td>
<td>2,561</td>
</tr>
</tbody>
</table>

**Electr. GenSet Heat Rate at 100% Load**

<table>
<thead>
<tr>
<th>Liquid fuel (WB2007/2008)</th>
<th>kJ/kWh</th>
<th>50</th>
<th>60</th>
<th>50</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8,056</td>
<td>8,012</td>
<td>8,056</td>
<td>8,012</td>
<td>8,056</td>
</tr>
</tbody>
</table>

**Lube Oil Consumption**

<table>
<thead>
<tr>
<th>kg/h</th>
<th>0.7-1.3</th>
<th>0.8-1.6</th>
<th>0.9-1.8</th>
<th>1.1-2.1</th>
<th>1.2-2.4</th>
</tr>
</thead>
</table>

**Nominal generator efficiency 97%**

**GenSet Dimensions**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>W</th>
<th>H</th>
<th>Dry mass</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>4,346</td>
<td>4,791</td>
<td>5,236</td>
<td>5,681</td>
<td>6,126</td>
<td></td>
</tr>
<tr>
<td>mm</td>
<td>2,486</td>
<td>2,766</td>
<td>2,766</td>
<td>2,986</td>
<td>2,986</td>
<td></td>
</tr>
<tr>
<td>mm</td>
<td>6,832</td>
<td>7,557</td>
<td>8,002</td>
<td>8,667</td>
<td>9,112</td>
<td></td>
</tr>
<tr>
<td>mm</td>
<td>2,293</td>
<td>2,293</td>
<td>2,420</td>
<td>2,420</td>
<td>2,420</td>
<td></td>
</tr>
<tr>
<td>mm</td>
<td>3,712</td>
<td>3,712</td>
<td>3,899</td>
<td>3,899</td>
<td>3,899</td>
<td></td>
</tr>
<tr>
<td>kg/h</td>
<td>0.7-1.3</td>
<td>0.8-1.6</td>
<td>0.9-1.8</td>
<td>1.1-2.1</td>
<td>1.2-2.4</td>
<td></td>
</tr>
</tbody>
</table>

**Dry mass**

<table>
<thead>
<tr>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>40.0</td>
</tr>
<tr>
<td>44.5</td>
</tr>
<tr>
<td>50.4</td>
</tr>
<tr>
<td>58.2</td>
</tr>
<tr>
<td>64.7</td>
</tr>
</tbody>
</table>

Weights and dimensions are subject to final application.
## MAN L23/30S

**Bore 225 mm, Stroke 300 mm**

<table>
<thead>
<tr>
<th>Engine speed</th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
</tr>
</thead>
<tbody>
<tr>
<td>rpm</td>
<td>750</td>
<td>720</td>
<td>750</td>
<td>720</td>
</tr>
<tr>
<td>Frequency</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>Electr. GenSet power</td>
<td>kW</td>
<td>710</td>
<td>682</td>
<td>852</td>
</tr>
</tbody>
</table>

**Liquid fuel (WB2007/2008) kJ/kWh**

<table>
<thead>
<tr>
<th>Bore 225 mm, Stroke 300 mm</th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine speed</td>
<td>rpm</td>
<td></td>
<td>900</td>
<td>900</td>
</tr>
<tr>
<td>Frequency</td>
<td>Hz</td>
<td></td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Electr. GenSet power</td>
<td>kW</td>
<td></td>
<td>1,008</td>
<td>1,176</td>
</tr>
</tbody>
</table>

**Electr. GenSet Heat Rate at 100% load**

<table>
<thead>
<tr>
<th>Liquid fuel (WB2007/2008) kJ/kWh</th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8,540</td>
<td>8,496</td>
<td>8,540</td>
<td>8,496</td>
</tr>
</tbody>
</table>

