MAN B&W Stationary Engines and Small Bore GenSets

Programme 2016

Engineering the Future – since 1758.

MAN Diesel & Turbo

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.

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 availablilty of more than 8,000 hours per year.

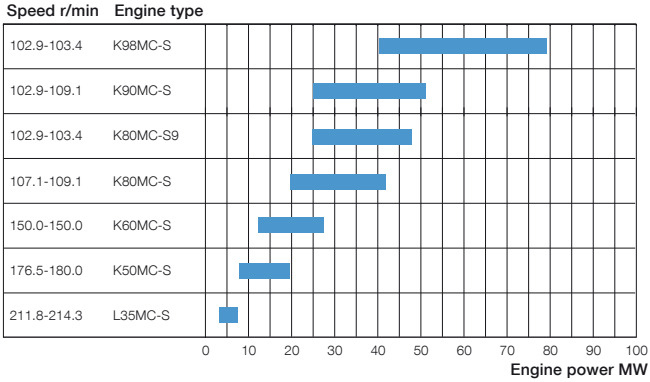
The engines of our design are sold and built by licensees (engine builders) placed worldwide.

MAN B&W Two-Stroke Engines

Engineering the Future – since 1758.

MAN Diesel & Turbo

MAN B&W Two-Stroke Engines



Type	Power range	Speed 50 Hz	Speed 60 Hz	Page
	kW_m	r/min	r/min	
K98MC-S	40,680 – 79,520	103.4	102.9	17
K90MC-S	25,340 – 51,480	107.1	109.1	18
12K90MC-S	40,920 – 51,480	103.4	102.9	18
K80MC-S9	25,130 – 48,120	103.4	102.9	19
K80MC-S	20,020 – 42,120	107.1	109.1	20
K60MC-S	12,460 – 27,720	150	150	21
K50MC-S	8,120 – 19,880	176.5	180.0	22
L35MC-S	3,605 – 7,800	214.3	211.8	23

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.

MAN B&W Two-Stroke Engines

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 45°C
- Blower inlet pressure 1,000 mbar
- Charge air coolant temperature 32°C

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.

MAN B&W Two-Stroke Engines

Site specified rating

$L_1 \geq$ 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 25ºC
- Blower inlet pressure 1,000 mbar
- Charge air coolant temperature 25ºC

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 45°C 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.

MAN B&W Two-Stroke Engines

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):

Designation		
▪ Density at 15°C	kg/m^3	1,010
▪ Kinematic viscosity at 50°C	cSt	55
▪ Flash point	°C	≥60
▪ Carbon residue	% (m/m)	22
▪ Ash	% (m/m)	0.15
▪ Water	% (m/m)	1.0
▪ Sulphur	% (m/m)	5.0
▪ Vanadium	ppm (m/m)	600
▪ Aluminium/silicon	mg/kg	60
▪ Sodium plus potassium	ppm (m/m)	200
▪ Calcium	ppm (m/m)	200
▪ Lead	ppm (m/m)	10
▪ TAN (total acid number)	mg KOH/g	<25
▪ SAN (strong acid number)	mg KOH/g	0

* *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):

Designation	Diesel engines ISO 8217:2010(E) rmk700	
▪ Density at 15°C	kg/m^3	1,010
▪ Kinematic viscosity at 50°C	cSt	700
▪ Flash point	°C	≥60
▪ Carbon residue	% (m/m)	20
▪ Ash	% (m/m)	0.15
▪ Water	% (m/m)	0.50
▪ Sulphur	% (m/m)	5
▪ Vanadium	mg/kg	450
▪ Aluminium/silicon	mg/kg	60
▪ API gravity (min)	°API	*
▪ Sodium	mg/kg	100
▪ Calcium	ppm (m/m)	200
▪ Lead	ppm (m/m)	10

