

Marine Engine

IMO Tier II and Tier III

Programme 2017



Engineering the Future – since 1758.

MAN Diesel & Turbo



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

If this document is delivered in another language than English and doubts arise concerning the translation, the English text shall prevail.

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MAN B&W Two-Stroke Propulsion Engines



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MAN B&W Two-Stroke Propulsion Engines

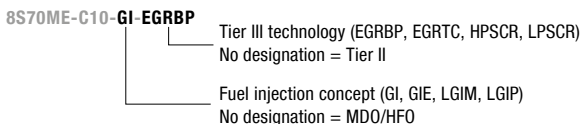
MAN Diesel & Turbo Tier II and Tier III Engine Programme

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

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 has been expanded to include these concepts, as described below (full designation, see page 15):



Tier III technologies and fuel injection concepts are explained in detail on page 10 (GI and LGI Dual Fuel Engines) and page 11 (Tier III Technologies).

ME-C engines

The electronic control of ME 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

On ME-B engines, the injection timing is electronically controlled whereas actuation of the exhaust valves is camshaft operated, but with electronically controlled variable closing timing.

CEAS and Turbocharger Selection (TCS)

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.eu → Two-Stroke under *CEAS Engine Calculations* and *Turbocharger Selection*.

In CEAS and TCS, all engines in this programme are designated '.5' and can be selected from the category 'Official Catalogue'.

MAN B&W Two-Stroke Propulsion Engines

Earlier versions of this engine programme have additional engines mentioned. Some of those engine types are still available under the category 'Replaced'. 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.

All engine design criteria, e.g. heat load, bearing load and mechanical stresses on the construction, are defined at 100% load independent of the selected guarantee point. This means that turbocharger matching, engine adjustment and engine load calibration must also be performed at 100% load independent of the guarantee point.

When choosing an SFOC guarantee at or below 100%, the tolerances, adjustment and calibration at 100% will affect engine running at the lower

MAN B&W Two-Stroke Propulsion Engines

SFOC guarantee load point. This includes tolerances on measurement equipment, engine process control and turbocharger performance.

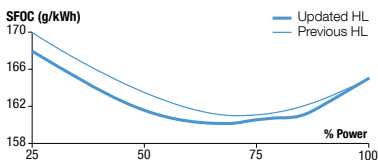
Consequently, SFOC guarantee tolerances are as follows:

- 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 11.

Updated fuel consumption on selected engines

As a result of tests, the fuel consumption on G95ME-C9, G90ME-C10, G80ME-C9 and S90ME-C10 engines has been updated. An example illustrating the improvement for a Tier II, L₁ rated G90ME-C10 engine in high-load (HL) optimisation is shown in the graph below.



The fuel consumption for tunings, Tier III and dual fuel engines has also been updated. Similar improvements can be realised with part load and low load tuning. A general overview of the changes can be seen on the individual engine pages in this programme. For detailed information, please use the CEAS application.

Turbocharging System

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

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

All engines with high-efficiency (67%) turbochargers can be ordered with a 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.

MAN B&W Two-Stroke Propulsion Engines

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 a tuning method:

- EGB: exhaust gas bypass

Also high-pressure tuning (HPT) is available on request for ME engines.

The above tuning methods are available for all SMCR points, but cannot be combined. The SFOC reduction potential of each tuning method at L₁ rating can be seen on each individual engine page.

In cases where part-load or low-load EGB tuning is applied, and a higher exhaust gas temperature is needed, a solution exists for additional automatic control of the EGB, the so-called economiser energy control (EEC). Forcing an open EGB at loads where the EGB is normally closed results in a higher mixed exhaust gas temperature, but with an SFOC penalty on. Calculations with this feature are made on request.

GI and LGI Dual Fuel Engines

This engine programme includes a number of engines designed for gas fuels (GI engines) and liquid gas fuels (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 most engines where GI is applicable. Figures for GIE and LGIM are included for selected engines (see pages 98-107).

SFOC figures are shown for dual fuel mode operation (i.e. operation on gas or liquid gas fuels). Fuel oil mode SFOC is identical to the SFOC for a similar fuel oil engine. Data for both modes can be found in the CEAS report.

Dual fuel engines are available with standard tuning methods for part-load and low-load optimisation in both fuel oil mode and dual fuel mode.

MAN B&W Two-Stroke Propulsion Engines

In dual fuel mode for GI, GIE and LGIP, fuel consumption consists of 3% and 5% for LGIM mass-based pilot liquid fuel of L₁ rating (SPOC = specific pilot oil consumption) and gas fuel (SGC = specific gas consumption).

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 9.

Heat rate is defined as follows [kJ/kWh] (example for methane as dual fuel):

$$\text{Heat rate (kJ/kWh)} = \text{SGC (g/kWh)} \times 50 \text{ kJ/g} + \text{SPOC (g/kWh)} \times 42.7 \text{ kJ/g}$$

The pilot oil amount typically account for about 5% of the heat rate, and the 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.

Tier III Technologies

To ensure compliance with IMO Tier III regulations, one of the two major NO_x reduction technologies must be selected – EGR or SCR. Which technology is preferred depends on market demands, engine size, other requirements and operational pattern.

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

All Tier III engines have two operating modes:

- Tier III mode fulfilling the IMO Tier III regulations
- Tier II mode fulfilling the IMO Tier II regulations

The Tier III technologies are designed for the use of low-sulphur fuels (0-0.1% sulphur) in Tier III mode. This limitation for sulphur content apply to Tier III operation only. In Tier II operation, the engine is in all cases capable of using fuels with a high sulphur content.

Tier III designs for use of high-sulphur fuels in Tier III mode are available on request. Fuel consumption guarantees can be given for engines for both Tier II and Tier III mode.