**Lube Oil Consumption kg/h**

<table>
<thead>
<tr>
<th>Cyl. No.</th>
<th>5</th>
<th>6</th>
<th>6</th>
<th>7</th>
<th>7</th>
<th>8</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>r/min</td>
<td>720/750</td>
<td>720/750</td>
<td>900</td>
<td>720/750</td>
<td>900</td>
<td>720/750</td>
<td>900</td>
</tr>
<tr>
<td>A mm</td>
<td>3,369</td>
<td>3,738</td>
<td>3,738</td>
<td>4,109</td>
<td>4,109</td>
<td>4,475</td>
<td>4,475</td>
</tr>
<tr>
<td>B mm</td>
<td>2,155</td>
<td>2,265</td>
<td>2,265</td>
<td>2,395</td>
<td>2,395</td>
<td>2,480</td>
<td>2,340</td>
</tr>
<tr>
<td>C mm</td>
<td>5,524</td>
<td>6,004</td>
<td>6,004</td>
<td>6,504</td>
<td>6,504</td>
<td>6,959</td>
<td>6,815</td>
</tr>
<tr>
<td>W mm</td>
<td>1,690</td>
<td>1,690</td>
<td>1,768</td>
<td>1,715</td>
<td>1,888</td>
<td>1,715</td>
<td>1,888</td>
</tr>
<tr>
<td>H mm</td>
<td>2,402</td>
<td>2,402</td>
<td>2,466</td>
<td>2,466</td>
<td>2,466</td>
<td>2,466</td>
<td>2,466</td>
</tr>
<tr>
<td>Dry mass</td>
<td>t</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>18.5</td>
<td>19.7</td>
<td>19.7</td>
<td>23.0</td>
<td>23.0</td>
<td>25.5</td>
<td>25.5</td>
</tr>
</tbody>
</table>

**Nominal generator efficiency 96%**

Weights and dimensions are subject to final application.
**MAN L21/31S**

**Bore 210 mm, Stroke 310 mm**

<table>
<thead>
<tr>
<th>Engine speed rpm</th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
<th>9L</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000</td>
<td>900</td>
<td>1,000</td>
<td>1,000</td>
<td>1,000</td>
<td>1,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency Hz</th>
<th>50</th>
<th>60</th>
<th>50</th>
<th>60</th>
<th>50</th>
<th>60</th>
<th>50</th>
<th>60</th>
<th>50</th>
<th>60</th>
<th>50</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
<td>50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electr. GenSet power kW</th>
<th>1,056</th>
<th>1,056</th>
<th>1,267</th>
<th>1,267</th>
<th>1,478</th>
<th>1,478</th>
<th>1,707</th>
<th>1,707</th>
<th>1,921</th>
<th>1,921</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000</td>
<td>900</td>
<td>1,000</td>
<td>900</td>
<td>1,000</td>
<td>900</td>
<td>1,000</td>
<td>900</td>
<td>1,000</td>
<td>900</td>
<td>1,000</td>
</tr>
</tbody>
</table>

**Electr. GenSet Heat Rate at 100% Load**

<table>
<thead>
<tr>
<th>Liquid fuel (WB2007/2008) kJ/kWh</th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
<th>9L</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,926</td>
<td>7,917</td>
<td>7,926</td>
<td>7,917</td>
<td>7,926</td>
<td>7,917</td>
</tr>
</tbody>
</table>

**Lube Oil Consumption kg/h**

<table>
<thead>
<tr>
<th>0.4-0.9</th>
<th>0.5-1.1</th>
<th>0.6-1.2</th>
<th>0.7-1.4</th>
<th>0.8-1.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>5L</td>
<td>6L</td>
<td>7L</td>
<td>8L</td>
<td>9L</td>
</tr>
</tbody>
</table>