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

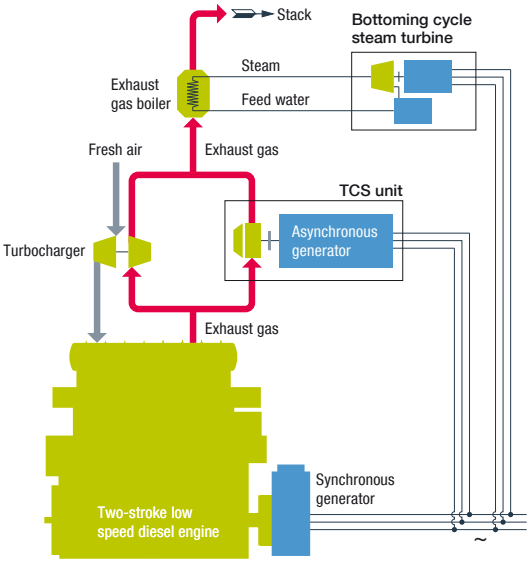
The engine data stated are valid using liquid gas or gaseous gas according to the guiding specification.

Designation		
▪ Lower calorific value (LCV)	MJ/kg	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.
▪ Gas methane number		No limit
▪ Methane content	(% volume)	No limit
▪ Hydrogen sulphide (H_2S)	(% volume)	Max. 0.05
▪ Hydrogen (H_2)	(% volume)	No limit
▪ Water and hydrocarbon condensates	(% volume)	0
▪ Ammonia	(mg/Nm^3)	Max. 25
▪ Chlorine + flourines	(mg/Nm^3)	Max. 50
▪ Particles or solid content	(mg/Nm^3)	Max. 50
▪ Particles or solid size	(µm)	Max. 5
▪ Gas inlet temperature	(°C)	45 ± 10
▪ Gas pressure		According to MAN Diesel & Turbo specification

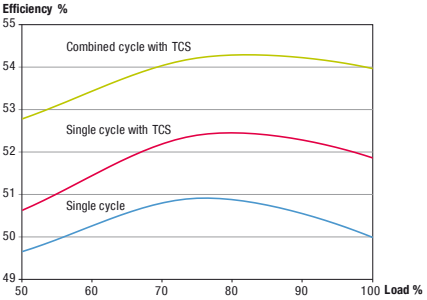
For other gas qualities, please contact MAN Diesel & Turbo, Copenhagen, or the engine builder.

MAN B&W Two-Stroke Engines

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



Part load behaviour



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

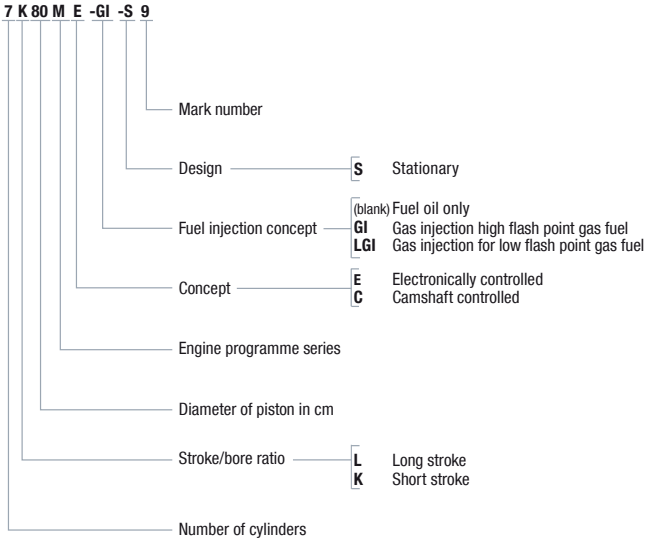
The final and binding extent of delivery of MAN B&W two-stroke diesel engines is to be supplied by our licensees, the engine builders, who are to be contacted in order to plan the execution of the actual project.

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.

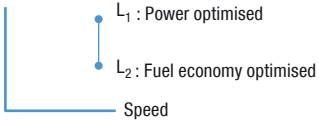
Please note that the licensees may select a different extent of delivery as their standard.

