Marine engine programme

MAN Energy Solutions

2nd edition 2019

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.

Contents

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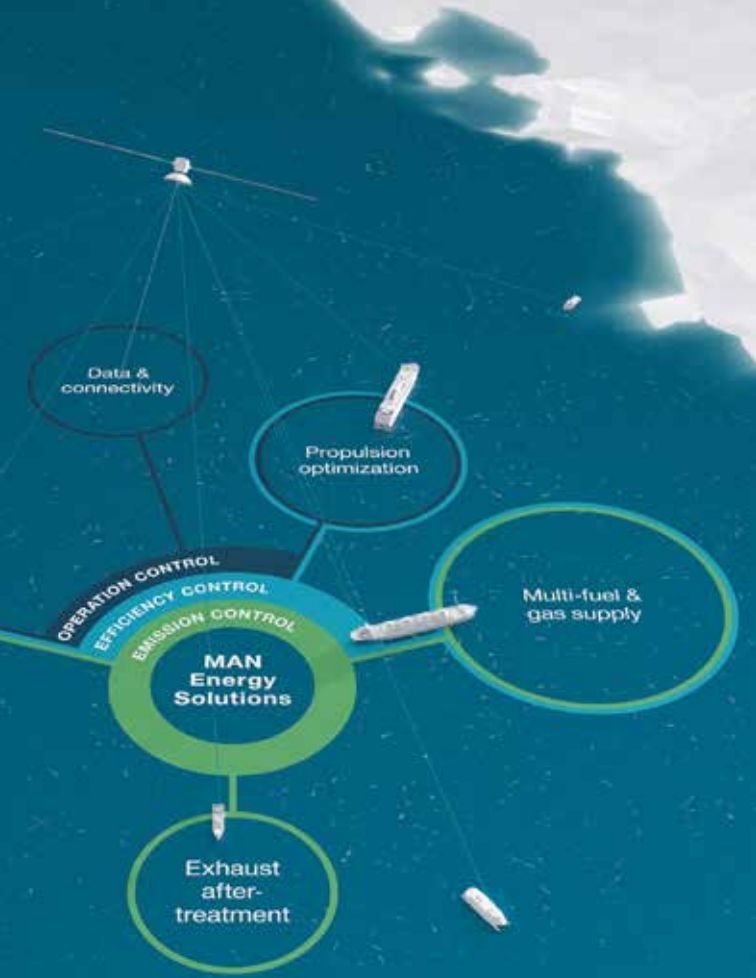


For more information please consult our website.

MAN B&W two-stroke propulsion engines

MAN Energy Solutions Tier II and Tier III engine programme

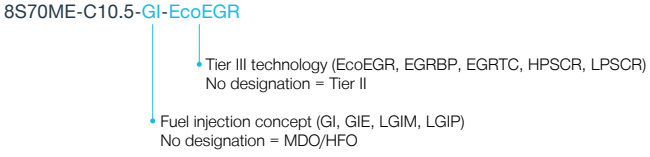
The two-stroke engines in this programme are either:

- Tier II engines complying with IMO Tier II
- Tier III engines complying with Tier II when operated in Tier II mode and with Tier III when operated in Tier III mode

Latest updates on engine development and options are available at: www.marine.man-es.com → Two-Stroke → Market Update Notes (MUN)

Engine type designation

To ensure that the engine designation describes the engine with regard to the fuel injection concept and applied Tier III technologies, the engine type designation also includes these concepts as described below (full designation, see page 18):



Tier III technologies and fuel injection concepts are explained in detail on page 12 (GI and LGI Dual Fuel Engines) and page 13 (Tier III Technologies).

ME-C engines
The electronic control of the ME-C engines includes flexible control of the cylinder process, i.e. fuel injection timing and actuation of exhaust valves, starting valves and cylinder lubrication.

ME-B engines
ME-B engines use electronically controlled pressure boosters for the fuel injection whereas actuation of the exhaust valves is camshaft operated, but with electronically controlled variable closing timing.

CEAS and turbocharger selection

CEAS and TCS applications include all available Tier II, Tier III technologies and dual fuel options. These applications include all available engines and variants, and specifications can be further investigated with respect to basic data essential for the design and dimensioning of a ship's engine room (CEAS) and applicable turbochargers (TCS).

CEAS and TCS are available at: www.marine.man-es.com → Two-Stroke under CEAS Engine Calculations and Turbocharger Selection.

In CEAS and TCS, all engines in this programme can be selected from the category 'Official Catalogue'.

Earlier versions of this engine programme mention additional engine types. Some of these are still available in CEAS and TCS under the category 'Replaced Catalogue'. New development will only be implemented in these designs to the extent considered necessary based on service experience. New efficiency enhancing features will not be available on older engine types.

Engine power

The engine brake power is stated in kW. The power values stated in the tables are available up to tropical conditions at sea level, i.e.:

- turbocharger inlet air temperature 45°C
- turbocharger inlet air pressure 1,000 mbar
- cooling water (sea/fresh) temperature 32/36°C

Specific fuel oil consumption (SFOC)

The figures in the two-stroke chapter represent the values obtained when the engine and turbocharger are matched to the lowest possible SFOC values while fulfilling the IMO NO_x Tier II or Tier III emission limits.

The SFOC figures are given in g/kWh and are based on the use of a fuel oil with a lower calorific value (LCV) equal to 42,700 kJ/kg at ISO conditions:

- turbocharger inlet air temperature 25°C
- turbocharger inlet air pressure 1,000 mbar
- cooling water temperature 25°C

Most commercially available HFOs with a viscosity below 700 cSt at 50°C can be used.

Tolerances

The energy efficiency design index (EEDI) has increased focus on part-load SFOC. Therefore, we offer the option of selecting the SFOC guarantee at a load point in the range from 50% to 100%. It is recommended that the SFOC guarantee point should be limited to the range 50% to 85% for part-load or low-load tuning methods.

When choosing an SFOC guarantee at or below 100%, the tolerances, adjustment and calibration at 100% will affect an engine running at the lower SFOC guarantee load point. This includes tolerances on measurement equipment, engine process control and turbocharger performance.

Consequently, SFOC guarantee tolerances are as follows:

- 5% tolerance for 100-85% engine load
- 6% tolerance for <85-65% engine load
- 7% tolerance for <65-50% engine load

Please note that the SFOC guarantee can only be given in one load point for Tier II engines. For Tier III engines see page 13.

Turbocharging system

Two-stroke engines can be delivered with MAN, ABB or MHI turbochargers as standard.

The SFOC figures given in the two-stroke chapter are based on turbocharging with the best possible turbocharging efficiency generally available, which means 67% for all engines with 45-cm bore and larger, and 64% for engine bores smaller than 45 cm. Both efficiency figures refer to 100% SMCR.

There are exceptions to this rule. Both S40ME-C9.5 and S35ME-C9.7-GI are now standard high-efficiency applications offering all Tier II standard tunings and all Tier III options requiring a high-efficiency turbocharger.

The S35ME-B9.7 is also available as high-efficiency applications offered

with high-load tuning and Tier III options with conventional-efficiency turbocharging.

Only engine specifications for which an applicable high-efficiency turbocharger is available are subject to firm order.

All Tier II engines with high-efficiency (67%) turbochargers can be ordered with lower (conventional) turbocharging efficiency. Utilising this possibility will result in higher exhaust gas temperatures, lower exhaust gas amounts, and a slight change in SFOC. It is not possible to apply tuning methods (part- or low-load) when making such a conversion.

Fuel consumption and optimisation possibilities for Tier II engines

Various optimisation possibilities for improved part-load and low-load SFOC are available for the MAN B&W type engines. High-load optimisation is for best possible SFOC at 100% engine load.

Optimisation of SFOC in the part-load range (50-85%) or low-load range (25-70%) requires selection of the EGB (exhaust gas bypass) tuning method. Also high-pressure tuning (HPT) is available on request for ME-C engines.

Engine Process Tuning (EPT) tuning is available for G95ME-C10.5, G80ME-C10.5 and G60ME-C10.5. EPT uses engine control process parameters to improve part/low load SFOC.

The tuning methods mentioned are available for all SMCR points, but cannot be combined.

In cases where part-load or low-load EGB tuning is applied, and a higher steam production is needed, the EEC (economiser energy control) solution offers additional automatic control of the EGB.

Forcing an open EGB at loads where the EGB is normally closed results in a higher exhaust gas temperature, but with an SFOC penalty. However, the total fuel consumption (engine and oil-fired boiler) will be improved.

Higher steam production can also be obtained for EPT tuned engines by adding an EGB. The EGB must be closed above 90% engine load, but can be opened below 90% to obtain higher exhaust temperature resulting in increased steam production.

Calculations with EEC are made on request

GI and LGI dual fuel engines

This engine programme includes a number of engines designed for gas fuel (GI engines) and liquid gas fuel (LGI engines) operation.

Fuel	Fuel designation	LCV [kJ/kg]
Methane	GI	50,000
Ethane	GIE	47,500
Methanol	LGIM	19,900
LPG*	LGIP	46,000

*LPG is a mixture of liquid propane and butane.

In this engine programme, GI figures are included for engines where GI is applicable. As examples, figures for GIE and LGIP are included for S60ME-C10.5 and G60ME-C10.5 engines, and figures for GIE and LGIM are included for the G50ME-C9.6 engine (see pages 97-109).

In dual fuel mode, the pilot oil energy fraction [%] amounts to 1.5% for GI and GIE, 3% for LGIP and 5% for LGIM of L_1 rating

GI and GIE engines are also available in fuel oil mode optimised versions where the pilot oil energy fraction amounts to 3.0% of L_1 rating.

The following fuel consumption figures are shown in the tables for dual fuel engines:

- dual fuel mode with distribution of specific gas consumption (SGC) and specific pilot oil consumption (SPOC)
- fuel oil mode

All types of GI engines can operate with fuel sharing, also referred to as specified dual fuel (SDF) operation, where the ratio between pilot fuel oil and gas fuel can be selected according to preset values.

Guarantee figures for dual fuel engines are given for heat rate, which has the same tolerances as SFOC guarantees, i.e. see page 10.

Heat rate is defined as follows (example for methane as dual fuel):
Heat rate (kJ/kWh) = SGC (g/kWh) × 50 kJ/g + SPOC (g/kWh) × 42.7 kJ/g

Distribution between SGC and SPOC as well as the heat rate over the load range are available in the CEAS report.

Please note that dual fuel engines must have cylinder lubrication systems capable of supplying both low-BN lubricating oils and high-BN lubricating oils.

Greenhouse gas emissions

IMO has developed the EEDI (energy efficiency design index) with CO_2 as the only greenhouse gas (GHG) emission accounted for. However, IMO is evaluating the possibilities for developing legislation on other GHGs than CO_2. Especially methane is in focus, as it is a very strong GHG and, accordingly, IMO is evaluating the possibilities for introducing legislation on methane slip with short notice as a first measure. In order to be prepared for possible legislation on methane emissions, especially from GI engines, MAN Energy Solutions will, for the complete two-stroke engine programme, be prepared to guarantee a maximum methane slip of 0.35 g/kWh.

Tier III technologies

To ensure compliance with IMO Tier III regulations, EGR or SCR NO_x reduction technology must be selected. The preferred technology depends on market demands, engine size, other requirements and operational pattern.

See our Emission Project Guide for more detailed descriptions of these technologies at www.marine.man-es.com → Two-Stroke → Project Guides → Other Guides → Emission Project Guide

All Tier III engines have at least two operating modes:
- Tier III mode fulfilling the IMO Tier III regulations
- Tier II mode fulfilling the IMO Tier II regulations

Tier III technologies are designed for either low-sulphur fuels (<0.1%) or high-sulphur fuels (>0.5% and <3.5%) in Tier III operation. In Tier II operation, the engine is in all cases capable of using fuels with a high sulphur content. The fuel sulphur content must be selected at engine order as it impacts the engine design.

Fuel consumption guarantees can be given for engines for both Tier II and Tier III mode.

EGR

Two EGR-matching concepts are available depending on engine bore:

- **EGRTC:** T/C cut-out matching for ME-C engines with bores ≥ 80 cm and more than one turbocharger applied
- **EGRBP:** Bypass matching for ME-C engines with bores ≤ 70 cm and one high efficiency turbocharger applied.

EGR operation is also possible for dual fuel engines, except GIE.

SCR is recommended for the small bore ME-B engines. However, if EGR is the preferred Tier III technology for an ME-B engine, please contact MAN Energy Solutions.

EcoEGR

EcoEGR is an SFOC optimised version of the EGRBP system available on all ME-C engines with high-efficiency turbochargers. Compared to the standard EGRBP system the EcoEGR engines operate with 10–15% recirculation in Tier II mode and with slightly increased recirculation in Tier III mode. For EcoEGR engines running on low-sulphur fuels (<0.5 %S), considerable overall savings are obtained. For high-sulphur fuels the overall benefits must be calculated on a case-to-case basis.

EcoEGR operation is also possible for dual fuel engines, except GIE.

If EcoEGR is the preferred Tier III technology on ME-B engines, please contact MAN Energy Solutions.

SCR

Two SCR concepts are available:

- **HPSCR:** High-pressure SCR with reactor installed upstream the turbocharger(s)
- **LPSCR:** Low-pressure SCR with reactor installed downstream the turbocharger(s)

SCR operation applies to ME-C and ME-B engines, including engine types with dual fuel. For some large-bore engines (bore ≥ 90 cm) with a high cylinder number, HPSCR is only available on special request.

The SCR system must be supplied by an approved supplier.

Application of high-sulphur fuels and SO_x scrubbers

All two-stroke engines in the MAN Energy Solutions marine engine programme are compatible with SO_x scrubbers.

A SO_x scrubber installation will increase the back pressure, thereby affecting engine performance. Accordingly, we require that a SO_x scrubber installation does not increase the back pressure by more than 30 mbar at SMCR.

CEAS is updated with the SO_x scrubber options available.

Fuels after 2020

From 1 January 2020, the global sulphur content for marine fuels must not exceed 0.5%. To ensure compliant operation, one of the following methods must be used:

- Use a compliant fuel:
- **Global:** max. 0.5% Sulphur
- **ECA:** max. 0.1% sulphur
- Use methane, ethane, methanol or LPG together with compliant pilot fuel.
- Use a high-sulphur fuel in combination with a SO_x scrubber to obtain an exhaust gas SO_x level equivalent to operation on a compliant fuel.

The fuel specification must be selected at engine order as it impacts the engine design.

Waste heat recovery systems

Waste heat recovery systems (WHRS) are available on request for both Tier II and Tier III engines with high-efficiency turbochargers. Contact MAN Energy Solutions for further information.

Lubricating oil consumption

The system oil consumption varies according to engine sizes and, operational and maintenance patterns.

Specific Cylinder Oil Consumption

Alpha ACC (Adaptive Cylinder-oil Control) is the lubricating mode for MAN B&W two-stroke engines that involves lube dosing proportional to the engine load and to the sulphur content in the fuel being burned.

Our general strategy is:
- Use low-BN oil for low-sulphur fuels
- Use high-BN oil for high-sulphur fuels

Dosage:
- Low-sulphur fuels: min. 0.6 g/kWh
- High-sulphur fuels: typically 0.3 g/kWh × %S for a 100 BN oil

Our Service Letters SL2014-587 and SL2014-593 offer further information: www.marine.man-es.com → Two-Stroke → Service Letters → SL2014-587 and SL2014-593

Extent of delivery

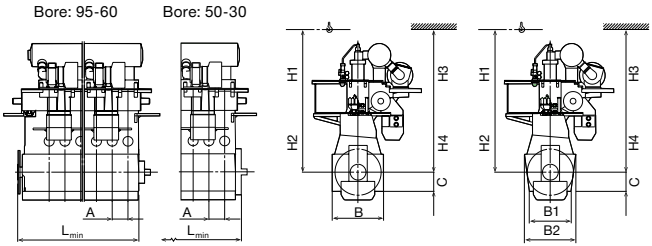
The final and binding extent of delivery of MAN B&W two-stroke engines is to be supplied by our licensee, the engine maker, who should be contacted in order to determine the execution for the actual project.

To facilitate negotiations between the yard, the engine maker and the customer, a set of guiding 'Extent of Delivery' (EoD) forms are available in which MAN Energy Solutions's recommended basic and optional executions are specified.

The licensees may select a different extent of delivery as their standard.

Engine dimensions

The minimum length L_{min} is stated from the aft end of the crankshaft to the fore end of the engine.



L_{min} Minimum length of engine
A Cylinder distance
B Bedplate width
B1 Bedplate width at foot flange
B2 Bedplate width at top flange
C Crankshaft to underside of foot flange
H1 Normal lifting procedure
H2 Reduced height lifting procedure
H3 Reduced height lifting procedure with MAN B&W double-jib crane
H4 Normal lifting procedure with MAN B&W double-jib crane

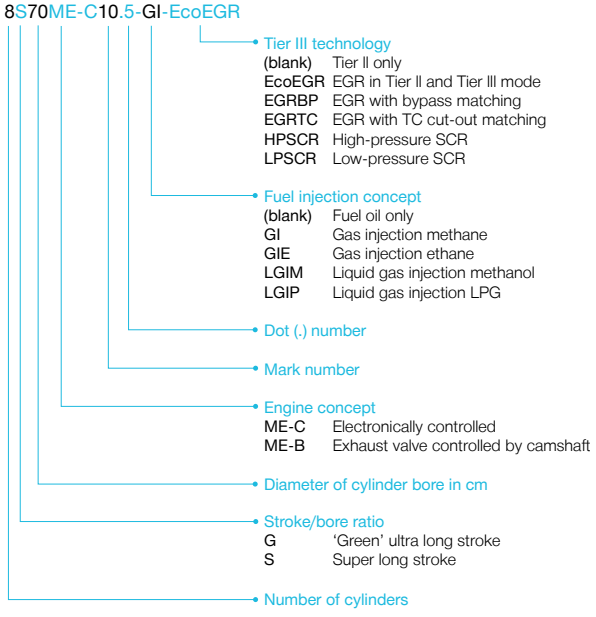
Dry masses

Dry masses are stated in metric tonnes for engines with MAN turbocharger(s) and a standard turning wheel. Figures will vary depending on the design and options chosen, e.g. moment compensators, tuning wheel, etc.

Dry masses for Tier III engines cover components directly integrated on the engine.

Indicated values are for guidance only and are not binding.

Engine type designation



For further usefull information scan the QR codes:

Two-stroke project guides

CEAS Engine Calculations

Turbocharger Selection

Future-proof your investments

MAN Energy Solutions
Future in the making

MAN B&W ME-LGIP engine

The 2020 SO_x regulations throw the world of ocean transport into uncertainty. Our innovative dual-fuel LPG engine lets you de-risk shipbuilding investments and take back control.

By switching to LPG, you stay compliant while retaining the flexibility to take advantage of optimal fuel prices in the future. LPG also offers lower total cost of ownership, giving you a valuable edge in a competitive market.

Power into the future with confidence.

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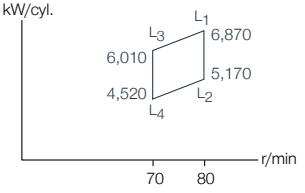
MAN B&W G95ME-C10.5

Tier II

Cyl.	L_1 kW
5	34,350
6	41,220
7	48,090
8	54,960
9	61,830
10	68,700
11	75,570
12	82,440

Stroke: 3,460 mm/**L_1 MEP:** 21.0 bar



Fuel oil

MAN B&W G95ME-C10.5

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	159.5	158.5	163.0
Part-load EPT	157.5	157.0	165.5
Low-load EPT	155.5	158.0	165.5

GI (Methane)

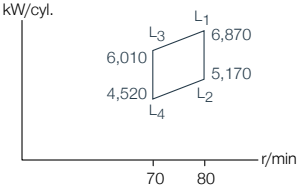
MAN B&W G95ME-C10.5-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	129.5+3.9/159.5	129.5+2.9/161.0	136.3+2.4/168.0

Note: Also available for GIE and LGIP, see page 12.

Cyl.	L_1 kW
5	34,350
6	41,220
7	48,090
8	54,960
9	61,830
10	68,700
11	75,570
12	82,440

Stroke: 3,460 mm/**L_1 MEP: 21.0 bar**



Fuel oil

MAN B&W G95ME-C10.5-EcoEGR

L_1 SFOC [g/kWh]	50%	75%	100%
Tier II mode	152.5	153.5	161.0
Tier III mode	161.5	160.5	165.0

MAN B&W G95ME-C10.5-EGRTC

L_1 SFOC [g/kWh]	50%	75%	100%
Tier II mode	155.5	158.0	165.0
Tier III mode	161.5	161.5	167.0

MAN B&W G95ME-C10.5-HPSCR

L_1 SFOC [g/kWh]	50%	75%	100%
Tier II mode	155.5	158.0	165.5
Tier III mode	157.0	159.0	166.0

MAN B&W G95ME-C10.5-LPSCR

L_1 SFOC [g/kWh]	50%	75%	100%
Tier II mode	155.5	158.0	165.5
Tier III mode	156.5	159.0	166.5

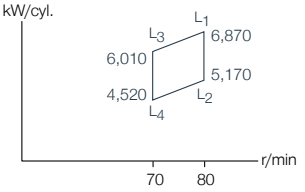
* Available on request for HPSCR.

MAN B&W G95ME-C10.5

Tier III

Cyl.	L_1 kW
5	34,350
6	41,220
7	48,090
8	54,960
9	61,830
10	68,700
11	75,570
12	82,440

Stroke: 3,460 mm/**L_1 MEP:** 21.0 bar



GI (Methane)

MAN B&W G95ME-C10.5-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	126.9+3.9/152.5	128.5+3.0/156.0	135.4+2.5/166.0
Tier III mode	134.6+3.9/161.5	134.5+3.0/163.0	138.8+2.5/170.0

MAN B&W G95ME-C10.5-GI-EGRTC

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	129.4+4.0/155.5	132.4+3.0/160.5	138.8+2.5/170.0
Tier III mode	134.5+4.0/161.5	135.4+3.0/164.0	140.5+2.5/172.0

MAN B&W G95ME-C10.5-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	129.4+4.0/155.5	132.5+3.0/160.5	139.2+2.5/170.5
Tier III mode	130.7+4.0/157.0	133.3+3.0/161.5	139.6+2.5/171.0

MAN B&W G95ME-C10.5-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	129.4+4.0/155.5	132.5+3.0/160.5	139.2+2.5/170.5
Tier III mode	130.3+4.0/156.5	133.3+3.0/161.5	140.1+2.5/171.5

* Available on request for HPSCR.

Note: Also available for GIE and LGIP, except GIE and EGR, see pages 12-14.

MAN B&W G95ME-C10.5

Specifications

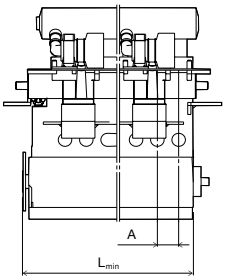
Dimensions:	A	B	C	H1	H4
mm	1,574	5,380	2,060	16,100	15,900

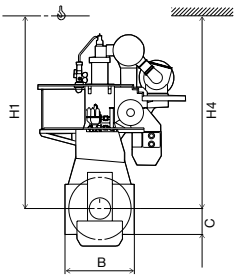
Cyl. distance	5-9 cyl.	10 cyl.	11 cyl.	12 cyl.
mm	1,574	1-6: 1,574	1-6: 1,574	1-6: 1,574
mm		7-10: 1,670	7-11: 1,670	7-12: 1,670

Cylinders:		5	6	7	8	9	10	11	12
L_{min}	mm	11,468	13,042	14,616	16,190	17,804	19,779	21,489	23,159

Dry mass

Tier II	t	1,090	1,260	1,445	1,640	1,840	2,030	2,230	2,425
Tier III (added)									
EcoEGR	t	11	13	14	15	29	29	31	33
EGR	t	11	13	14	15	29	29	31	33
HP SCR	t	10	15	15	15				
LP SCR	t	-	-	-	-	-	-	-	-
Dual fuel (added)									
GI	t	8	9	11	12	13	15	16	17



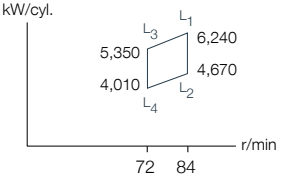


MAN B&W G90ME-C10.5

Tier II

Cyl.	L_1 kW
5	31,200
6	37,440
7	43,680
8	49,920
9	56,160
10	62,400
11	68,640
12	74,880

Stroke: 3,260 mm/**L_1 MEP:** 21.5 bar



Fuel oil

MAN B&W G90ME-C10.5

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	161.5	160.5	165.0
Part-load EGB	159.5	159.0	167.5
Low-load EGB	157.5	160.0	167.5

GI (Methane)

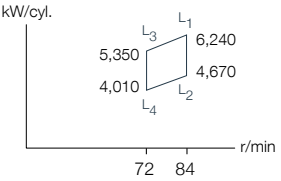
MAN B&W G90ME-C10.5-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	131.2+3.9/161.5	131.2+3.0/163.0	138.0+2.5/170.0

Note: Also available for GIE and LGIP, see page 12.

Cyl.	L_1 kW
5	31,200
6	37,440
7	43,680
8	49,920
9	56,160
10*	62,400
11*	68,640
12*	74,880

Stroke: 3,260 mm/**L_1 MEP:** 21.5 bar



Fuel oil

MAN B&W G90ME-C10.5-EcoEGR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	154.5	155.5	163.0
Tier III mode	163.5	162.5	167.0

MAN B&W G90ME-C10.5-EGRTC

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	157.5	160.0	167.0
Tier III mode	163.5	163.5	169.0

MAN B&W G90ME-C10.5-HPSCR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	157.5	160.0	167.5
Tier III mode	159.0	161.0	168.0

MAN B&W G90ME-C10.5-LPSCR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	157.5	160.0	167.5
Tier III mode	158.5	161.0	168.5

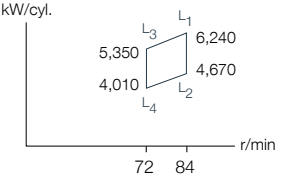
* Available on request for HPSCR.

MAN B&W G90ME-C10.5

Tier III

Cyl.	L_1 kW
5	31,200
6	37,440
7	43,680
8	49,920
9	56,160
10*	62,400
11*	68,640
12*	74,880

Stroke: 3,260 mm/**L_1 MEP:** 21.5 bar



GI (Methane)

MAN B&W G90ME-C10.5-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	128.5+4.0/154.5	130.2+3.0/158.0	137.1+2.5/168.0
Tier III mode	136.2+4.0/163.5	136.2+3.0/165.0	140.5+2.5/172.0

MAN B&W G90ME-C10.5-GI-EGRTC

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.1+4.0/157.5	134.1+3.1/162.5	140.5+2.5/172.0
Tier III mode	136.2+4.0/163.5	137.1+3.1/166.0	142.2+2.5/174.0

MAN B&W G90ME-C10.5-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.1+4.0/157.5	134.1+3.1/162.5	140.9+2.5/172.5
Tier III mode	132.3+4.0/159.0	135.0+3.1/163.5	141.3+2.5/173.0

MAN B&W G95ME-C10.5-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.1+4.0/157.5	134.1+3.1/162.5	140.9+2.5/172.5
Tier III mode	131.9+4.0/158.5	135.0+3.1/163.5	141.7+2.5/173.5

* Available on request for HPSCR.

Note: Also available for GIE and LGIP, except GIE and EGR, see pages 12-14.

MAN B&W G90ME-C10.5

Specifications

Dimensions:		A	B1	B2	C	H1	H4
mm		1,490	5,110	5,034	1,885	14,425	13,975

Cylinders:		5	6	7	8	9	10	11	12
L_{min}	mm	10,740	12,040	12,855	14,345*	15,835*	18,040	19,530	21,020

Dry mass

Tier II	t	892	1,034	1,162	1,316*	1,477*	1,619	1,786	1,915

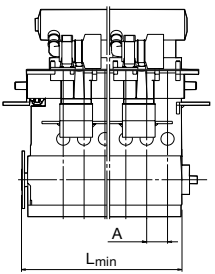
Tier III (added)

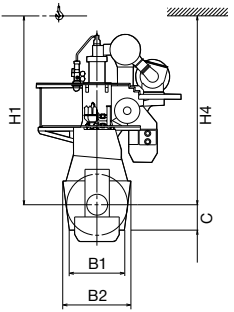
EcoEGR	t	11	13	14	15	29	29	31	33
EGR	t	11	13	14	15	29	29	31	33
HPSCR	t	7	10	15	15	15			
LP SCR	t	-	-	-	-	-	-	-	-

Dual fuel (added)

GI	t	7	8	9	10	12	13	14	15

* 8-9-cylinder engines can be ordered with either divided or undivided crankshaft. Data is given for undivided crankshaft.



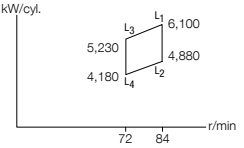


MAN B&W S90ME-C10.5

Tier II

Cyl.	L_1 kW
5	30,500
6	36,600
7	42,700
8	48,800
9	54,900
10	61,000
11	67,100
12	73,200

Stroke: 3,260 mm/**L_1 MEP:** 21.0 bar



Fuel oil

MAN B&W S90ME-C10.5

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	162.5	161.5	166.0
Part-load EGB	160.5	160.0	168.5
Low-load EGB	158.5	161.0	168.5

GI (Methane)

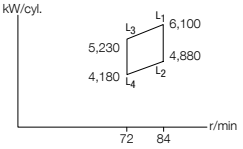
MAN B&W S90ME-C10.5-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	132.0+3.9/162.5	132.0+3.0/164.0	138.8+2.5/171.0

Note: Also available for GIE and LGIP, see page 12.

Cyl.	L_1 kW
5	30,500
6	36,600
7	42,700
8	48,800
9	54,900
10*	61,000
11*	67,100
12*	73,200

Stroke: 3,260 mm/**L_1 MEP:** 21.0 bar



Fuel oil

MAN B&W S90ME-C10.5-EcoEGR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	155.5	156.5	164.0
Tier III mode	164.5	163.5	168.0

MAN B&W S90ME-C10.5-EGRTC

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	158.5	161.0	168.0
Tier III mode	164.5	164.5	170.0

MAN B&W S90ME-C10.5-HPSCR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	158.5	161.0	168.5
Tier III mode	160.0	162.0	169.0

MAN B&W S90ME-C10.5-LPSCR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	158.5	161.0	168.5
Tier III mode	159.5	162.0	169.5

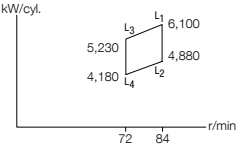
* Available on request for HPSCR.

MAN B&W S90ME-C10.5

Tier III

Cyl.	L_1 kW
5	30,500
6	36,600
7	42,700
8	48,800
9	54,900
10*	61,000
11*	67,100
12*	73,200

Stroke: 3,260 mm/**L_1 MEP:** 21.0 bar



GI (Methane)

MAN B&W S90ME-C10.5-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	129.4+4.0/155.5	131.0+3.1/159.0	137.9+2.5/169.0
Tier III mode	137.1+4.0/164.5	137.0+3.1/166.0	141.3+2.5/173.0

MAN B&W S90ME-C10.5-GI-EGRTC

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.9+4.0/158.5	135.0+3.1/163.5	141.3+2.6/173.0
Tier III mode	137.0+4.0/164.5	138.0+3.1/167.0	143.0+2.6/175.0

MAN B&W S90ME-C10.5-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.9+4.0/158.5	135.0+3.1/163.5	141.7+2.5/173.5
Tier III mode	133.2+4.0/160.0	135.8+3.1/164.5	142.2+2.5/174.0

MAN B&W S90ME-C10.5-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.9+4.0/158.5	135.0+3.1/163.5	141.7+2.5/173.5
Tier III mode	132.8+4.0/159.5	135.8+3.1/164.5	142.6+2.5/174.5

* Available on request for HPSCR.

Note: Also available for GIE and LGIP, except GIE and EGR, see pages 12-14.

MAN B&W S90ME-C10.5

Specifications

Dimensions:		A	B1	B2	C	H1	H4
mm		1,590	5,160	5,450	1,900	15,000	14,875

Cylinders:		5	6	7	8	9	10	11	12
L_{min}	mm	10,312	11,902	13,492	16,135	17,725	19,315	20,905	22,495

Dry mass

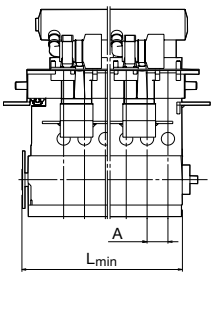
Tier II	t	953	1,104	1,255	1,446	1,626	1,771	1,942	2,088

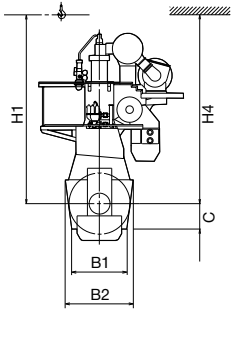
Tier III (added)

EcoEGR	t	9	12	13	14	14	26	29	31
EGR	t	9	12	13	14	14	26	29	31
HPSCR	t	7	10	15	15	15			
LPSCR	t	-	-	-	-	-	-	-	-

Dual fuel (added)

GI	t	7	9	10	11	12	13	15	16



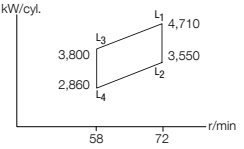


MAN B&W G80ME-C10.5

Tier II

Cyl.	L_1 kW
6	28,260
7	32,970
8	37,680
9	42,390

Stroke: 3,720 mm/**L_1 MEP:** 21.0 bar



Fuel oil

MAN B&W G80ME-C10.5

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	160.5	159.5	164.0
Part-load EPT	158.5	158.0	166.5
Low-load EPT	156.5	159.0	166.5

GI (Methane)

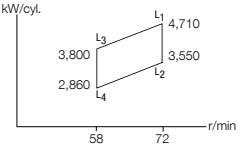
MAN B&W G80ME-C10.5-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	130.3+3.9/160.5	130.4+3.0/162.0	137.1+2.4/169.0

Note: Also available for GIE and LGIP, see page 12

Cyl.	L_1 kW
6	28,260
7	32,970
8	37,680
9	42,390

Stroke: 3,720 mm/**L_1 MEP:** 21.0 bar



Fuel oil

MAN B&W G80ME-C10.5-EcoEGR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	153.5	154.5	162.0
Tier III mode	162.5	161.5	166.0

MAN B&W G80ME-C10.5-EGRTC

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	156.5	159.0	166.0
Tier III mode	162.5	162.5	168.0

MAN B&W G80ME-C10.5-HPSCR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	156.5	159.0	166.5
Tier III mode	158.0	160.0	167.0

MAN B&W G80ME-C10.5-LPSCR

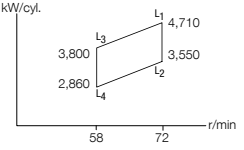
L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	156.5	159.0	166.5
Tier III mode	157.5	160.0	167.5

MAN B&W G80ME-C10.5

Tier III

Cyl.	L_1 kW
6	28,260
7	32,970
8	37,680
9	42,390

Stroke: 3,720 mm/**L_1 MEP:** 21.0 bar



GI (Methane)

MAN B&W G80ME-C10.5-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	127.7+4.0/153.5	129.5+3.0/157.0	136.2+2.5/167.0
Tier III mode	135.4+4.0/162.5	135.5+3.0/164.0	139.6+2.5/171.0

MAN B&W G80ME-C10.5-GI-EGRTC

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	130.2+4.0/156.5	133.3+3.1/161.5	139.6+2.5/171.0
Tier III mode	135.4+4.0/162.5	136.3+3.1/165.0	141.3+2.5/173.0

MAN B&W G80ME-C10.5-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	130.2+4.0/156.5	133.3+3.0/161.5	140.1+2.5/171.5
Tier III mode	131.5+4.0/158.0	134.1+3.0/162.5	140.5+2.5/172.0

MAN B&W G80ME-C10.5-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	130.2+4.0/156.5	133.3+3.0/161.5	140.0+2.5/171.5
Tier III mode	131.1+4.0/157.5	134.1+3.0/162.5	140.9+2.5/172.5

Note: Also available for GIE and LGIP, except GIE and EGR, see pages 12-14.