MAN B&W Two-Stroke Propulsion Engines

EGR

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

EGR Concept	Description
EGRTC	T/C cut-out matching for engines with bores ≥ 80 cm and more than one turbocharger applied
EGRBP	Bypass matching for engines with bores ≤ 70 cm and one high-efficiency turbocharger and for engines with bores ≤ 40 cm and one conventional efficiency turbocharger

EGR operation applies to ME and ME-B engines, including engine types for dual fuel, except GIE.

For the smallest bore engines, especially with 5 and 6 cylinders, the availability of applicable turbochargers makes it difficult to apply EGR. Therefore, SCR is recommended for these engines.

SCR

Two SCR concepts are available:

SCR Concept	Description
HPSCR	High-pressure SCR with a static mixer and SCR reactor installed upstream the turbocharger(s)
LPSCR	Low-pressure SCR with a static mixer and SCR reactor installed downstream the turbocharger(s)

SCR operation applies to ME and ME-B engines, including engine types with dual fuel.

The SCR system must be supplied by an approved supplier.

For some large-bore engines (bores ≥ 90 cm) with a high cylinder number, HPSCR is only available on special request.

Illustrations of the Tier III Technologies



MAN B&W Two-Stroke Propulsion Engines

Waste Heat Recovery Systems

Waste heat can be economically recovered on engines with high-efficiency turbochargers by installing equipment for waste heat recovery (WHR) and matching the engine for WHR. WHR systems are available for both Tier II and Tier III engines on request.

The following types of WHR systems have been approved for application:

- Power turbines with a power output equal to 3-5% of the engine shaft power at SMCR.
- Power turbines and steam turbines with a power output corresponding to 8-10% of the engine shaft power at SMCR.
- Steam turbine system – with a power output corresponding to 4-6% of the engine shaft power at SMCR.
- Turbochargers with a motor/generator attached to the turbocharger shaft, and with a power output equal to 3-5% of the engine shaft power at SMCR.

Lubricating Oil Consumption

The system oil consumption varies for the different engine sizes and operational patterns. The consumption varies for different engine sizes as well as operational and maintenance patterns.

Specific Cylinder Oil Consumption

Alpha ACC (Adaptive Cylinder-oil Control) is the lubrication mode for MAN B&W two-stroke engines that involves lube oil dosing proportional to the engine load and to the sulphur content in the fuel oil being burned. The specific minimum dosage for low-sulphur fuels is set to 0.6 g/kWh. The typical ACC dosage for a BN 100 cylinder oil is $0.3 \text{ g/kWh} \times \text{S\%}$.

Our Service Letter SL2014-587 offers further information:

www.marine.man.eu → Two-Stroke → Service Letters → SL2014-587

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.

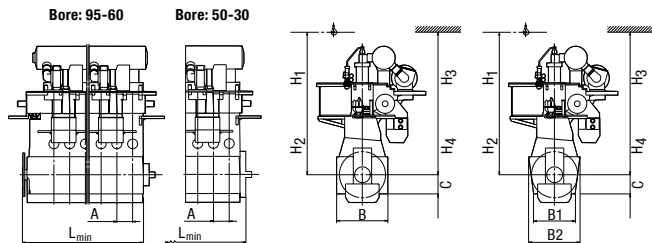
To facilitate negotiations between the yard, the engine maker and the customer, a set of guiding 'Extent of Delivery' (EoD) forms are available in which MAN Diesel & Turbo's recommended basic and optional executions are specified.

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

MAN B&W Two-Stroke Propulsion Engines

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.

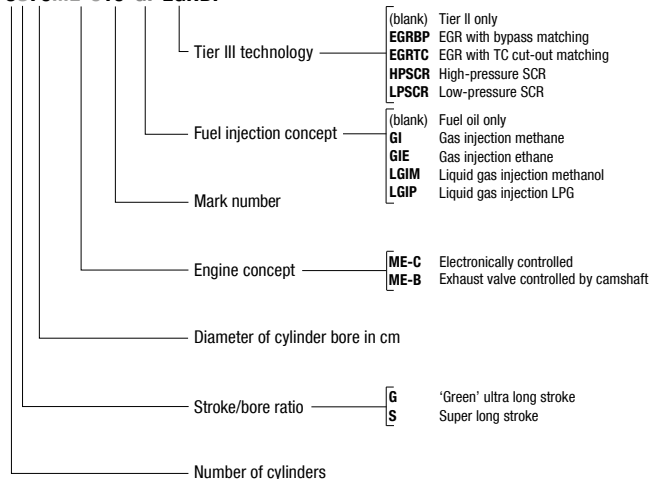
Dry masses for Tier III engines cover components directly integrated on the engine.

Indicated values are for guidance only and are not binding.

MAN B&W Two-Stroke Propulsion Engines

Engine Type Designation

8S70ME-C10-GI-EGRBP

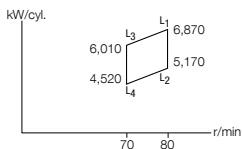


MAN B&W G95ME-C9

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



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W G95ME-C9

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	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

Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W G95ME-C9-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

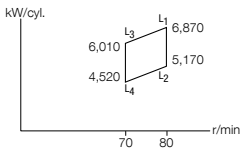
SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	158.5	157.5	165.0
Part load	EGB	160.5	160.0	168.5
Low load	EGB	158.5	161.0	168.5

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	128.6 (7.9)	129.5 (6.0)	136.7 (5.0)
Part load	EGB	130.2 (8.0)	131.5 (6.1)	139.6 (5.1)
Low load	EGB	128.5 (8.0)	132.4 (6.1)	139.6 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW	Stroke: 3,460 mm
5	34,350	
6	41,220	
7	48,090	
8	54,960	
9*	61,830	
10*	68,700	
11*	75,570	
12*	82,440	



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W G95ME-C9-EGRTC

L₁ 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 G95ME-C9-HPSCR

L₁ 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 G95ME-C9-LPSCR

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	158.5	161.0	168.5
Tier III mode	159.5	162.0	169.5

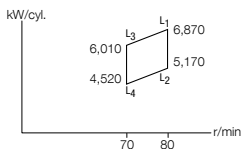
* Available on request for HPSCR.