MAN B&W Two-Stroke Engines

Engine type designation



Site Rating



Bore 980 mm, Stroke 2,400 mm

Power and Heat Rate

Speed r/min	103.4				102.9			
Frequency Hz	50				60			
Layout points	L_1		L_2		L_1		L_2	
	kW_m	kW_e	kW_m	kW_e	kW_m	kW_e	kW_m	kW_e
9 K98MC-S	51,120	49,840	40,860	39,840	50,850	49,580	40,680	39,665
10 K98MC-S	56,800	55,380	45,400	44,265	56,500	55,090	45,200	44,070
11 K98MC-S	62,480	60,920	49,940	48,690	62,150	60,595	49,720	48,475
12 K98MC-S	68,160	66,455	54,480	53,120	67,800	66,105	54,240	52,885
14 K98MC-S	79,520	77,530	63,560	61,970	79,100	77,125	63,280	61,700

Heat Rate at MCR

kJ/kWh_m	7,390	7,130	7,390	7,130
kJ/kWh_e	7,580	7,310	7,580	7,310

With TCS

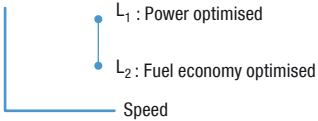
Up to 4% heat rate reduction is obtainable depending on actual site ambient conditions.

Lubricating and Cylinder Oil Consumption

Cylinder oil consumption	0.6 - 1.2 g/kWh

MAN B&W K90MC-S

Site Rating



Bore 900 mm, Stroke: 2,300 mm

Power and Heat Rate

Speed r/min	107.1				109.1			
Frequency Hz	50				60			
Layout points	L_1		L_2		L_1		L_2	
	kW_m	kW_e	kW_m	kW_e	kW_m	kW_e	kW_m	kW_e
7 K90MC-S	31,080	30,300	24,850	24,230	31,640	30,850	25,340	24,705
8 K90MC-S	35,520	34,630	26,800	26,130	36,160	35,255	28,960	28,235
9 K90MC-S	39,960	38,960	31,950	31,150	40,680	39,660	32,580	31,765
10 K90MC-S	44,400	43,290	35,500	34,610	45,200	44,070	36,200	35,295
11 K90MC-S	48,840	47,620	39,050	38,075	49,720	48,475	39,820	38,825

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:				
kJ/kWh_m	7,340	7,090	7,340	7,090
kJ/kWh_e	7,530	7,270	7,530	7,270

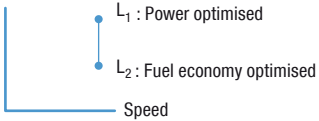
With TCS

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



Bore 800 mm, Stroke 2,600 mm

Power and Heat Rate

Speed r/min	103.4				102.9			
Frequency Hz	50				60			
Layout points	L_1		L_2		L_1		L_2	
	kW_m	kW_e	kW_m	kW_e	kW_m	kW_e	kW_m	kW_e
7 K80MC-S9	28,070	27,370	25,200	24,570	27,930	27,230	25,130	24,500
8 K80MC-S9	32,080	31,280	28,800	28,080	31,920	31,120	28,720	28,000
9 K80MC-S9	36,090	35,190	32,400	31,590	35,910	35,010	32,310	31,500
10 K80MC-S9	40,100	39,100	36,000	35,100	39,900	38,900	35,900	35,000
11 K80MC-S9	44,110	43,010	39,600	38,610	43,890	42,790	39,490	38,500
12 K80MC-S9	48,120	46,920	43,200	42,120	47,880	46,680	43,080	42,000

Heat Rate at MCR

kJ/kWh_m	7,130	7,000	7,130	7,000
kJ/kWh_e	7,310	7,180	7,310	7,180

With TCS

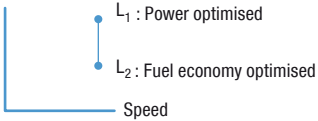
Up to 4% heat rate reduction is obtainable depending on actual site ambient conditions.