MAN B&W G80ME-C10.5

Specifications

Dimensions:		A	B1	B2	C	H1	H4
mm		1,400	-	5,252	-	-	-

Cylinders:		6	7	8	9
L_{min}	mm	-	-	-	-

Dry mass

Tier II	**t**	898	1,002	1,115*	1,283

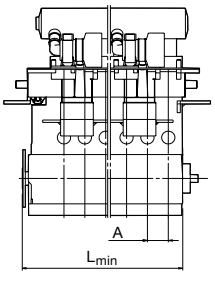
Tier III (added)

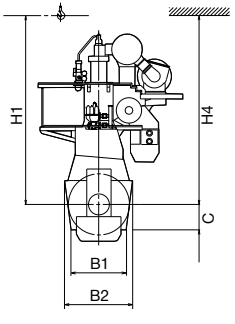
EcoEGR	**t**	11	12	13	14
EGR	**t**	11	12	13	14
HPSCR	**t**	6	10	10	15
LPSCR	**t**	-	-	-	-

Dual fuel (added)

GI	**t**	7	8	9	9

* Dry mass and cylinder L_{min} are with undivided crankshaft and chain in aft.



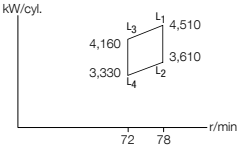


MAN B&W S80ME-C9.5

Tier II

Cyl.	L_1 kW
6	27,060
7	31,570
8	36,080
9	40,590

Stroke: 3,450 mm/**L_1 MEP:** 20.0 bar



Fuel oil

MAN B&W S80ME-C9.5

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	164.5	162.0	166.0
Part-load EGB	161.5	160.5	167.5
Low-load EGB	159.5	161.5	167.5

GI (Methane)

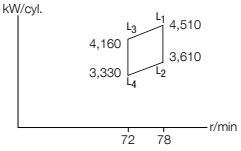
MAN B&W S80ME-C9.5-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	133.7+3.9/164.5	132.5+3.0/164.5	138.8+2.5/171.0

Note: Also available for GIE and LGIP, see page 12.

Cyl.	L_1 kW
6	27,060
7	31,570
8	36,080
9	40,590

Stroke: 3,450 mm/L_1 **MEP:** 20.0 bar



Fuel oil

MAN B&W S80ME-C9.5-EcoEGR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	157.5	157.0	164.0
Tier III mode	166.5	164.0	168.0

MAN B&W S80ME-C9.5-EGRTC

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	159.5	161.5	167.0
Tier III mode	166.5	165.0	170.0

MAN B&W S80ME-C9.5-HPSCR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	159.5	161.5	167.5
Tier III mode	161.0	162.5	168.0

MAN B&W S80ME-C9.5-LPSCR

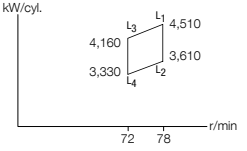
L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	159.5	161.5	167.5
Tier III mode	160.5	162.5	168.5

MAN B&W S80ME-C9.5

Tier III

Cyl.	L_1 kW
6	27,060
7	31,570
8	36,080
9	40,590

Stroke: 3,450 mm/**L_1 MEP:** 20.0 bar



GI (Methane)

MAN B&W S80ME-C9.5-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.1+4.0/157.5	131.5+3.1/159.5	137.9+2.5/169.0
Tier III mode	138.8+4.0/166.5	137.4+3.1/166.5	141.3+2.5/173.0

MAN B&W S80ME-C9.5-GI-EGRTC

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	132.8+4.0/159.5	135.4+3.1/164.0	140.4+2.6/172.0
Tier III mode	138.7+4.0/166.5	138.4+3.1/167.5	143.0+2.6/175.0

MAN B&W S80ME-C9.5-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	132.8+4.0/159.5	135.4+3.1/164.0	140.9+2.5/172.5
Tier III mode	134.1+4.0/161.0	136.3+3.1/165.0	141.3+2.5/173.0

MAN B&W S80ME-C9.5-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	132.8+4.0/159.5	135.4+3.1/164.0	140.9+2.5/172.5
Tier III mode	133.6+4.0/160.5	136.3+3.1/165.0	141.7+2.5/173.5

Note: Also available for GIE and LGIP, except GIE and EGR, see pages 12-14.

MAN B&W S80ME-C9.5

Specifications

Dimensions:	A	B_1	B_2	C	H1	H4
mm	1,334	5,180	5,374	1,890	15,175	15,500

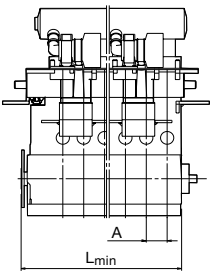
Cylinders:		6	7	8	9
L_{min}	mm	10,100	11,434	12,768	14,102

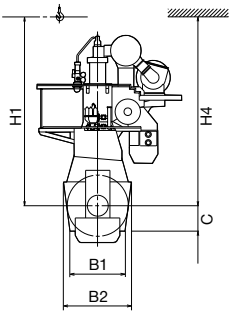
Dry mass

Tier II	t	833	933	1,043	1,153

Tier III (added)					
EcoEGR	t	11	12	13	14
EGR	t	11	12	13	14
HPSCR	t	6	10	10	15
LPSCR	t	-	-	-	-

Dual fuel (added)					
GI	t	7	8	9	10



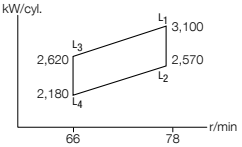


MAN B&W G70ME-C10.5

Tier II

Cyl.	L_1 kW
5	15,500
6	18,600

Stroke: 3,256 mm/**L_1 MEP:** 19.0 bar



Fuel oil

MAN B&W G70ME-C10.5

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	160.5	158.5	163.0
Part-load EGB	158.5	157.0	165.5
Low-load EGB	156.5	158.0	165.5

GI (Methane)

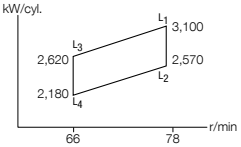
MAN B&W G70ME-C10.5-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	130.4+3.9/160.5	129.8+2.9/161.0	136.3+2.4/168.0

Note: Also available for GIE and LGIP, see page 12.

Cyl.	L_1 kW
5	15,500
6	18,600

Stroke: 3,256 mm/**L_1 MEP:** 19.0 bar



Fuel oil

MAN B&W G70ME-C10.5-EcoEGR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	153.5	153.5	161.0
Tier III mode	162.5	160.5	165.0

MAN B&W G70ME-C10.5-EGRBP

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	156.5	158.0	166.0
Tier III mode	163.5	162.5	168.0

MAN B&W G70ME-C10.5-HPSCR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	156.5	158.0	165.5
Tier III mode	158.0	159.0	166.0

MAN B&W G70ME-C10.5-LPSCR

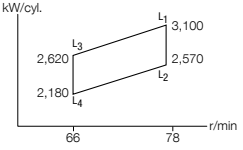
L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	156.5	158.0	165.5
Tier III mode	157.5	159.0	166.5

MAN B&W G70ME-C10.5

Tier III

Cyl.	L_1 kW
5	15,500
6	18,600

Stroke: 3,256 mm/**L_1 MEP:** 19.0 bar



GI (Methane)

MAN B&W G70ME-C10.5-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	127.7+3.9/153.5	128.6+3.0/156.0	135.4+2.5/166.0
Tier III mode	135.4+3.9/162.5	134.6+3.0/163.0	138.8+2.5/170.0

MAN B&W G70ME-C10.5-GI-EGRBP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	130.2+4.0/156.5	132.4+3.1/160.5	139.6+2.5/171.0
Tier III mode	136.1+4.0/163.5	136.3+3.1/165.0	141.3+2.5/173.0

MAN B&W G70ME-C10.5-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	130.2+4.0/156.5	132.4+3.0/160.5	139.2+2.5/170.5
Tier III mode	131.5+4.0/158.0	133.3+3.0/161.5	139.6+2.5/171.0

MAN B&W G70ME-C10.5-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	130.2+4.0/156.5	132.4+3.0/160.5	139.2+2.5/170.5
Tier III mode	131.1+4.0/157.5	133.3+3.0/161.5	140.0+2.5/171.5

Note: Also available for GIE and LGIP, except GIE and EGR, see pages 12-14.

MAN B&W G70ME-C10.5

Specifications

Dimensions:	A	B1	B2	C	H1
mm	1,044	4,470	4,628	1,750	13,625

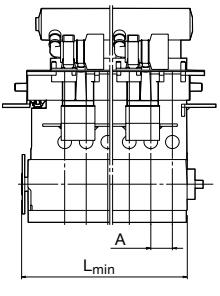
Cylinders:		5	6
L_{min}	mm	7,452	8,496

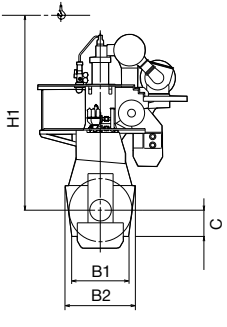
Dry mass

Tier II	t	521	586

Tier III (added)			
EcoEGR	t	14	16
EGR	t	15	16
HPSCR	t	4	5
LPSCR	t	-	-

Dual fuel (added)			
GI	t	5	6



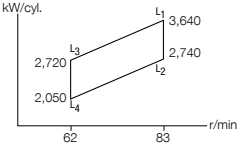


MAN B&W G70ME-C9.5

Tier II

Cyl.	L_1 kW
5	18,200
6	21,840
7	25,480
8	29,120

Stroke: 3,256 mm/L_1 **MEP:** 21.0 bar



Fuel oil

MAN B&W G70ME-C9.5

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	165.5	163.0	167.0
Part-load EGB	162.5	161.5	168.5
Low-load EGB	160.5	162.5	168.5

GI (Methane)

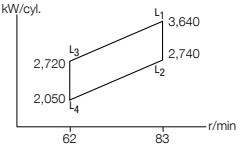
MAN B&W G70ME-C9.5-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	134.5+4.0/165.5	133.3+3.0/165.5	139.6+2.5/172.0

Note: Also available for GIE and LGIP, see page 12.

Cyl.	L_1 kW
5	18,200
6	21,840
7	25,480
8	29,120

Stroke: 3,256 mm/**L_1 MEP:** 21.0 bar



Fuel oil

MAN B&W G70ME-C9.5-EcoEGR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	158.5	158.0	165.0
Tier III mode	167.5	165.0	169.0

MAN B&W G70ME-C9.5-EGRBP

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	160.5	162.5	169.0
Tier III mode	168.5	167.0	172.0

MAN B&W G70ME-C9.5-HPSCR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	160.5	162.5	168.5
Tier III mode	162.0	163.5	169.0

MAN B&W G70ME-C9.5-LPSCR

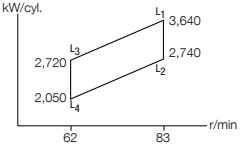
L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	160.5	162.5	168.5
Tier III mode	161.5	163.5	169.5

MAN B&W G70ME-C9.5

Tier III

Cyl.	L_1 kW
5	18,200
6	21,840
7	25,480
8	29,120

Stroke: 3,256 mm/L_1 **MEP:** 21.0 bar



GI (Methane)

MAN B&W G70ME-C9.5-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.9+4.0/158.5	132.3+3.1/160.5	138.7+2.5/170.0
Tier III mode	139.6+4.0/167.5	138.3+3.1/167.5	142.2+2.5/174.0

MAN B&W G70ME-C9.5-GI-EGRBP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	133.6+4.1/160.5	136.2+3.1/165.0	142.1+2.6/174.0
Tier III mode	140.4+4.1/168.5	140.1+3.1/169.5	144.7+2.6/177.0

MAN B&W G70ME-C9.5-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	133.6+4.0/160.5	136.2+3.1/165.0	141.7+2.5/173.5
Tier III mode	134.9+4.0/162.0	137.1+3.1/166.0	142.2+2.5/174.0

MAN B&W G70ME-C9.5-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	133.6+4.0/160.5	136.2+3.1/165.0	141.7+2.5/173.5
Tier III mode	134.5+4.0/161.5	137.1+3.1/166.0	142.6+2.5/174.5

Note: Also available for GIE and LGIP, except GIE and EGR, see pages 12-14.

MAN B&W G70ME-C9.5

Specifications

Dimensions:		A	B1	B2	C	H1	H2	H3
Fuel oil	mm	1,044	4,470	4,628	1,750	14,225	13,250	12,800
GI	mm	1,044	4,470	4,628	1,750	14,225	13,250	13,175

Cylinders:		5	6	7	8
L_{min}	mm	7,452	8,496	10,856	12,116

Dry mass

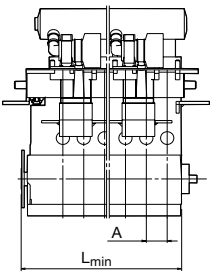
Tier II	t	585	665	750	855

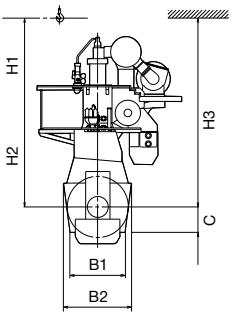
Tier III (added)

EcoEGR	t	15	16	17	18
EGR	t	14	16	17	18
HPSCR	t	4	5	6	7
LPSCR	t	-	-	-	-

Dual fuel (added)

GI	t	5	6	7	8



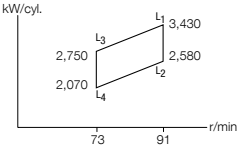


MAN B&W S70ME-C10.5

Tier II

Cyl.	L_1 kW
5	17,150
6	20,580
7	24,010
8	27,440

Stroke: 2,800 mm/L_1 **MEP:** 21.0 bar



Fuel oil

MAN B&W S70ME-C10.5

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	164.5	162.0	166.0
Part-load EGB	161.5	160.5	167.5
Low-load EGB	159.5	161.5	167.5

GI (Methane)

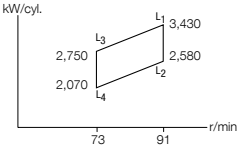
MAN B&W S70ME-C10.5-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	133.7+3.9/164.5	132.5+3.0/164.5	138.8+2.5/171.0

Note: Also available for GIE and LGIP, see page 12

Cyl.	L_1 kW
5	17,150
6	20,580
7	24,010
8	27,440

Stroke: 2,800 mm/**L_1 MEP:** 21.0 bar



Fuel oil

MAN B&W S70ME-C10.5-EcoEGR

L_1 SFOC [g/kWh]

	50%	75%	100%
Tier II mode	157.5	157.0	164.0
Tier III mode	166.5	164.0	168.0

MAN B&W S70ME-C10.5-EGRBP

L_1 SFOC [g/kWh]

	50%	75%	100%
Tier II mode	159.5	161.5	168.0
Tier III mode	167.5	166.0	171.0

MAN B&W S70ME-C10.5-HPSCR

L_1 SFOC [g/kWh]

	50%	75%	100%
Tier II mode	159.5	161.5	167.5
Tier III mode	161.0	162.5	168.0

MAN B&W S70ME-C10.5-LPSCR

L_1 SFOC [g/kWh]

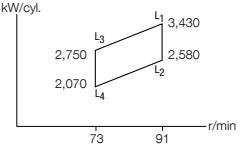
	50%	75%	100%
Tier II mode	159.5	161.5	167.5
Tier III mode	160.5	162.5	168.5

MAN B&W S70ME-C10.5

Tier III

Cyl.	L_1 kW
5	17,150
6	20,580
7	24,010
8	27,440

Stroke: 2,800 mm/L_1 **MEP:** 21.0 bar



GI (Methane)

MAN B&W S70ME-C10.5-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	131.1+4.0/157.5	131.5+3.1/159.5	137.9+2.5/169.0
Tier III mode	138.8+4.0/166.5	137.4+3.1/166.5	141.3+2.5/173.0

MAN B&W S70ME-C10.5-GI-EGRBP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	132.7+4.1/159.5	135.4+3.1/164.0	141.3+2.6/173.0
Tier III mode	139.6+4.1/167.5	139.2+3.1/168.5	143.8+2.6/176.0

MAN B&W S70ME-C10.5-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	132.8+4.0/159.5	135.4+3.1/164.0	140.9+2.5/172.5
Tier III mode	134.1+4.0/161.0	136.3+3.1/165.0	141.3+2.5/173.0

MAN B&W S70ME-C10.5-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	132.8+4.0/159.5	135.4+3.1/164.0	140.9+2.5/172.5
Tier III mode	133.6+4.0/160.5	136.3+3.1/165.0	141.7+2.5/173.5

Note: Also available for GIE and LGIP, except GIE and EGR, see pages 12-14.

MAN B&W S70ME-C10.5

Specifications

Dimensions:	A	B1	B2	C	H1	H4
mm	1,098	4,012	4,140	1,520	12,675	12,575

Cylinders:		5	6	7	8
L_{min}	mm	7,446	8,544	9,642	10,740

Dry mass

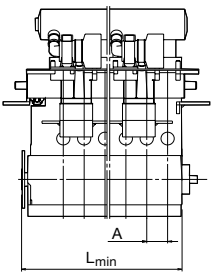
Tier II	t	424	502	563	634

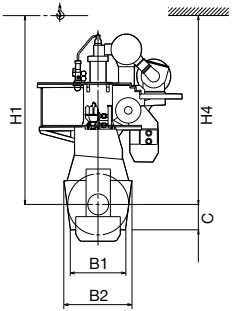
Tier III (added)

EcoEGR	t	15	16	17	18
EGR	t	15	16	17	18
HPSCR	t	4	5	6	6
LPSCR	t	-	-	-	-

Dual fuel (added)

GI	t	5	6	7	7



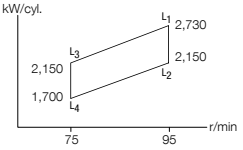


MAN B&W S65ME-C8.6

Tier II

Cyl.	L_1 kW
5	13,650
6	16,380
7	19,110
8	21,840

Stroke: 2,730 mm/L_1 **MEP:** 19.0 bar



Fuel oil

MAN B&W S65ME-C8.6

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	164.5	161.5	165.5
Part-load EGB	161.5	160.0	167.0
Low-load EGB	159.5	161.0	167.0

GI (Methane)

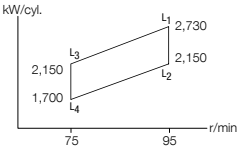
MAN B&W S65ME-C8.6-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	133.7+3.9/164.5	132.0+3.0/164.0	138.3+2.5/170.5

Note: Also available for GIE and LGIP, see page 12

Cyl.	L_1 kW
5	13,650
6	16,380
7	19,110
8	21,840

Stroke: 2,730 mm/**L_1 MEP:** 19.0 bar



Fuel oil

MAN B&W S65ME-C8.6-EcoEGR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	157.5	156.5	163.5
Tier III mode	166.5	163.5	167.5

MAN B&W S65ME-C8.6-EGRBP

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	159.5	161.0	167.5
Tier III mode	167.5	165.5	170.5

MAN B&W S65ME-C8.6-HPSCR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	159.5	161.0	167.0
Tier III mode	161.0	162.0	167.5

MAN B&W S65ME-C8.6-LPSCR

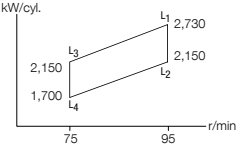
L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	159.5	161.0	167.0
Tier III mode	160.5	162.0	168.0

MAN B&W S65ME-C8.6

Tier III

Cyl.	L_1 kW
5	13,650
6	16,380
7	19,110
8	21,840

Stroke: 2,730 mm/L_1 **MEP:** 19.0 bar



GI (Methane)

MAN B&W S65ME-C8.6-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.0+4.0/157.5	131.1+3.0/159.0	137.4+2.5/168.5
Tier III mode	138.7+4.0/166.5	137.1+3.0/166.0	140.9+2.5/172.5

MAN B&W S65ME-C8.6-GI-EGRBP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	132.7+4.1/159.5	134.9+3.1/163.5	140.8+2.6/172.5
Tier III mode	139.5+4.1/167.5	138.8+3.1/168.0	143.4+2.6/175.5

MAN B&W S65ME-C8.6-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	132.7+4.0/159.5	135.0+3.1/163.5	140.4+2.5/172.0
Tier III mode	134.0+4.0/161.0	135.8+3.1/164.5	140.9+2.5/172.5

MAN B&W S65ME-C8.6-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	132.7+4.0/159.5	135.0+3.1/163.5	140.4+2.5/172.0
Tier III mode	133.6+4.0/160.5	135.8+3.1/164.5	141.3+2.5/173.0

Note: Also available for GIE and LGIP, except GIE and EGR, see pages 12-14.

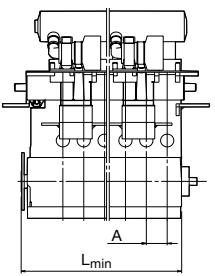
MAN B&W S65ME-C8.6

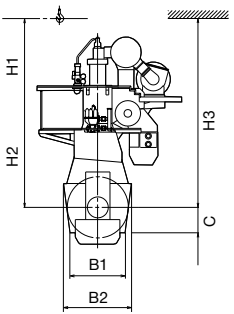
Specifications

Dimensions:		A	B1	B2	C	H1	H2	H3
mm		1,084	4,124	4,170	1,410	11,950	11,225	11,025

Cylinders:		5	6	7	8
L_{min}	mm	7,148	8,232	9,316	10,400

Dry mass					
Tier II	t	390	460	522	587
Tier III (added)					
EcoEGR	t	14	15	16	17
EGR	t	14	15	16	17
HPSCR	t	4	5	6	6
LPSCR	t	-	-	-	-
Dual fuel (added)					
GI	t	5	5	6	7



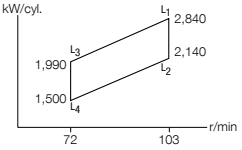


MAN B&W G60ME-C10.5

Tier II

Cyl.	L_1 kW
5	14,200
6	17,040
7	19,880
8	22,720

Stroke: 2,790 mm/L_1 **MEP:** 21.0 bar



Fuel oil

MAN B&W G60ME-C10.5

L_1 SFOC [g/kWh]			
Opt. load range	50%	75%	100%
High-load	161.5	160.5	165.0
Part-load EPT	159.5	159.0	167.5
Low-load EPT	157.5	160.0	167.5

GI (Methane)

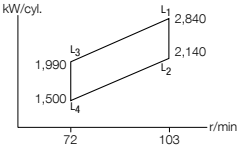
MAN B&W G60ME-C10.5-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	50%	75%	100%
High-load	131.2+3.9/161.5	131.2+3.0/163.0	138.0+2.5/170.0

Note: Also available for GIE and LGIP, see page 12

Cyl.	L_1 kW
5	14,200
6	17,040
7	19,880
8	22,720

Stroke: 2,790 mm/**L_1 MEP:** 21.0 bar



Fuel oil

MAN B&W G60ME-C10.5-EcoEGR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	154.5	155.5	163.0
Tier III mode	163.5	162.5	167.0

MAN B&W G60ME-C10.5-EGRBP

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	157.5	160.0	168.0
Tier III mode	164.5	164.5	170.0

MAN B&W G60ME-C10.5-HPSCR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	157.5	160.0	167.5
Tier III mode	159.0	161.0	168.0

MAN B&W G60ME-C10.5-LPSCR

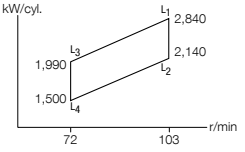
L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	157.5	160.0	167.5
Tier III mode	158.5	161.0	168.5

MAN B&W G60ME-C10.5

Tier III

Cyl.	L_1 kW
5	14,200
6	17,040
7	19,880
8	22,720

Stroke: 2,790 mm/**L_1 MEP:** 21.0 bar



GI (Methane)

MAN B&W G60ME-C10.5-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	128.5+4.0/154.5	130.3+3.0/158.0	137.1+2.5/168.0
Tier III mode	136.2+4.0/163.5	136.3+3.0/165.0	140.5+2.5/172.0

MAN B&W G60ME-C10.5-GI-EGRBP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.0+4.1/157.5	134.1+3.1/162.5	141.3+2.6/173.0
Tier III mode	137.0+4.1/164.5	137.9+3.1/167.0	143.0+2.6/175.0

MAN B&W G60ME-C10.5-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.1+4.0/157.5	134.1+3.1/162.5	140.9+2.5/172.5
Tier III mode	132.3+4.0/159.0	135.0+3.1/163.5	141.3+2.5/173.0

MAN B&W G60ME-C10.5-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.1+4.0/157.5	134.1+3.1/162.5	140.9+2.5/172.5
Tier III mode	131.9+4.0/158.5	135.0+3.1/163.5	141.7+2.5/173.5

Note: Also available for GIE and LGIP, except GIE and EGR, see pages 12-14.

MAN B&W G60ME-C10.5

Specifications

Dimensions:		A	B1	B2	C	H1	H2	H3
mm		1,080	4,090	4,220	1,500	12,175	11,400	11,075

Cylinders:		5	6	7	8
L_{min}	mm	7,390	8,470	9,550	10,630

Dry mass

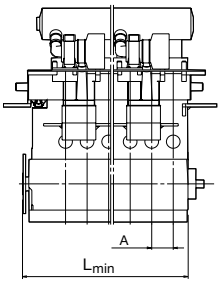
Tier II	t	395	439	491	543

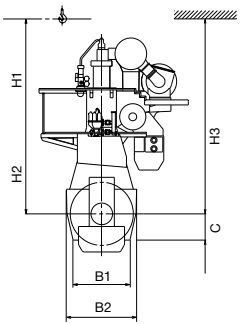
Tier III (added)

EcoEGR	t	14	14	15	16
EGR	t	14	14	15	16
HPSCR	t	3	4	5	5
LPSCR	t	-	-	-	-

Dual fuel (added)

GI	t	5	6	7	7



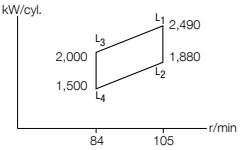


MAN B&W S60ME-C10.5

Tier II

Cyl.	L_1 kW
5	12,450
6	14,940
7	17,430
8	19,920

Stroke: 2,400 mm/L_1 **MEP:** 21.0 bar



Fuel oil

MAN B&W S60ME-C10.5

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	164.5	162.0	166.0
Part-load EGB	161.5	160.5	167.5
Low-load EGB	159.5	161.5	167.5

GI (Methane)

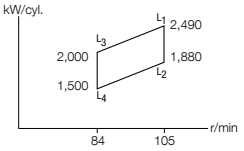
MAN B&W S60ME-C10.5-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	133.7+3.9/164.5	132.5+3.0/164.5	138.8+2.5/171.0

Note: Also available for GIE and LGIP, see page 12

Cyl.	L_1 kW
5	12,450
6	14,940
7	17,430
8	19,920

Stroke: 2,400 mm/**L_1 MEP:** 21.0 bar



Fuel oil

MAN B&W S60ME-C10.5-EcoEGR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	157.5	157.0	164.0
Tier III mode	166.5	164.0	168.0

MAN B&W S60ME-C10.5-EGRBP

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	159.5	161.5	168.0
Tier III mode	167.5	166.0	171.0

MAN B&W S60ME-C10.5-HPSCR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	159.5	161.5	167.5
Tier III mode	161.0	162.5	168.0

MAN B&W S60ME-C10.5-LPSCR

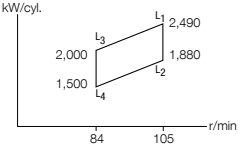
L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	159.5	161.5	167.5
Tier III mode	160.5	162.5	168.5

MAN B&W S60ME-C10.5

Tier III

Cyl.	L_1 kW
5	12,450
6	14,940
7	17,430
8	19,920

Stroke: 2,400 mm/**L_1 MEP:** 21.0 bar



GI (Methane)

MAN B&W S60ME-C10.5-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	131.1+4.0/157.5	131.5+3.1/159.5	137.9+2.5/169.0
Tier III mode	138.8+4.0/166.5	137.4+3.1/166.5	141.3+2.5/173.0

MAN B&W S60ME-C10.5-GI-EGRBP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	132.7+4.1/159.5	135.4+3.1/164.0	141.3+2.6/173.0
Tier III mode	139.6+4.1/167.5	139.2+3.1/168.5	143.8+2.6/176.0

MAN B&W S60ME-C10.5-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	132.8+4.0/159.5	135.4+3.1/164.0	140.9+2.5/172.5
Tier III mode	134.1+4.0/161.0	136.3+3.1/165.0	141.3+2.5/173.0

MAN B&W S60ME-C10.5-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	132.8+4.0/159.5	135.4+3.1/164.0	140.9+2.5/172.5
Tier III mode	133.6+4.0/160.5	136.3+3.1/165.0	141.7+2.5/173.5

Note: Also available for GIE and LGIP, except GIE and EGR, see pages 12-14.

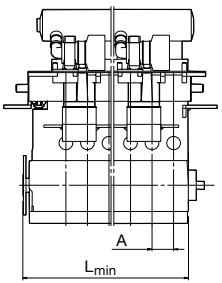
Specifications

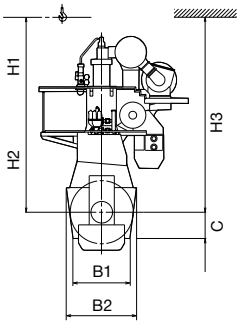
Dimensions:		A	B1	B2	C	H1	H2	H3
mm		940	3,420	3,550	1,300	10,500	9,725	10,125

Cylinders:		5	6	7	8
L_{min}	mm	6,502	7,442	8,382	9,322

Dry mass

Tier II	**t**	293	332	369	425
Tier III (added)					
EcoEGR	**t**	14	14	15	16
EGR	**t**	14	14	15	16
HPSCR	**t**	3	4	5	5
LPSCR	**t**	-	-	-	-
Dual fuel (added)					
GI	**t**	5	5	6	7



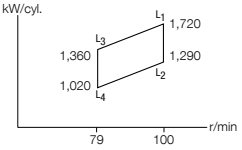


MAN B&W G50ME-C9.6

Tier II

Cyl.	L_1 kW
5	8,600
6	10,320
7	12,040
8	13,760
9	15,480

Stroke: 2,500 mm/**L_1 MEP:** 21.0 bar



Fuel oil

MAN B&W G50ME-C9.6

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	163.5	162.5	167.0
Part-load EGB	161.5	161.0	169.5
Low-load EGB	159.5	162.0	169.5

GI (Methane)

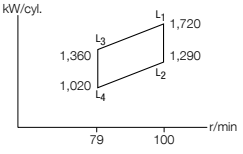
MAN B&W G50ME-C9.6-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	50%	75%	100%
High-load	132.8+4.0/163.5	132.9+3.0/165.0	139.6+2.5/172.0

Note: Also available for GIE, LGIM and LGIP, see page 12

Cyl.	L_1 kW
5	8,600
6	10,320
7	12,040
8	13,760
9	15,480

Stroke: 2,500 mm/**L_1 MEP:** 21.0 bar



Fuel oil

MAN B&W G50ME-C9.6-EcoEGR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	156.5	157.5	165.0
Tier III mode	165.5	164.5	169.0

MAN B&W G50ME-C9.6-EGRBP

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	159.5	162.0	170.0
Tier III mode	166.5	166.5	172.0

MAN B&W G50ME-C9.6-HPSCR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	159.5	162.0	169.5
Tier III mode	161.0	163.0	170.0

MAN B&W G50ME-C9.6-LPSCR

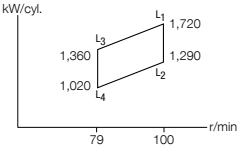
L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	159.5	162.0	169.5
Tier III mode	160.5	163.0	170.5

MAN B&W G50ME-C9.6

Tier III

Cyl.	L_1 kW
5	8,600
6	10,320
7	12,040
8	13,760
9	15,480

Stroke: 2,500 mm/**L_1 MEP:** 21.0 bar



GI (Methane)

MAN B&W G50ME-C9.6-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	130.2+4.0/156.5	131.9+3.1/160.0	138.7+2.5/170.0
Tier III mode	137.9+4.0/165.5	137.9+3.1/167.0	142.2+2.5/174.0

MAN B&W G50ME-C9.6-GI-EGRBP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	132.7+4.1/159.5	135.8+3.1/164.5	143.0+2.6/175.0
Tier III mode	138.7+4.1/166.5	139.6+3.1/169.0	144.7+2.6/177.0

MAN B&W G50ME-C9.6-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	132.7+4.1/159.5	135.8+3.1/164.5	142.6+2.6/174.5
Tier III mode	134.0+4.1/161.0	136.7+3.1/165.5	143.0+2.6/175.0

MAN B&W G50ME-C9.6-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	132.7+4.1/159.5	135.8+3.1/164.5	142.6+2.6/174.5
Tier III mode	133.6+4.1/160.5	136.7+3.1/165.5	143.4+2.6/175.5

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 12-14.