MAN B&W G95ME-C9

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



Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W G95ME-C9-GI-EGRTC

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]**

	50%	75%	100%
Tier II mode	158.5	161.0	168.0
Tier III mode	164.5	164.5	170.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	128.4 (8.1)	132.3 (6.2)	139.1 (5.1)
Tier III mode	133.6 (8.1)	135.3 (6.2)	140.8 (5.1)

MAN B&W G95ME-C9-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]**

	50%	75%	100%
Tier II mode	158.5	161.0	168.5
Tier III mode	160.0	162.0	169.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	128.4 (8.1)	132.3 (6.2)	139.6 (5.1)
Tier III mode	129.7 (8.1)	133.2 (6.2)	140.0 (5.1)

MAN B&W G95ME-C9-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]**

	50%	75%	100%
Tier II mode	158.5	161.0	168.5
Tier III mode	159.5	162.0	169.5

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

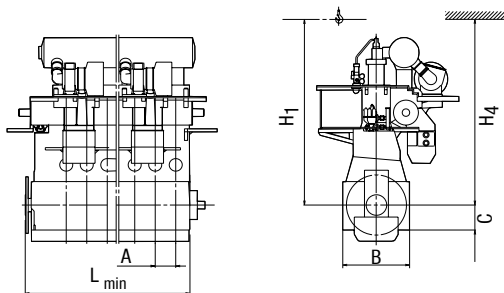
Tier II mode	128.5 (8.1)	132.3 (6.2)	139.6 (5.1)
Tier III mode	129.3 (8.1)	133.2 (6.2)	140.4 (5.1)

* Available on request for HPSCR.

** Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B	C	H ₁	H ₄
mm	1,574	5,380	2,060	15,925	15,525
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	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

Tier II

Dry mass:	t	1,080	1,250	1,430	1,625	1,820	2,010	2,210	2,400
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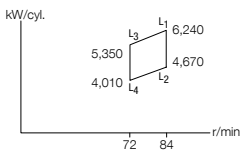
Tier III

Dry mass (added):									
EGR	t	18	19	20	22	35	35	37	38
HP SCR	t	10	15	15	15				
LP SCR	t	-	-	-	-	-	-	-	-



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



Fuel Oil

L₁ MEP: 21.5 bar

MAN B&W G90ME-C10

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	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

Dual Fuel Mode for GI (Methane)

MAN B&W G90ME-C10-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

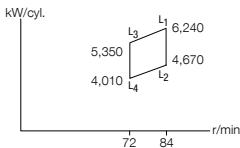
SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	157.5	156.5	164.0
Part load	EGB	159.5	159.0	167.5
Low load	EGB	157.5	160.0	167.5

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	127.8 (7.8)	128.7 (6.0)	135.9 (4.9)
Part load	EGB	129.4 (8.0)	130.7 (6.1)	138.8 (5.0)
Low load	EGB	127.7 (8.0)	131.5 (6.1)	138.8 (5.0)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW	Stroke: 3,260 mm
5	31,200	
6	37,440	
7	43,680	
8	49,920	
9	56,160	
10*	62,400	
11*	68,640	
12*	74,880	



Fuel Oil

L₁ MEP: 21.5 bar

MAN B&W G90ME-C10-EGRTC

L₁ 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-HPSCR

L₁ 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-LPSCR

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	157.5	160.0	167.5
Tier III mode	158.5	161.0	168.5

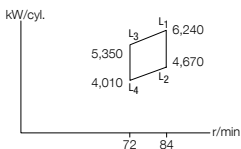
* Available on request for HPSCR.

MAN B&W G90ME-C10

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



Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.5 bar

MAN B&W G90ME-C10-GI-EGRTC

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]**

	50%	75%	100%
Tier II mode	157.5	160.0	167.0
Tier III mode	163.5	163.5	169.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	127.6 (8.1)	131.5 (6.1)	138.3 (5.1)
Tier III mode	132.8 (8.1)	134.5 (6.1)	140.0 (5.1)

MAN B&W G90ME-C10-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]**

	50%	75%	100%
Tier II mode	157.5	160.0	167.5
Tier III mode	159.0	161.0	168.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	127.6 (8.1)	131.5 (6.1)	138.7 (5.0)
Tier III mode	128.9 (8.1)	132.4 (6.1)	139.2 (5.0)

MAN B&W G90ME-C10-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]**

	50%	75%	100%
Tier II mode	157.5	160.0	167.5
Tier III mode	158.5	161.0	168.5

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

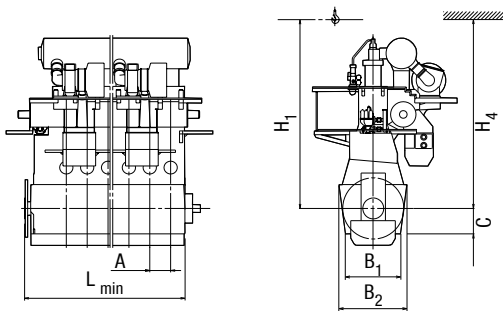
Tier II mode	127.6 (8.0)	131.5 (6.1)	138.7 (5.1)
Tier III mode	128.5 (8.0)	132.4 (6.1)	139.6 (5.1)

* Available on request for HPSCR.

** Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₄
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	9,920	11,410	12,900	14,390*	15,880*	18,040	19,530	21,020

Tier II

Dry mass:	t	876	1,014	1,153	1,295*	1,457*	1,619	1,771	1,915
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Tier III

Dry mass (added):

EGR	t	16	18	19	20	21	33	35	37
HP SCR	t	7	10	15	15	15			
LP SCR	t	-	-	-	-	-	-	-	-

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

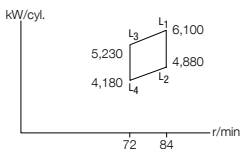


MAN B&W S90ME-C10

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



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W S90ME-C10

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	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

Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W S90ME-C10-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

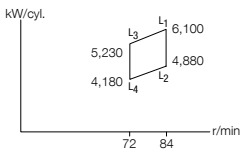
SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	158.5	157.5	165.0
Part load	EGB	160.5	160.0	168.5
Low load	EGB	158.5	161.0	168.5

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	128.6 (7.9)	129.5 (6.0)	136.7 (5.0)
Part load	EGB	130.2 (8.0)	131.5 (6.1)	139.6 (5.1)
Low load	EGB	128.5 (8.0)	132.4 (6.1)	139.6 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW	Stroke: 3,260 mm
5	30,500	
6	36,600	
7	42,700	
8	48,800	
9	54,900	
10*	61,000	
11*	67,100	
12*	73,200	



Fuel Oil

MAN B&W S90ME-C10-EGRTC

L₁ 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-HPSCR

L₁ 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-LPSCR

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	158.5	161.0	168.5
Tier III mode	159.5	162.0	169.5

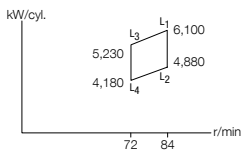
* Available on request for HPSCR.

MAN B&W S90ME-C10

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



Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W S90ME-C10-GI-EGRTC

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]**

	50%	75%	100%
Tier II mode	158.5	161.0	168.0
Tier III mode	164.5	164.5	170.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	128.4 (8.1)	132.3 (6.2)	139.1 (5.1)
Tier III mode	133.6 (8.1)	135.3 (6.2)	140.8 (5.1)

MAN B&W S90ME-C10-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]**

	50%	75%	100%
Tier II mode	158.5	161.0	168.5
Tier III mode	160.0	162.0	169.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	128.4 (8.1)	132.3 (6.2)	139.6 (5.1)
Tier III mode	129.7 (8.1)	133.2 (6.2)	140.0 (5.1)

MAN B&W S90ME-C10-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]**

	50%	75%	100%
Tier II mode	158.5	161.0	168.5
Tier III mode	159.5	162.0	169.5

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

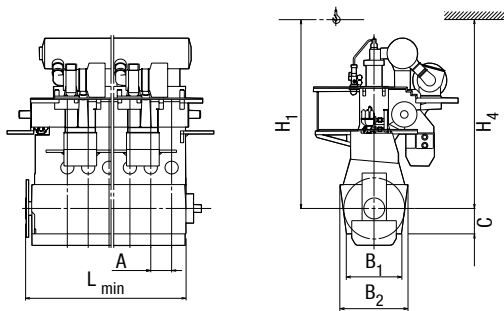
Tier II mode	128.5 (8.1)	132.3 (6.2)	139.6 (5.1)
Tier III mode	129.3 (8.1)	133.2 (6.2)	140.4 (5.1)

* Available on request for HPSCR.

** Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₄
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

Tier II

Dry mass:	t	953	1,104	1,255	1,446	1,626	1,771	1,942	2,088

Tier III

Dry mass (added):									
EGR	t	16	18	19	20	21	33	35	37
HP SCR	t	7	10	15	15	15			
LP SCR	t	-	-	-	-	-	-	-	-

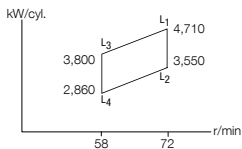


MAN B&W G80ME-C9

Tier II

Cyl.	L ₁ kW
6	28,260
7	32,970
8	37,680
9	42,390

Stroke: 3,720 mm



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W G80ME-C9

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	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

Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W G80ME-C9-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

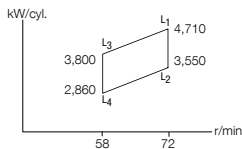
SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	158.5	157.5	165.0
Part load	EGB	160.5	160.0	168.5
Low load	EGB	158.5	161.0	168.5

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	128.7 (7.9)	129.5 (6.0)	136.7 (5.0)
Part load	EGB	130.2 (8.0)	131.5 (6.1)	139.6 (5.1)
Low load	EGB	128.5 (8.0)	132.4 (6.1)	139.6 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW	Stroke: 3,720 mm
6	28,260	
7	32,970	
8	37,680	
9	42,390	



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W G80ME-C9-EGRTC

L₁ 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 G80ME-C9-HPSCR

L₁ 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 G80ME-C9-LPSCR

L₁ SFOC [g/kWh]

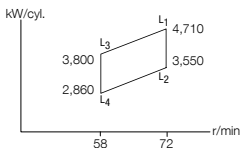
	50%	75%	100%
Tier II mode	158.5	161.0	168.5
Tier III mode	159.5	162.0	169.5

MAN B&W G80ME-C9

Tier III

Cyl.	L ₁ kW
6	28,260
7	32,970
8	37,680
9	42,390

Stroke: 3,720 mm



Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W G80ME-C9-GI-EGRTC

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	158.5	161.0	168.0
Tier III mode	164.5	164.5	170.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	128.5 (8.1)	132.3 (6.2)	139.1 (5.1)
Tier III mode	133.6 (8.1)	135.3 (6.2)	140.8 (5.1)

MAN B&W G80ME-C9-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	158.5	161.0	168.5
Tier III mode	160.0	162.0	169.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	128.5 (8.1)	132.3 (6.2)	139.6 (5.1)
Tier III mode	129.7 (8.1)	133.2 (6.2)	140.0 (5.1)