Lubricating and Cylinder Oil Consumption

Cylinder oil consumption	0.6 - 1.2 g/kWh

MAN B&W K80MC-S

Site Rating



Bore 800 mm, Stroke 2,300 mm

Power and Heat Rate

Speed r/min	107.1				109.1			
Frequency Hz	50				60			
Layout points	L_1		L_2		L_1		L_2	
	kW_m	kW_e	kW_m	kW_e	kW_m	kW_e	kW_m	kW_e
7 K80MC-S	24,570	23,955	19,670	19,180	24,990	24,365	20,020	19,520
8 K80MC-S	28,080	27,380	22,480	21,920	28,560	27,845	22,880	22,310
9 K80MC-S	31,590	30,800	25,290	24,660	32,130	31,325	25,740	25,095
10 K80MC-S	35,100	34,225	28,100	27,400	35,700	34,810	28,600	27,885
11 K80MC-S	38,610	37,645	30,910	30,135	39,270	38,290	31,460	30,675
12 K80MC-S	42,120	41,065	33,720	32,875	42,840	41,770	34,320	33,460

Heat Rate at MCR

kJ/kWh_m	7,340	7,090	7,340	7,090
kJ/kWh_e	7,530	7,270	7,530	7,270

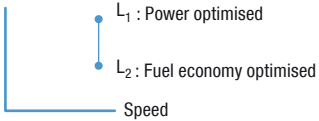
With TCS

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



Bore 600 mm, Stroke 1,740 mm

Power and Heat Rate

Speed r/min	150				150			
Frequency Hz	50				60			
Layout points	L_1		L_2		L_1		L_2	
	kW_m	kW_e	kW_m	kW_e	kW_m	kW_e	kW_m	kW_e
7 K60MC-S	13,860	13,515	12,460	12,150	13,860	13,515	12,460	12,150
8 K60MC-S	15,840	15,445	14,240	13,885	15,840	15,445	14,240	13,885
9 K60MC-S	17,820	17,375	16,020	15,620	17,820	17,375	16,020	15,620
10 K60MC-S	19,800	19,305	17,800	17,355	19,800	19,305	17,800	17,355
11 K60MC-S	21,780	21,235	19,580	19,090	21,780	21,235	19,580	19,090
12 K60MC-S	23,760	23,165	21,360	20,825	23,760	23,165	21,360	20,825
14 K60MC-S	27,720	27,025	24,920	24,295	27,720	27,025	24,920	24,295

Heat Rate at MCR

kJ/kWh_m	7,170	7,050	7,170	7,050
kJ/kWh_e	7,360	7,230	7,360	7,230

With TCS

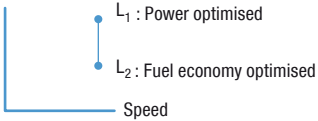
Up to 4% heat rate reduction is obtainable depending on actual site ambient conditions.

Lubricating and Cylinder Oil Consumption

Cylinder oil consumption	0.6 - 1.2 g/kWh

MAN B&W K50MC-S

Site Rating



Bore 500 mm, Stroke 1,370 mm

Power and Heat Rate

Speed r/min	176.5				180.0			
Frequency Hz	50				60			
Layout points	L_1		L_2		L_1		L_2	
	kW_m	kW_e	kW_m	kW_e	kW_m	kW_e	kW_m	kW_e
7 K50MC-S	9,940	9,690	7,980	7,780	10,150	9,895	8,120	7,915
8 K50MC-S	11,360	11,075	9,120	8,890	11,600	11,310	9,280	9,050
9 K50MC-S	12,780	12,460	10,260	10,005	13,050	12,725	10,440	10,180
10 K50MC-S	14,200	13,845	11,400	11,115	14,500	14,140	11,600	11,310
11 K50MC-S	15,620	15,230	12,540	12,225	15,950	15,550	12,760	12,440
12 K50MC-S	17,040	16,615	13,680	13,340	17,400	16,965	13,920	13,570
14 K50MC-S	19,880	19,385	15,960	15,560	20,300	19,795	16,240	15,835