MAN B&W G50ME-C9.6

Specifications

Dimensions:		A	B1	B2	C	H1	H2	H3
mm		872	3,776	3,652	1,205	10,775	10,075	9,775

Cylinders:		5	6	7	8	9
L_{min}	mm	6,260	7,132	8,004	8,876	9,748

Dry mass

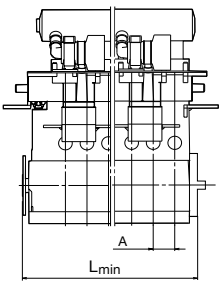
Tier II	t	210	245	275	310	345

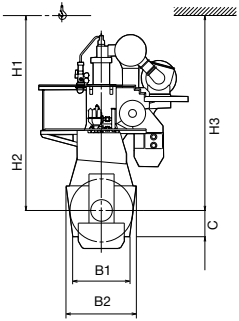
Tier III (added)

EcoEGR	t	12	12	13	13	13
EGR	t	12	12	13	13	13
HPSCR	t	4	4	5	6	6
LPSCR	t	-	-	-	-	-

Dual fuel (added)

GI	t	4	4	5	5	6



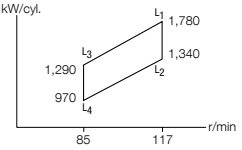


MAN B&W S50ME-C9.7

Tier II

Cyl.	L_1 kW
5	8,900
6	10,680
7	12,460
8	14,240
9	16,020

Stroke: 2,214 mm/**L_1 MEP:** 21.0 bar



Fuel oil

MAN B&W S50ME-C9.7

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	161.5	160.5	165.0
Part-load EGB	159.5	159.0	167.5
Low-load EGB	157.5	160.0	167.5

GI (Methane)

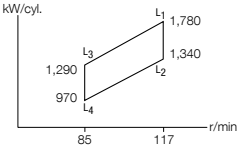
MAN B&W S50ME-C9.7-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	131.2+3.9/161.5	131.2+3.0/163.0	138.0+2.5/170.0

Note: Also available for GIE, LGIM and LGIP, see page 12

Cyl.	L_1 kW
5	8,900
6	10,680
7	12,460
8	14,240
9	16,020

Stroke: 2,214 mm/**L1 MEP:** 21.0 bar



Fuel oil

MAN B&W S50ME-C9.7-EcoEGR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	154.5	155.5	163.0
Tier III mode	163.5	162.5	167.0

MAN B&W S50ME-C9.7-EGRBP

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	157.5	160.0	168.0
Tier III mode	164.5	164.5	170.0

MAN B&W S50ME-C9.7-HPSCR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	157.5	160.0	167.5
Tier III mode	159.0	161.0	168.0

MAN B&W S50ME-C9.7-LPSCR

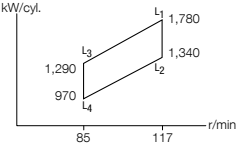
L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	157.5	160.0	167.5
Tier III mode	158.5	161.0	168.5

MAN B&W S50ME-C9.7

Tier III

Cyl.	L_1 kW
5	8,900
6	10,680
7	12,460
8	14,240
9	16,020

Stroke: 2,214 mm/**L_1 MEP:** 21.0 bar



GI (Methane)

MAN B&W S50ME-C9.7-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	128.5+4.0/154.5	130.2+3.0/158.0	137.1+2.5/168.0
Tier III mode	136.2+4.0/163.5	136.2+3.0/165.0	140.5+2.5/172.0

MAN B&W S50ME-C9.7-GI-EGRBP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.0+4.0/157.5	134.1+3.1/162.5	141.3+2.6/173.0
Tier III mode	137.0+4.0/164.5	137.9+3.1/167.0	143.0+2.6/175.0

MAN B&W S50ME-C9.7-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.1+4.0/157.5	134.1+3.1/162.5	140.9+2.5/172.5
Tier III mode	132.3+4.0/159.0	135.0+3.1/163.5	141.3+2.5/173.0

MAN B&W S50ME-C9.7-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.1+4.0/157.5	134.1+3.1/162.5	140.9+2.5/172.5
Tier III mode	131.9+4.0/158.5	135.0+3.1/163.5	141.7+2.5/173.5

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 12-14.

MAN B&W S50ME-C9.7

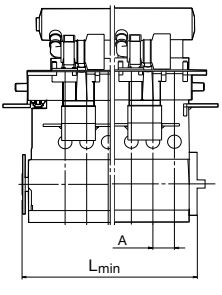
Specifications

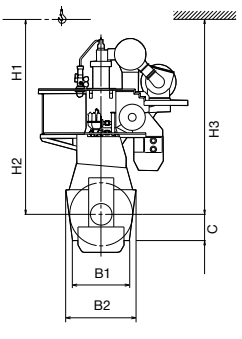
Dimensions:		A	B1	B2	C	H1	H2	H3
mm		875	3,350	3,290	1,190	9,875	9,125	8,850

Cylinders:		5	6	7	8	9
L_{min}	mm	6,073	6,948	7,823	8,698	9,573

Dry mass

Tier II	t	193	223	259	289	320
Tier III (added)						
EcoEGR	t	12	12	13	13	13
EGR	t	12	12	13	13	13
HPSCR	t	4	4	5	6	7
LPSCR	t	-	-	-	-	-
Dual fuel (added)						
GI	t	4	4	5	5	6



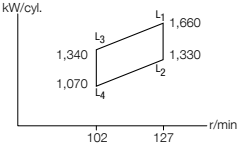


MAN B&W S50ME-C8.5

Tier II

Cyl.	L_1 kW
5	8,300
6	9,960
7	11,620
8	13,280
9	14,940

Stroke: 2,000 mm/**L_1 MEP:** 20.0 bar



Fuel oil

MAN B&W S50ME-C8.5

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	168.5	166.0	170.0
Part-load EGB	165.5	164.5	171.5
Low-load EGB	163.5	165.5	171.5

GI (Methane)

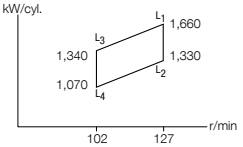
MAN B&W S50ME-C8.5-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	137.0+4.0/168.5	135.8+3.1/168.5	142.2+2.5/175.0

Note: Also available for GIE and LGIP, see page 12.

Cyl.	L_1 kW
5	8,300
6	9,960
7	11,620
8	13,280
9	14,940

Stroke: 2,000 mm/**L1 MEP:** 20.0 bar



Fuel oil

MAN B&W S50ME-C8.5-EcoEGR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	161.5	161.0	168.0
Tier III mode	170.5	168.0	172.0

MAN B&W S50ME-C8.5-EGRBP

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	163.5	165.5	172.0
Tier III mode	171.5	170.0	175.0

MAN B&W S50ME-C8.5-HPSCR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	163.5	165.5	171.5
Tier III mode	165.0	166.5	172.0

MAN B&W S50ME-C8.5-LPSCR

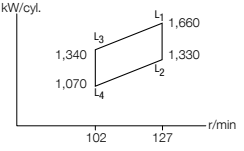
L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	163.5	165.5	171.5
Tier III mode	164.5	166.5	172.5

MAN B&W S50ME-C8.5

Tier III

Cyl.	L_1 kW
5	8,300
6	9,960
7	11,620
8	13,280
9	14,940

Stroke: 2,000 mm/**L_1 MEP:** 20.0 bar



GI (Methane)

MAN B&W S50ME-C8.5-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	134.4+4.1/161.5	134.8+3.1/163.5	141.3+2.6/173.0
Tier III mode	142.1+4.1/170.5	140.8+3.1/170.5	144.7+2.6/177.0

MAN B&W S50ME-C8.5-GI-EGRBP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	136.1+4.2/163.5	138.7+3.2/168.0	144.6+2.6/177.0
Tier III mode	142.9+4.2/171.5	142.6+3.2/172.5	147.2+2.6/180.0

MAN B&W S50ME-C8.5-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	136.1+4.1/163.5	138.8+3.1/168.0	144.3+2.6/176.5
Tier III mode	137.4+4.1/165.0	139.6+3.1/169.0	144.7+2.6/177.0

MAN B&W S50ME-C8.5-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	136.1+4.1/163.5	138.8+3.1/168.0	144.3+2.6/176.5
Tier III mode	137.0+4.1/164.5	139.6+3.1/169.0	145.1+2.6/177.5

Note: Also available for GIE and LGIP, except GIE and EGR, see pages 12-14.

MAN B&W S50ME-C8.5

Specifications

Dimensions:		A	B	C	H1	H2	H3
mm		850	3,150	1,085	9,050	8,500	8,250

Cylinders:		5	6	7	8	9
L_{min}	mm	5,924	6,774	7,624	8,474	9,324

Dry mass

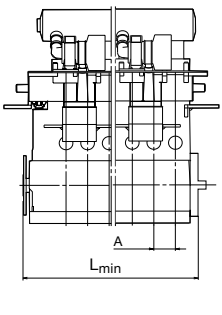
Tier II	t	180	210	240	270	295

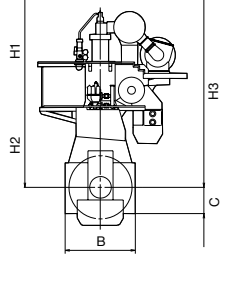
Tier III (added)

EcoEGR	t	12	12	13	13	13
EGR	t	12	12	13	13	13
HPSCR	t	3	4	5	5	6
LPSCR	t	-	-	-	-	-

Dual fuel (added)

GI	t	4	4	5	5	6



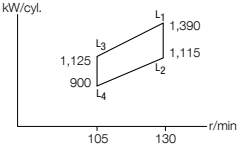


MAN B&W S46ME-C8.6

Tier II

Cyl.	L_1 kW
5	6,950
6	8,340
7	9,730
8	11,120

Stroke: 1,932 mm/**L_1 MEP:** 20.0 bar



Fuel oil

MAN B&W S46ME-C8.6

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	165.5	163.0	167.0
Part-load EGB	162.5	161.5	168.5
Low-load EGB	160.5	162.5	168.5

GI (Methane)

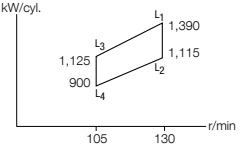
MAN B&W S46ME-C8.6-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	134.5+4.0/165.5	133.3+3.0/165.5	139.6+2.5/172.0

Note: Also available for GIE.

Cyl.	L_1 kW
5	6,950
6	8,340
7	9,730
8	11,120

Stroke: 1,932 mm/**L_1 MEP:** 20.0 bar



Fuel oil

MAN B&W S46ME-C8.6-EcoEGR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	158.5	158.0	165.0
Tier III mode	167.5	165.0	169.0

MAN B&W S46ME-C8.6-EGRBP

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	160.5	162.5	169.0
Tier III mode	168.5	167.0	172.0

MAN B&W S46ME-C8.6-HPSCR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	160.5	162.5	168.5
Tier III mode	162.0	163.5	169.0

MAN B&W S46ME-C8.6-LPSCR

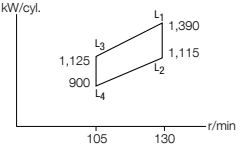
L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	160.5	162.5	168.5
Tier III mode	161.5	163.5	169.5

MAN B&W S46ME-C8.6

Tier II Tier III

Cyl.	L_1 kW
5	6,950
6	8,340
7	9,730
8	11,120

Stroke: 1,932 mm/**L_1 MEP:** 20.0 bar



GI (Methane)

MAN B&W S46ME-C8.6-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.9+4.0/158.5	132.4+3.1/160.5	138.7+2.5/170.0
Tier III mode	139.6+4.0/167.5	138.4+3.1/167.5	142.2+2.5/174.0

MAN B&W S46ME-C8.6-GI-EGRBP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	133.6+4.1/160.5	136.2+3.1/165.0	142.1+2.6/174.0
Tier III mode	140.4+4.1/168.5	140.1+3.1/169.5	144.7+2.6/177.0

MAN B&W S46ME-C8.6-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	133.6+4.1/160.5	136.2+3.1/165.0	141.7+2.5/173.5
Tier III mode	134.9+4.1/162.0	137.1+3.1/166.0	142.2+2.5/174.0

MAN B&W S46ME-C8.6-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	133.6+4.0/160.5	136.2+3.1/165.0	141.7+2.5/173.5
Tier III mode	134.5+4.0/161.5	137.1+3.1/166.0	142.6+2.5/174.5

Note: Also available for GIE, except GIE and EGR, see pages 12-14.

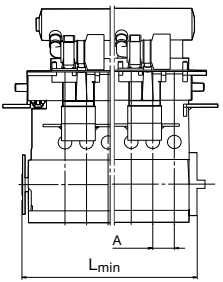
MAN B&W S46ME-C8.6

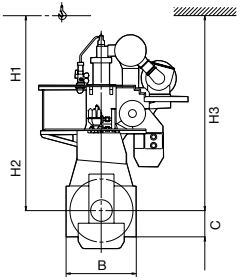
Specifications

Dimensions:		A	B	C	H1	H2	H3
mm		782	2,924	986	9,000	8,175	7,900

Cylinders:		5	6	7	8
L_{min}	mm	5,528	6,310	7,092	7,874

Dry mass					
Tier II	t	150	168	191	211
Tier III (added)					
EcoEGR	t	12	12	12	12
EGR	t	12	12	12	12
HPSCR	t	3	3	4	5
LPSCR	t	-	-	-	-
Dual fuel (added)					
GI	t	-	-	-	-



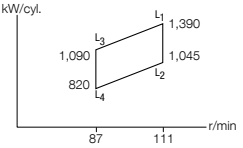


MAN B&W G45ME-C9.5

Tier II

Cyl.	L_1 kW
5	6,950
6	8,340
7	9,730
8	11,120

Stroke: 2,250 mm/**L_1 MEP:** 21.0 bar



Fuel oil

MAN B&W G45ME-C9.5

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	168.5	166.0	170.0
Part-load EGB	165.5	164.5	171.5
Low-load EGB	163.5	165.5	171.5

GI (Methane)

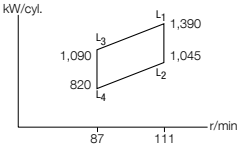
MAN B&W G45ME-C9.5-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	137.0+4.0/168.5	135.8+3.1/168.5	142.2+2.5/175.0

Note: Also available for GIE.

Cyl.	L_1 kW
5	6,950
6	8,340
7	9,730
8	11,120

Stroke: 2,250 mm/**L1 MEP:** 21.0 bar



Fuel oil

MAN B&W G45ME-C9.5-EcoEGR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	161.5	161.0	168.0
Tier III mode	170.5	168.0	172.0

MAN B&W G45ME-C9.5-EGRBP

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	163.5	165.5	172.0
Tier III mode	171.5	170.0	175.0

MAN B&W G45ME-C9.5-HPSCR

L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	163.5	165.5	171.5
Tier III mode	165.0	166.5	172.0

MAN B&W G45ME-C9.5-LPSCR

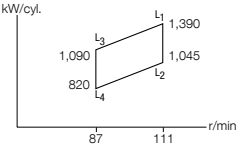
L_1 SFOC [g/kWh]			
	50%	75%	100%
Tier II mode	163.5	165.5	171.5
Tier III mode	164.5	166.5	172.5

MAN B&W G45ME-C9.5

Tier III

Cyl.	L_1 kW
5	6,950
6	8,340
7	9,730
8	11,120

Stroke: 2,250 mm/**L_1 MEP:** 21.0 bar



GI (Methane)

MAN B&W G45ME-C9.5-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	134.4+4.1/161.5	134.8+3.1/163.5	141.3+2.6/173.0
Tier III mode	142.1+4.1/170.5	140.8+3.1/170.5	144.7+2.6/177.0

MAN B&W G45ME-C9.5-GI-EGRBP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	136.1+4.2/163.5	138.7+3.2/168.0	144.6+2.6/177.0
Tier III mode	142.9+4.2/171.5	142.6+3.2/172.5	147.2+2.6/180.0

MAN B&W G45ME-C9.5-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	136.1+4.1/163.5	138.8+3.1/168.0	144.3+2.6/176.5
Tier III mode	137.4+4.1/165.0	139.6+3.1/169.0	144.7+2.6/177.0

MAN B&W G45ME-C9.5-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	136.1+4.1/163.5	138.8+3.1/168.0	144.3+2.6/176.5
Tier III mode	137.0+4.1/164.5	139.6+3.1/169.0	145.1+2.6/177.5

Note: Also available for GIE, except GIE and EGR, see pages 12-14.

MAN B&W G45ME-C9.5

Specifications

Dimensions:	A	B1	B2	C	H1	H2	H3
mm	784	3,350	3,260	1,169	9,725	9,525	9,250

Cylinders:		5	6	7	8
L_{min}	mm	5,638	6,464	7,290	8,116

Dry mass

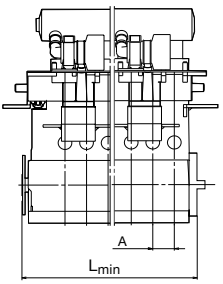
Tier II	t	163	183	206	234

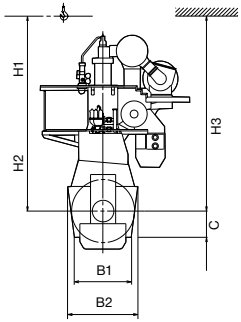
Tier III (added)

EcoEGR	t	12	12	12	12
EGR	t	12	12	12	12
HPSCR	t	3	3	4	5
LPSCR	t	-	-	-	-

Dual fuel (added)

GI	t	4	4	5	5



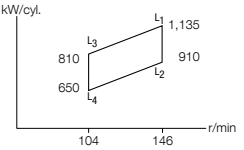


MAN B&W S40ME-C9.5

Tier II

Cyl.	L_1 kW
5	5,675
6	6,810
7	7,945
8	9,080
9	10,215

Stroke: 1,770 mm/L_1 **MEP:** 21.0 bar



Fuel oil

MAN B&W S40ME-C9.5

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	170.5	168.0	172.0
Part-load EGB	167.5	166.5	173.5
Low-load EGB	165.5	167.5	173.5

GI (Methane)

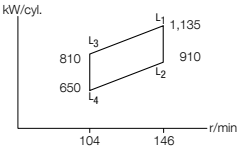
MAN B&W S40ME-C9.5-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	138.7+4.1/170.5	137.5+3.1/170.5	143.8+2.6/177.0

Note: Also available for GIE.

Cyl.	L_1 kW
5	5,675
6	6,810
7	7,945
8	9,080
9	10,215

Stroke: 1,770 mm/**L_1 MEP:** 21.0 bar



Fuel oil

MAN B&W S40ME-C9.5-EcoEGR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	163.5	163.0	170.0
Tier III mode	172.5	170.0	174.0

MAN B&W S40ME-C9.5-EGRBP

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	165.5	167.5	174.0
Tier III mode	173.5	172.0	177.0

MAN B&W S40ME-C9.5-HPSCR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	165.5	167.5	173.5
Tier III mode	167.0	168.5	174.0

MAN B&W S40ME-C9.5-LPSCR

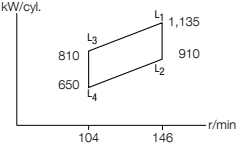
L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	165.5	167.5	173.5
Tier III mode	166.5	168.5	174.5

MAN B&W S40ME-C9.5

Tier III

Cyl.	L_1 kW
5	5,675
6	6,810
7	7,945
8	9,080
9	10,215

Stroke: 1,770 mm/**L_1 MEP:** 21.0 bar



GI (Methane)

MAN B&W S40ME-C9.5-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	136.1+4.1/163.5	136.5+3.2/165.5	143.0+2.6/175.0
Tier III mode	143.8+4.1/172.5	142.5+3.2/172.5	146.4+2.6/179.0

MAN B&W S40ME-C9.5-GI-EGRBP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	137.7+4.2/165.5	140.4+3.2/170.0	146.3+2.7/179.0
Tier III mode	144.6+4.2/173.5	144.2+3.2/174.5	148.9+2.7/182.0

MAN B&W S40ME-C9.5-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	137.8+4.2/165.5	140.4+3.2/170.0	145.9+2.6/178.5
Tier III mode	139.1+4.2/167.0	141.3+3.2/171.0	146.4+2.6/179.0

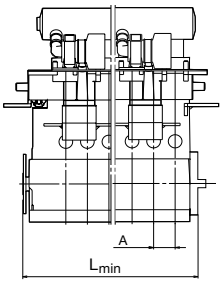
MAN B&W S40ME-C9.5-GI-LPSCR

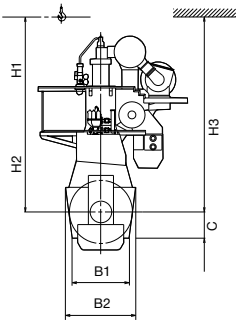
L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	137.8+4.2/165.5	140.4+3.2/170.0	145.9+2.6/178.5
Tier III mode	138.6+4.2/166.5	141.3+3.2/171.0	146.8+2.6/179.5

Note: Also available for GIE, except GIE and EGR, see pages 12-14.

Specifications

Dimensions:		A	B1	B2	C	H1	H2	H3
mm		700	2,650	2,610	950	7,800	7,475	7,200
Cylinders:		**5**	**6**	**7**	**8**	**9**		
L_{min}	mm	5,000	5,700	6,400	7,100	7,800		
Dry mass								
Tier II	t	107	126	142	157	189		
Tier III (added)								
EcoEGR	t	10	10	10	10	10		
EGR	t	10	10	10	10	10		
HPSCR	t	2	3	3	4	4		
LPSCR	t	-	-	-	-	-		
Dual fuel (added)								
GI	t	3	3	4	4	5		



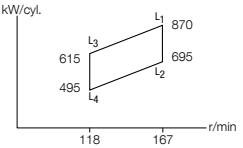


MAN B&W S35ME-B9.7

Tier II | Tier III

Cyl.	L_1 kW
5	4,350
6	5,220
7	6,090
8	6,960

Stroke: 1,550 mm/**L_1 MEP:** 21.0 bar



Fuel oil

MAN B&W S35ME-B9.7

L_1 SFOC [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	169.5	167.0	170.0

MAN B&W S35ME-B9.7-HPSCR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	170.5	168.0	171.0
Tier III mode	172.0	169.0	171.5

MAN B&W S35ME-B9.7-LPSCR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	170.5	168.0	171.0
Tier III mode	171.0	168.5	171.5

Note: If EGR is the preferred Tier III technology, MAN Energy Solutions must be contacted.

MAN B&W S35ME-B9.7

Specifications

Dimensions:	A	B1	B2	C	H1	H2	H3
mm	612	2,300	2,288	830	6,925	6,625	6,275

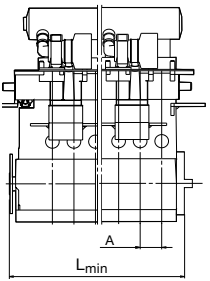
Cylinders:		5	6	7	8
L_{min}	mm	4,430	4,990	5,602	6,214

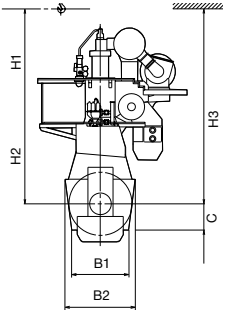
Dry mass

Tier II	t	81	90	99	111

Tier III (added)

HPSCR	t	2	2	3	3
LPSCR	t	-	-	-	-



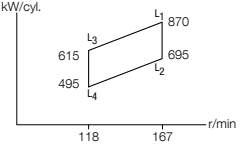


MAN B&W S35ME-C9.7-GI

Tier II

Cyl.	L_1 kW
5	4,350
6	5,220
7	6,090
8	6,960

Stroke: 1,550 mm/L_1 **MEP:** 21.0 bar



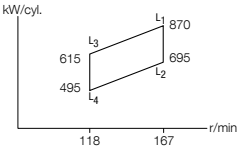
GI (Methane)

MAN B&W S35ME-C9.7-GI

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	132.8+8.0/167.5	132.4+6.1/167.5	139.2+5.0/174.0

Cyl.	L_1 kW
5	4,350
6	5,220
7	6,090
8	6,960

Stroke: 1,550 mm/**L_1 MEP:** 21.0 bar



GI (Methane)

MAN B&W S35ME-C9.7-GI-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	130.1+8.1/160.5	131.4+6.2/162.5	138.2+5.1/172.0
Tier III mode	137.8+8.1/169.5	137.4+6.2/169.5	141.7+5.1/176.0

MAN B&W S35ME-C9.7-GI-EGRBP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.7+8.3/162.5	135.2+6.3/167.0	141.6+5.2/176.0
Tier III mode	138.5+8.3/170.5	139.0+6.3/171.5	144.1+5.2/179.0

MAN B&W S35ME-C9.7-GI-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.8+8.2/162.5	135.3+6.2/167.0	141.2+5.1/175.5
Tier III mode	133.1+8.2/164.0	136.1+6.2/168.0	141.7+5.1/176.0

MAN B&W S35ME-C9.7-GI-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	131.8+8.2/162.5	135.3+6.2/167.0	141.2+5.2/175.5
Tier III mode	132.7+8.2/163.5	136.1+6.2/168.0	142.1+5.2/176.5

Note: Also available for GIE, except GIE and EGR, see pages 12-14.

MAN B&W S35ME-C9.7-GI

Tier II | Tier III

Specifications

Dimensions:	A	B1	B2	C	H1	H2	H3
mm	612	2,300	2,288	830	6,925	6,625	6,275

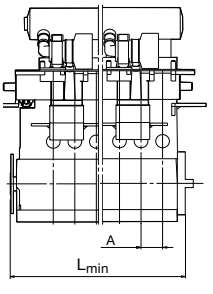
Cylinders:		5	6	7	8
L_{min}	mm	4,430	4,990	5,602	6,214

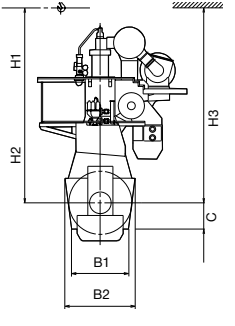
Dry mass

Tier II	t	77	87	98	108

Tier III (added)

EcoEGR	t	8	8	8	8
EGR	t	8	8	8	8
HPSCR	t	2	2	3	3
LPSCR	t	-	-	-	-





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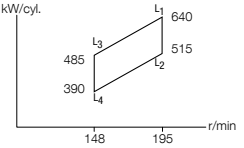
MAN

MAN B&W S30ME-B9.5

Tier II | Tier III

Cyl.	L_1 kW
5	3,200
6	3,840
7	4,480
8	5,120

Stroke: 1,328 mm/**L_1 MEP:** 21.0 bar



Tier II Fuel oil

MAN B&W S30ME-B9.5

L_1 SFOC [g/kWh]			
Opt. load range	50%	75%	100%
High-load	175.5	173.0	176.0

Tier III fuel oil

MAN B&W S30ME-B9.5-HPSCR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	175.5	173.0	176.0
Tier III mode	177.0	174.0	176.5

MAN B&W S30ME-B9.5-LPSCR

L_1 SFOC [g/kWh]			
	50%	**75%**	**100%**
Tier II mode	175.5	173.0	176.0
Tier III mode	176.0	173.5	176.5

Note: If EGR is the preferred Tier III technology, MAN Energy Solutions must be contacted.

MAN B&W S30ME-B9.5

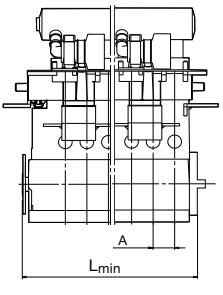
Specifications

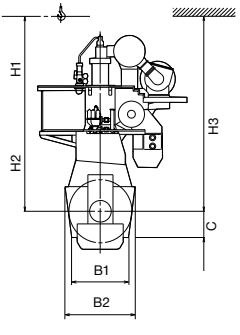
Dimensions:	A	B1	B2	C	H1	H2	H3
mm	538	1,980	2,020	712	6,025	5,950	5,625

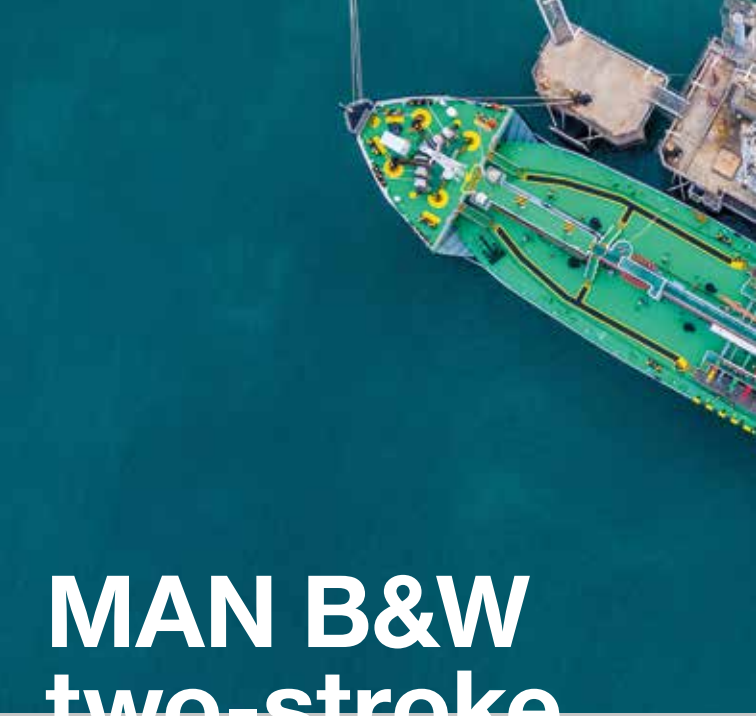
Cylinders:	5	6	7	8
L_{min} mm	4,087	4,625	5,163	5,701

Dry mass

Tier II t	61	69	77	86
Tier III (added)				
HPSCR t	1	2	2	2
LPSCR t	-	-	-	-







MAN B&W two-stroke propulsion engines

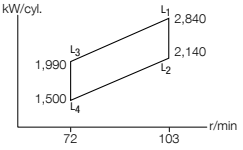
Alternative fuels
Tier II and Tier III

MAN B&W G60ME-C10.5

Tier II

Cyl.	L_1 kW
5	14,200
6	17,040
7	19,880
8	22,720

Stroke: 2,790 mm/L_1 **MEP:** 21.0 bar



GIE (Ethane)

MAN B&W G60ME-C10.5-GIE

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	144.2+4.1/161.5	146.1+3.1/163.0	150.5+2.6/170.0

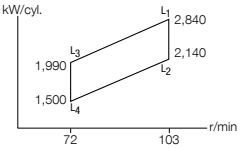
LGIP (LPG)

MAN B&W G60ME-C10.5-LGIP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	142.6+7.9/161.5	143.5+6.0/160.5	148.6+5.0/165.0
Part-load EPT	140.6+8.0/159.5	142.1+6.1/159.0	150.8+5.0/167.5
Low-load EPT	138.8+8.0/157.5	143.0+6.1/160.0	150.8+5.0/167.5

Cyl.	L_1 kW
5	14,200
6	17,040
7	19,880
8	22,720

Stroke: 2,790 mm/**L1 MEP:** 21.0 bar



GIE (Ethane)

MAN B&W G60ME-C10.5-GIE-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	140.6+4.1/157.5	145.6+3.2/162.5	152.7+2.6/172.5
Tier III mode	141.9+4.1/159.0	146.5+3.2/163.5	153.2+2.6/173.0

MAN B&W G60ME-C10.5-GIE-LPSCR

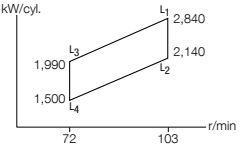
L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	140.6+4.1/157.5	145.6+3.2/162.5	152.7+2.6/172.5
Tier III mode	141.5+4.1/158.5	146.5+3.2/163.5	153.6+2.6/173.5

MAN B&W G60ME-C10.5

Tier III

Cyl.	L_1 kW
5	14,200
6	17,040
7	19,880
8	22,720

Stroke: 2,790 mm/L_1 **MEP:** 21.0 bar



LGIP (LPG)

MAN B&W G60ME-C10.5-LGIP-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	136.0+8.0/154.5	138.8+6.1/155.5	146.7+5.0/163.0
Tier III mode	144.4+8.0/163.5	145.3+6.1/162.5	150.4+5.0/167.0

MAN B&W G60ME-C10.5-LGIP-EGRBP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	138.7+8.1/157.5	142.9+6.2/160.0	151.2+5.1/168.0
Tier III mode	145.2+8.1/164.5	147.1+6.2/164.5	153.1+5.1/170.0

MAN B&W G60ME-C10.5-LGIP-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	138.7+8.1/157.5	143.0+6.1/160.0	150.8+5.0/167.5
Tier III mode	140.1+8.1/159.0	143.9+6.1/161.0	151.3+5.0/168.0

MAN B&W G60ME-C10.5-LGIP-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	138.7+8.0/157.5	143.0+6.1/160.0	150.8+5.1/167.5
Tier III mode	139.7+8.0/158.5	143.9+6.1/161.0	151.7+5.1/168.5

MAN B&W G60ME-C10.5

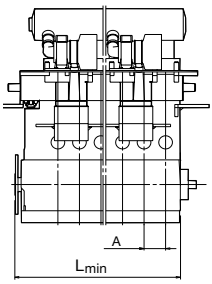
Specifications

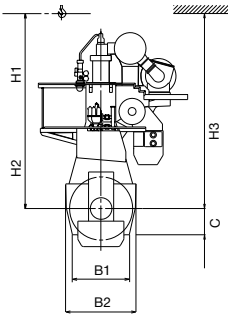
Dimensions:	A	B1	B2	C	H1	H2	H3
mm	1,080	4,090	4,220	1,500	12,175	11,400	11,075