Nominal generator efficiency is 96% for 5L,6L,7L and 97% for 8L,9L

**GenSet Dimensions**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
</tr>
<tr>
<td>3,959</td>
<td>4,314</td>
<td>4,669</td>
<td>5,024</td>
<td>5,379</td>
</tr>
<tr>
<td>6,000</td>
<td>6,350</td>
<td>6,640</td>
<td>7,290</td>
<td>8,120</td>
</tr>
<tr>
<td>2,110</td>
<td>2,110</td>
<td>2,110</td>
<td>2,180</td>
<td>2,180</td>
</tr>
<tr>
<td>3,070</td>
<td>3,070</td>
<td>3,170</td>
<td>3,170</td>
<td>3,170</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dry mass</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.0</td>
<td>26.0</td>
</tr>
</tbody>
</table>

Weights and dimensions are subject to final application.
# MAN L16/24S

**Bore 160 mm, Stroke 240 mm**

<table>
<thead>
<tr>
<th>Engine speed</th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
<th>9L</th>
</tr>
</thead>
<tbody>
<tr>
<td>rpm</td>
<td>1,000</td>
<td>1,200</td>
<td>1,000</td>
<td>1,200</td>
<td>1,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency</th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
<th>9L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hz</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
<td>50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electr. GenSet power</th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
<th>9L</th>
</tr>
</thead>
<tbody>
<tr>
<td>kW</td>
<td>432</td>
<td>480</td>
<td>547</td>
<td>634</td>
<td>638</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Engine speed</th>
<th>1,000</th>
<th>1,200</th>
<th>1,000</th>
<th>1,200</th>
<th>1,000</th>
<th>1,200</th>
<th>1,000</th>
<th>1,200</th>
<th>1,000</th>
<th>1,200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>

**Electr. GenSet Heat Rate at 100% Load**

<table>
<thead>
<tr>
<th>Liquid fuel (WB2007/2008)</th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
<th>9L</th>
</tr>
</thead>
<tbody>
<tr>
<td>kJ/kWh</td>
<td>8,673</td>
<td>8,496</td>
<td>8,673</td>
<td>8,496</td>
<td>8,673</td>
</tr>
</tbody>
</table>

**Lube Oil Consumption**

<table>
<thead>
<tr>
<th>kg/h</th>
<th>5L</th>
<th>6L</th>
<th>7L</th>
<th>8L</th>
<th>9L</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2-0.4</td>
<td>0.2-0.5</td>
<td>0.3-0.6</td>
<td>0.3-0.7</td>
<td>0.3-0.8</td>
<td></td>
</tr>
</tbody>
</table>

*Nominal generator efficiency 96%*

**GenSet Dimensions**

<table>
<thead>
<tr>
<th>A</th>
<th>mm</th>
<th>2,807</th>
<th>3,082</th>
<th>3,557</th>
<th>3,832</th>
<th>4,107</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>mm</td>
<td>1,400</td>
<td>1,490</td>
<td>1,585</td>
<td>1,680</td>
<td>1,680</td>
</tr>
<tr>
<td>C</td>
<td>mm</td>
<td>4,207</td>
<td>4,572</td>
<td>5,142</td>
<td>5,512</td>
<td>5,787</td>
</tr>
<tr>
<td>W</td>
<td>mm</td>
<td>1,464</td>
<td>1,464</td>
<td>1,478</td>
<td>1,478</td>
<td>1,478</td>
</tr>
<tr>
<td>H</td>
<td>mm</td>
<td>2,337</td>
<td>2,337</td>
<td>2,415/2,337</td>
<td>2,415</td>
<td>2,415</td>
</tr>
<tr>
<td>Dry mass</td>
<td>t</td>
<td>9.8</td>
<td>10.5</td>
<td>12.0</td>
<td>13.7</td>
<td>14.5</td>
</tr>
</tbody>
</table>

Weights and dimensions are subject to final application.
Contacts

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F: MAN Diesel & Turbo Four-stroke licence
FS: MAN Diesel & Turbo Four-stroke SEMT Pielstick licence
TC: MAN Diesel & Turbo Turbocharger licence

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<th>Contact Details</th>
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<tr>
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