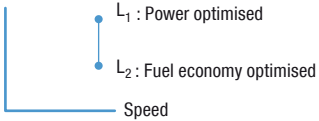
Heat Rate at MCR

kJ/kWh_m	7,430	7,170	7,430	7,170
kJ/kWh_e	7,620	7,360	7,620	7,360

Lubricating and Cylinder Oil Consumption

Cylinder oil consumption	0.6 - 1.2 g/kWh

Site Rating



Bore 350 mm, Stroke 1,050 mm

Power and Heat Rate

Speed r/min	214.3				211.8			
Frequency Hz	50				60			
Layout points	L_1		L_2		L_1		L_2	
	kW_m	kW_e	kW_m	kW_e	kW_m	kW_e	kW_m	kW_e
7 L35MC-S	4,550	4,435	3,640	3,550	4,480	4,370	3,605	3,515
8 L35MC-S	5,200	5,070	4,160	4,055	5,120	4,990	4,120	4,015
9 L35MC-S	5,850	5,705	4,680	4,560	5,760	5,690	4,635	4,520
10 L35MC-S	6,500	6,340	5,200	5,070	6,400	6,240	5,150	5,020
11 L35MC-S	7,150	6,970	5,720	5,575	7,040	6,865	5,665	5,520
12 L35MC-S	7,800	7,605	6,240	6,085	7,680	7,490	6,180	6,025

Heat Rate at MCR

kJ/kWh_m	7,390	7,130	7,390	7,130
kJ/kWh_e	7,580	7,310	7,580	7,310

Lubricating and Cylinder Oil Consumption

Cylinder oil consumption	0.6 - 1.2 g/kWh

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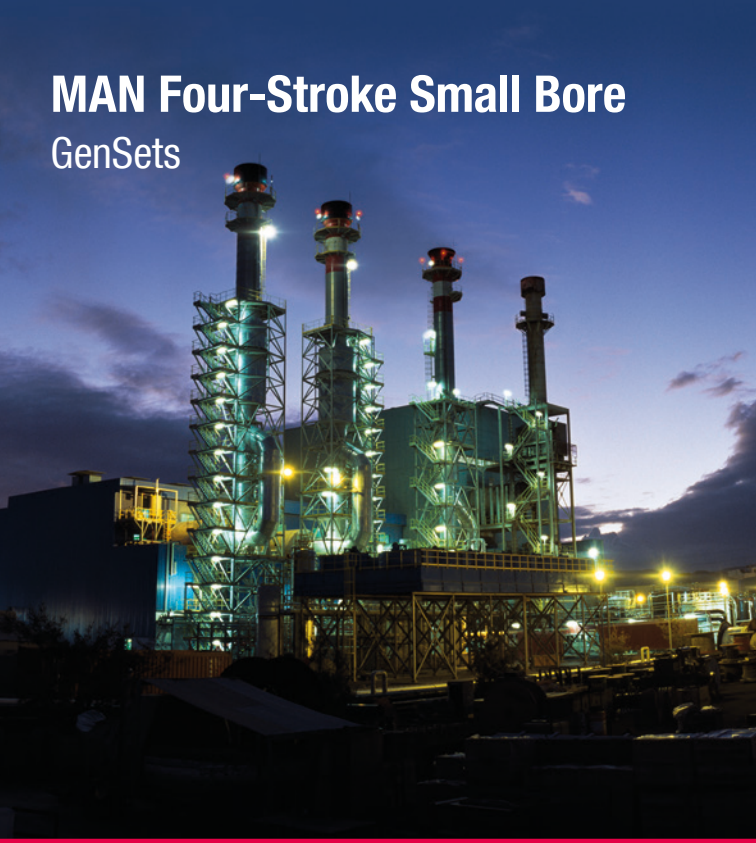
Engineering the Future – since 1758.

MAN Diesel & Turbo

MAN Four-Stroke Small Bore

GenSets



Engineering the Future – since 1758.