Cylinders:		5	6	7	8
L_{min}	mm	7,390	8,470	9,550	10,630

Dry mass

Tier II	t	395	439	491	543
Tier III (added)					
EcoEGR	t	14	14	15	16
EGR	t	14	14	15	16
HPSCR	t	3	4	5	5
LPSCR	t	-	-	-	-
Dual fuel (added)					
GIE	t	5	6	7	7
LGIP	t	5	6	7	7



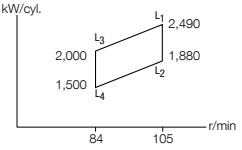


MAN B&W S60ME-C10.5

Tier II

Cyl.	L_1 kW
5	12,450
6	14,940
7	17,430
8	19,920

Stroke: 2,400 mm/L_1 **MEP:** 21.0 bar



GIE (Ethane)

MAN B&W S60ME-C10.5-GIE

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	146.9+4.1/167.5	147.4+3.1/169.5	151.4+2.6/176.0

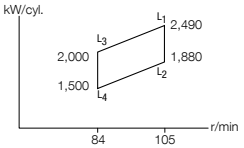
LGIP (LPG)

MAN B&W S60ME-C10.5-LGIP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	145.4+7.9/164.5	144.9+6.0/162.0	149.5+5.0/166.0
Part-load EGB	142.5+8.0/161.5	143.4+6.1/160.5	150.8+5.0/167.5
Low-load EGB	140.7+8.0/159.5	144.4+6.1/161.5	150.8+5.0/167.5

Cyl.	L_1 kW
5	12,450
6	14,940
7	17,430
8	19,920

Stroke: 2,400 mm/**L1 MEP:** 21.0 bar



GIE (Ethane)

MAN B&W S60ME-C10.5-GIE-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	142.4+4.1/162.5	147.0+3.2/169.0	152.7+2.6/177.5
Tier III mode	143.7+4.1/164.0	147.8+3.2/170.0	153.2+2.6/178.0

MAN B&W S60ME-C10.5-GIE-LPSCR

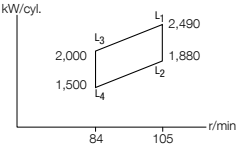
L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	142.4+4.1/162.5	147.0+3.2/169.0	152.7+2.6/177.5
Tier III mode	143.3+4.1/163.5	147.8+3.2/170.0	153.6+2.6/178.5

MAN B&W S60ME-C10.5

Tier III

Cyl.	L_1 kW
5	12,450
6	14,940
7	17,430
8	19,920

Stroke: 2,400 mm/L_1 **MEP:** 21.0 bar



LGIP (LPG)

MAN B&W S60ME-C10.5-LGIP-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	138.8+8.0/157.5	140.1+6.1/157.0	147.6+5.0/164.0
Tier III mode	147.1+8.0/166.5	146.6+6.1/164.0	151.3+5.0/168.0

MAN B&W S60ME-C10.5-LGIP-EGRBP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	140.5+8.1/159.5	144.3+6.2 /161.5	151.2+5.1/168.0
Tier III mode	147.9+8.1/167.5	148.4 (6.2) /166.0	154.0+5.1/171.0

MAN B&W S60ME-C10.5-LGIP-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	140.6+8.0/159.5	144.3+6.1/161.5	150.8+5.0/167.5
Tier III mode	142.0+8.0/161.0	145.3+6.1/162.5	151.3+5.0/168.0

MAN B&W S60ME-C9.10-LGIP-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	140.6+8.0/159.5	144.3+6.1/161.5	150.8+5.1/167.5
Tier III mode	141.5+8.0/160.5	145.3+6.1/162.5	151.7+5.1/168.5

Specifications

Dimensions:	A	B1	B2	C	H1	H2	H3
mm	940	3,440	3,520	1,300	10,500	9,725	10,125

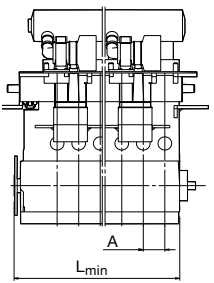
Cylinders:		5	6	7	8
L_{min}	mm	6,440	7,380	8,320	9,260

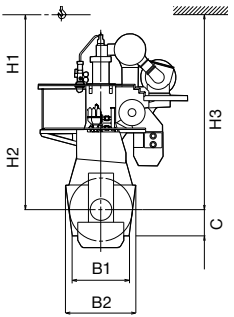
Dry mass

Tier II	t	293	332	369	425

Tier III (added)					
EcoEGR	t	14	14	15	16
EGR	t	14	14	15	16
HPSCR	t	3	4	5	5
LPSCR	t	-	-	-	-

Dual fuel (added)					
GIE	t	5	5	6	7
LGIP	t	5	5	6	7



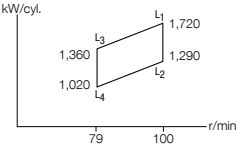


MAN B&W G50ME-C9.6

Tier II

Cyl.	L_1 kW
5	8,600
6	10,320
7	12,040
8	13,760
9	15,480

Stroke: 2,500 mm/L_1 **MEP:** 21.0 bar



GIE (Ethane)

MAN B&W G50ME-C9.6-GIE

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	146.0+4.1/166.5	147.9+3.1/170.0	152.3+2.6/177.0

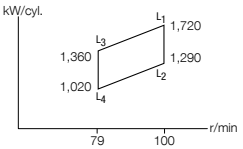
LGIM (Methanol)

MAN B&W G50ME-C9.6-LGIM

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
Opt. load range	**50%**	**75%**	**100%**
High-load	322.4+13.3/163.5	327.2+10.1/162.5	340.4+8.4/167.0
Part-load EGB	317.7+13.5/161.5	323.7+10.3/161.0	345.5+8.5/169.5
Low-load EGB	313.4+13.5/159.5	325.8+10.3/162.0	345.5+8.5/169.5

Cyl.	L_1 kW
5	8,600
6	10,320
7	12,040
8	13,760
9	15,480

Stroke: 2,500 mm**/L1 MEP:** 21.0 bar



GIE (Ethane)

MAN B&W G50ME-C9.6-GIE-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	142.3+4.2/162.5	147.4+3.2/169.5	154.5+2.6/179.5
Tier III mode	143.7+4.2/164.0	148.3+3.2/170.5	155.0+2.6/180.0

MAN B&W G50ME-C9.6-GIE-LPSCR

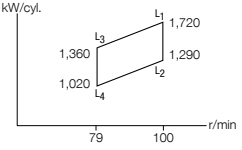
L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	142.3+4.2/162.5	147.4+3.2/169.5	154.5+2.6/179.5
Tier III mode	143.2+4.2/163.5	148.3+3.2/170.5	155.4+2.6/180.5

MAN B&W G50ME-C9.6

Tier III

Cyl.	L_1 kW
5	8,600
6	10,320
7	12,040
8	13,760
9	15,480

Stroke: 2,500 mm/L_1 **MEP:** 21.0 bar



LGIM (Methanol)

MAN B&W G50ME-C9.6-LGIM-EcoEGR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	307.0+13.4/156.5	316.0+10.2/157.5	335.9+8.5/165.0
Tier III mode	326.3+13.4/165.5	331.0+10.2/164.5	344.5+8.5/169.0

MAN B&W G50ME-C9.6-LGIM-EGRBP

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	312.9+13.7/159.5	325.5+10.4/162.0	346.3+8.6/170.0
Tier III mode	328.0+13.7/166.5	335.2+10.4/166.5	350.6+8.6/172.0

MAN B&W G50ME-C9.6-LGIM-HPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	313.1+13.6/159.5	325.7+10.3/162.0	345.5+8.5/169.5
Tier III mode	316.3+13.6/161.0	327.8+10.3/163.0	346.5+8.5/170.0

MAN B&W G50ME-C9.6-LGIM-LPSCR

L_1 dual fuel mode (SGC+SPOC)/fuel oil mode (SFOC) [g/kWh]			
	50%	75%	100%
Tier II mode	313.2+13.5/159.5	325.7+10.3/162.0	345.4+8.5/169.5
Tier III mode	315.3+13.5/160.5	327.8+10.3/163.0	347.6+8.5/170.5

MAN B&W G50ME-C9.6

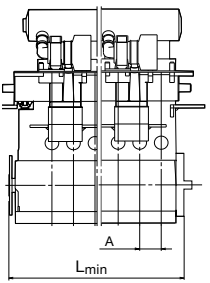
Specifications

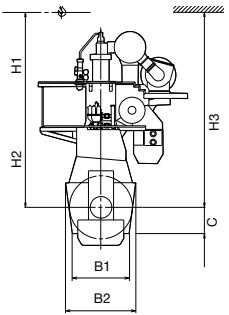
Dimensions:		A	B1	B2	C	H1	H2	H3
mm		872	3,776	3,652	1,205	10,775	10,075	9,775

Cylinders:		5	6	7	8	9
L_{min}	mm	6,260	7,132	8,004	8,876	9,748

Dry mass

Tier II	t	210	245	275	310	345
Tier III (added)						
EcoEGR	t	12	12	13	13	13
EGR	t	12	12	13	13	13
HPSCR	t	4	4	5	6	6
LPSCR	t	-	-	-	-	-
Dual fuel (added)						
GIE	t	5	5	6	6	7
LGIM	t	7	7	8	9	10





MAN B&W two-stroke propulsion systems

MAN Alpha

Propeller Programme – FPP and CPP

The MAN Alpha FPP portfolio covers:

- power range of 4-40 MW per shaft
- blade configurations for 3, 4, 5 and 6-bladed propellers
- propellers with integrated shaft line and stern tube solutions
- wide range of stern tube lube and sealing systems
  - oil, water, biodegradable oils.

6.9-metre MAN Alpha Kappel propeller for a 105,000 dwt crude oil carrier ▸

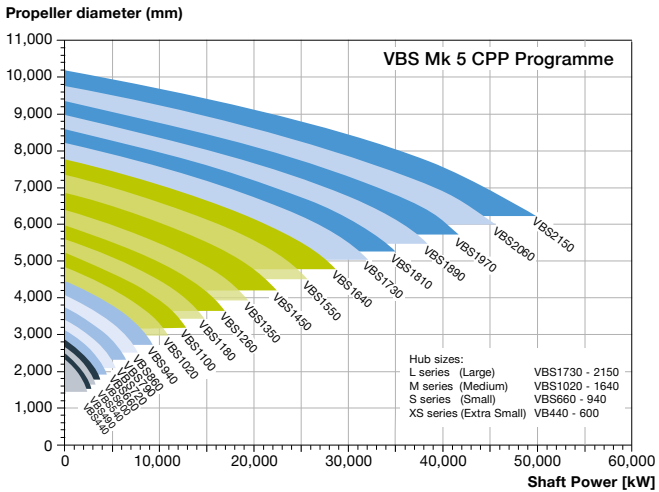
The MAN Alpha FPPs are characterised by the following benefits:

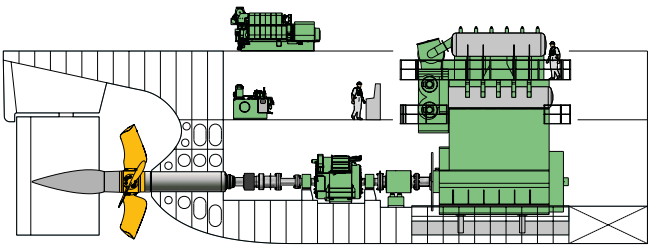
- High-efficient, hydrodynamically optimised blade profiles
  - Kappel designs available
- High reliability: robust approach with ample mechanical design margins
- High-efficient aft-ship integration with rudder, rudder bulb, ducts, etc.
- Layouts for complete two-stroke propulsion systems, e.g. with PTO solutions
- Plant calculations with upfront consideration to torsional vibration calculation (TVC), alignment and control systems.

MAN Alpha controllable pitch propeller

- Standard Mk 5 versions are 4-bladed – 3 and 5-bladed propellers are available upon request
- The figures stated after the VBS indicate the propeller hub diameter
- Standard blade/hub materials are Ni-Al-bronze; stainless steel is optional
- Propellers are available up to the highest ice classes; however the standard programme is based on ‘no ice’.

Standard programme





Two-stroke propulsion system installation – complete powertrain with propeller and aft ship equipment

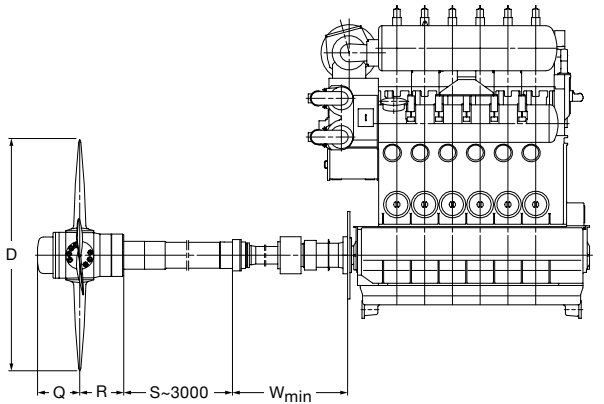
MAN B&W standard package examples

Cyl.	kW	Prop. speed r/min	D [1] mm	Hub VBS mm	Q mm	R mm	Wmin mm	Prop. mass t [2]
G70ME-C9.5/-GI								
5	18,200	83	8,100	1,890	1,436	1,496	3,700	90.0
6	21,840	83	8,450	2,060	1,565	1,593	3,700	93.5
7	25,480	83	8,750	2,150	1,634	1,645	3,700	102.0
8	29,120	83						[3]
S65ME-C8.5/-GI								
5	14,350	95	7,150	1,730	1,315	1,339	3,400	66.1
6	17,220	95	7,450	1,810	1,375	1,385	3,400	73.0
7	20,090	95	7,700	1,890	1,436	1,466	3,400	81.2
8	22,960	95	7,900	1,970	1,497	1,512	3,400	89.3

[1] For optimal Kappel blades, the propeller diameter is reduced by an average of 3-10% compared to the listed standard diameters

[2] The masses are stated for 4,000 mm stern tube and 8,000 mm propeller shaft

[3] Available on request



MAN B&W standard package examples

Cyl.	kW	Prop. speed r/min	D [1] mm	Hub VBS mm	Q mm	R mm	Wmin mm	Prop. mass t [2]
G60ME-C9.5/-GI								
5	13,400	97	6,950	1,640	1,246	1,287	3,300	60.0
6	16,080	97	7,250	1,730	1,315	1,339	3,300	64.2
7	18,760	97	7,450	1,810	1,375	1,420	3,300	70.3
8	21,440	97	7,700	1,890	1,436	1,496	3,100	74.6
G50ME-C9.6/-GI								
5	8,600	100	6,150	1,450	1,102	1,174	3,100	42.7
6	10,320	100	6,450	1,550	1,178	1,231	3,100	45.1
7	12,040	100	6,650	1,550	1,178	1,231	3,100	48.1
8	13,760	100	6,850	1,640	1,246	1,287	2,900	50.9
9	15,480	100	7,050	1,730	1,315	1,339	3,100	58.1
S50ME-C9.7/-GI								
5	8,900	117	5,650	1,350	1,037	1,096		
6	10,680	117	5,850	1,450	1,114	1,148		
7	12,460	117	6,050	1,450	1,114	1,148		
8	14,240	117	6,200	1,550	1,175	1,256		
9	16,020	117	6,350	1,640	1,260	1,288		
S50ME-C8.5/-GI [3]								
5	8,300	127	5,400	1,350	1,030	1,082	2,690	31.7
6	9,960	127	5,600	1,350	1,100	1,145	2,690	35.4
7	11,620	127	5,800	1,450	1,175	1,233	2,690	39.9
8	13,280	127	5,950	1,450	1,175	1,248	2,690	42.0

[1] For optimal Kappel blades, the propeller diameter is reduced by an average of 3-10% compared to the listed standard diameters

[2] The masses are stated for 4,000 mm stern tube and 8,000 mm propeller shaft

[3] Data for 9 cylinder is available on request

MAN B&W standard package examples

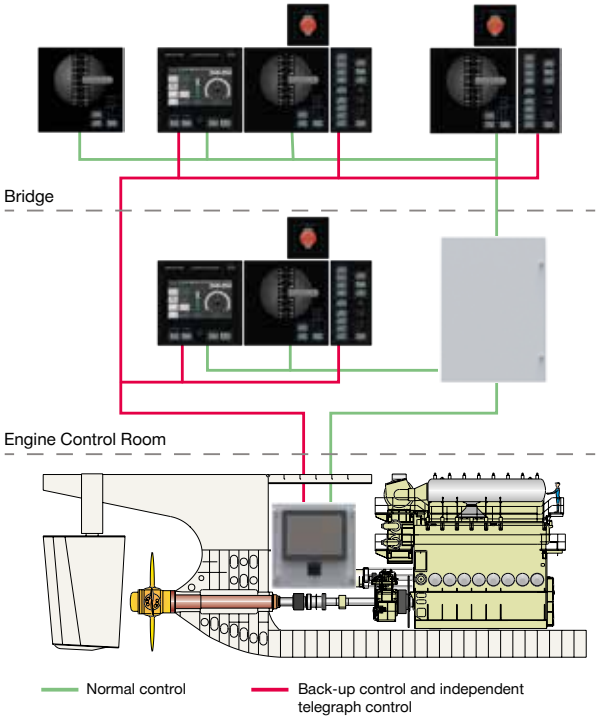
Cyl.	kW	Prop. speed r/min	D [1] mm	Hub VBS mm	Q mm	R mm	Wmin mm	Prop. mass t [2]
G45ME-C9.5/-GI								
5	6,950	111	5,650	1,350	1,026	1,109	2,700	28.8
6	8,340	111	5,900	1,350	1,026	1,109	2,700	30.6
7	9,730	111	6,100	1,450	1,102	1,197	2,700	35.1
8	11,120	111	6,250	1,550	1,178	1,236	2,700	37.6
S40ME-C9.5/-GI								
5	5,675	146	4,650	1,100	885	972	2,500	22.1
6	6,810	146	4,800	1,180	957	1,025	2,500	24.6
7	7,945	146	4,950	1,180	957	1,025	2,500	26.0
8	9,080	146	5,050	1,260	975	1,081	2,500	29.8
9	10,215	146	5,550	1,350	1,026	1,140	2,700	34.4
S35ME-B9.7/-GI								
5	4,350	167	4,050	940	821	920	2,500	16.3
6	5,220	167	4,200	1,020	821	920	2,500	16.9
7	6,090	167	4,350	1,100	885	946	2,500	19.4
8	6,960	167	4,450	1,100	885	946	2,500	20.4
S30ME-B9.5/-GI								
5	3,200	195	3,500	860	653	750	2,350	10.5
6	3,840	195	3,600	860	653	750	2,350	11.0
7	4,480	195	3,700	940	714	886	2,350	12.3
8	5,120	195	3,800	940	714	886	2,350	13.0

[1] For optimal Kappel blades, the propeller diameter is reduced by an average of 3-10% compared to the listed standard diameters

[2] The masses are stated for 3,000 mm stern tube and 8,000 mm propeller shaft

Alphatronic 3000 Propulsion control system

A high number of various FPP and CPP propulsion package applications are controlled by the Alphatronic 3000 system – customised for combinations of MAN low and medium speed engines in a wide range of diesel-mechanical, hybrid or diesel-electric propulsion setups.



Simple system architecture for a straightforward two-stroke CPP propulsion plant

MAN four-stroke propulsion engines

MAN four-stroke propulsion engines – all emission requirements

Besides focus on power density and fuel economy, MAN Energy Solutions is committed to a steady reduction of the environmental impact of our engines.

IMO Tier II

Applying well-proven methods to achieve a cleaner and more efficient combustion process, MAN Energy Solutions has significantly decreased NO_X emissions. Our four-stroke propulsion engines are IMO Tier II compliant with internal engine measures alone.

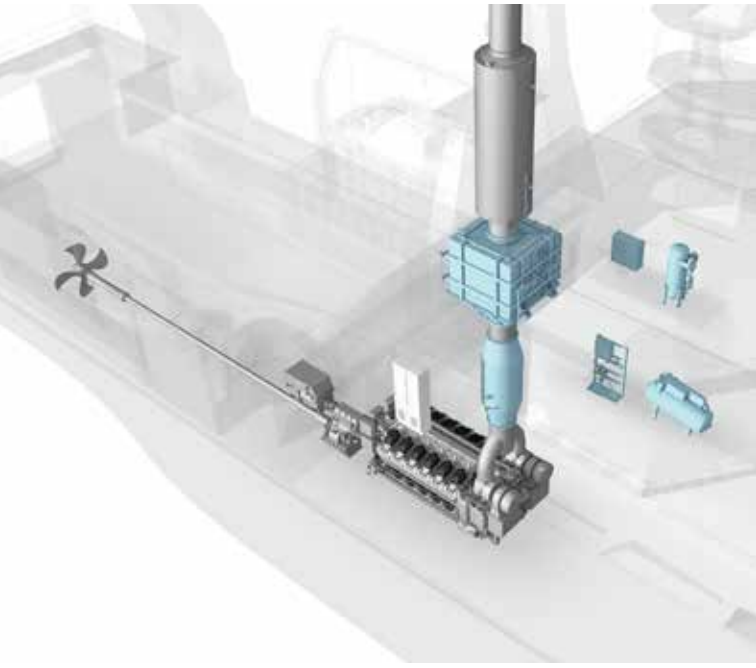
IMO Tier III

For operation in emission control areas (ECA), MAN Energy Solutions has developed a comprehensive range of selective catalytic reduction (SCR) systems that tremendously reduce NO_X levels surpassing IMO Tier III requirements.

MAN Energy Solutions is the first manufacturer to successfully produce and offer IMO Tier III compliant four-stroke marine engines based on a fully modular SCR kit covering our entire four-stroke engine portfolio. In 2014 MAN Energy Solutions was awarded the first IMO Tier III EIAPP certificate together with the classification society DNV-GL.

MAN Energy Solutions' standard SCR system is available in fourteen different sizes covering our entire portfolio of four-stroke engines. Customised SCR systems are offered on demand.

MAN has developed a complete range of SCR systems that work perfectly with our engines for maximum system efficiency. The intelligent exhaust gas temperature control allows significant savings in fuel consumptions as compared to third-party supplier systems. MAN SCR systems work with MGO, MDO and HFO with up to 3.5% sulphur.



MAN SCR system

Our modular system comes in 14 different sizes to match all power demands. Some notable benefits of standardisation are significant cost reduction and simplification of installation.

The modular SCR component kit

Urea consumption

The urea consumption depends on engine type, selected performance characteristics (engine map), in case of an engine with ECOMAP capability, operating profile, fuel type, ambient conditions, type of reduction agent, etc.

For more detailed information on the expected level of urea consumption, please contact MAN Energy Solutions with your project specific request.

Conventional injection engines

Our well-established engine types are used in a vast array of applications all over the world. Based on long-term experience of historical proportions, our engines are in continuous development to increase power, reduce emissions, increase reliability, reduce fuel oil consumption, and increase longevity. Our engines are the prime movers of choice in the maritime sector.

Common rail (CR) engines

The flexibility of our CR technology enables a substantial improvement of the combustion process that improves the fuel economy and reduces emission levels. It is particularly advantageous in the low-load and mid-load ranges where our unique ECOMAP system (optional) applies different engine maps to reduce fuel consumption while observing IMO emission limits. Another feature is our patented Boost Injection. Our engine control system senses a load increase at a very early stage and tremendously improves the load response with the activation of boost injection by the common rail control. In addition, exhaust gas opacity is markedly reduced, far below the visibility limit. Our CR engines run efficiently on liquid fuels complying with ISO 8217-2017 DMA, DMZ, and DMB, and on residual fuels (HFO) up to 700 cSt (in compliance with ISO-F-RMK 700).

Diesel oil (D) engines

The V28/33D STC features very favourable ratios of power-to-weight and power-to-installation space. The combination of low fuel consumption, low emissions and reduced life cycle costs makes this engine the ideal solution for propulsion in high speed ferries, naval and offshore patrol vessels. The V28/33D STC engine operates on distillates according to ISO 8217 DMA or equivalent fuel types.

Sequential turbocharging (STC)

The MAN Energy Solutions sequential turbocharging system operates with two high-efficiency turbochargers. Depending on the amount of charge air required, the second turbocharger is switched on or off. In this way, the engine is operated at its optimum operating point over the whole applicable load range.

The result is an extended operating envelope at low engine speeds, which gives a power reserve for ship acceleration, ship turning, sprints or towing. Furthermore, the STC system is characterised by a low thermal signature, decreased smoke emission, low vibrations and continuous low-load operation with reduced fuel consumption, which makes it the ideal solution for propulsion in naval applications and offshore patrol vessels.

Dual fuel (DF) engines

Dual fuel engines from MAN Energy Solutions run efficiently on liquid fuels or natural gas with very low emissions that are compliant with IMO limits. On gaseous fuel, the engines comply with IMO Tier III without the need for additional exhaust gas aftertreatment, and on liquid fuel they either fulfill IMO Tier II, or IMO Tier III together with an SCR system. The possibility to switch over seamlessly from gas to diesel operation and vice versa provides full flexibility in multiple applications.

All dual fuel engines can run on natural gas with a methane number higher than 80 without adjustments. For lower methane numbers, MAN Energy Solutions can deliver well-adapted solutions. The optimised combustion chamber ensures very low fuel consumption in both operational modes.

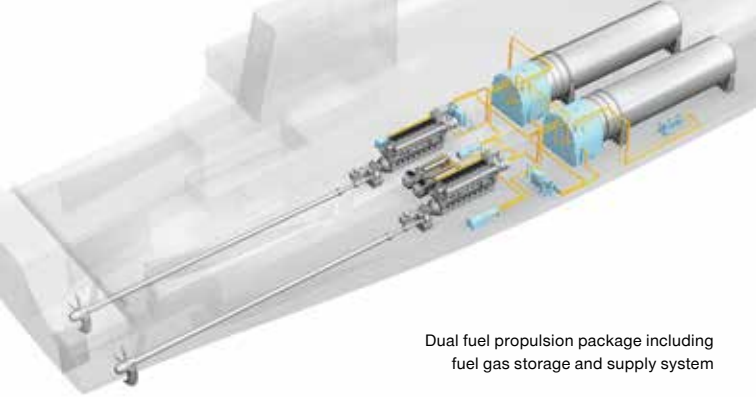
MAN Cryo fuel gas supply systems

MAN Cryo fuel gas systems are the world's leading solution for safely storing energy on board gas fuelled ships and reliably providing it to the engines.

After pioneering in the market for LNG-fuelled ships in 1999, MAN Cryo fuel gas systems have since then been installed on a major part of today's gas fuelled ship fleet, either standardised or tailor-made. The references range from passenger ferries to offshore platform supply vessels, tug boats, bunker barges and even ice breakers.

MAN Energy Solutions provides one-stop solutions with complete packages consisting of main engines, auxiliary gensets, propulsion train, LNG fuel tank, coldbox, control system and bunkering station.

Vacuum-insulated type-C LNG tank including cold box



Dual fuel propulsion package including fuel gas storage and supply system

In order to deliver cost-optimised systems with shortest delivery times, MAN Energy Solutions offers a broad range of standard cryo packages in all required sizes. Beyond this standard scope and for larger tank sizes, customised solutions are engineered in the most efficient way in order to meet all our customers' demands.

MAN Cryo LNG standard packages (example sizes)

Geometrical volume m^3	Net filling volume (95%) m^3	Outer diameter m	Tank length (without TCS)
76	73	3.6	10.9
100	95	3.6	13.9
124	118	3.6	16.9
142	135	4.2	14.0
175	167	4.2	17.0
209	199	4.2	20.0
249	237	5.3	16.4
300	285	5.3	19.4
352	335	5.3	22.4
385	366	6.0	19.8
450	428	6.0	22.5
516	491	6.0	25.8
600	570	6.9	23.2

Engine power

Engine brake power is stated in kW.

Ratings are given according to ISO 3046-1:2002.

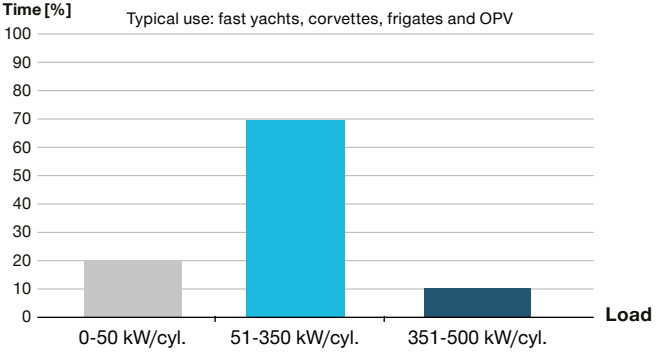
According to ISO 15550:2016, the power figures in the tables are valid within a range of ±3% up to tropical conditions at sea level, i.e.:

- compressor inlet temperature 45 °C
- compressor inlet pressure 1,000 mbar
- sea water temperature 32 °C

Usually for four-stroke propulsion engines, the power is defined according to the ICN[1] (MCR) definition (ISO 3046-1:2002:ISO standard power).

For the load profile type Navy, of the engine types V28/33D STC, the rated power of the engine is stated according to the ICFN[1] power definition (ISO 3046:2002:ISO standard fuel stop power).

Load profile type: Navy (ICFN)



[1] I = ISO power
C = continuous power output
F = fuel stop power
N = net

Specific fuel oil consumption (SFOC) and heat rate

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

- ambient air pressure: 1,000 mbar
- ambient air temperature: 25 °C (77 °F)
- charge air temperature: according to engine type, corresponding to 25 °C cooling water temperature before CAC

The figures are given with a tolerance of +5% and without engine driven pumps. Attached pumps and engines running in suction dredger operation will require additional fuel.

In accordance with the NO_x Technical Code 2008 of the International Maritime Organization, DM-grade fuel oil is used as reference fuel oil for engine tests and, thus, also forms the basis for the SFOC figures stated for engines in liquid fuel operation.

Unless otherwise specifically stated, SFOC figures are based on a lower calorific value of the fuel oil of 42,700 kJ/kg and, in addition for engines with common rail injection (CR-engines), on DMA-grade fuel oil (ISO 8217-2017). For engines with conventional fuel injection, SFOC figures are based on DMB-grade fuel oil (ISO 8217-2017). For further details, please refer to our engine specific project guides available from MAN Energy Solutions.

Specific lube oil consumption (SLOC)

The specific lube oil consumption is specified at MCR (maximum continuous rating) with a tolerance of 20%.

Blocking of output

Blocking of output is made for engines driving a propeller at 100% of the rated output. For engines powering an alternator, blocking of output is made at 110%. However, operation above 100% load is only recommended for a short period of time for recovery and prevention of a frequency drop.

Weights and dimensions

For marine main engines, the weights stated refer to engines without a flywheel.

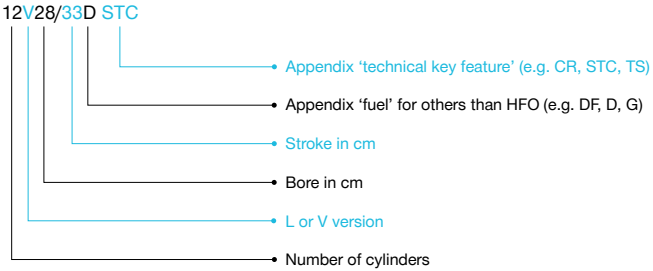
All weights given are without lube oil and cooling water.

For auxiliary engines (GenSets), weights refer to the unit (including alternator). The weight of the GenSet may vary depending on the alternator make.

The length of the GenSet unit depends on the alternator make. For a twin engine installation, the centreline distance is stated for each engine type.

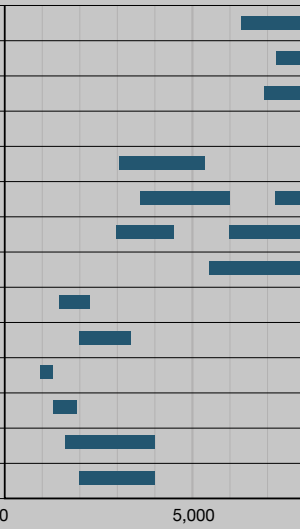
The centreline distance for twin engine installation is given as a minimum value. Specific requirements to the passageway (e.g. of classification societies or flag state authority), seating type or a gallery can lead to higher values.

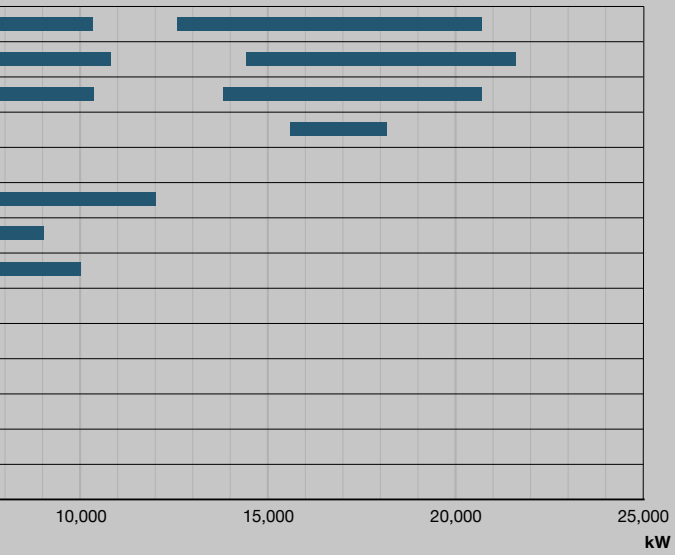
Engine type designation



MAN four-stroke propulsion engines programme

r/min	Engine type
500-514	L51/60DF V51/60DF
500-514	L48/60CR V48/60CR
500-514	L48/60B V48/60B
500-600	V45/60CR
720-750	L35/44DF
720-750	L32/44CR V32/44CR
720-750	L32/40 V32/40
1,000-1,032	V28/33D STC
775	L28/32A
800	L27/38 – L27/38 (MDO/MGO)
900	L23/30A
1000	L21/31
1,600-1,900	175D
1,765-1,950	VP185




10,000
15,000
20,000
25,000
kW

MAN V51/60DF

Tier II Tier III

High efficient variant

Tier III in gas mode

Bore: 510 mm, **Stroke:** 600 mm

Speed	**r/min**	514	500
mep	**bar**	20.0	20.6
		kW	**kW**
12V51/60DF		12,600	12,600
14V51/60DF		14,700	14,700
16V51/60DF		16,800	16,800
18V51/60DF		18,900	18,900

LHV of fuel gas ≥ 28,000 kJ/Nm^3
(Nm^3 corresponds to one cubic meter of gas at 0 °C and 1.013 bar)

Specific fuel oil consumption (SFOC) and Heat rate to ISO conditions

MCR	**100%**	**85%**
Specific fuel oil consumption[1)]	179.5 g/kWh (43 °C)[4)]	177.0 g/kWh (43 °C)[4)]
Heat rate[2)]	7,190 kJ/kWh (43 °C)[4)]	7,200 kJ/kWh (45 °C)[4)]

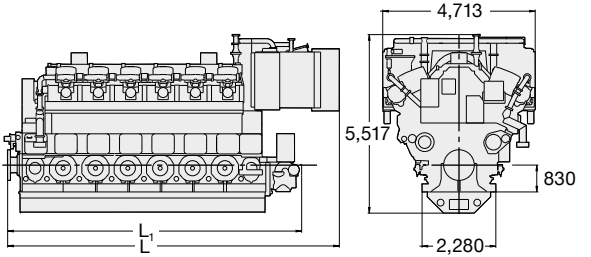
Specific lube oil consumption[3)]: 0.38 g/kWh for nominal output 1,050 kW/cyl.