MAN B&W G80ME-C9-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	158.5	161.0	168.5
Tier III mode	159.5	162.0	169.5

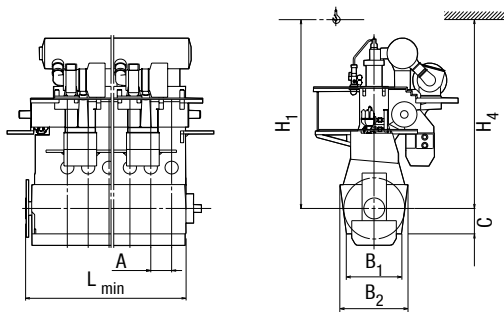
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	128.5 (8.1)	132.3 (6.2)	139.6 (5.1)
Tier III mode	129.3 (8.1)	133.2 (6.2)	140.4 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₄
mm	1,400	5,320	5,680	1,960	16,100	15,825

Cylinders:	6	7	8	9
L _{min} mm	10,735	12,135	13,535*	15,880

Tier II

Dry mass:	t	945	1,055	1,175*	1,350
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Tier III

Dry mass (added):

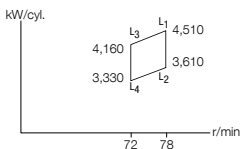
EGR	t	16	17	18	19
HP SCR	t	6	10	10	15
LP SCR	t	-	-	-	-

* Dry mass and cylinder L_{min} are with undivided crankshaft and chain in aft, with divided crankshaft and chain in mid, dry mass is 1,223 t and cylinder L_{min} is 14,480 mm.



Cyl.	L ₁ kW
6	27,060
7	31,570
8	36,080
9	40,590

Stroke: 3,450 mm



Fuel Oil

L₁ MEP: 20.0 bar

MAN B&W S80ME-C9

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	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

Dual Fuel Mode for GI (Methane)

L₁ MEP: 20.0 bar

MAN B&W S80ME-C9-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

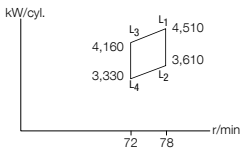
SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	160.5	158.0	165.0
Part load	EGB	161.5	160.5	167.5
Low load	EGB	159.5	161.5	167.5

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	130.4 (7.9)	129.9 (6.0)	136.7 (5.0)
Part load	EGB	131.1 (8.0)	132.0 (6.1)	138.8 (5.0)
Low load	EGB	129.4 (8.0)	132.8 (6.1)	138.8 (5.0)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW	Stroke: 3,450 mm
6	27,060	
7	31,570	
8	36,080	
9	40,590	



Fuel Oil

L₁ MEP: 20.0 bar

MAN B&W S80ME-C9-EGRTC

L₁ 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-HPSCR

L₁ 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-LPSCR

L₁ SFOC [g/kWh]

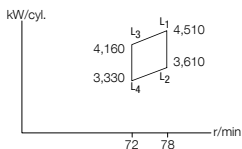
	50%	75%	100%
Tier II mode	159.5	161.5	167.5
Tier III mode	160.5	162.5	168.5

MAN B&W S80ME-C9

Tier III

Cyl.	L ₁ kW
6	27,060
7	31,570
8	36,080
9	40,590

Stroke: 3,450 mm



Dual Fuel Mode for GI (Methane)

L₁ MEP: 20.0 bar

MAN B&W S80ME-C9-GI-EGRTC

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	159.5	161.5	167.0
Tier III mode	166.5	165.0	170.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	129.3 (8.1)	132.7 (6.2)	138.3 (5.1)
Tier III mode	135.3 (8.1)	135.7 (6.2)	140.8 (5.1)

MAN B&W S80ME-C9-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

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

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	129.3 (8.0)	132.8 (6.1)	138.7 (5.0)
Tier III mode	130.6 (8.0)	133.6 (6.1)	139.2 (5.0)

MAN B&W S80ME-C9-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

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

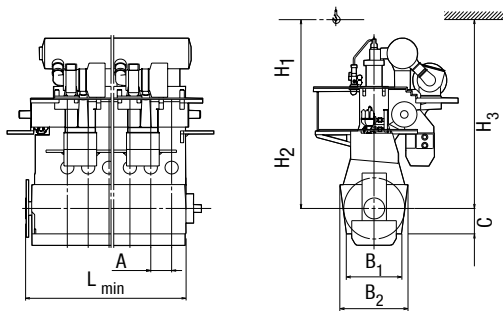
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	129.4 (8.0)	132.8 (6.1)	138.7 (5.1)
Tier III mode	130.2 (8.0)	133.6 (6.1)	139.6 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₂	H ₃
mm	1,334	5,180	5,374	1,890	15,050	13,925	13,500

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

Tier II

Dry mass:	t	833	933	1,043	1,153
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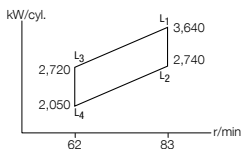
Tier III

Dry mass (added):					
EGR	t	16	17	18	19
HP SCR	t	6	10	10	15
LP SCR	t	-	-	-	-



Cyl.	L ₁ kW
5	18,200
6	21,840
7	25,480
8	29,120

Stroke: 3,256 mm



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W G70ME-C9

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	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

Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W G70ME-C9-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

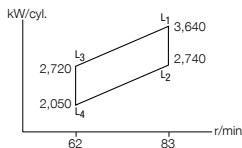
SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	161.5	159.0	166.0
Part load	EGB	162.5	161.5	168.5
Low load	EGB	160.5	162.5	168.5