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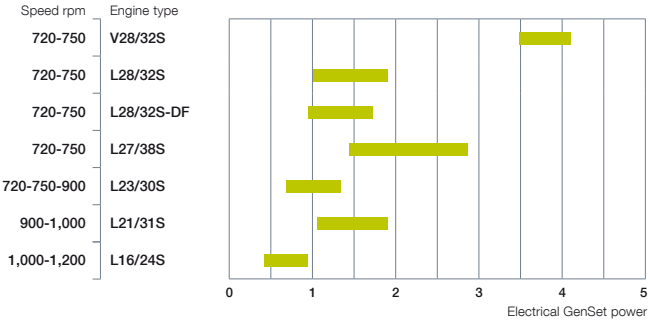
MAN Four-Stroke Small Bore GenSets



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

Engine type designation

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_{th} thermal fuel input. All small bore four-stroke engines comply with the latest World Bank guidelines. Engines with even lower NO_x values are available on request. MAN Diesel & Turbo is prepared to deliver NO_x as well as SO_x and particle reduction systems.

MAN Four-Stroke Small Bore GenSets

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:

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

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.

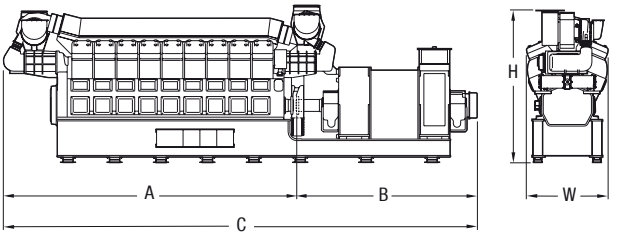
MAN V28/32S

Bore 280 mm, Stroke 320 mm		16V		18V	
Engine speed	rpm	750	720	750	720
Frequency	Hz	50	60	50	60
Electr. GenSet power	kW	3,674	3,517	4,133	3,957
Electr. GenSet Heat Rate at 100% Load					
Liquid fuel (WB2007/2008)	kJ/kWh	8,142	8,134	8,142	8,134
Lube Oil Consumption	kg/h	1.5-3.0		1.6-3.4	

Nominal generator efficiency 97.7%

GenSet Dimensions			
A	mm	6,116	6,626
B	mm	3,822	4,081
C	mm	9,938	10,707
W	mm	2,470	2,470
H	mm	3,574	3,574
Dry mass	t	62.2	70.8

Weights and dimensions are subject to final application



Bore 280 mm, Stroke 320 mm		5L		6L		7L		8L		9L	
Engine speed	rpm	750	720	750	720	750	720	750	720	750	720
Frequency	Hz	50	60	50	60	50	60	50	60	50	60
Electr. GenSet power	kW	1,056	1,008	1,267	1,210	1,478	1,411	1,707	1,630	1,921	1,833

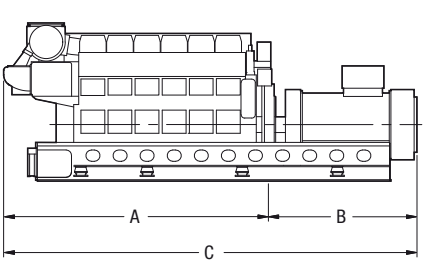
Electr. GenSet Heat Rate at 100% Load											
Liquid fuel (WB2007/2008)	kJ/kWh	8,460	8,429	8,460	8,429	8,460	8,429	8,373	8,342	8,373	8,342

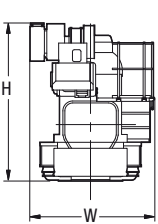
Lube Oil Consumption	kg/h	0.7-1.1	0.8-1.3	0.9-1.5	1.0-1.8	1.2-2.0

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

GenSet Dimensions						
A	mm	4,279	4,759	5,499	5,979	6,199
B	mm	2,400	2,510	2,680	2,770	2,690
C	mm	6,679	7,269	8,179	8,749	8,889
W	mm	2,370	2,370	2,390	2,419	2,489
H	mm	2,684	2,684	2,874	2,874	3,034
Dry mass	t	32.6	36.3	39.4	40.7	47.1

Weights and dimensions are subject to final application





MAN L28/32S-DF

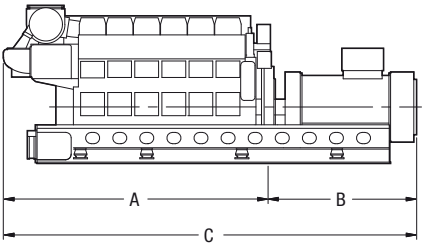
Bore 280 mm, Stroke 320 mm		5L		6L		7L		8L		9L	
Engine speed	rpm	750	720	750	720	750	720	750	720	750	720
Frequency	Hz	50	60	50	60	50	60	50	60	50	60
Electr. GenSet power	kW	950	950	1,140	1,140	1,330	1,330	1,520	1,520	1,710	1,710