[1)] Liquid fuel operation
[2)] Gas operation (including pilot fuel), gas fuel: methane no. ≥ 80
[3)] Related to 100% actual engine load
[4)] Engine type specific reference charge air temperature before cylinder

Dimensions

Cyl. No.		**12**	**14**	**16**	**18**
L	**mm**	10,254	11,254	12,254	13,644
L$_1$	**mm**	9,088	10,088	11,088	12,088
Dry mass	**t**	187	213	240	265

Minimum centreline distance for twin engine installation: 4,800 mm



MAN L51/60DF

High efficient variant

Bore: 510 mm, **Stroke:** 600 mm

Speed	**r/min**	514	500
mep	**bar**	20.0	20.6
		kW	**kW**
6L51/60DF		6,300	6,300
7L51/60DF		7,350	7,350
8L51/60DF		8,400	8,400
9L51/60DF		9,450	9,450

LHV of fuel gas ≥ 28,000 kJ/Nm^3
(Nm^3 corresponds to one cubic meter of gas at 0 °C and 1.013 bar)

Specific fuel oil consumption (SFOC) and Heat rate to ISO conditions

MCR	**100%**	**85%**
Specific fuel oil consumption[1]	179.5 g/kWh (43°C)[4]	177.0 g/kWh (43°C)[4]
Heat rate[2]	7,190 kJ/kWh (43°C)[4]	7,200 kJ/kWh (45°C)[4]

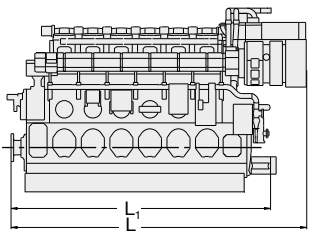
Specific lube oil consumption[3]: 0.38 g/kWh for nominal output 1,050 kW/cyl.

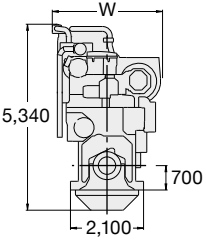
[1] Liquid fuel operation
[2] Gas operation (including pilot fuel), gas fuel: methane no. ≥ 80
[3] Related to 100% actual engine load
[4] Engine type specific reference charge air temperature before cylinder

Dimensions

Cyl. No.		**6**	**7**	**8**	**9**
L	**mm**	8,494	9,314	10,134	11,160
L_1	**mm**	7,455	8,275	9,095	9,915
W	**mm**	3,165	3,165	3,165	3,283
Dry mass	**t**	106	119	135	148

Minimum centreline distance for twin engine installation: 3,200 mm





MAN V51/60DF

Tier II | Tier III

High power variant

Tier III in gas mode

Bore: 510 mm, **Stroke:** 600 mm

Speed	**r/min**	514	500
mep	**bar**	21.9	22.5
		kW	**kW**
12V51/60DF		13,800	13,800
14V51/60DF		16,100	16,100
16V51/60DF		18,400	18,400
18V51/60DF		20,700	20,700

LHV of fuel gas ≥ 28,000 kJ/Nm^3
(Nm^3 corresponds to one cubic meter of gas at 0 °C and 1.013 bar)

Specific fuel oil consumption (SFOC) and Heat rate to ISO conditions

MCR	**100%**	**85%**
Specific fuel oil consumption[1)]	186.0 g/kWh (43 °C)[4)]	182.0 g/kWh (43 °C)[4)]
Heat rate[2)]	7,400 kJ/kWh (50 °C)[4)]	7,400 kJ/kWh (50 °C)[4)]

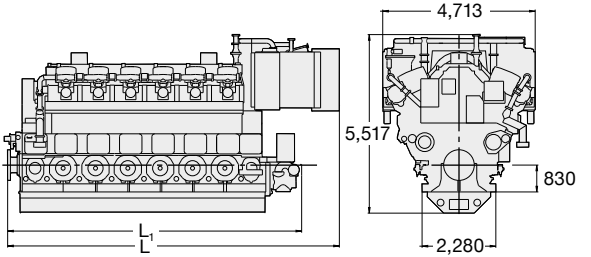
Specific lube oil consumption[3)]: 0.35 g/kWh for nominal output 1,150 kW/cyl.

[1)] Liquid fuel operation
[2)] Gas operation (including pilot fuel), gas fuel: methane no. ≥ 80
[3)] Related to 100% actual engine load
[4)] Engine type specific reference charge air temperature before cylinder

Dimensions

Cyl. No.		**12**	**14**	**16**	**18**
L	**mm**	10,254	11,254	12,254	13,644
L$_1$	**mm**	9,088	10,088	11,088	12,088
Dry mass	**t**	187	213	240	265

Minimum centreline distance for twin engine installation: 4,800 mm



MAN L51/60DF

High power variant

Bore: 510 mm, **Stroke:** 600 mm

Speed	**r/min**	514	500
mep	**bar**	21.9	22.5
		kW	**kW**
6L51/60DF		6,900	6,900
7L51/60DF		8,050	8,050
8L51/60DF		9,200	9,200
9L51/60DF		10,350	10,350

LHV of fuel gas ≥ 28,000 kJ/Nm^3
(Nm^3 corresponds to one cubic meter of gas at 0 °C and 1.013 bar)

Specific fuel oil consumption (SFOC) and Heat rate to ISO conditions

MCR	**100%**	**85%**
Specific fuel oil consumption[1]	186.0 g/kWh (43 °C)[4]	182.0 g/kWh (43 °C)[4]
Heat rate[2]	7,400 kJ/kWh (50 °C)[4]	7,400 kJ/kWh (50 °C)[4]

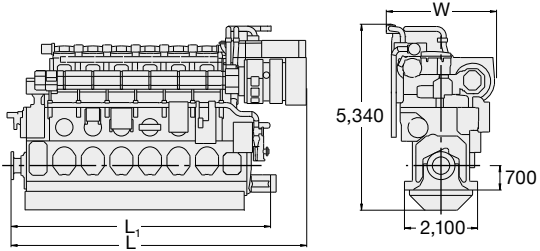
Specific lube oil consumption[3]: 0.35 g/kWh for nominal output 1,150 kW/cyl.

[1] Liquid fuel operation
[2] Gas operation (including pilot fuel), gas fuel: methane no. ≥ 80
[3] Related to 100% actual engine load
[4] Engine type specific reference charge air temperature before cylinder

Dimensions

Cyl. No.		**6**	**7**	**8**	**9**
L	**mm**	8,494	9,314	10,134	11,160
L_1	**mm**	7,455	8,275	9,095	9,915
W	**mm**	3,165	3,165	3,165	3,283
Dry mass	**t**	106	119	135	148

Minimum centreline distance for twin engine installation: 3,200 mm



MAN V48/60CR

Tier II | Tier III

Tier III with SCR

Bore: 480 mm, **Stroke:** 600 mm

Speed	**r/min**	514	500
mep	**bar**	25.8	26.5
		kW	**kW**
12V48/60CR		14,400	14,400
14V48/60CR		16,800	16,800
16V48/60CR		19,200	19,200
18V48/60CR		21,600	21,600

Specific fuel oil consumption (SFOC) to ISO conditions

MCR	**100%**	**85%**
V48/60CR	182 g/kWh	173.5 g/kWh

Specific lube oil consumption[1]: 0.5 g/kWh for nominal output 1,200 kW/cyl.

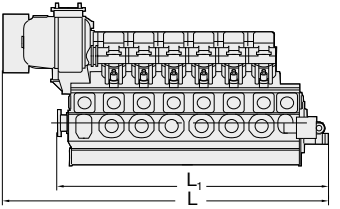
Engine type specific reference charge air temperature before cylinder 37 °C

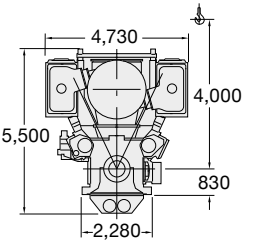
[1] Related to 100% actual engine load

Dimensions

Cyl. No.		**12**	**14**	**16**	**18**
L	**mm**	10,790	11,790	13,140	14,140
L_1	**mm**	9,088	10,088	11,088	12,088
Dry mass	**t**	189	213	240	265

Minimum centreline distance for twin engine installation: 4,800 mm





Tier III with SCR

Bore: 480 mm, **Stroke:** 600 mm

Speed	**r/min**	514	500
mep	**bar**	25.8	26.5
		kW	**kW**
6L48/60CR		7,200	7,200
7L48/60CR		8,400	8,400
8L48/60CR		9,600	9,600
9L48/60CR		10,800	10,800

Specific fuel oil consumption (SFOC) to ISO conditions

MCR	**100%**	**85%**
L48/60CR	184.0 g/kWh	175.5 g/kWh

Specific lube oil consumption[1]: 0.5 g/kWh for nominal output 1,200 kW/cyl.

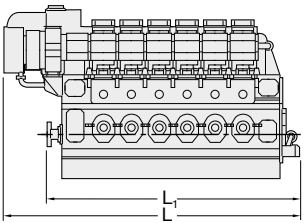
Engine type specific reference charge air temperature before cylinder 37 °C

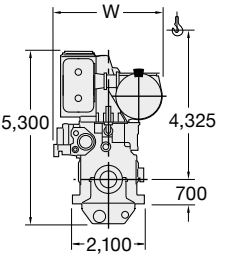
[1] Related to 100% actual engine load

Dimensions

Cyl. No.		**6**	**7**	**8**	**9**
L	**mm**	8,760	9,580	10,540	11,360
L_1	**mm**	7,455	8,275	9,095	9,915
W	**mm**	3,165	3,165	3,280	3,280
Dry mass	**t**	106	119	135	148

Minimum centreline distance for twin engine installation: 3,200 mm





MAN V48/60B

Tier II | Tier III

Tier III with SCR

Bore: 480 mm, **Stroke:** 600 mm

Speed	**r/min**	514	500
mep	**bar**	24.7	25.4
		kW	**kW**
12V48/60B		13,800	13,800
14V48/60B		16,100	16,100
16V48/60B		18,400	18,400
18V48/60B		20,700	20,700

Specific fuel oil consumption (SFOC) to ISO conditions

MCR	**100%**	**85%**
V48/60B	184 g/kWh	180 g/kWh

Specific lube oil consumption[1]: 0.46 g/kWh for nominal output 1,150 kW/cyl.

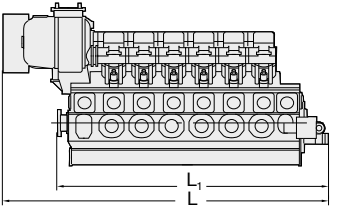
Engine type specific reference charge air temperature before cylinder 37 °C

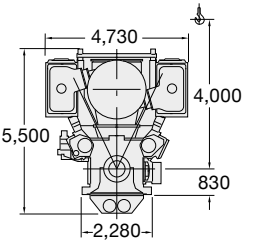
[1] Related to 100% actual engine load

Dimensions

Cyl. No.		**12**	**14**	**16**	**18**
L	**mm**	10,790	11,790	13,140	14,140
L_1	**mm**	9,088	10,088	11,088	12,088
Dry mass	**t**	186	209	240	259

Minimum centreline distance for twin engine installation: 4,800 mm





MAN L48/60B

Bore: 480 mm, **Stroke:** 600 mm

Speed	**r/min**	514	500
mep	**bar**	24.7	25.4
		kW	**kW**
6L48/60B		6,900	6,900
7L48/60B		8,050	8,050
8L48/60B		9,200	9,200
9L48/60B		10,350	10,350

Specific fuel oil consumption (SFOC) to ISO conditions

MCR	**100%**	**85%**
L48/60B	186 g/kWh	182 g/kWh

Specific lube oil consumption[1]: 0.46 g/kWh for nominal output 1,150 kW/cyl.

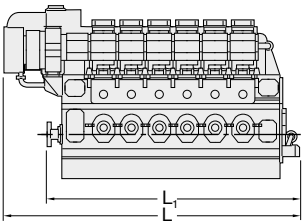
Engine type specific reference charge air temperature before cylinder 37 °C

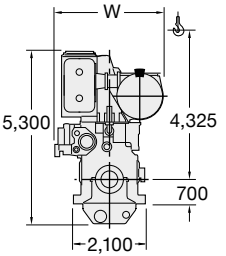
[1] Related to 100% actual engine load

Dimensions

Cyl. No.		**6**	**7**	**8**	**9**
L	**mm**	8,760	9,580	10,540	11,360
L_1	**mm**	7,455	8,275	9,095	9,915
W	**mm**	3,165	3,165	3,280	3,280
Dry mass	**t**	104	118	134	146

Minimum centreline distance for twin engine installation: 3,200 mm





MAN V45/60CR

Tier II Tier III

Tier III with SCR

Bore: 450 mm, **Stroke:** 600 mm

Speed	**r/min**	600
mep	**bar**	27.3
		kW
12V45/60CR		15,600
14V45/60CR		18,200

Specific fuel oil consumption (SFOC) to ISO conditions

MCR	**100%**	**85%**
V45/60CR	170.0 g/kWh	166.0 g/kWh

Specific lube oil consumption [1]: 0.5 g/kWh for nominal output 1,300 kW/cyl.

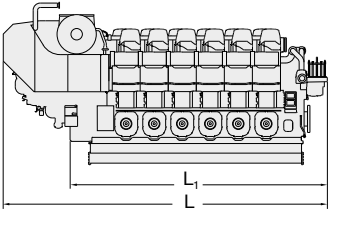
Engine type specific reference charge air temperature before HP TC 43 °C / before cylinder 37 °C

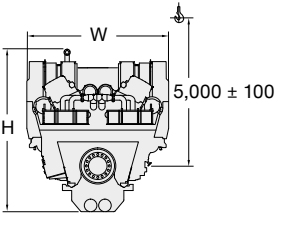
[1] Related to 100% actual engine load

Dimensions

Cyl. No.		**12**	**14**
L	**mm**	11,330	12,310
L_1	**mm**	10,590	11,570
W	**mm**	4,970	4,970
H	**mm**	5,240	5,240
Dry mass	**t**	204	230

Minimum centreline distance for twin engine installation: 5,050 mm





Tier III in gas mode

Bore: 350 mm, **Stroke:** 440 mm

Speed	**r/min**	750	720
mep	**bar**	20.0	20.1
		kW	**kW**
6L35/44DF		3,180	3,060
7L35/44DF		3,710	3,570
8L35/44DF		4,240	4,080
9L35/44DF		4,770	4,590
10L35/44DF		5,300	5,100

LHV of fuel gas ≥ 28,000 kJ/Nm^3
(Nm^3 corresponds to one cubic meter of gas at 0 °C and 1.013 bar)

Specific fuel oil consumption (SFOC) and Heat rate to ISO conditions

MCR		**100%**	**85%**
Specific fuel oil consumption[1]	6L	179.5 g/kWh	175.5 g/kWh
	7L-10L	178.5 g/kWh	175.5 g/kWh
Heat rate[2]		7,410 kJ/kWh	7,440 kJ/kWh

Specific lube oil consumption[3]: 0.5 g/kWh for nominal output 530 kW/cyl. or 0.52 g/kWh for nominal output 510 kW/cyl.

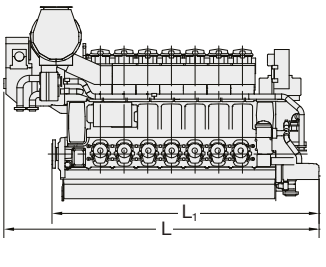
Engine type specific reference charge air temperature before cylinder 40 °C

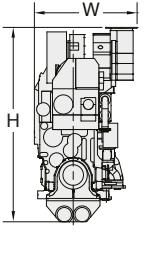
[1] Liquid fuel operation
[2] Gas operation (including pilot fuel), gas fuel: methane no. ≥ 80
[3] Related to 100% actual engine load

Dimensions

Cyl. No.		**6**	**7**	**8**	**9**	**10**
L	**mm**	6,485	7,015	7,545	8,075	8,605
L_1	**mm**	5,265	5,877	6,407	6,937	7,556
W	**mm**	2,539	2,678	2,678	2,678	2,678
H	**mm**	4,163	4,369	4,369	4,369	4,369
Dry mass[4]	**t**	43.1	48.2	53.3	57.6	62.3

Minimum centreline distance for twin engine installation: 2,500 mm
[4] Including built-on lube oil automatic filter, fuel oil filter and electronic equipment
Speed 720 r/min for generator drive only





MAN V32/44CR

Tier II | Tier III | EPA Tier 2

Tier III with SCR

Bore: 320 mm, **Stroke:** 440 mm

Speed	**r/min**	750	720
mep	**bar**	27.1	28.3
		kW	**kW**
12V32/44CR		7,200	7,200
14V32/44CR[1]		8,120	8,120
16V32/44CR		9,600	9,600
18V32/44CR[2]		10,800	10,800
20V32/44CR		12,000	12,000

Specific fuel oil consumption (SFOC) to ISO conditions

MCR	**100%**	**85%**
V32/44CR	176.0 g/kWh	172.0 g/kWh
14V32/44CR	175.5 g/kWh	173.0 g/kWh
V32/44CR FPP	176.5 g/kWh	172.5 g/kWh
14V32/44CR FPP	177.5 g/kWh	174.0 g/kWh

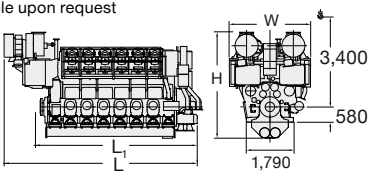
Specific lube oil consumption[3]: 0.5 g/kWh for nominal output 600 kW/cyl., 0.52 g/kWh for nominal output 580 kW/cyl., 0.55 g/kWh for nominal output 550 kW/cyl.

Engine type specific reference charge air temperature before cylinder 40 °C

Dimensions

Cyl. No.		**12**	**14**	**16**	**18**	**20**
L	**mm**	7,195	7,970	8,600	9,230	9,860
L_1	**mm**	5,795	6,425	7,055	7,685	8,315
W	**mm**	3,100	3,100	3,100	3,100	3,100
H	**mm**	4,039	4,262	4,262	4,262	4,262
Dry mass[4]	**t**	70	79	87	96	104

Minimum centreline distance for twin engine installation: 4,000 mm
Speed 720 r/min for generator drive/constant speed operation only
[1] 580 kW/cyl.
[2] 18V32/44CR available rigidly mounted only
[3] Related to 100% actual engine load
[4] Including built-on lube oil automatic filter, fuel oil filter and electronic equipment
Fixed pitch propeller: 550 kW/cyl., 750 r/min
Wet oil sump available upon request



Bore: 320 mm, **Stroke:** 440 mm

Speed	**r/min**	750	720
mep	**bar**	27.1	28.3
		kW	**kW**
6L32/44CR		3,600	3,600
7L32/44CR[1)]		4,060	4,060
8L32/44CR		4,800	4,800
9L32/44CR		5,400	5,400
10L32/44CR		6,000	6,000

Specific fuel oil consumption (SFOC) to ISO conditions

MCR	**100%**	**85%**
L32/44CR	176.0 g/kWh	172.0 g/kWh
7L32/44CR	175.5 g/kWh	173.0 g/kWh
L32/44CR FPP	176.5 g/kWh	172.5 g/kWh
7L32/44CR FPP	177.5 g/kWh	174.0 g/kWh

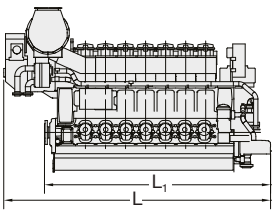
Specific lube oil consumption[2)]: 0.5 g/kWh for nominal output 600 kW/cyl., 0.52 g/kWh for nominal output 580 kW/cyl., 0.55 g/kWh for nominal output 550 kW/cyl.

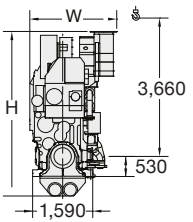
Engine type specific reference charge air temperature before cylinder 40 °C

Dimensions

Cyl. No.		**6**	**7**	**8**	**9**	**10**
L	**mm**	6,312	6,924	7,454	7,984	8,603
L_1	**mm**	5,265	5,877	6,407	6,937	7,556
W	**mm**	2,174	2,359	2,359	2,359	2,359
H	**mm**	4,163	4,369	4,369	4,369	4,369
Dry mass[3)]	**t**	39.5	44.5	49.5	53.5	58.0

Minimum centreline distance for twin engine installation: 2,500 mm
Speed 720 r/min for generator drive/constant speed operation only
[1)] 580 kW/cyl.
[2)] Related to 100% actual engine load
[3)] Including built-on lube oil automatic filter, fuel oil filter and electronic equipment
Fixed pitch propeller: 550 kW/cyl., 750 r/min
Wet oil sump available upon request





MAN V32/40

Tier II Tier III

Tier III with SCR

Bore: 320 mm, **Stroke:** 400 mm

Speed	**r/min**	750	720
mep	**bar**	24.9	25.9
		kW	**kW**
12V32/40		6,000	6,000
14V32/40		7,000	7,000
16V32/40		8,000	8,000
18V32/40		9,000	9,000

Specific fuel oil consumption (SFOC) to ISO conditions

MCR	100%	85%
V32/40	184 g/kWh	182 g/kWh
V32/40 FPP	187 g/kWh	183 g/kWh

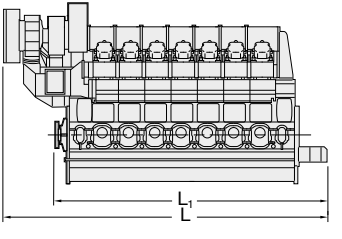
Specific lube oil consumption[1]: 0.5 g/kWh for nominal output 500 kW/cyl., 0.56 g/kWh for nominal output 450 kW/cyl.

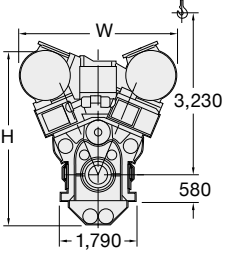
Engine type specific reference charge air temperature before cylinder 43 °C

Dimensions

Cyl. No.		12	14	16	18
L	**mm**	6,915	7,545	8,365	8,995
L_1	**mm**	5,890	6,520	7,150	7,780
W	**mm**	3,140	3,140	3,730	3,730
H	**mm**	4,100	4,100	4,420	4,420
Dry mass	**t**	61	68	77	85

Minimum centreline distance for twin engine installation: 4,000 mm
Speed 720 r/min for generator drive/constant speed operation only
Fixed pitch propeller: 450 kW/cyl., 750 r/min
V32/40 as marine main engine to be applied for multi-engine plants only
[1] Related to 100% actual engine load





Bore: 320 mm, **Stroke:** 400 mm

Speed	**r/min**	750	720
mep	**bar**	24.9	25.9
		kW	**kW**
6L32/40		3,000	3,000
7L32/40		3,500	3,500
8L32/40		4,000	4,000
9L32/40		4,500	4,500

Specific fuel oil consumption (SFOC) to ISO conditions

MCR	100%	85%
L32/40	186 g/kWh	183 g/kWh
L32/40 FPP	189 g/kWh	184 g/kWh

Specific lube oil consumption[1]: 0.5 g/kWh for nominal output 500 kW/cyl., 0.56 g/kWh for nominal output 450 kW/cyl.

Engine type specific reference charge air temperature before cylinder 43 °C

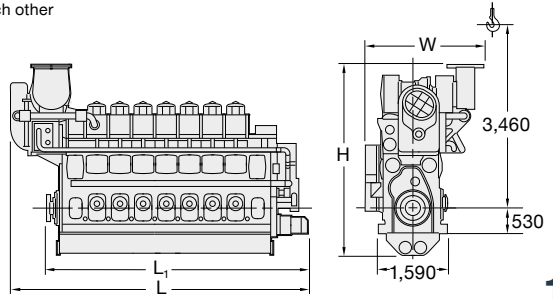
Dimensions

Cyl. No.		6	7	8	9
L	**mm**	5,940	6,470	7,000	7,530
L_1	**mm**	5,140	5,670	6,195	6,725
W	**mm**	2,630	2,630	2,715	2,715
H	**mm**	4,010	4,010	4,490	4,490
Dry mass	**t**	38	42	47	51

Minimum centreline distance for twin engine installation: 2,500 mm[2]
Speed 720 r/min for generator drive/constant speed operation only
Fixed pitch propeller: 450 kW/cyl., 750 r/min

[1] Related to 100% actual engine load

[2] Please contact MAN Energy Solutions for the precise information about the centreline distance for two engines with the same cylinder number standing near each other



MAN V28/33D STC

Tier II Tier III

Tier III with SCR

Bore: 280 mm, **Stroke:** 330 mm

		Standard engine	Load profile 'Navy'
Speed	**r/min**	1,000	1,032
mep	**bar**	26.9	28.6
Rated power output		**- ICN (MCR) kW**	**- ICFN kW**
12V28/33D STC		5,460	6,000
16V28/33D STC		7,280	8,000
20V28/33D STC		9,100	10,000

Specific fuel oil consumption (SFOC) to ISO conditions

Cyl. No.		12	16, 20	12	16, 20
ICFN fuel stop power	**g/kWh**	-	-	194.0	192.0
MCR 100%	**g/kWh**	191.0	189.0	191.0	189.0
MCR 85%	**g/kWh**	186.0	184.0	194.5	192.5

Specific lube oil consumption[1]: 0.4 g/kWh for nominal output 455 kW/cyl.

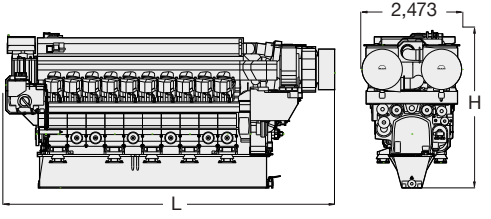
Engine type specific reference charge air temperature before cylinder 40 °C

Figures on theoretical propeller curve for distillates according to ISO 8217 DMA, with all attached pumps

Dimensions

Cyl. No.		12	16	20
L	**mm**	6,207	7,127	8,047
H[2]	**mm**	3,417	3,417	3,417
H[3]	**mm**	3,682	3,682	3,682
Dry mass[4]	**t**	36.0	43.5	51.2

[1] Related to 100% actual engine load
[2] With low oilsump
[3] With deep oilsump
Weight and performance parameters refer to engine with flywheel, TC silencer, attached pumps, oil filters and lube oil cooler
[4] Tolerance: 5%
V28/33D STC as marine main engine to be applied for multi-engine plants only in class-approved vessels



MAN L28/32A

Bore: 280 mm, **Stroke:** 320 mm

Speed	**r/min**	775
mep	**bar**	19.3
		kW
6L28/32A		1,470
7L28/32A[1)]		1,715
8L28/32A		1,960
9L28/32A		2,205

Specific fuel oil consumption (SFOC) to ISO conditions

MCR	**100%**	**85%**
L28/32A CPP	194 g/kWh	192 g/kWh
L28/32A FPP	194 g/kWh	192 g/kWh

Specific lube oil consumption 1.0 g/kWh

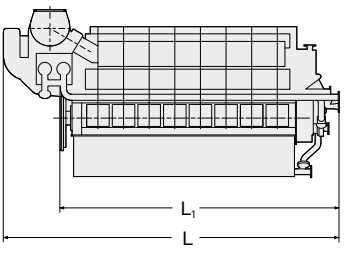
Engine type specific reference charge air temperature before cylinder 40 °C

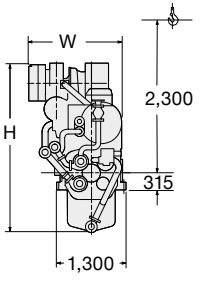
Dimensions

Cyl. No.		**6**	**7**	**8**	**9**
L	**mm**	5,330	5,810	6,290	6,770
L_1	**mm**	4,340	4,750	5,230	5,780
W	**mm**	1,732	1,732	1,732	1,844
H	**mm**	3,186	3,186	3,186	3,242
Dry mass	**t**	18.0	20.5	23.0	25.5

Minimum centreline distance for twin-engine installation: 2,000 mm

[1)] Not available for fixed pitch propeller (FPP)





MAN L27/38

Tier II Tier III

Tier III with SCR

Bore: 270 mm, **Stroke:** 380 mm

Speed	**r/min**	800	800 (MDO[1]/MGO)
mep	**bar**	23.5	25.2
		kW	**kW**
6L27/38		2,040	2,190
7L27/38		2,380	2,555
8L27/38		2,720	2,920
9L27/38		3,060	3,285

Specific fuel oil consumption (SFOC) to ISO conditions

MCR		**100%**		**85%**	
	340 kW	365 kW	340 kW	365 kW	
L27/38 CPP	188 g/kWh	191 g/kWh	185 g/kWh	186 g/kWh	
L27/38 FPP	187 g/kWh	191 g/kWh	181 g/kWh	185 g/kWh	

Specific lube oil consumption 0.8 g/kWh

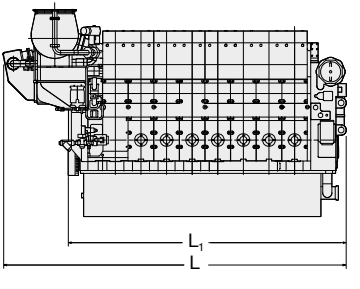
Engine type specific reference charge air temperature before cylinder 40 °C

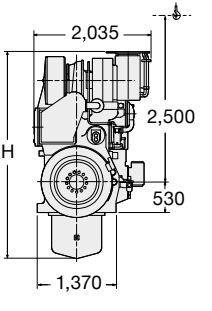
Dimensions

Cyl. No.		**6**	**7**	**8**	**9**
L	**mm**	5,070	5,515	5,960	6,405
L_1	**mm**	3,962	4,407	4,852	5,263
H	**mm**	3,555	3,687	3,687	3,687
Dry mass	**t**	29.0	32.5	36.0	39.5

Minimum centreline distance for twin engine installation: 2,500 mm

[1] MDO viscosity must not exceed 6 mm^2/s = cSt at 40 °C.





MAN L23/30A

Tier III with SCR

Bore: 225 mm, **Stroke:** 300 mm

Speed	**r/min**	900
mep	**bar**	17.1
		kW
6L23/30A		960
8L23/30A		1,280

Specific fuel oil consumption (SFOC) to ISO conditions

MCR	**100%**	**85%**
L23/30A CPP	194 g/kWh	193 g/kWh
L23/30A FPP	194 g/kWh	193 g/kWh

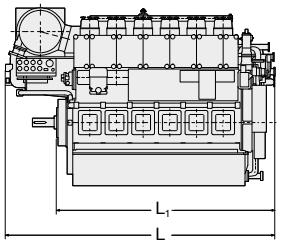
Specific lube oil consumption 1.0 g/kWh

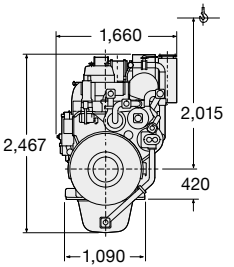
Engine type specific reference charge air temperature before cylinder 40 °C

Dimensions

Cyl. No.		**6**	**8**
L	**mm**	3,737	4,477
L_1	**mm**	3,062	3,802
Dry mass	**t**	11.0	13.5

Minimum centreline distance for twin engine installation: 1,900 mm





MAN L21/31

Tier II Tier III

Tier III with SCR

Bore: 210 mm, **Stroke:** 310 mm

Speed	**r/min**	1,000
mep	**bar**	24.0
		kW
6L21/31		1,290
7L21/31		1,505
8L21/31		1,720
9L21/31		1,935

Specific fuel oil consumption (SFOC) to ISO conditions

MCR	**100%**	**85%**
L21/31 CPP	192 g/kWh	190 g/kWh
L21/31 FPP	192 g/kWh	190 g/kWh

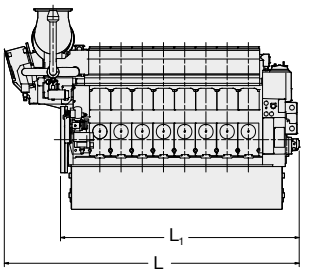
Specific lube oil consumption 0.8 g/kWh

Engine type specific reference charge air temperature before cylinder 40 °C

Dimensions

Cyl. No.		**6**	**7**	**8**	**9**
L	**mm**	4,544	4,899	5,254	5,609
L_1	**mm**	3,424	3,779	4,134	4,489
H	**mm**	3,113	3,267	3,267	3,267
W	**mm**	1,695	1,695	1,820	1,820
Dry mass	**t**	16.0	17.5	19.0	20.5

Minimum centreline distance for twin engine installation: 2,400 mm



MAN Energy Solutions

MAN VP185

Tier II

Bore: 185 mm, **Stroke:** 196 mm

Engine model	Rating definition	kW	rpm	SFOC at 100% MCR g/kWh	SFOC at 75% MCR g/kWh
12VP185TM	B: Unrestricted Marine	2,000	1,765	208	202
12VP185TM	A2: Unrestricted Marine	2,300	1,860	211	203
12VP185TM	A1: Limited Time	2,720	1,950	216	205
18VP185TM	B: Unrestricted Marine	3,000	1,765	208	202
18VP185TM	A2: Unrestricted Marine	3,500	1,860	211	203
18VP185TM	A1: Limited Time	4,000	1,950	216	205

Specific fuel oil consumption according to ISO 3046-1:2002 based on a lower calorific value of fuel of 42,700 kJ/kg with all driven lube oil, HT and LT water pumps attached, fulfilling IMO Tier II emissions limitations of +5% SFOC tolerance. 45°C ambient 32°C sea water.