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	131.2 (7.9)	130.7 (6.0)	137.5 (5.0)
Part load	EGB	131.9 (8.0)	132.8 (6.1)	139.6 (5.1)
Low load	EGB	130.2 (8.0)	133.7 (6.1)	139.6 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW	Stroke: 3,256 mm
5	18,200	
6	21,840	
7	25,480	
8	29,120	



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W G70ME-C9-EGRBP

L₁ 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-HPSCR

L₁ 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-LPSCR

L₁ SFOC [g/kWh]

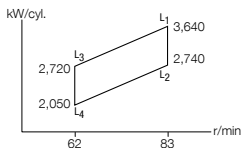
	50%	75%	100%
Tier II mode	160.5	162.5	168.5
Tier III mode	161.5	163.5	169.5

MAN B&W G70ME-C9

Tier III

Cyl.	L ₁ kW
5	18,200
6	21,840
7	25,480
8	29,120

Stroke: 3,256 mm



Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W G70ME-C9-GI-EGRBP

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	160.5	162.5	169.0
Tier III mode	168.5	167.0	172.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	130.1 (8.2)	133.5 (6.3)	139.9 (5.2)
Tier III mode	136.9 (8.2)	137.4 (6.3)	142.5 (5.2)

MAN B&W G70ME-C9-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	160.5	162.5	168.5
Tier III mode	162.0	163.5	169.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	130.2 (8.1)	133.6 (6.2)	139.6 (5.1)
Tier III mode	131.4 (8.1)	134.5 (6.2)	140.0 (5.1)

MAN B&W G70ME-C9-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	160.5	162.5	168.5
Tier III mode	161.5	163.5	169.5

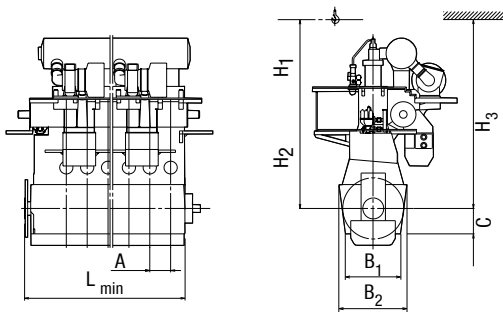
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	130.2 (8.1)	133.6 (6.2)	139.6 (5.1)
Tier III mode	131.0 (8.1)	134.5 (6.2)	140.4 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₂	H ₃
mm	1,260	4,760	4,900	1,750	14,225	13,250	12,800

Cylinders:	5	6	7	8
L _{min} mm	8,486	9,596	10,856	12,116

Tier II

Dry mass:	t	585	665	750	855
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Tier III

Dry mass (added):					
EGR	t	14	16	17	18
HP SCR	t	5	5	6	7
LP SCR	t	-	-	-	-

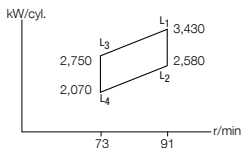


MAN B&W S70ME-C10

Tier II

Cyl.	L ₁ kW
5	17,150
6	20,580
7	24,010
8	27,440

Stroke: 2,800 mm



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W S70ME-C10

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	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

Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W S70ME-C10-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	160.5	158.0	165.0
Part load	EGB	161.5	160.5	167.5
Low load	EGB	159.5	161.5	167.5

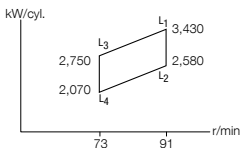
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	130.4 (7.9)	129.9 (6.0)	136.7 (5.0)
Part load	EGB	131.1 (8.0)	132.0 (6.1)	138.8 (5.0)
Low load	EGB	129.4 (8.0)	132.8 (6.1)	138.8 (5.0)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW
5	17,150
6	20,580
7	24,010
8	27,440

Stroke: 2,800 mm



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W S70ME-C10-EGRBP

L₁ 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-HPSCR

L₁ 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-LPSCR

L₁ SFOC [g/kWh]

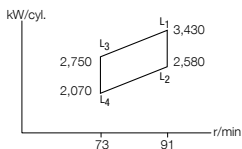
	50%	75%	100%
Tier II mode	159.5	161.5	167.5
Tier III mode	160.5	162.5	168.5

MAN B&W S70ME-C10

Tier III

Cyl.	L ₁ kW
5	17,150
6	20,580
7	24,010
8	27,440

Stroke: 2,800 mm



Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W S70ME-C10-GI-EGRTC

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

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

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	129.3 (8.1)	132.7 (6.2)	139.1 (5.1)
Tier III mode	136.1 (8.1)	136.6 (6.2)	141.7 (5.1)

MAN B&W S70ME-C10-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

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

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	129.3 (8.0)	132.8 (6.1)	138.7 (5.0)
Tier III mode	130.6 (8.0)	133.6 (6.1)	139.2 (5.0)

MAN B&W S70ME-C10-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

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

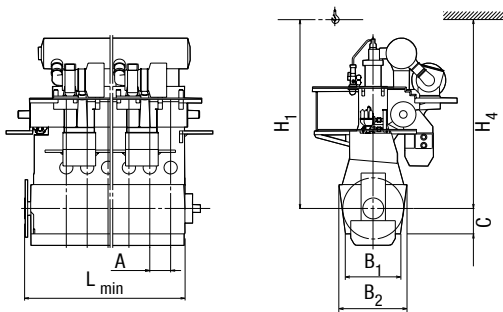
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	129.4 (8.0)	132.8 (6.1)	138.7 (5.1)
Tier III mode	130.2 (8.0)	133.6 (6.1)	139.6 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₄
mm	1,098	4,012	4,122	1,520	12,500	11,750

Cylinders:	5	6	7	8
L _{min} mm	7,464	8,562	9,660	10,758

Tier II

Dry mass:	t	442	523	593	667
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Tier III