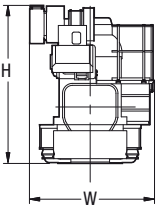
Lube Oil Consumption	kg/h	0.6-1.0	0.7-1.2	0.8-1.4	1.0-1.6	1.0-1.8

Nominal generator efficiency 95%

GenSet Dimensions						
A	mm	4,321	4,801	5,281	5,761	6,241
B	mm	2,400	2,510	2,680	2,770	2,690
C	mm	6,721	7,311	7,961	8,531	8,931
W	mm	-	-	-	-	2,388
H	mm	2,835	3,009	3,009	3,009	3,009
Dry mass	t	32.6	36.3	39.4	40.7	47.1

Weights and dimensions are subject to final application





MAN L27/38S

Bore 270 mm, Stroke 380 mm		5L		6L		7L		8L		9L	
Engine speed	rpm	750	720	750	720	750	720	750	720	750	720
Frequency	Hz	50	60	50	60	50	60	50	60	50	60
Electr. GenSet power	kW	1,552	1,455	1,921	1,921	2,241	2,241	2,561	2,561	2,881	2,881

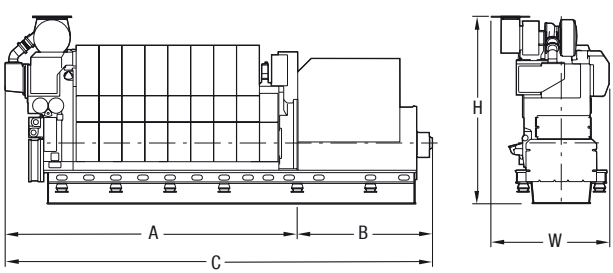
Electr. GenSet Heat Rate at 100% Load											
Liquid fuel (WB2007/2008)	kJ/kWh	8,056	8,012	8,056	8,012	8,056	8,012	8,056	8,012	8,056	8,012

Lube Oil Consumption	kg/h	0.7-1.3	0.8-1.6	0.9-1.8	1.1-2.1	1.2-2.4

Nominal generator efficiency 97%

GenSet Dimensions						
A	mm	4,346	4,791	5,236	5,681	6,126
B	mm	2,486	2,766	2,766	2,986	2,986
C	mm	6,832	7,557	8,002	8,667	9,112
W	mm	2,293	2,293	2,420	2,420	2,420
H	mm	3,712	3,712	3,899	3,899	3,899
Dry mass	t	40.0	44.5	50.4	58.2	64.7

Weights and dimensions are subject to final application



MAN L23/30S

Bore 225 mm, Stroke 300 mm		5L		6L		7L		8L	
Engine speed	rpm	750	720	750	720	750	720	750	720
Frequency	Hz	50	60	50	60	50	60	50	60
Electr. GenSet power	kW	710	682	852	818	995	954	1,137	1,091

Electr. GenSet Heat Rate at 100% load									
Liquid fuel (WB2007/2008)	kJ/kWh	8,540	8,496	8,540	8,496	8,540	8,496	8,540	8,496

Bore 225 mm, Stroke 300 mm		5L	6L	7L	8L
Engine speed	rpm	-	900	900	900
Frequency	Hz	-	60	60	60
Electr. GenSet power	kW	-	1,008	1,176	1,344

Electr. GenSet Heat Rate at 100% load					
Liquid fuel (WB2007/2008)	kJ/kWh		8,584	8,584	8,584

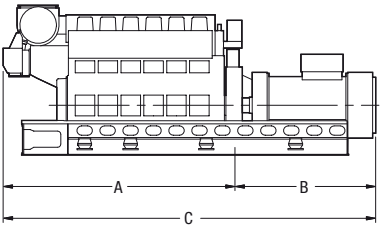
Lube Oil Consumption	kg/h	0.4-0.7	0.5-1.0	0.6-1.2	0.7-1.4