Rating definitions:

A1 rating
For fast patrol craft where the rated power is only required for approximately 15% of the operating profile.

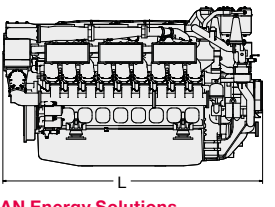
A2 rating
For fast patrol or displacement craft where 90% to 100% of rated power is likely to be used for 70% of the operating profile.

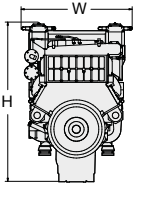
B rating
Typically for longer range displacement vessels where 70% to 100% of the rated power is likely to be used for >70% of the operating profile.

Dimensions

Cyl. No.		12	18
L	**mm**	3,200	4,039
H	**mm**	2,312	2,447
W	**mm**	1,692	1,692
Dry mass[1)]	**t**	7.8	11.1

[1)] Approximately
Engine dry weight includes the engine mounted sea water heat exchanger and oil cooler. The dimensions given are for guidance only.





MAN 175D

12V

Bore: 175 mm, **Stroke:** 215 mm

Engine model	Rating def.	kW	rpm	SFOC at 100% MCR Tier II/Tier III g/kWh	SFOC at 75% MCR Tier II/Tier III g/kWh	Avg. Load[1] %
12V175D-MH	Heavy Duty	1,499	1,800	204.0/206.0	206.0/208.0	100
12V175D-MH	Heavy Duty	1,499	1,600	195.0/197.0	199.0/201.0	100
12V175D-MH	Heavy Duty	1,740	1,800	198.0/201.0	202.5/205.5	85
12V175D-MM	Medium Duty	1,860	1,800	199.5/201.5	198.0/200.0	80
12V175D-MM	Medium Duty	2,040	1,800	195.0/198.0	199.5/202.5	70
12V175D-MM	Medium Duty	2,220	1,800	195.5/198.5	196.9/199.0	40
12V175D-MM	Medium Duty	2,220	1,900	197.0/200.0	199.0/201.0	65
12V175D-ML	Light Duty	2,400	2,000	196.0/199.0	194.0/196.0	60

[1] Average load up to.

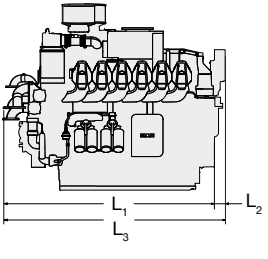
For multi-engine arrangement only. SFOC figures for distillates according to ISO 8217 DMA, with attached lube oil, HT and LT-cooling water pumps.

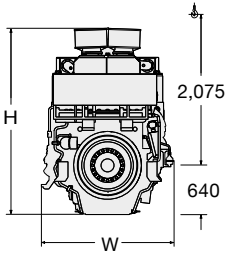
Dimensions

Cyl. No.		12
L_1	mm	2,733
L_2	mm	167
L_3	mm	2,900
H	mm	2,295
W	mm	1,632
Dry weight[2]	t	9.00

[2] Approximately

Engine dry weight does not include optional sea water cooler and may vary due to various configurations. The dimensions given are for guidance only.





MAN 175D

16V

Tier II Tier III

Tier III with SCR

Bore: 175 mm, **Stroke:** 215 mm

Engine model	Rating def.	kW	rpm	SFOC at 100% MCR Tier II/Tier III g/kWh	Avg. Load[1] %
16V175D-MH	Heavy Duty	2,000	1,600	195.0/197.0	100
16V175D-MH	Heavy Duty	2,000	1,800	204.0/206.0	100
16V175D-MH	Heavy Duty	2,320	1,800	198.0/201.0	85
16V175D-MM	Medium Duty	2,480	1,800	199.5/201.5	80
16V175D-MM	Medium Duty	2,720	1,800	195.0/198.0	70
16V175D-MM	Medium Duty	2,960	1,900	197.0/200.0	65
16V175D-MM	Medium Duty	2,960	1,800	195.5/198.5	40
16V175D-ML	Light Duty	3,200	2,000	196.0/199.0	60

[1] Average load up to.

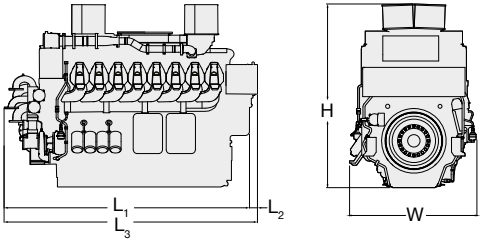
For multi-engine arrangement only. SFOC figures for distillates according to ISO 8217 DMA, with attached lube oil, HT and LT-cooling water pumps.

Dimensions (preliminary)

Cyl. No.		16
L_1	mm	3,253
L_2	mm	167
L_3	mm	3,420
H	mm	2,462
W	mm	1,673
Dry weight[2]	t	11.15

[2] Approximately

Engine dry weight does not include optional sea water cooler and may vary due to various configurations. The dimensions given are for guidance only.



MAN 175D

20V

Bore: 175 mm, **Stroke:** 215 mm

Engine model	Rating def.	kW	rpm	SFOC at 100% MCR Tier II/Tier III g/kWh	Avg. Load[1] %
20V175D-MH	Heavy Duty	2,500	1,600	195.0/197.0	100
20V175D-MH	Heavy Duty	2,500	1,800	204.0/206.0	100
20V175D-MH	Heavy Duty	2,900	1,800	198.0/201.0	85
20V175D-MM	Medium Duty	3,100	1,800	199.5/201.5	80
20V175D-MM	Medium Duty	3,400	1,800	195.0/198.0	70
20V175D-MM	Medium Duty	3,700	1,900	197.0/200.0	65
20V175D-MM	Medium Duty	3,700	1,800	195.5/198.5	40
20V175D-ML	Light Duty	4,000	2,000	196.0/199.0	60

[1] Average load up to.

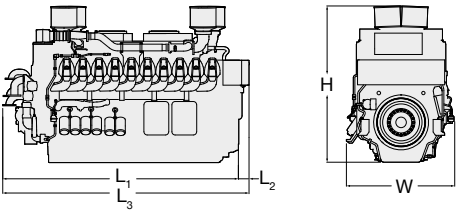
For multi-engine arrangement only. SFOC figures for distillates according to ISO 8217 DMA, with attached lube oil, HT and LT-cooling water pumps.

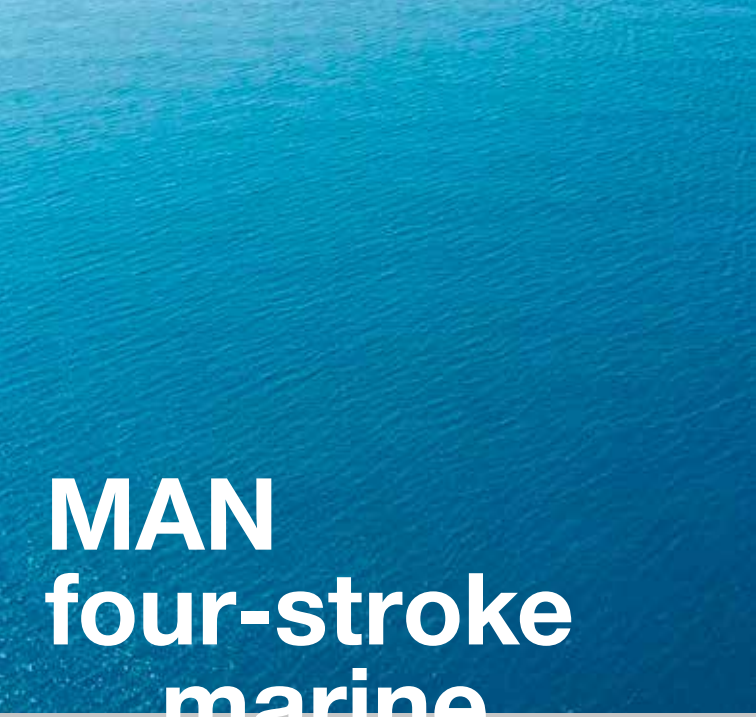
Dimensions (preliminary)

Cyl. No.		20
L_1	mm	3,773
L_2	mm	167
L_3	mm	3,940
H	mm	2,295
W	mm	1,691
Dry weight[2]	t	13.30

[2] Approximately

Engine dry weight does not include optional sea water cooler and may vary due to various configurations. The dimensions given are for guidance only.





MAN four-stroke marine GenSets

MAN four-stroke marine GenSets – all emission requirements

Besides focus on power density and fuel economy, MAN Energy Solutions is committed to a steady reduction of the environmental impact of our engines.

IMO Tier II

MAN Energy Solutions has decreased NO_x emissions significantly by applying well-proven methods that ensure a cleaner and more efficient combustion process. Our four-stroke propulsion engines are IMO Tier II compliant by internal engine measures alone.

IMO Tier III

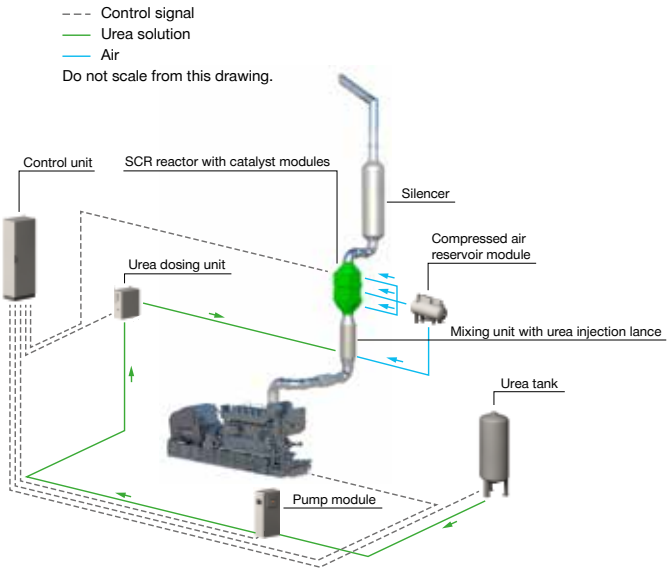
For operation in emission control areas (ECA), MAN Energy Solutions has developed a comprehensive range of selective catalytic reduction (SCR) systems that provides a tremendous reduction in NO_x levels surpassing IMO Tier III requirements.

MAN Energy Solutions is the first manufacturer to successfully produce and offer IMO Tier III compliant four-stroke marine engines based on a fully modular SCR kit covering our entire four-stroke engine portfolio.

In 2014 MAN Energy Solutions was awarded the first IMO Tier III EIAPP certificate together with the classification society DNV-GL.

MAN Energy Solutions' standard SCR system is available in fourteen different sizes covering our entire portfolio of four-stroke engines. Customised SCR systems are offered on demand.

MAN has developed a complete range of SCR systems that work perfectly with our engines for maximum system efficiency. The intelligent exhaust gas temperature control enables significant savings in fuel consumption as compared to third party supplier systems. MAN SCR systems work with MGO, MDO and HFO with up to 3.5% sulphur.



MAN GenSet plant with complete SCR system

100% MCR PTO-solutions for L21/31 and L27/38 GenSets

Optimised for both new and existing ship designs.

PTO on alternator – external pump

Pump on alternator – common base frame

PTO on front end – external pump (new feature)

Pump on front end – common base frame (new feature)

Fuel oil saving for small bore GenSet (part load optimised)

GenSets can be delivered with improved fuel oil consumption at low load and part load. The penalty will be higher SFOC at high load. The part-load optimised engine complies with the IMO Tier II limit.

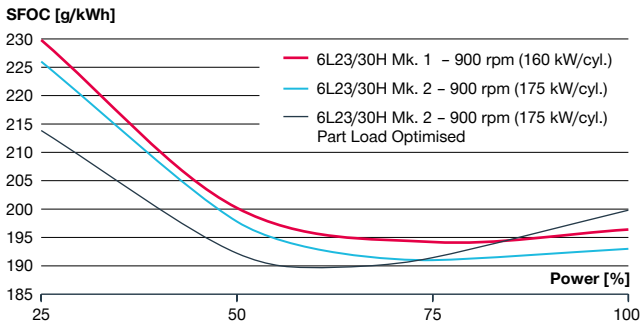
The new tuning method, referred to as part-load optimisation, optimises the engine performance at approx. 60-65% MCR, as this is often the load range in which the GenSet is operating, but it can also be customised to other specific operating conditions.

With part load optimisation, fuel oil savings of up to 12 g/kWh can be obtained, depending on the engine type/model and load point.

Traditionally, GenSets are optimised at 85% MCR, because the power management system will engage additional GenSets when more power is needed.

With part-load optimisation, there is a fuel oil penalty when the load exceeds approx. 80% MCR, but this has no practical consequence as the GenSet rarely exceeds 85% MCR.

This is illustrated in the figure below. For further information, please contact MAN Energy Solutions.



Based on Project Guide figures for IMO Tier II engines – 60Hz:
ISO reference condition, HFO/MDO, without pumps, tolerance +5% (not included)

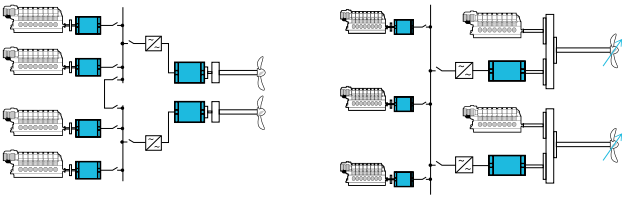
Electric and hybrid propulsion power trains (HyProp ECO)

MAN Energy Solutions offers a full range of electric and hybrid propulsion power trains. Our solutions are designed and optimised to meet the highest efficiencies of a complete propulsion plant system covering the complete operational profile of the vessel. Our propulsion systems provide a well-balanced and tailor-made solution with emphasis on increased fuel efficiency, flexibility and performance.

Our comprehensive propulsion packages include the complete array of required components from GenSets to propulsors, including switchboards, variable speed drives and propulsion motors. Full electric propulsion power trains as well as hybrid systems ensure the optimal technical and economical solution while maximising power demand flexibility.

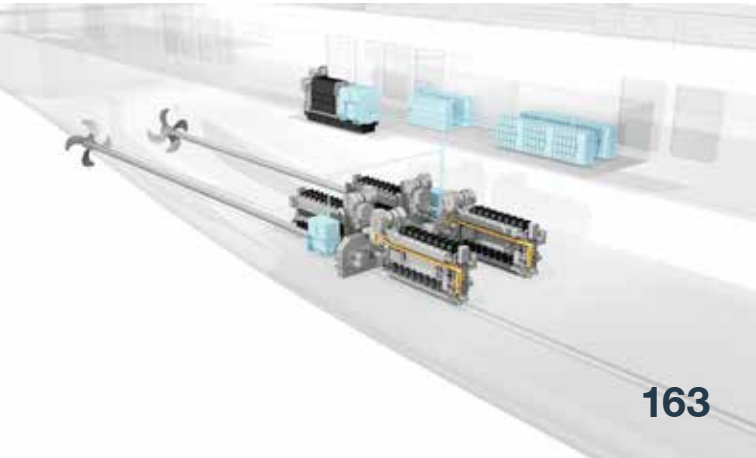
With HyPrpo ECO a hybrid propulsion system was introduced to the market for controlling the power delivered by or to the shaft machine. It overcomes the constraint on constant speed propulsion machinery by utilising variable speed drives at the shaft generator/motor.

Our new developed HyProp battery system also integrates batteries which enable an optimised loading of our engines, and provide electrical spinning reserve, dynamic support of the propellers as well as peak shaving.



High-efficient and customised power trains for electric and hybrid propulsion applications

HyProp ECO
Hybrid
propulsion
system

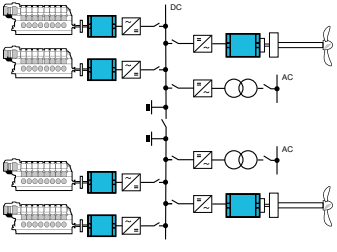


Energy saving electric propulsion (EPROX-DC)

Recent developments in electric propulsion have resulted in electric systems where engines can operate at variable speed. The “classic” constant speed operation of GenSets is no longer a constraint. Utilising an enlarged engine operation map with a speed range of 60% to 100% paves the way to a high potential in fuel oil savings. Each speed set point of the engines can be adjusted independently in order to achieve a minimum fuel oil consumption according to the system load. The electric system using DC distribution enables a decoupled operation of the engines, propulsion drives, and other consumers of energy.

Another major advantage is the possible integration of energy storage sources, like batteries. They can reduce the transient loads on the engines and improve the dynamic response of the propulsion system. Fast load application is removed from the engines and load peaks are shaved. Also, emission free propulsion can be realized when running on the batteries. In addition, the energy storage sources will have a positive effect on engine maintenance.

MAN Energy Solutions offers this advanced package solution in close cooperation with our partner Aspin Kemp & Associates.



EPROX-DC energy-saving electric propulsion plant

EPROX-DC propulsion solution

EPROX-DC propulsion solution on anchor handling tug supply vessel

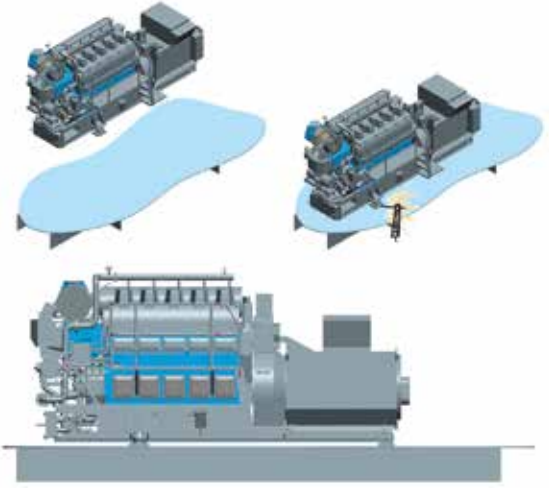
MAN L23/30H monocoque GenSet – continued development

The monocoque GenSet includes several updates of the tried and tested L23/30H engine, which are focused on weight reduction, vibration optimisation and simplified installation.

The most significant update is that the alternator is now a load-bearing component, with a 'top brace' connection to the engine. This enables up to 63% weight reduction of the base frame, which again results in weight reduction of up to 13% of the GenSet and a lower vibration level.

The three and four point 'deck-level' supports significantly simplify the GenSet installation process. This design is installed on a flat deck, which is a major reduction of the vessels foundation structure. Furthermore, applying only three conicals makes the GenSets self-leveling.

The monocoque GenSet application is available for all variants of the L23/30H engine.



Monocoque GenSet

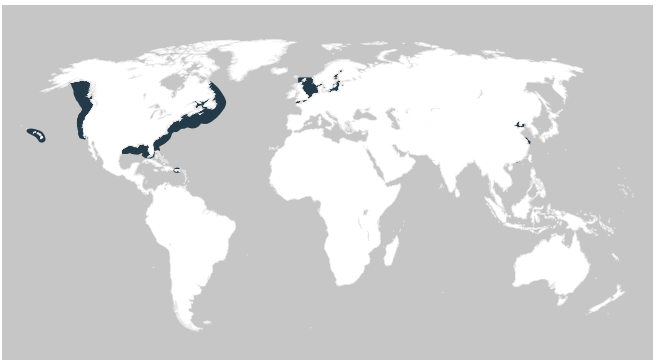
Marine fuels after 2020 (in accordance with ISO 8217)

From 1 January 2020, the global 0.5% limit for sulphur content in marine fuels enters into force. To ensure compliant operation, one of following methods must be used:

- HFO GenSet running on a compliant low-sulphur fuel oil (LSFO) in accordance with ISO 8217.
- Global: max 0.5% sulphur (VLSFO).
- ECA: max 0.1% sulphur (ULSFO).
- HFO GenSet running on a high-sulphur fuel oil (HSFO) in accordance with ISO 8217 and with a SO_X scrubber for exhaust gas cleaning.
- DF GenSet running on LNG with a compliant pilot distillate fuel.

MAN GenSets have for decades been running on low-sulphur and low-viscosity fuels on small power plants on Greenland. The many years of experience have been transferred to the standard marine GenSet. To be prepared for operation on compliant fuels after 2020, the HFO GenSets will be updated with optimised fuel pumps and inlet/exhaust valve materials for low-viscosity fuels.

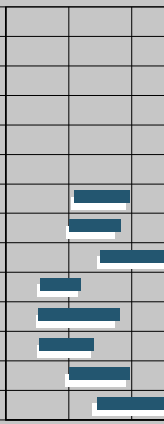
It is important to note that paraffinic and aromatic fuels are incompatible and should not be mixed in the same fuel tank. Notice the issued Service Letters, PrimeServ Customer Information and follow MAN guidelines.



ECAs – 0.10% S (effective 2015) Global sulfur cap – 0.50% S (effective 2020)

MAN four-stroke marine GenSets programme

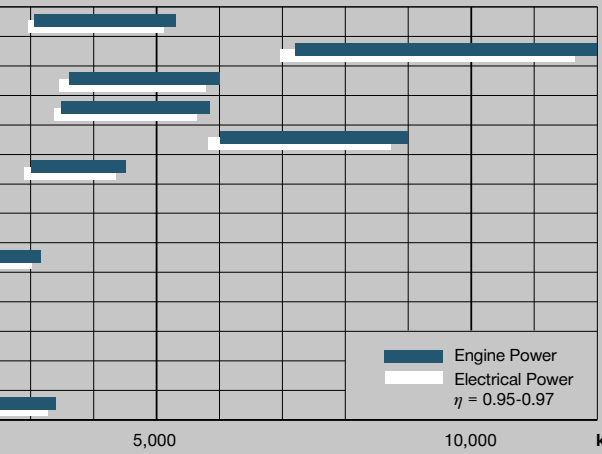
r/min	Engine type
720-750	L35/44DF
720-750	V32/44CR
720-750	L32/44CR
720-750	L32/44
720-750	V32/40
720-750	L32/40
720-750	L28/32H
720-750	L28/32DF
720-750	L27/38 – L27/38 (MDO/MGO)
720-900	L23/30DF
720-900	L23/30H Mk 3
720-900	L23/30H Mk 2
900-1,000	L21/31
1,080-1,800	175D



GenSets

GenSets can be applied as auxiliary GenSets, GenSets for electric propulsion or for offshore applications.

Project specific demands can be clarified at an early project stage.



Tier III GenSets

Four-stroke GenSets are Tier III compatible when a downstream SCR is added to clean the exhaust gas on a Tier II engine. The additional SCR will only have an impact on SFOC if the backpressure is increased.

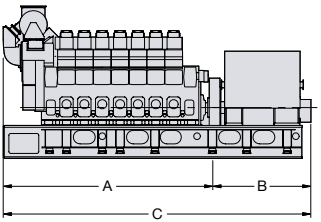
Bore: 350 mm, **Stroke:** 440 mm

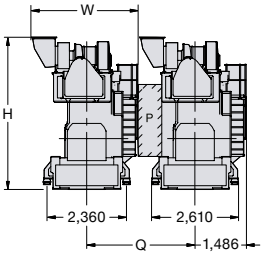
Speed	**r/min**	750		720	
Frequency	**Hz**	50		60	
		Eng. kW	**Gen. kW**[1]	**Eng. kW**	**Gen. kW**[1]
6L35/44DF		3,180	3,069	3,060	2,953
7L35/44DF		3,710	3,580	3,570	3,445
8L35/44DF		4,240	4,092	4,080	3,937
9L35/44DF		4,770	4,603	4,590	4,429
10L35/44DF		5,300	5,115	5,100	4,922

Dimensions[2]

Cyl. no.		**6**	**7**	**8**	**9**	**10**
A	**mm**	6,270	6,900	7,480	8,110	8,690
B[3]	**mm**	3,900	4,100	4,400	4,600	4,800
C[3]	**mm**	10,170	11,000	11,880	12,710	13,490
W	**mm**	2,958	3,108	3,108	3,108	3,108
H	**mm**	4,631	4,867	4,867	4,867	4,867
Dry mass[3]	**t**	85	94	103	110	118

1) Based on nominal generator efficiencies of 96.5%
2) Dimensions are not finally fixed
3) Depending on alternator applied





P Free passage between the engines, width 600 mm and height 2,000 mm
Q Minimum distance between centre of engines: ~3,400 mm (with gallery)

MAN V32/44CR

Tier II | Tier III | EPA Tier 2

Tier III with SCR

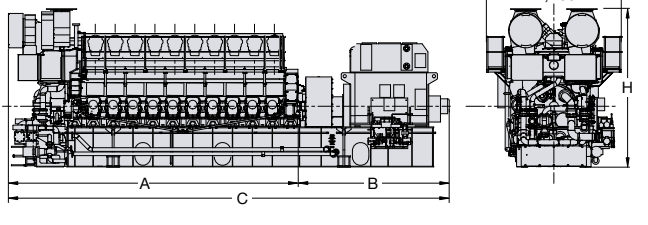
Bore: 320 mm, **Stroke:** 440 mm

Speed	**r/min**	750		720	
Frequency	**Hz**	50		60	
		Eng. kW	**Gen. kW[1)]**	**Eng. kW**	**Gen. kW[1)]**
12V32/44CR		7.200	6.984	7.200	6.984
14V32/44CR[2)]		8.120	7.876	8.120	7.876
16V32/44CR		9,600	9,312	9,600	9,312
18V32/44CR[3)]		10,800	10,476	10,800	10,476
20V32/44CR		12,000	11,640	12,000	11,640

Dimensions

Cyl. no.		**12**	**14**	**16**	**18**	**20**
A	**mm**	5,382	6,012	6,642	7,272	7,902
B	**mm**	4,201	4,201	4,201	4,201	4,201
C	**mm**	11,338	11,968	12,598	13,228	13,858
H	**mm**	5,014	5,014	5,014	5,014	5,014
Dry mass	**t**	117	131	144	159	172

1) Based on nominal generator efficiencies of 97%
2) 580 kW/cyl.
3) 18V32/44CR available rigidly mounted only
Frame Auxiliary Box (FAB) available upon request



Tier III with SCR

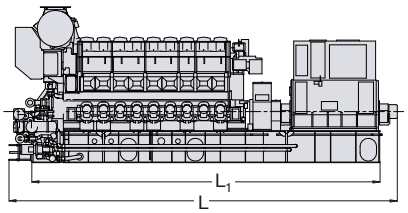
Bore: 320 mm, Stroke: 440 mm

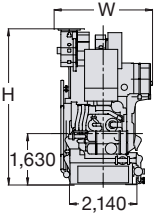
Speed r/min	750		720	
Frequency Hz	50		60	
	Eng. kW	Gen. kW[1)]	Eng. kW	Gen. kW[1)]
6L32/44CR	3,600	3,474	3,600	3,474
7L32/44CR[2)]	4,060	3,918	4,060	3.918
8L32/44CR	4,800	4,632	4,800	4,632
9L32/44CR	5,400	5,211	5,400	5,211
10L32/44CR	6,000	5,790	6,000	5,790

Dimensions

Cyl. no.		6	7	8	9	10
L	mm	10,738	11,268	11,798	12,328	12,858
L_1	mm	10,150	10,693	11,236	11,779	12,309
W	mm	2,490	2,490	2,573	2,573	2,573
H	mm	4,768	4,768	4,955	4,955	4,955
Dry mass	t	71	78	84	91	97

1) Based on nominal generator efficiencies of 96.5%
2) 580 kW/cyl.
Frame Auxiliary Box (FAB) available upon request





Free passage between the engines, width 600 mm and height 2,000 mm
Minimum distance between centre of engines: ~2,835 mm (without gallery) ~3,220 mm (with gallery)

Tier III with SCR

Exclusively for auxiliary GenSet operation. High power density and space saving GenSet with conventional injection and optimised SFOC for part-load operation.

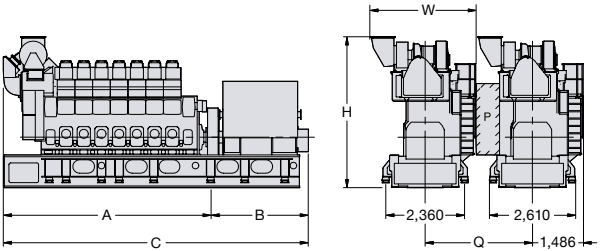
Bore: 320 mm, **Stroke:** 440 mm

Speed	**r/min**	750		720	
Frequency	**Hz**	50		60	
		Eng. kW	**Gen. kW**[1)]	**Eng. kW**	**Gen. kW**[1)]
6L32/44		3,498	3,375	3,498	3,375
8L32/44		4,664	4,500	4,664	4,500
9L32/44		5,247	5,063	5,247	5,063
10L32/44		5,830	5,625	5,830	5,625

Dimensions

Cyl. no.		**6**	**8**	**9**	**10**
A	**mm**	6,470	7,531	8,061	8,590
B	**mm**	3,990	4,229	4,529	4,530
C	**mm**	10,460	11,760	12,590	13,120
W	**mm**	2,845	3,054	3,105	3,105
H	**mm**	4,701	4,887	4,887	4,887
Dry mass	**t**	82	98	107	113

[1)] Based on nominal generator efficiencies of 96.5%



P Free passage between the engines, width 600 mm and height 2,000 mm
Q Minimum distance between centre of engines: ~2,835 mm (with gallery)

MAN V32/40

Tier II Tier III

Tier III with SCR

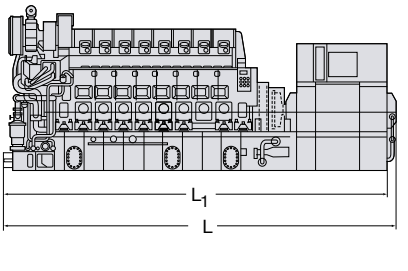
Bore: 320 mm, **Stroke:** 400 mm

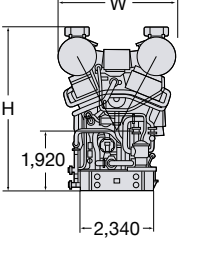
Speed	**r/min**	750		720	
Frequency	**Hz**	50		60	
		Eng. kW	**Gen. kW**[1)]	**Eng. kW**	**Gen. kW**[1)]
12V32/40		6,000	5,820	6,000	5,820
14V32/40		7,000	6,790	7,000	6,790
16V32/40		8,000	7,760	8,000	7,760
18V32/40		9,000	8,730	9,000	8,730

Dimensions

Cyl. no.		**12**	**14**	**16**	**18**
L	**mm**	11,045	11,710	12,555	13,185
L_1	**mm**	10,450	11,115	11,950	12,580
W	**mm**	3,365	3,365	3,730	3,730
H	**mm**	4,850	4,850	5,245	5,245
Dry mass	**t**	101	113	126	138

[1)] Based on nominal generator efficiencies of 97%





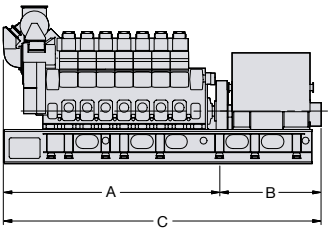
Bore: 320 mm, **Stroke:** 400 mm

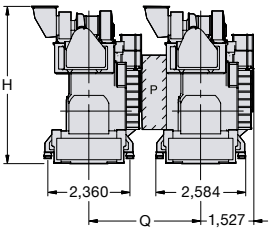
Speed	r/min	750		720	
Frequency	Hz	50		60	
		Eng. kW	Gen. kW[1)]	Eng. kW	Gen. kW[1)]
6L32/40		3,000	2,895	3,000	2,895
7L32/40		3,500	3,378	3,500	3,378
8L32/40		4,000	3,860	4,000	3,860
9L32/40		4,500	4,343	4,500	4,343

Dimensions

Cyl. no.		6	7	8	9
A	mm	6,340	6,870	7,400	7,930
B	mm	3,415	3,415	3,635	3,635
C	mm	9,755	10,285	11,035	11,565
H	mm	4,622	4,622	4,840	4,840
Dry mass	t	75.0	79.0	87.0	91.0

[1)] Based on nominal generator efficiencies of 96.5%





P Free passage between the engines, width 600 mm and height 2,000 mm
Q Minimum distance between centre of engines: ~2,835 mm (without gallery) ~3,220 mm (with gallery)

MAN L28/32H

Tier II Tier III

Tier III with SCR

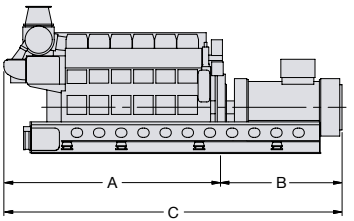
Bore: 280 mm, **Stroke:** 320 mm

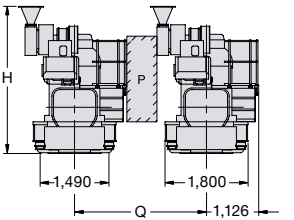
Speed	r/min	750		720	
Frequency	Hz	50		60	
		Eng. kW	Gen. kW[1)]	Eng. kW	Gen. kW[1)]
5L28/32H		1,100	1,045	1,050	1,000
6L28/32H		1,320	1,255	1,260	1,200
7L28/32H		1,540	1,465	1,470	1,400
8L28/32H		1,760	1,670	1,680	1,600
9L28/32H		1,980	1,880	1,890	1,800

Dimensions

Cyl. no.		5	6	7	8	9
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
H	mm	3,184	3,184	3,374	3,374	3,534
Dry mass	t	32.6	36.3	39.4	40.7	47.1

[1)] Based on nominal generator efficiencies of 95%





P Free passage between the engines, width 600 mm and height 2,000 mm

Q Minimum distance between centre of engines: ~2,655 mm (without gallery) ~2,850 mm (with gallery)

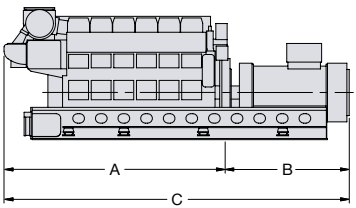
Bore: 280 mm, **Stroke:** 320 mm

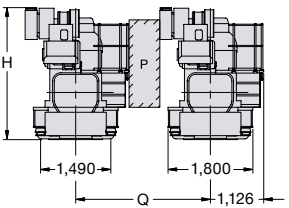
Speed	r/min	750		720	
Frequency	Hz	50		60	
		Eng. kW	Gen. kW[1)]	Eng. kW	Gen. kW[1)]
5L28/32DF		1,000	950	1,000	950
6L28/32DF		1,200	1,140	1,200	1,140
7L28/32DF		1,400	1,330	1,400	1,330
8L28/32DF		1,600	1,520	1,600	1,520
9L28/32DF		1,800	1,710	1,800	1,710

Dimensions

Cyl. no.		5	6	7	8	9
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
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

[1)] Based on nominal generator efficiencies of 95%
Gas methane number ≥ 80





P Free passage between the engines, width 600 mm and height 2,000 mm
Q Minimum distance between centre of engines: ~2,655 mm (without gallery)
~2,850 mm (with gallery)

MAN L27/38

Tier II Tier III

Tier III with SCR

Bore: 270 mm, **Stroke:** 380 mm

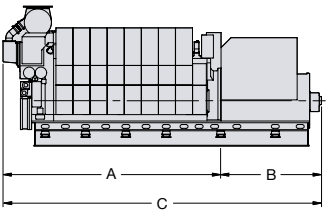
Speed	**r/min**	750/720		750/720 (MDO[1]/MGO)	
Frequency	**Hz**	50/60		50/60	
		Eng. kW	**Gen. kW[2]**	**Eng. kW**	**Gen. kW[2]**
5L27/38		1,600/1,500	1,535/ 1,440	-	-
6L27/38		1,980	1,900	2,100	2,015
7L27/38		2,310	2,220	2,450	2,355
8L27/38		2,640	2,535	2,800	2,690
9L27/38		2,970	2,850	3,150	3,025

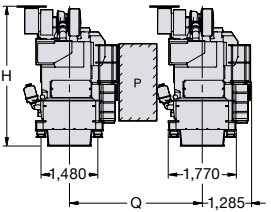
Dimensions

Cyl. no.		**5**	**6**	**7**	**8**	**9**
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
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

[1] MDO viscosity must not exceed 6 mm^2/s = cSt @ 40 °C

[2] Based on nominal generator efficiencies of 96%





P Free passage between the engines, width 600 mm and height 2,000 mm

Q Minimum distance between centre of engines: ~2,900 mm (without gallery) ~3,100 mm (with gallery).