Dry mass (added):					
EGR	t	14	16	17	18
HP SCR	t	4	5	6	6
LP SCR	t	-	-	-	-

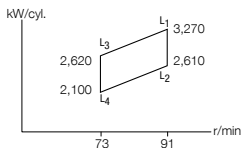


MAN B&W S70ME-C8

Tier II

Cyl.	L ₁ kW
5	16,350
6	19,620
7	22,890
8	26,160

Stroke: 2,800 mm



Fuel Oil

L₁ MEP: 20.0 bar

MAN B&W S70ME-C8

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	167.5	165.0	169.0
Part load	EGB	164.5	163.5	170.5
Low load	EGB	162.5	164.5	170.5

Dual Fuel Mode for GI (Methane)

L₁ MEP: 20.0 bar

MAN B&W S70ME-C8-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	163.5	161.0	168.0
Part load	EGB	164.5	163.5	170.5
Low load	EGB	162.5	164.5	170.5

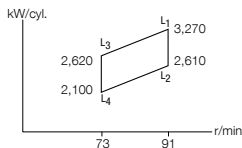
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	132.8 (8.0)	132.4 (6.1)	139.2 (5.0)
Part load	EGB	133.6 (8.1)	134.4 (6.2)	141.2 (5.1)
Low load	EGB	131.8 (8.1)	135.3 (6.2)	141.2 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW
5	16,350
6	19,620
7	22,890
8	26,160

Stroke: 2,800 mm



Fuel Oil

L₁ MEP: 20.0 bar

MAN B&W S70ME-C8-EGRBP

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	162.5	164.5	171.0
Tier III mode	170.5	169.0	174.0

MAN B&W S70ME-C8-HPSCR

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	162.5	164.5	170.5
Tier III mode	164.0	165.5	171.0

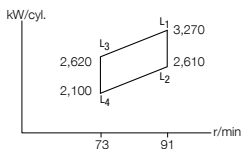
MAN B&W S70ME-C8-LPSCR

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	162.5	164.5	170.5
Tier III mode	163.5	165.5	171.5

Cyl.	L ₁ kW
5	16,350
6	19,620
7	22,890
8	26,160

Stroke: 2,800 mm



Dual Fuel Mode for GI (Methane)

L₁ MEP: 20.0 bar

MAN B&W S70ME-C8-GI-EGRTC

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	162.5	164.5	171.0
Tier III mode	170.5	169.0	174.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	131.7 (8.3)	135.2 (6.3)	141.6 (5.2)
Tier III mode	138.5 (8.3)	139.0 (6.3)	144.1 (5.2)

MAN B&W S70ME-C8-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	162.5	164.5	170.5
Tier III mode	164.0	165.5	171.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	131.8 (8.2)	135.3 (6.2)	141.2 (5.1)
Tier III mode	133.1 (8.2)	136.1 (6.2)	141.7 (5.1)

MAN B&W S70ME-C8-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	162.5	164.5	170.5
Tier III mode	163.5	165.5	171.5

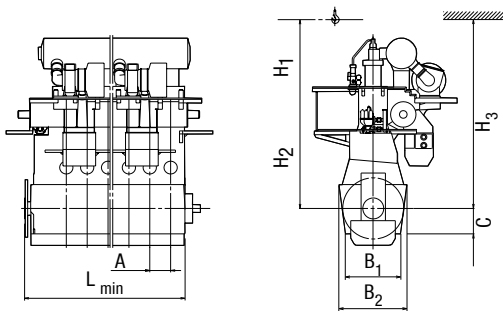
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	131.8 (8.2)	135.3 (6.2)	141.2 (5.1)
Tier III mode	132.7 (8.2)	136.1 (6.2)	142.1 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₂	H ₃
mm	1,190	4,390	4,454	1,521	12,550	11,725	11,500

Cylinders:	5	6	7	8
L _{min} mm	7,781	8,971	10,161	11,351

Tier II

Dry mass:	t	451	534	605	681
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Tier III

Dry mass (added):					
EGR	t	15	16	17	18
HP SCR	t	4	5	6	6
LP SCR	t	-	-	-	-

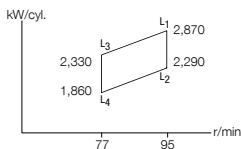


MAN B&W S65ME-C8

Tier II

Cyl.	L ₁ kW
5	14,350
6	17,220
7	20,090
8	22,960

Stroke: 2,730 mm



Fuel Oil

L₁ MEP: 20.0 bar

MAN B&W S65ME-C8

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	167.5	165.0	169.0
Part load	EGB	164.5	163.5	170.5
Low load	EGB	162.5	164.5	170.5

Dual Fuel Mode for GI (Methane)

L₁ MEP: 20.0 bar

MAN B&W S65ME-C8-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	164.5	162.0	168.0
Part load	EGB	164.5	163.5	170.5
Low load	EGB	162.5	164.5	170.5

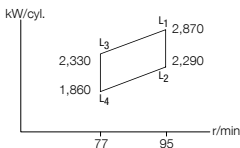
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	133.7 (8.0)	133.2 (6.1)	139.2 (5.0)
Part load	EGB	133.5 (8.1)	134.4 (6.2)	141.2 (5.1)
Low load	EGB	131.8 (8.1)	135.3 (6.2)	141.2 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW
5	14,350
6	17,220
7	20,090
8	22,960

Stroke: 2,730 mm



Fuel Oil

L₁ MEP: 20.0 bar

MAN B&W S65ME-C8-EGRBP

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	162.5	164.5	171.0
Tier III mode	170.5	169.0	174.0

MAN B&W S65ME-C8-HPSCR

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	162.5	164.5	170.5
Tier III mode	164.0	165.5	171.0

MAN B&W S65ME-C8-LPSCR

L₁ SFOC [g/kWh]