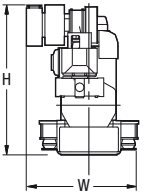
Nominal generator efficiency 96%

GenSet Dimensions

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

Weights and dimensions are subject to final application





Bore 210 mm, Stroke 310 mm		5L		6L		7L		8L		9L	
Engine speed	rpm	1,000	900	1,000	900	1,000	900	1,000	900	1,000	900
Frequency	Hz	50	60	50	60	50	60	50	60	50	60
Electr. GenSet power	kW	1,056	1,056	1,267	1,267	1,478	1,478	1,707	1,707	1,921	1,921

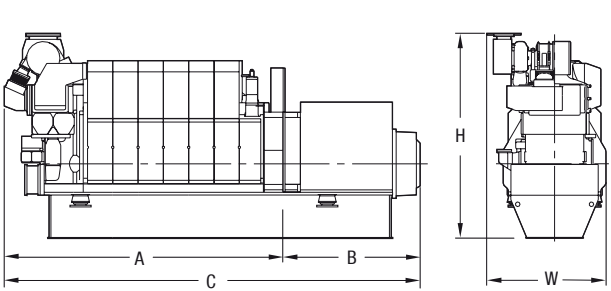
Electr. GenSet Heat Rate at 100% Load											
Liquid fuel (WB2007/2008)	kJ/kWh	7,926	7,917	7,926	7,917	7,926	7,917	7,844	7,836	7,844	7,836

Lube Oil Consumption	kg/h	0.4-0.9	0.5-1.1	0.6-1.2	0.7-1.4	0.8-1.6

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

GenSet Dimensions						
A	mm	3,959	4,314	4,669	5,024	5,379
B	mm	2,041	2,036	1,971	2,266	2,741
C	mm	6,000	6,350	6,640	7,290	8,120
W	mm	2,110	2,110	2,110	2,180	2,180
H	mm	3,070	3,070	3,170	3,170	3,170
Dry mass	t	23.0	26.0	28.5	31.0	33.5

Weights and dimensions are subject to final application



MAN L16/24S

Bore 160 mm, Stroke 240 mm		5L		6L		7L		8L		9L	
Engine speed	rpm	1,000	1,200	1,000	1,200	1,000	1,200	1,000	1,200	1,000	1,200
Frequency	Hz	50	60	50	60	50	60	50	60	50	60
Electr. GenSet power	kW	432	480	547	634	638	739	730	845	821	950

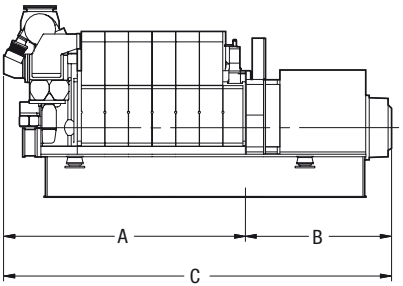
Electr. GenSet Heat Rate at 100% Load											
Liquid fuel (WB2007/2008)	kJ/kWh	8,673	8,496	8,673	8,496	8,673	8,496	8,673	8,496	8,673	8,496

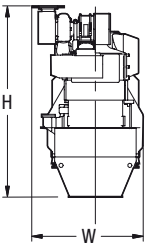
Lube Oil Consumption	kg/h	0.2-0.4	0.2-0.5	0.3-0.6	0.3-0.7	0.3-0.8

Nominal generator efficiency 96%

GenSet Dimensions						
A	mm	2,807	3,082	3,557	3,832	4,107
B	mm	1,400	1,490	1,585	1,680	1,680
C	mm	4,207	4,572	5,142	5,512	5,787
W	mm	1,464	1,464	1,478	1,478	1,478
H	mm	2,337	2,337	2,415/2,337	2,415	2,415
Dry mass	t	9.8	10.5	12.0	13.7	14.5

Weights and dimensions are subject to final application





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Engineering the Future – since 1758.

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