MAN L23/30H Mk 3

Tier III with SCR

Bore: 225 mm, **Stroke:** 300 mm

Speed	**r/min**		750		720		900
Frequency	**Hz**		50		60		60
		Eng. kW	**Gen. kW**[1)]	**Eng. kW**	**Gen. kW**[1)]	**Eng. kW**	**Gen. kW**[1)]
5L23/30H Mk 3 ECR		-	-	500	475	-	-
5L23/30H Mk 3		885	840	850	810	-	-
6L23/30H Mk 3		1,062	1,010	1,020	970	1,200	1,140
7L23/30H Mk 3		1,239	1,180	1,190	1,130	1,400	1,330
8L23/30H Mk 3		1,416	1,345	1,360	1,290	1,600	1,520
9L23/30H Mk 3		1,593	1,515	1,530	1,455	1,800	1,710

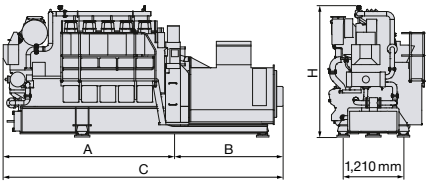
Dimensions (5-7 cylinder)

Cyl. no.		**5**	**5**	**6**	**6**	**7**	**7**
	r/min	720 ECR	720/750	720/750	900	720/750	900
A	**mm**	3,379	3,379	3,749	3,749	4,119	4,276
B	**mm**	2,202	2,202	2,252	2,252	2,302	2,302
C	**mm**	5,581	5,581	6,001	6,001	6,421	6,578
H	**mm**	2,621	2,621	2,621	2,621	2,621	2,621
Dry mass	**t**	16.8	16.8	18.4	18.6	20.7	20.7

Dimensions (8-9 cylinder)

Cyl. no.		**8**	**8**	**9**	**9**
	r/min	720/750	900	720/750	900
A	**mm**	4,489	4,896	4,859	5,266
B	**mm**	2,352	2,352	2,402	2,402
C	**mm**	6,841	7,248	7,261	7,668
H	**mm**	2,621	2,621	2,621	2,621
Dry mass	**t**	22.5	22.6	24.5	24.5

[1)] Based on nominal generator efficiencies of 95%



Free passage between the engines, width 600 mm and height 2,000 mm
Minimum distance between centre of engines: ~2,250 mm (without gallery) ~2,600 mm (with gallery)

MAN L23/30H Mk 2

Tier II Tier III

Tier III with SCR

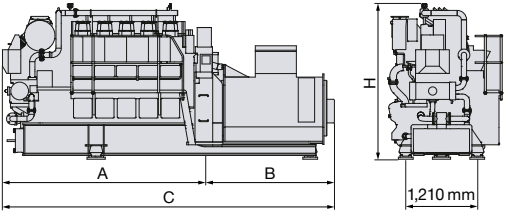
Bore: 225 mm, **Stroke:** 300 mm

Speed	**r/min**	750		720		900	
Frequency	**Hz**	50		60		60	
		Eng. kW	**Gen. kW**[1)]	**Eng. kW**	**Gen. kW**[1)]	**Eng. kW**	**Gen. kW**[1)]
5L23/30H Mk 2 ECR		525	500	525	500	-	-
5L23/30H Mk 2		675/740	640/705	650/710	620/675	-	-
6L23/30H Mk 2		888	845	852	810	1,050	1,000
7L23/30H Mk 2		1,036	985	994	945	1,225	1,165
8L23/30H Mk 2		1,184	1,125	1,136	1,080	1,400	1,330

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**	3,379	3,749	3,749	4,119	4,276	4,489	4,896
B	**mm**	2,202	2,252	2,252	2,302	2,302	2,352	2,352
C	**mm**	5,581	6,001	6,001	6,421	6,578	6,841	7,248
H	**mm**	2,621	2,621	2,621	2,621	2,621	2,621	2,621
Dry mass	**t**	16.8	18.4	18.6	20.7	20.7	22.5	22.6

[1)] Based on nominal generator efficiencies of 95%
Note: Part load optimised – approved and available



Free passage between the engines, width 600 mm and height 2,000 mm
Minimum distance between centre of engines: ~2,250 mm (without gallery) ~2,600 mm (with gallery)

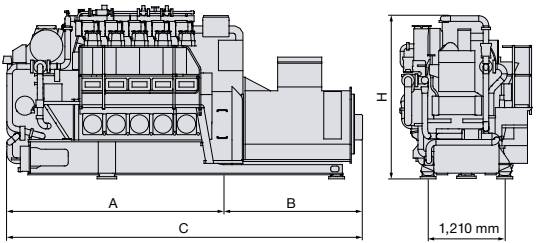
Bore: 225 mm, **Stroke:** 300 mm

Speed	r/min	750		720		900	
Frequency	Hz	50		60		60	
		Eng. kW	Gen. kW[1)]	Eng. kW	Gen. kW[1)]	Eng. kW	Gen. kW[1)]
5L23/30DF		625	590	625	590	-	-
6L23/30DF		750	710	750	710	900	855
7L23/30DF		875	830	875	830	1,050	995
8L23/30DF		1,000	950	1,000	950	1,200	1,140

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	3,469	3,839	3,839	4,209	4,276	4,579	4,896
B	mm	2,202	2,252	2,252	2,302	2,302	2,352	2,352
C	mm	5,671	6,091	6,091	6,511	6,578	6,931	7,241
H	mm	2,749	2,749	2,749	2,749	2,749	2,749	2,749
Dry mass	t	17.3	19.0	19.2	21.4	21.4	23.3	23.4

[1)] Based on nominal generator efficiencies of 95%.
Engine variants with 750 and 720 r/min are certified for compliance with IMO Tier III in the load range 20-100%.
Engine variants with 900 r/min have not been tested, and an SCR catalyst may be required to achieve compliance with IMO Tier III.
Gas methane number ≥ 80.



Free passage between the engines, width 600 mm and height 2,000 mm
Minimum distance between centre of engines: ~2,250 mm (without gallery) ~2,600 mm (with gallery)

MAN L21/31

Tier II Tier III

Tier III with SCR

Bore: 210 mm, **Stroke:** 310 mm

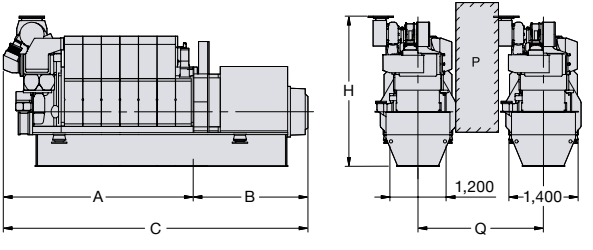
Speed	**r/min**	1,000		900	
Frequency	**Hz**	50		60	
		Eng. kW	**Gen. kW**[1)]	**Eng. kW**	**Gen. kW**[1)]
5L21/31		1,000	950	1,000	950
6L21/31		1,320	1,255	1,320	1,255
7L21/31		1,540	1,465	1,540	1,465
8L21/31		1,760	1,675	1,760	1,675
9L21/31		1,980	1,880	1,980	1,880

Dimensions

Cyl. no.		**5**	**6**	**7**	**8**	**9**
A	**mm**	3,959	4,314	4,669	5,572	5,927
B	**mm**	1,870	2,000	1,970	2,110	2,135
C	**mm**	5,829	6,314	6,639	7,682	8,062
H	**mm**	3,183	3,183	3,289	3,289	3,289
Dry mass	**t**	22.5	26.0	29.5	33.0	36.5

[1)] Based on nominal generator efficiencies of 95%

Note: Part load optimised – approved and available



P Free passage between the engines, width 600 mm and height 2,000 mm

Q Minimum distance between centre of engines: ~2,400 mm (without gallery) ~2,600 mm (with gallery).

Bore: 175 mm, **Stroke:** 215 mm, **Cylinder:** 12

Engine model	Rating def.	kWm	kWe[1]	rpm (frequency)	SFOC at 100% MCR Tier II/Tier III g/kWh
12V175D-MEM	Diesel-electric	1,440	1,382	1,500 (50 Hz)	188/191
	medium duty	1,800	1,728	1,800 (60 Hz)	195/198
12V175D-MEL	Diesel-electric	1,620	1,555	1,500 (50 Hz)	188/191
	light duty	1,920	1,843	1,800 (60 Hz)	195/198
12V175D-MEV[2]	EPROX-DC	2,040	1,958	1,080-1,800 (36-60 Hz	197/199
	operation	1,860	1,786	1,080-1,800/36-60 Hz	197/199
12V175D-MA	Auxiliary duty	1,620	1,555	1,500 (50 Hz)	188/191
		1,920	1,843	1,800 (60 Hz)	195/198

[1] 3-phase, 0.8 p.f., assumes alternator efficiency of 96.0%.
[2] SFOC values for nominal speed of 1,800 rpm
SFOC figures related to mechanical output and for distillates according to ISO 8217 DMA, with attached lube oil, HT and LT-cooling water pumps.

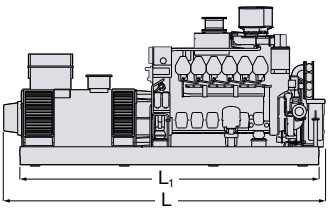
Rating definitions:

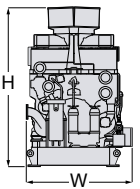
Marine electric propulsion medium duty	Average load: up to 75%
Marine electric propulsion light duty	Average load: up to 50%
Marine electric propulsion, variable speed	Average load: up to 75%
Marine auxiliary	Average load: up to 50%

Dimensions

L	**mm**	5,385
L_1	**mm**	5,000
H	**mm**	2,670
W	**mm**	1,770
Dry weight	**t**	15.80

GenSet dimensions and weight shown are for guidance only. Details may vary due to different configurations.





MAN 175D

16V

Tier II Tier III

Tier III with SCR

Bore: 175 mm, **Stroke:** 215 mm, **Cylinder:** 16

Engine model	Rating def.	kWm	kWe[1]	rpm (frequency)	SFOC at 100% MCR Tier II/Tier III g/kWh
16V175D-MEM	Diesel-electric	1,920	1,843	1,500 (50 Hz)	188/191
	medium duty	2,400	2,304	1,800 (60 Hz)	195/198
16V175D-MEL	Diesel-electric	2,160	2,074	1,500 (50 Hz)	188/191
	light duty	2,560	2,458	1,800 (60 Hz)	195/198
16V175D-MEV[2]	EPROX-DC	2,480	2,381	1,080-1,800 (36-60 Hz)	197/199
	operation	2,720	2,611	1,080-1,800 (36-60 Hz)	197/199

[1] 3-phase, 0.8 p.f., assumes alternator efficiency of 96.0%.
[2] SFOC values for nominal speed of 1,800 rpm
SFOC figures related to mechanical output and for distillates according to ISO 8217 DMA, with attached lube oil, HT and LT-cooling water pumps.

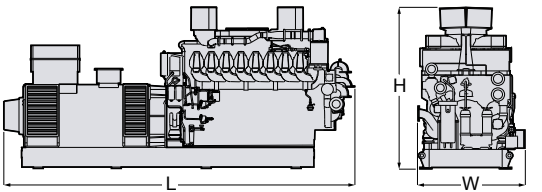
Rating definitions:

Marine electric propulsion medium duty	Average load: up to 75%
Marine electric propulsion light duty	Average load: up to 50%
Marine electric propulsion, variable speed	Average load: up to 75%

Dimensions

L	**mm**	6,000
H	**mm**	2,850
W	**mm**	1,800
Dry weight	**t**	23

GenSet dimensions and weight shown are for guidance only. Details may vary due to different configurations.



MAN 175D

20V

Bore: 175 mm, **Stroke:** 215 mm, **Cylinder:** 20

Engine model	Rating def.	kWm	kWe[1]	rpm (frequency)	SFOC at 100% MCR Tier II/Tier III g/kWh
20V175D-MEM	Diesel-electric	2,400	2,304	1,500 (50 Hz)	188/191
	medium duty	3,000	2,880	1,800 (60 Hz)	195/198
20V175D-MEL	Diesel-electric	2,700	2,592	1,500 (50 Hz)	188/191
	light duty	3,200	3,072	1,800 (60 Hz)	195/198
20V175D-MEV[2]	EPROX-DC	3,100	2,976	1,080-1,800 (36-60 Hz)	197/199
	operation	3,400	3,264	1,080-1,800 (36-60 Hz)	197/199

[1] 3-phase, 0.8 p.f., assumes alternator efficiency of 96.0%.
[2] SFOC values for nominal speed of 1,800 rpm
SFOC figures related to mechanical output and for distillates according to ISO 8217 DMA, with attached lube oil, HT and LT-cooling water pumps.

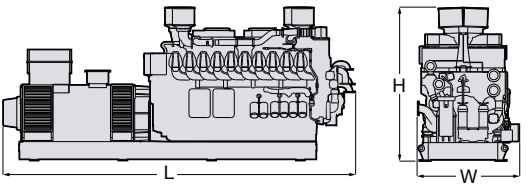
Rating definitions:

Marine electric propulsion medium duty	Average load: up to 75%
Marine electric propulsion light duty	Average load: up to 50%
Marine electric propulsion, variable speed	Average load: up to 75%

Dimensions

L	**mm**	6,500
H	**mm**	2,900
W	**mm**	1,800
Dry weight	**t**	27

GenSet dimensions and weight shown are for guidance only. Details may vary due to different configurations.



S.E.M.T. Pielstick four-stroke propulsion engines

S.E.M.T. Pielstick PA6 B STC

Tier II Tier III

Tier III with SCR

Bore: 280 mm, **Stroke:** 330 mm

Speed	**r/min**	1,050
mep	**bar**	22.8
		kW[1]
12PA6 B STC		4,860
16PA6 B STC		6,480
20PA6 B STC		8,100

Specific Fuel Oil Consumption (SFOC) to ISO conditions

MCR	**100%**	**85%**
PA6 B STC	-[2]	-[2]

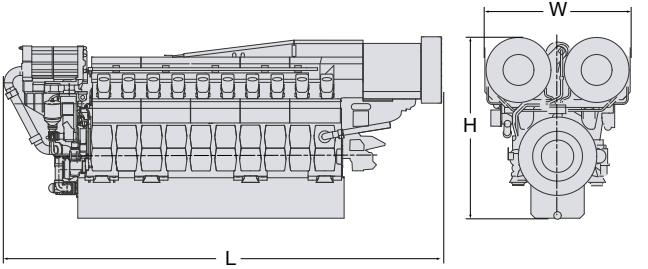
Dimensions

Cyl. No.		**12**	**16**	**20**
L	**mm**	5,830	6,780	7,960
W	**mm**	2,340	2,340	2,640
H	**mm**	3,124	3,124	3,166
Dry mass	**t**	31	37	43

Engine fuel: distillate according to ISO 8217 DMA
Engine rating: engine rating according to ISO 3046 conditions

[1] 110% load for one in six operating hours on navy vessels, with approval according to HSVR from DNV, available on special request

[2] SFOC values are project specific. Please contact MAN Energy Solutions for further information.



Tier II Tier III

Tier III with SCR

S.E.M.T. Pielstick PA6 B

GenSet for electric propulsion.

Bore 280 mm, **Stroke** 330 mm

Speed	**r/min**	**1,000**		**900**	
Frequency	**Hz**	50		60	
		Eng. kW	**Gen. kW[1)]**	**Eng. kW**	**Gen. kW[1)]**
12PA6 B		4,440	4,307	4,200	4,074
16PA6 B		5,920	5,742	5,600	5,432
18PA6 B		6,660	6,460	6,300	6,111
20PA6 B		7,400	7,178	7,000	6,790

Dimensions[2)]

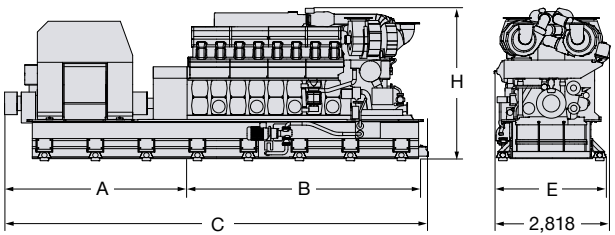
Cyl. No.		**12**	**16**	**18**	**20**
A	**mm**	4,370	4,727	4,732	4,770
B	**mm**	4,600	5,637	6,097	6,557
C	**mm**	9,287	10,583	11,048	11,547
H	**mm**	3,695	3,695	3,695	3,695
E	**mm**	2,670	2,670	2,670	2,670
Dry mass[3)]	**t**	60	72	80	85

[1)] Nominal generator efficiencies: 97%

[2)] Dimensions are based on operation under inclination up to 25 degrees in any direction

[3)] Incl. 5% tolerance, weight may vary due to different configurations

Engine fuel: distillate according to ISO 8217 DMA and DMZ
Permissible overload of 10% for 1 hour every other 12 hours of operation



S.E.M.T. Pielstick PC2.6 B

Tier II Tier III

Tier III with SCR

Bore: 400 mm, **Stroke:** 500 mm

Speed	**r/min**	600
mep	**bar**	23.9
		kW
12PC2.6 B		9,000
14PC2.6 B		10,500
16PC2.6 B		12,000

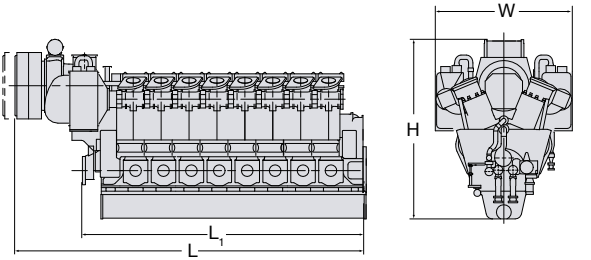
Specific Fuel Oil Consumption (SFOC) to ISO conditions

MCR	**100%**	**85%**
PC2.6 B	-[1)]	-[1)]

Dimensions

Cyl. No.		**12**	**14**	**16**
L	**mm**	9,100	9,840	10,580
L_1	**mm**	5,960	6,700	7,440
W	**mm**	3,780	3,780	3,780
H	**mm**	4,800	4,800	4,800
Dry mass	**t**	94	104	114

[1)] SFOC values are project specific. Please contact MAN Energy Solutions for further information.




GLOBAL 1200

MAN Four-stroke propulsion systems

MAN Alpha

Propeller programme – FPP and CPP

The MAN Alpha FPP portfolio covers:

- power range of 4-40 MW per shaft
- blade configurations for 3, 4, 5 and 6-bladed propellers
- propellers with integrated shaft line and stern tube solutions
- a wide range of stern tube lube and sealing systems
  - oil, water, biodegradable oils

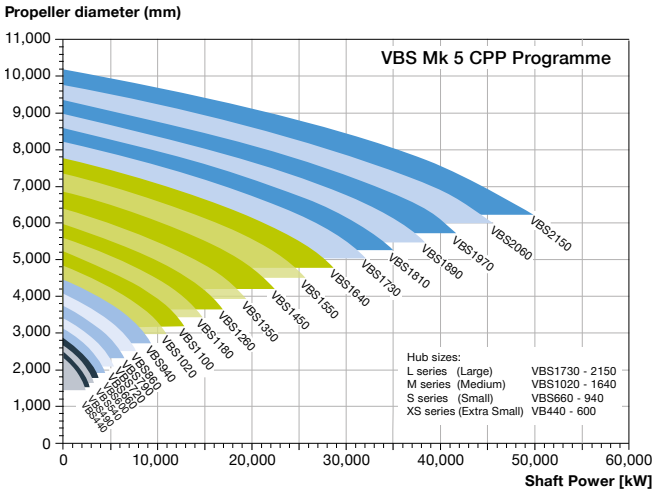
The MAN Alpha FPPs are characterised by the following benefits:

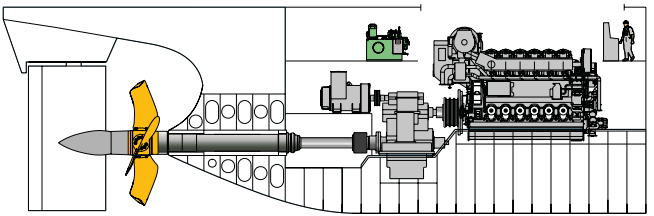
- High-efficient hydrodynamically optimised blade profiles
  - Kappel designs available
- High reliability: robust approach with ample mechanical design margins
- High-efficient aft ship integration with rudder, rudder bulb, ducts, etc.
- Layouts for complete propulsion systems
- Plant calculations with upfront consideration to torsional vibration calculation (TVC), alignment and control systems

MAN Alpha controllable pitch propeller

- As standard Mk 5 versions are 4-bladed – optionally 3- and 5-bladed propellers are available on request
- The figures stated after VBS indicate the propeller hub diameter
- Standard blade/hub materials are Ni-Al-bronze, stainless steel is optional
- The propellers are available up to the highest ice classes. However the standard programme, is based on 'no ice'

Standard programme





Four-stroke propulsion system installation – complete powertrain with propeller and aft ship equipment MAN Alpha Kappel propeller – four-bladed CP with fairing cone for rudder bulb

MAN standard package examples

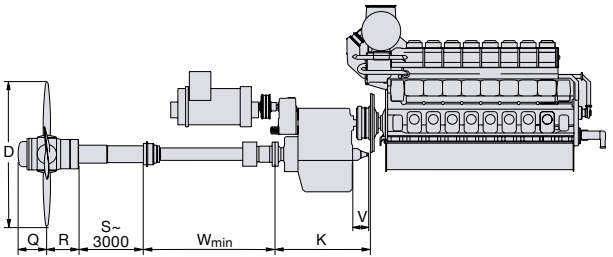
Cyl.	kW	Prop. speed r/min	D mm	Hub VBS mm	Q mm	R mm	Wmin mm	K mm	V mm	Prop. mass t[1]
L51/60DF										
6	6,900	162	4,400	1,100	851	920				
6	6,900	133	5,000	1,180	914	989				
6	6,900	103	5,850	1,350	1,037	1,096				
7	8,050	160	4,550	1,180	914	989				
7	8,050	133	5,150	1,260	975	1,036				
7	8,050	104	6,000	1,450	1,114	1,148				
8	9,200	157	4,700	1,180	914	989				
8	9,200	132	5,300	1,350	1,037	1,096				
8	9,200	103	6,200	1,450	1,114	1,148				
9	10,350	155	4,850	1,260	975	1,036				
9	10,350	131	5,450	1,350	1,037	1,096				
9	10,350	102	6,400	1,550	1,175	1,213				
V48/60CR										
12	14,400	160	4,950	1,350	1,037	1,096	1,800	2,620		26.7
12	14,400	130	5,600	1,450	1,114	1,163	1,850	2,770		33.2
12	14,400	100	6,600	1,640	1,260	1,256	1,900	3,140		42.2
14	16,800	160	5,100	1,450	1,114	1,163	1,850	2,775		31.7
14	16,800	130	5,850	1,550	1,187	1,208	1,900	2,905		38.1
14	16,800	100	6,850	1,730	1,330	1,307	1,950	3,355		48.5
16	19,200	160	5,260	1,450	1,114	1,163	1,850	2,805		32.9
16	19,200	130	6,050	1,640	1,260	1,256	1,950	3,155		43.9
16	19,200	100	7,100	1,730	1,330	1,367	2,000	3,455		56.3
18	21,600	160	5,400	1,550	1,187	1,213	1,900	2,905		37.3
18	21,600	130	6,200	1,640	1,260	1,266	1,950	3,155		45.5
18	21,600	100	7,300	1,810	1,390	1,420	2,000	3,655		61.4

[1] S_{min} and propeller mass are based on 6,000 mm propeller shaft and 3,000 mm stern tube

MAN standard package examples

Cyl.	kW	Prop. speed r/min	D mm	Hub VBS mm	Q mm	R mm	Wmin mm	K mm	V mm	Prop. mass t[1]
L48/60CR										
6	7,200	172	4,250	1,100	851	970	1,700			19.1
6	7,200	143	4,800	1,180	914	989	1,700			23.0
6	7,200	112	5,600	1,350	1,037	1,096	1,700			29.9
7	8,400	169	4,400	1,100	851	995	1,700			21.4
7	8,400	141	5,000	1,260	975	1,036	1,700			26.4
7	8,400	110	5,850	1,350	1,037	1,096	1,750			32.3
8	9,600	166	4,550	1,180	914	989	1,700			24.2
8	9,600	139	5,150	1,260	975	1,036	1,700			28.2
8	9,600	110	6,000	1,450	1,114	1,148	1,800			37.9
9	10,800	163	4,700	1,260	975	1,036	1,700			27.2
9	10,800	137	5,300	1,350	1,037	1,096	1,800			33.2
9	10,800	108	6,200	1,450	1,114	1,163	1,800			40.2

[1] S_{min} and propeller mass are based on 6,000 mm propeller shaft and 3,000 mm stern tube



MAN standard package examples

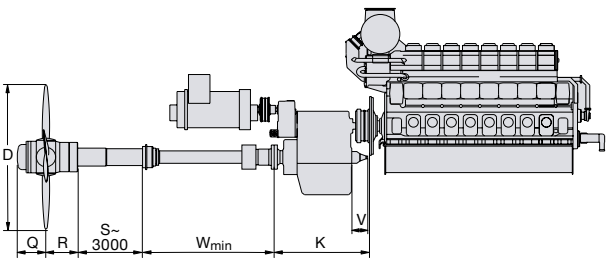
Cyl.	kW	Prop. speed r/min	D mm	Hub VBS mm	Q mm	R mm	Wmin mm	K mm	V mm	Prop. mass t [1]
V48/60B										
12	13,800	162	4,950	1,350	1,027	1,100	1,800		876	31.5
12	13,800	135	5,600	1,450	1,122	1,197	1,900		876	39.0
12	13,800	106	6,600	1,640	1,260	1,256	1,900		876	51.2
14	16,100	163	5,100	1,450	1,122	1,197	1,800		876	36.6
14	16,100	131	5,850	1,550	1,175	1,225	1,900		876	45.4
14	16,100	99	6,850	1,730	1,330	1,339	1,950		TBS	55.8
16	18,400	162	5,250	1,450	1,122	1,197	1,900		876	39.2
16	18,400	129	6,050	1,550	1,175	1,225	1,950		876	50.0
16	18,400	97	7,100	1,810	1,390	1,300	2,000		TBS	61.0
18	20,700	161	5,400	1,550	1,175	1,225	1,900		876	44.7
18	20,700	128	6,200	1,640	1,260	1,256	1,950		876	54.7
18	20,700	96	7,300	1,890	1,450	1,370	2,000		TBS	63.3
L48/60B										
6	6,900	170	4,250	1,100	851	920	1,700		739	18.5
6	6,900	142	4,800	1,180	914	1,004	1,700		739	22.5
6	6,900	111	5,600	1,350	1,027	1,096	1,700		876	28.9
7	8,050	167	4,400	1,100	851	945	1,700		739	20.7
7	8,050	139	5,000	1,260	972	1,036	1,700		739	25.7
7	8,050	109	5,850	1,350	1,027	1,035	1,750		876	31.6
8	9,200	165	4,550	1,180	914	1,004	1,700		739	23.2
8	9,200	138	5,150	1,260	972	1,036	1,700		739	27.2
8	9,200	109	6,000	1,450	1,122	1,197	1,800		876	36.6
9	10,350	162	4,700	1,260	972	1,036	1,700		739	25.9
9	10,350	136	5,300	1,350	1,027	1,096	1,750		876	31.0
9	10,350	107	6,200	1,450	1,122	1,163	1,800		876	39.1

[1] S_{min} and propeller mass are based on 6,000 mm propeller shaft and 3,000 mm stern tube

MAN standard package examples

Cyl.	kW	Prop. speed r/min	D mm	Hub VBS mm	Q mm	R mm	Wmin mm	K mm	V mm	Prop. mass t [1]
V45/60CR										
12	15,600	161	5,100	1,450	1,122	1,197	1,800			
12	15,600	133	5,750	1,550	1,175	1,236	1,900			
12	15,600	106	6,750	1,640	1,260	1,288	1,950			
14	18,200	164	5,200	1,450	1,122	1,227	1,800			
14	18,200	131	5,950	1,550	1,175	1,256	1,900			
14	18,200	104	7,000	1,730	1,330	1,339	3,000			
L35/44DF										
6	3,180	208	3,300	790	600	692	1,400			6.4
6	3,180	167	3,800	940	714	886	1,530			8.7
6	3,180	130	4,400	1,020	775	896	1,530			10.9
7	3,710	198	3,500	860	653	750	1,530			7.9
7	3,710	161	4,000	940	714	886	1,530			9.5
7	3,710	128	4,600	1,100	836	1,001	1,560			12.7
8	4,240	197	3,600	860	653	750	1,530			8.4
8	4,240	165	4,050	940	714	886	1,530			10.0
8	4,240	127	4,750	1,100	836	1,001	1,560			13.6
9	4,770	202	3,600	940	714	886	1,530			9.3
9	4,770	167	4,100	1,020	775	896	1,560			11.9
9	4,770	130	4,800	1,100	836	1,001	1,630			14.7
10	5,300	199	3,700	940	714	886	1,560			10.2
10	5,300	166	4,200	1,020	775	896	1,560			12.5
10	5,300	126	5,000	1,180	897	1,004	1,630			16.8

[1] S_{min} and propeller mass are based on 6,000 mm propeller shaft and 3,000 mm stern tube



MAN standard package examples

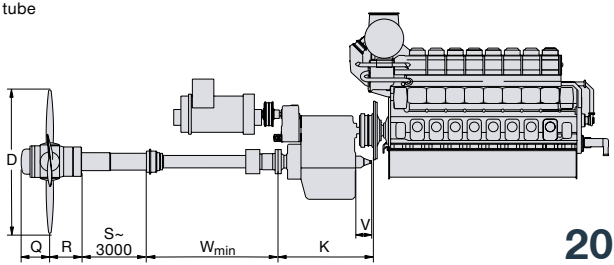
Cyl.	kW	Prop. speed r/min	D mm	Hub VBS mm	Q mm	R mm	Wmin mm	K mm	V mm	Prop. mass t [1]
V32/44CR										
12	7,200	207	3,800	1,020	795	879	1,650			14.4
12	7,200	167	4,400	1,100	851	920	1,700			17.4
12	7,200	128	5,250	1,260	975	1,036	1,700			22.9
14	8,120	202	3,950	1,020	795	879	1,650			15.2
14	8,120	164	4,550	1,180	914	989	1,700			19.7
14	8,120	127	5,400	1,260	975	1,036	1,700			24.4
16	9,600	205	4,050	1,100	851	945	1,700			18.1
16	9,600	165	4,650	1,180	914	989	1,700			21.8
16	9,600	127	5,550	1,350	1,037	1,096	1,750			28.2
18	10,800	205	4,150	1,180	914	989	1,700			20.2
18	10,800	164	4,750	1,260	975	1,036	1,700			24.2
18	10,800	126	5,700	1,450	1,114	1,148	1,800			32.7
20	12,000	204	4,250	1,180	914	989	1,700			21.2
20	12,000	163	4,850	1,260	975	1,036	1,750			25.8
20	12,000	124	5,850	1,450	1,114	1,163	1,800			34.7
L32/44CR										
6	3,600	206	3,350	860	653	750	1,400			8.9
6	3,600	170	3,800	940	714	886	1,520			10.4
6	3,600	130	4,450	1,020	775	896	1,520			12.4
7	4,060	202	3,500	860	653	750	1,520			9.7
7	4,060	168	3,950	940	714	886	1,520			11.2
7	4,060	131	4,600	1,100	836	1,001	1,550			14.3
8	4,800	199	3,600	940	714	886	1,520			10.9
8	4,800	167	4,050	1,020	775	896	1,520			12.5
8	4,800	129	4,750	1,100	836	1,001	1,630			16.2
9	5,400	200	3,650	940	714	886	1,520			11.3
9	5,400	166	4,150	1,020	775	896	1,550			13.6
9	5,400	128	4,900	1,180	897	1,004	1,630			17.9
10	6,000	201	3,700	940	714	886	1,550			12.3
10	6,000	164	4,250	1,020	775	896	1,630			15.1
10	6,000	128	5,000	1,180	897	1,004	1,650			18.9

[1] S_{min} and propeller mass are based on 6,000 mm propeller shaft and 3,000 mm stern tube

MAN standard package examples

Cyl.	kW	Prop. speed r/min	D mm	Hub VBS mm	Q mm	R mm	Wmin mm	K mm	V mm	Prop. mass t [1]
V32/40										
12	6,000	187	3,950	1,020	775	896	1,560			15.2
12	6,000	159	4,400	1,100	836	970	1,630			18.3
12	6,000	128	5,050	1,180	914	989	1,700			22.6
14	7,000	183	4,100	1,020	775	901	1,630			17.1
14	7,000	158	4,550	1,100	836	970	1,650			19.8
14	7,000	127	5,250	1,260	975	1,036	1,700			26.1
16	8,000	183	4,200	1,100	836	970	1,650			19.3
16	8,000	155	4,700	1,180	914	989	1,700			23.6
16	8,000	126	5,400	1,260	975	1,036	1,700			27.8
18	9,000	181	4,300	1,100	836	995	1,700			21.0
18	9,000	153	4,850	1,260	975	1,036	1,700			26.2
18	9,000	123	5,600	1,350	1,037	1,096	1,740			31.6
L32/40										
6	3,000	205	3,300	790	639	692	1,400			8.8
6	3,000	171	3,700	860	653	745	1,400			9.9
6	3,000	137	4,200	940	714	886	1,520			12.0
7	3,500	199	3,450	860	653	745	1,400			9.8
7	3,500	168	3,850	940	714	886	1,520			11.8
7	3,500	134	4,400	1,020	775	896	1,520			13.9
8	4,000	198	3,550	860	653	745	1,400			10.3
8	4,000	165	4,000	940	714	906	1,520			12.5
8	4,000	133	4,550	1,100	836	1,001	1,560			16.3
9	4,500	195	3,650	940	714	906	1,520			12.2
9	4,500	164	4,100	1,020	775	896	1,520			14.1
9	4,500	134	4,650	1,100	836	1,006	1,560			17.1

[1] S_{min} and propeller mass are based on 6,000 mm propeller shaft and 3,000 mm stern tube



MAN standard package examples

Cyl.	kW	Prop. speed r/min	D mm	Hub VBS mm	Q mm	R mm	Wmin mm	K mm	V mm	Prop. mass t [1]
V28/33D STC										
12	6,000	187	3,700	940	735	828	1,600			10.9
12	6,000	155	4,000	1,020	795	879	1,650			13.1
12	6,000	140	4,300	1,100	851	920	1,650			14.5
16	8,000	211	3,700	1,020	795	879	1,650			13.1
16	8,000	184	4,000	1,100	851	920	1,650			14.7
16	8,000	159	4,300	1,100	851	945	1,700			16.2
20	10,000	228	3,700	1,100	851	920	1,650			14.6
20	10,000	199	4,000	1,100	851	945	1,700			16.3
20	10,000	176	4,300	1,180	914	989	1,700			18.3

[1] S_{min} and propeller mass are based on 6,000 mm propeller shaft and 3,000 mm stern tube

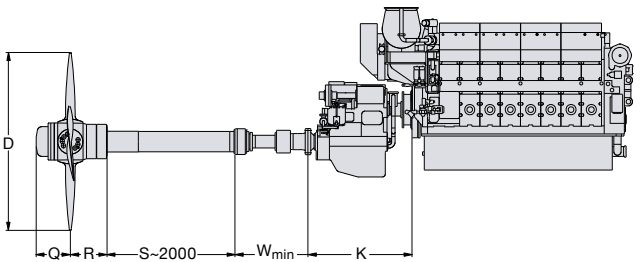
L27/38										
6	2,040	258	2,650	660	501	631	1,320			4.9
6	2,040	218	2,950	720	547	650	1,350			5.7
6	2,040	191	3,200	790	639	692	1,350			6.6
6	2,040	163	3,500	790	639	692	1,350			7.0
6	2,040	152	3,650	860	653	745	1,350			7.8
7	2,380	247	2,800	720	547	513	1,350			5.7
7	2,380	211	3,100	720	547	513	1,350			6.1
7	2,380	186	3,350	790	639	692	1,350			7.0
7	2,380	161	3,650	860	653	745	1,400			8.1
7	2,380	150	3,800	860	653	745	1,400			8.4
8	2,720	242	2,900	720	547	513	1,350			6.1
8	2,720	209	3,200	790	639	692	1,350			6.9
8	2,720	186	3,450	790	639	692	1,400			7.5
8	2,720	173	3,600	860	653	745	1,400			8.3
8	2,720	147	3,950	940	714	886	1,400			9.7
9	3,060	243	2,950	720	547	513	1,350			6.3
9	3,060	206	3,300	790	639	692	1,400			7.5
9	3,060	184	3,550	860	653	745	1,400			8.5
9	3,060	172	3,700	860	653	745	1,400			8.7
9	3,060	147	4,050	940	714	886	1,530			10.5

[1] S_{min} and propeller mass are based on 4,000 mm propeller shaft and 2,000 mm stern tube for 21/31, 27/38 and 6,000 mm propeller shaft and 3,000 mm stem tube for the other types

MAN standard package examples

Cyl.	kW	Prop. speed r/min	D mm	Hub VBS mm	Q mm	R mm	Wmin mm	K mm	V mm	Prop. mass t [1]
L21/31										
6	1,290	274	2,350	600	456	566	1,320			3.8
6	1,290	232	2,600	600	456	566	1,320			4.1
6	1,290	205	2,800	660	501	631	1,320			4.4
6	1,290	181	3,000	660	501	631	1,320			4.7
7	1,505	260	2,500	600	456	566	1,320			4.1
7	1,505	223	2,750	660	501	631	1,320			4.6
7	1,505	198	2,950	660	501	631	1,320			4.8
7	1,505	176	3,150	720	547	650	1,320			5.4
8	1,720	261	2,550	600	456	581	1,320			4.4
8	1,720	219	2,850	660	501	631	1,320			4.8
8	1,720	196	3,050	720	547	650	1,320			5.1
8	1,720	176	3,250	720	547	650	1,350			5.6
9	1,935	262	2,600	660	501	631	1,320			4.7
9	1,935	221	2,900	720	547	650	1,320			5.4
9	1,935	199	3,100	720	547	650	1,350			5.9
9	1,935	188	3,200	720	547	650	1,350			6.0

[1] S_{min} and propeller mass are based on 4,000 mm propeller shaft and 2,000 mm stern tube for 21/31, 27/38 and 6,000 mm propeller shaft and 3,000 mm stem tube for the other types

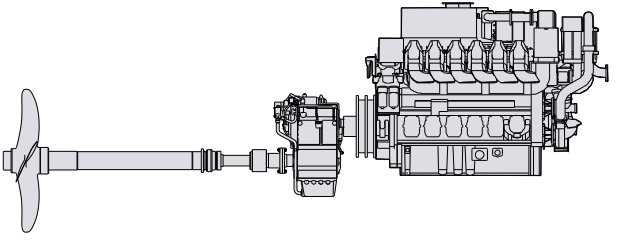


MAN Alpha FPP solutions for MAN 175D

Engine rating[1)]	Engine power	Engine speed	Propeller speed	Propeller diameter	Propeller 4-bladed	Shaft diameter	Design speed
12V175D	kW	r/min	r/min	mm	type	mm	knots
MH	1,740	1,800	884	1,300	FPP	175	25
MH	1,740	1,800	702	1,400	FPP	175	25
MH	1,740	1,800	620	1,450	FPP	175	25
MH	1,740	1,800	523	1,600	FPP	175	25
MH	1,740	1,800	450	1,750	FPP	175	20
MH	1,740	1,800	400	1,850	FPP	205	20
MH	1,740	1,800	360	2,000	FPP	205	20
MH	1,740	1,800	331	2,100	FPP	205	20
MH	1,740	1,800	302	2,250	FPP	205	15
MH	1,740	1,800	288	2,300	FPP	205	15
MH	1,740	1,800	261	2,450	FPP	225	15
MH	1,740	1,800	247	2,500	FPP	225	15
MM	2,220	1,900	741	1,300	FPP	175	25
MM	2,220	1,900	654	1,450	FPP	175	25
MM	2,220	1,900	552	1,550	FPP	205	25
MM	2,220	1,900	475	1,750	FPP	205	20
MM	2,220	1,900	422	1,850	FPP	205	20
MM	2,220	1,900	380	2,000	FPP	205	20
MM	2,220	1,900	350	2,100	FPP	205	20
MM	2,220	1,900	319	2,200	FPP	225	15
MM	2,220	1,900	304	2,250	FPP	225	15
MM	2,220	1,900	275	2,500	FPP	225	15

[1)] Engine rating designations: MH = Marine 'Heavy Duty' and MM = Marine 'Medium Duty'

Propellers for the MAN 12V175D engines are optimized for a diesel-mechanical twin screw vessel operating at 85% engine rating. The standard propeller programme is dimensioned according to Lloyd's Register No Ice.

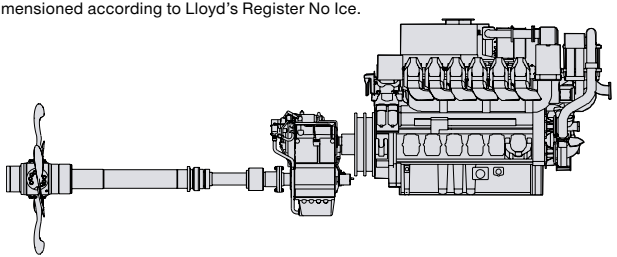


MAN Alpha CPP solutions for MAN 175D

Engine rating[1)]	Engine power	Engine speed	Propeller speed	Propeller diameter	Propeller hub diam.	Shaft diameter	Design speed
12V175D	kW	r/min	r/min	mm	mm	mm	knots
MH	1,740	1,800	884	1,250	440	175	25
MH	1,740	1,800	702	1,350	440	175	25
MH	1,740	1,800	620	1,450	440	175	25
MH	1,740	1,800	523	1,600	490	175	25
MH	1,740	1,800	450	1,750	490	175	20
MH	1,740	1,800	400	1,850	490	205	20
MH	1,740	1,800	360	2,000	540	205	20
MH	1,740	1,800	331	2,100	540	205	20
MH	1,740	1,800	302	2,200	540	205	15
MH	1,740	1,800	288	2,300	600	205	15
MH	1,740	1,800	261	2,450	600	225	15
MH	1,740	1,800	247	2,500	600	225	15
MM	2,220	1,900	741	1,350	440	175	25
MM	2,220	1,900	654	1,450	440	175	25
MM	2,220	1,900	552	1,550	490	205	25
MM	2,220	1,900	475	1,750	490	205	20
MM	2,220	1,900	422	1,850	540	205	20
MM	2,220	1,900	380	2,000	540	205	20
MM	2,220	1,900	350	2,100	600	205	20
MM	2,220	1,900	319	2,250	600	225	15
MM	2,220	1,900	304	2,300	600	225	15
MM	2,220	1,900	275	2,500	660	225	15

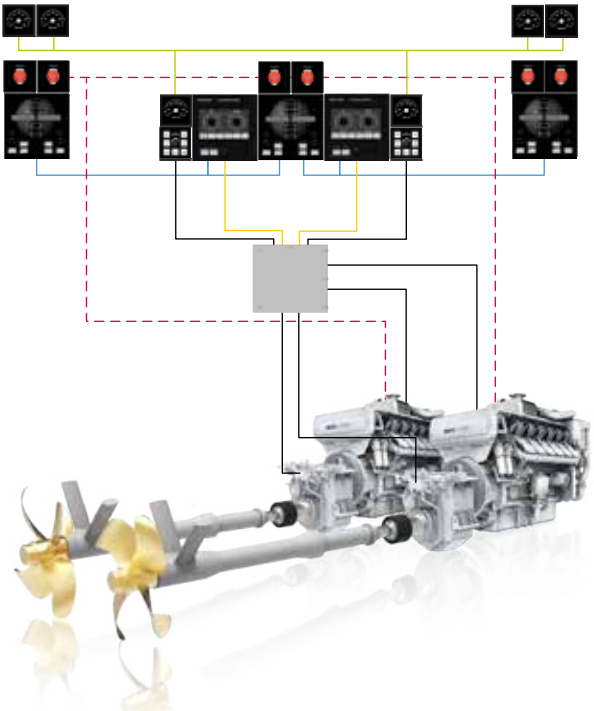
[1)] Engine rating designations: MH = Marine 'Heavy Duty' and MM = Marine 'Medium Duty'

Propellers for the MAN 12V175D engines are optimized for a diesel-mechanical twin screw vessel operating at 85% engine rating. The standard propeller programme is dimensioned according to Lloyd's Register No Ice.



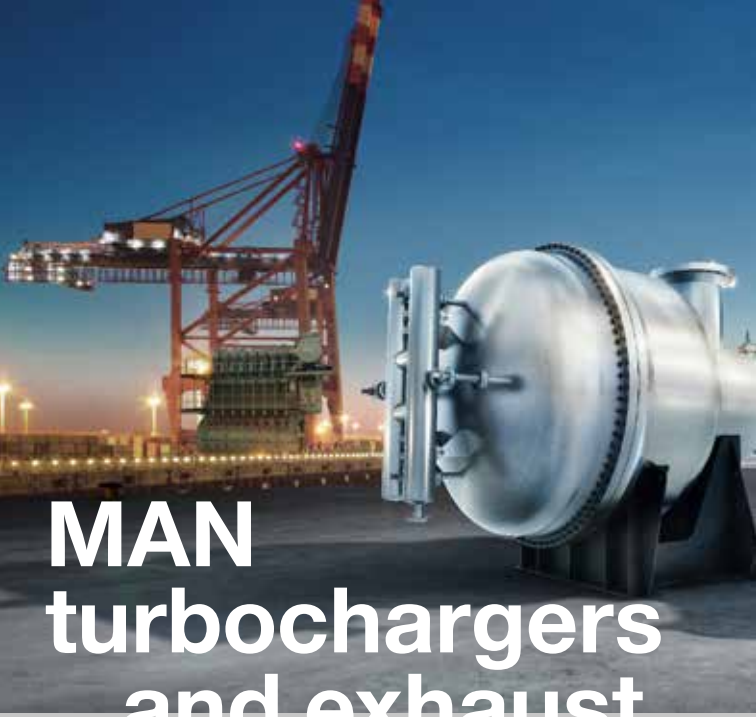
Alphatronic 3000 propulsion control system

A high number of various FPP and CPP propulsion package applications are controlled by the Alphatronic 3000 system – customised for combinations of MAN medium and high speed engines in a wide range of diesel-mechanical, hybrid or electric propulsion setups.



Simple system architecture for a straightforward twin MAN 175D FPP plant

Alphatronic 3000 at your finger tips: Safe and accurate propulsion control all the way – from the navigator's finger tips to the propeller tips. Any manoeuvring order given is translated into electrical speed setting-, pitch- or clutch signals, governing the hydraulic servo circuits of the gearbox and propeller system. Swift and reliable vessel manoeuvres are ensured due to quick and stable system response.



MAN turbochargers and exhaust gas systems

MAN turbochargers and exhaust gas systems

MAN Energy Solutions has a long and successful track record in the development of exhaust gas turbochargers for low, medium and high-speed diesel and gas engines. Drawing on its unrivalled expertise in the design and manufacture of this crucial engine component, MAN Energy Solutions can offer you world-leading technology that helps you maximise the efficiency of your operations.

MAN turbochargers are designed to deliver peak performance throughout their working lives – in some of the harshest conditions encountered anywhere in the world. This is achieved by combining three elements: simplicity, flexibility and reliability. For example, we develop and build our turbochargers to make installation, operation, servicing and maintenance as easy and efficient as possible. This reduces your initial capital investment and results in lower lifecycle costs.

Applications

- Marine propulsion
- Marine GenSets
- Power generation
- Construction
- Mining
- Off-road vehicles
- Locomotives
- Industrial
- Offshore
- Mechanical drives

Technical data

Turbine type	Axial flow turbine
Max. permissible temp.	520 °C
Pressure ratio	up to 4.7
Optimised for IMO Tier III	

Supercharged engine output

Type	kW	Mass kg
TCT40	9,460	2,500
TCT50	12,000	3,455
TCT60	15,120	4,735
TCT70	19,040	6,480
TCT80	24,030	8,890

Specific air consumption (Ie) 7.5 kg/kWh

MAN TCA Series

Technical data

Turbine type	Axial flow turbine
Max. permissible temp.	500 °C two-stroke / 650 °C four-stroke
Pressure ratio	up to 5.5
Suitable for HFO, MDO, gas	

Turbocharger programme

	Max. supercharged engine output kW		Max. permissible	
Type	**Two-stroke**	**Four-stroke**	**Speed**	**Mass**
	le* = 7.5 kg/kWh	le* = 6.5 kg/kWh	rpm	kg
TCA33	-	5,400	27,800	1,370
TCA44	7,400	7,900	22,500	1,950
TCA55	10,200	10,400	20,000	3,200
TCA66	14,600	14,800	16,900	5,300
TCA77	20,700	21,000	14,200	8,330
TCA88	32,400	30,000	12,000	14,000

* Specific air consumption

Technical data

Turbine type	Radial flow turbine
Max. permissible temp.	650 °C
Pressure ratio	up to 5.4
Suitable for HFO, MDO, gas	

Turbocharger programme

	Max. supercharged engine output kW		Max. permissible	
Type	**Two-stroke**	**Four-stroke**	**Speed**	**Mass**
	le* = 7.0 kg/kWh	le* = 6.5 kg/kWh	rpm	kg
TCR10	-	600	85,000	50
TCR12	-	880	70,900	100
TCR14	-	1,300	58,700	110
TCR16	-	1,850	48,800	180
TCR18	2,700	2,750	40,300	300
TCR20	4,000	4,000	33,400	500
TCR22	7,000	6,850	25,600	1,050

* Specific air consumption

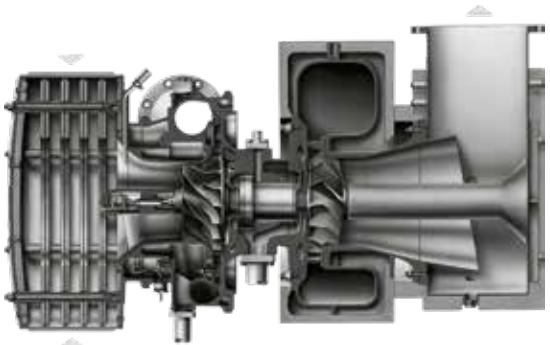
Technical data

Turbine type	Radial flow turbine
Max. permissible temp.	650 °C (opt. 720 °C)
Pressure ratio	up to 4.5
Suitable for HFO, MDO, gas	

Turbocharger programme

Type	Max. supercharged engine output kW	Max. permissible speed rpm	Mass kg
NR12/S	670	75,000	155
NR14/S	950	64,000	190
NR17/S	1,350	52,600	260
NR20/S	1,870	44,700	350
NR24/S	2,690	37,300	505
NR29/S	3,820	31,300	780
NR34/S	5,400	26,300	1,450

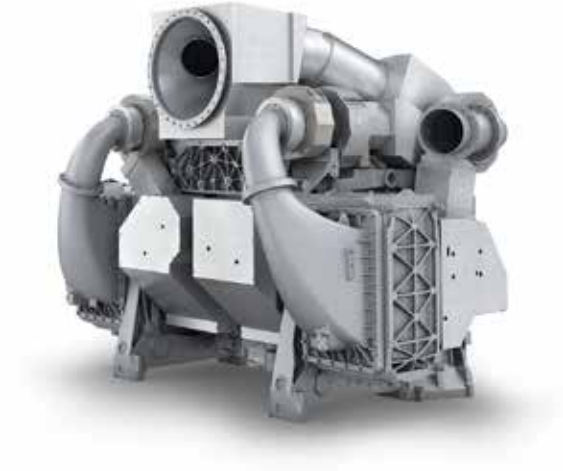
Specific air consumption Ie = 7 kg/kWh



MAN ECOCHARGE
Market leader in two-stage turbocharging

MAN ECOCHARGE two-stage turbocharging is suitable for high and medium-speed engines of all fuel types and for application in all engine power ranges. Extremely high efficiencies and pressure ratios enable increased power density and improved key engine parameters. For example, it is possible to use a smaller engine for the same required power output or to achieve lower NO_X emissions and lower specific fuel oil consumptions (SFOC).

As a compact two-stage unit, the MAN ECOCHARGE delivers outstanding turbocharging efficiency. A variety of product types and sizes are available, ensuring the perfect turbocharger-to-engine-fit. MAN ECOCHARGE always consists of a clever combination of high and low-pressure turbochargers. While MAN TCX has been specifically designed for high-pressure applications, MAN TCA and MAN TCR as well as our new MAN TCT generation series round up the package as low-pressure turbochargers.



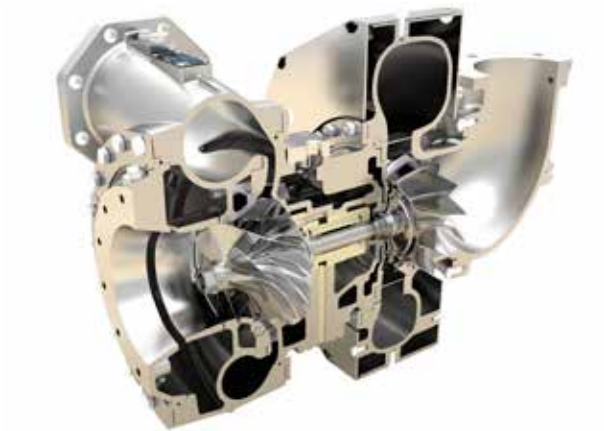
Technical data

Turbine type	Mixed flow turbine
Max. permissible temp.	650 °C
Pressure ratio (two stages)	up to 10.5
Suitable for HFO, MDO, gas	

TCX turbocharger programme

Type	Max. engine output* kW	Max. permissible speed rpm	Mass kg
TCX17	8,500	40,980	470
TCX19	11,900	34,550	870
TCX21	16,900	29,000	1,564
TCX23	23,900	24,390	2,394

* le = 6 kg/kWh; pHPCin = 3 bar; THPCin = 45 °C



MAN ETB

MAN's EGR Blower series – Electrical Turbo Blower (ETB)

Specifically designed for EGR systems the MAN ETB plays an important role in enabling these systems to reach IMO Tier III emission limitation. The EGR blower is a core component of MAN Energy Solutions' high-pressure EGR system that raises the exhaust-gas pressure in order to overcome the pressure difference between exhaust gas and scavenging receiver. In addition the recirculated exhaust gas amount is controlled during the EGR operation by varying the blower speed.

The desired EGR operating conditions are achieved by using a high-speed electric motor, directly coupled to the compressor wheel and speed controlled by a frequency converter. The scope of supply consists of the ETB and one cabinet with frequency converter and sine wave filter.

The MAN ETB features a high-efficient blower wheel, optimized for the low-pressure ratios necessary for the high pressure EGR system of a two-stroke diesel engine with materials designed to withstand corrosive agents caused by Sulphur content fuels. As such MAN's ETB is suitable for high-pressure EGR engines of all fuel types and in all application ranges.

Technical data

Type	Max. blower speed	Mass of blower
	rpm	kg
ETB40 [1]	9,200	1,860
ETB30 [2]	14,000	1,200

[1] Available
[2] Coming up soon

With ETB30 and ETB40 the MAN two-stroke engine portfolio can be covered with just two frame sizes.

The maximum engine power output with one ETB depends on the EGR volume flow and the pressure difference between exhaust gas and scavenging receiver. Therefore an EGR blower selection tool will be introduced and the output will be available in CEAS soon.

For more information and blower assignment, please contact turbochargers@man-es.com.

ETB – explicitly designed for EcoEGR

MAN's ETB is explicitly designed for EcoEGR applications where the blower will run continuously in both Tier III and Tier II Eco mode. This results in a compact and cost optimized design with highest availability.

In Tier II Eco mode the EGR volume flow is approx. 50% of the required volume flow in Tier III mode. To cover the operating points of both running modes MAN's ETB features an extremely wide compressor map.

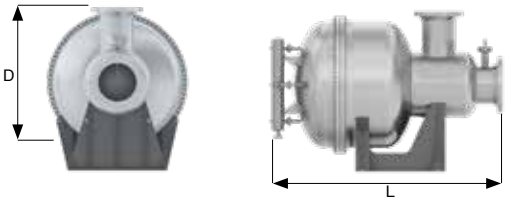
The ETB achieves benchmark efficiencies and therefore the operational costs are minimized.

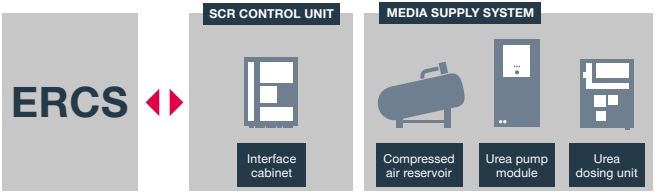
For more information about EcoEGR see the section EcoEGR in the MAN B&W two-stroke propulsion engines chapter.

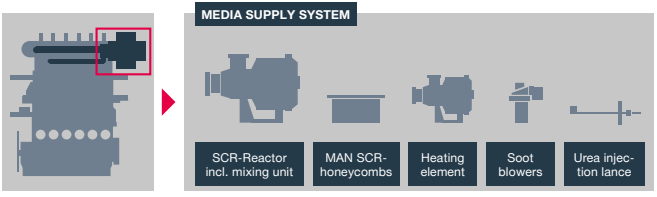
MAN SCR-HP

Dimensions

Cluster	Reactor diameter	Reactor length < 0.1% sulphur	Reactor length < 3.5% sulphur
	mm	mm	mm
1	1,900	4,800	5,800
2	2,300	5,000	6,000
3	2,900	5,500	6,500
4	3,100	5,800	6,800
5	3,800	6,300	7,300
6	4,500	6,900	7,900







MAN SCR-HP

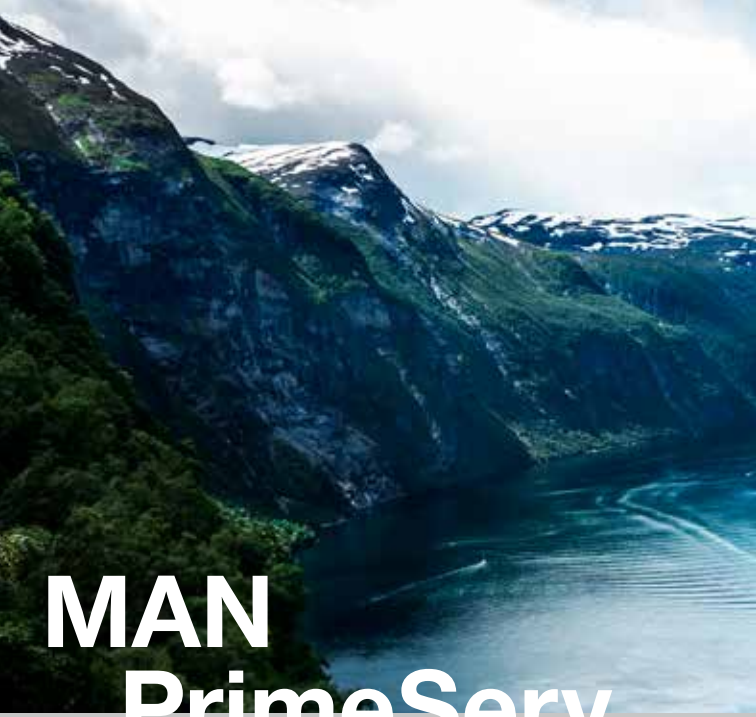
The MAN SCR-HP is a small and compact NO_X emission reduction system. The most compact design in the market allows for easy integration, and the few frame sizes will cover the entire two-stroke portfolio up to 25 MW per SCR reactor.

The integrated mixing unit reduces the overall length and volume. The specific honeycombs ensure a compact design.

The MAN SCR-HP can be mounted in all positions and is capable of running on all fuels.

Auxiliary components like the urea injection lance, urea dosing unit and urea pump module are from MAN's well-proven SCR-LP system.

SCR-HP system



MAN PrimeServ

The service brand of MAN Energy Solutions

MAN PrimeServ

Keeping you moving – Expert hands to guide you

MAN Energy Solutions' low-speed and medium-speed engines move 50% of global trade, powering one in every two ships plying the world's trade routes. When it comes to powering energy grids, it responds to world-changing trends, such as growing energy demand and growing populations, with smart, efficient and eco-friendly power grid solutions. Whether your business is stationary or marine focused, MAN PrimeServ tailors its services to meet your needs, ensuring service support for all MAN Energy Solutions products, whether manufactured within the MAN Group or by authorised licensees. Taking care of your two-stroke and four-stroke main engines, your GenSets or turbochargers and propulsion packages – you can be sure of well-serviced, efficient, reliable equipment when you need it most.

Service with passion

MAN Energy Solutions offers a strong after sales service with a clear performance commitment, qualified and reliable experts and tailor-made solutions – all combined in our global service brand MAN PrimeServ. Our approach is simple, yet effective: Premium service performed with passion meeting your needs. We listen and provide optimum flexibility and reliability in the services we offer. Straddling the globe with a network of more than 100 service centres, MAN PrimeServ is fully primed to provide local expertise, wherever you are and whenever you need it.

The right spare parts, when you need them

MAN spare parts are designed and manufactured for you to use precisely in conjunction with MAN equipment. Tried and tested, MAN spare parts are backed by more than 250 years of experience and ongoing research, as well as customer feedback, aimed entirely at increasing the performance of your engines.

For the ultimate peace-of-mind MAN spare parts come with a warranty. The MAN PrimeServ network assures, a reliable supply chain, giving you privileged access to the best parts wherever and whenever you need them, right throughout your equipment's life cycle. MAN PrimeServ is the only class-approved supplier to all MAN-designed engines.

MAN PrimeServ

Optimised equipment – Your partners for retrofit solutions

MAN PrimeServ offers advanced retrofit solutions to optimise the reliability, economic efficiency, and environmental sustainability of existing equipment.

Make the most of retrofit solutions that are tailor-made for your specific machinery and concepts involving not only the core machine itself, but also the auxiliary systems, instruments, and controls your equipment requires. By improving efficiency, and thus performance, these solutions ensure savings on fuel oil and lube oil, while enabling flexible operation, increasing time between overhauls, and hence reduce maintenance. Not only can you extend the lifecycle of your engines, but you can also meet new environmental regulations, joining the road to energy transition and decarbonisation.

Competent OEM service when and where you need it

OEM service is the logical step from the very outset when your equipment is installed and commissioned. Highly-skilled MAN PrimeServ engineers ensure quality 24-hour service for your equipment, advising and acting on

all technical matters, with the ultimate goal of guiding you and your employees towards the optimal performance of your system.

By choosing MAN OEM technical assistance around the globe, you reap the benefits of genuine OEM parts and expertise, reducing downtime, enabling more efficient operation and hence lowering running costs, while extending engine life and increasing productivity.

Service agreements – Focused on your service needs

When it comes to operating, maintaining or managing your equipment, MAN PrimeServ offers a wide range of service and spare parts agreements for the electric power generation, marine and offshore business sectors. Your service needs are met on all levels, from supplying spare parts or supervising overhauls, to managing complete power stations. Manage your costs with confidence. MAN PrimeServ service agreements may have different names, but they are all drawn up individually to match your individual demands and expectations, putting you in the enviable position of being able to estimate your maintenance costs in advance. Once your equipment is in the expert hands of MAN PrimeServ you can return your main focus to your core business.

Digital service solutions – Digital and human expertise

PrimeServ Assist has been developed to bring you cutting-edge service solutions, where advanced digital analytics are coupled with human expertise to effectively monitor your machinery 24/7, 365 days a year, no matter where you are. Maintenance advice and ad-hoc notifications will immediately be given to you if we detect any anomalies, all through the MAN CEON platform. With PrimeServ Assist, you are getting competent technical support proactively, straight to your PC or mobile device. This type of smart service ensures the most reliable operation of your MAN engine.

eLearning – Wherever, whenever

Properly training your technical personnel is paramount to the safe and efficient operation of your business. The MAN PrimeServ Academy Network ensures the professional qualification of your employees in

machine operation, maintenance and troubleshooting. When your employees attend any of the 13 academies located in Europe, North and South America and Asia, they will receive hands-on instruction on full-scale machinery and simulators. With expertly-trained personnel and quality machinery your business can only succeed.

In times of digitisation eLearning is needed to complement the MAN PrimeServ Academy course offering. Therefore, we are continuously developing our eAcademy. eLearning is flexible, self-paced and can be carried out any time and any place. Participants have the ability to learn at their own pace, and at times that are convenient for their personal schedule. Furthermore, they can pick and choose the content most important for their daily work, or areas where they feel they need to increase their knowledge in.

Worldwide service network

MAN PrimeServ is represented in all key markets and major ports with a large number of service centres worldwide. Our hubs are equipped with advanced technologies for repairs, and our skilled field service managers provide first class technical support for your benefit – 24/7, 365 days a year. All united in PrimeServ: an excellent network, optimised processes, technical competence, and high service-orientation.

Service workshops – More than 40 workshops around the globe

No matter where you operate there's a good chance a MAN PrimeServ workshop is nearby. More than 40 workshops around the globe carry all the tools and systems needed to conduct complete overhauls of engines, components, and auxiliary systems, including turbochargers, governors and electronic controls.

Providing you with support when the unforeseeable happens, MAN PrimeServ workshops are there to get you back in control and fast. With quick and effective response, the worldwide network ensures anything from technical support to complex repairs in the event of unexpected damage.

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TC: MAN Energy Solutions turbocharger licence
FP: MAN Energy Solutions fixed pitch propeller license

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