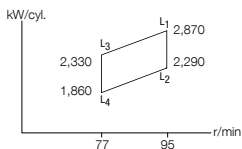
	50%	75%	100%
Tier II mode	162.5	164.5	170.5
Tier III mode	163.5	165.5	171.5

MAN B&W S65ME-C8

Tier III

Cyl.	L ₁ kW
5	14,350
6	17,220
7	20,090
8	22,960

Stroke: 2,730 mm



Dual Fuel Mode for GI (Methane)

L₁ MEP: 20.0 bar

MAN B&W S65ME-C8-GI-EGRBP

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	162.5	164.5	171.0
Tier III mode	170.5	169.0	174.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	131.7 (8.3)	135.2 (6.3)	141.6 (5.2)
Tier III mode	138.5 (8.3)	139.0 (6.3)	144.1 (5.2)

MAN B&W S65ME-C8-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	162.5	164.5	170.5
Tier III mode	164.0	165.5	171.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	131.8 (8.2)	135.3 (6.2)	141.2 (5.1)
Tier III mode	133.1 (8.2)	136.1 (6.2)	141.7 (5.1)

MAN B&W S65ME-C8-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	162.5	164.5	170.5
Tier III mode	163.5	165.5	171.5

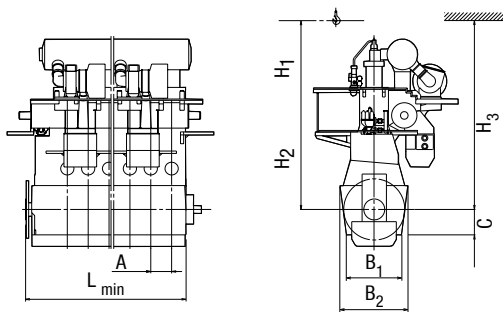
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	131.8 (8.2)	135.3 (6.2)	141.2 (5.1)
Tier III mode	132.7 (8.2)	136.1 (6.2)	142.1 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₂	H ₃
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

Tier II

Dry mass:	t	382	451	512	575
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Tier III

Dry mass (added):					
EGR	t	14	15	16	17
HP SCR	t	4	5	6	6
LP SCR	t	-	-	-	-

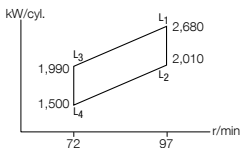


MAN B&W G60ME-C9

Tier II

Cyl.	L ₁ kW
5	13,400
6	16,080
7	18,760
8	21,440

Stroke: 2,790 mm



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W G60ME-C9

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	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

Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W G60ME-C9-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

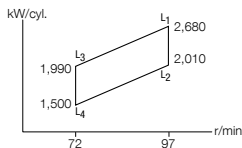
SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	161.5	159.0	166.0
Part load	EGB	162.5	161.5	168.5
Low load	EGB	160.5	162.5	168.5

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	131.2 (7.9)	130.7 (6.0)	137.5 (5.0)
Part load	EGB	131.9 (8.0)	132.8 (6.1)	139.6 (5.1)
Low load	EGB	130.2 (8.0)	133.7 (6.1)	139.6 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW	Stroke: 2,790 mm
5	13,400	
6	16,080	
7	18,760	
8	21,440	



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W G60ME-C9-EGRBP

L₁ 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 G60ME-C9-HPSCR

L₁ 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 G60ME-C9-LPSCR

L₁ SFOC [g/kWh]

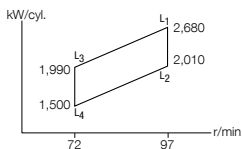
	50%	75%	100%
Tier II mode	160.5	162.5	168.5
Tier III mode	161.5	163.5	169.5

MAN B&W G60ME-C9

Tier III

Cyl.	L ₁ kW
5	13,400
6	16,080
7	18,760
8	21,440

Stroke: 2,790 mm



Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W G60ME-C9-GI-EGRBP

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	160.5	162.5	169.0
Tier III mode	168.5	167.0	172.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	130.1 (8.2)	133.5 (6.2)	139.9 (5.2)
Tier III mode	136.9 (8.2)	137.4 (6.2)	142.5 (5.2)

MAN B&W G60ME-C9-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	160.5	162.5	168.5
Tier III mode	162.0	163.5	169.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	130.2 (8.1)	133.6 (6.2)	139.6 (5.1)
Tier III mode	131.4 (8.1)	134.5 (6.2)	140.0 (5.1)

MAN B&W G60ME-C9-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	160.5	162.5	168.5
Tier III mode	161.5	163.5	169.5

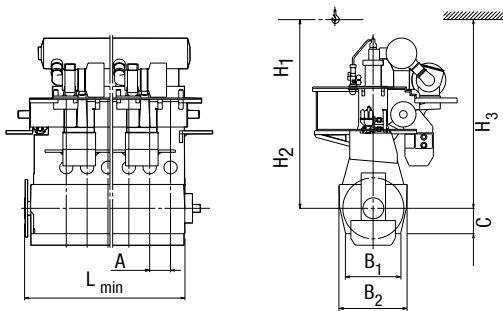
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	130.2 (8.1)	133.6 (6.2)	139.6 (5.1)
Tier III mode	131.0 (8.1)	134.5 (6.2)	140.4 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₂	H ₃
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

Tier II

Dry mass:	t	395	439	491	543
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Tier III

Dry mass (added):					
EGR	t	14	14	15	16
HP SCR	t	3	4	5	5
LP SCR	t	-	-	-	-

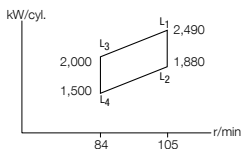


MAN B&W S60ME-C10

Tier II

Cyl.	L ₁ kW
5	12,450
6	14,940
7	17,430
8	19,920

Stroke: 2,400 mm



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W S60ME-C10

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	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

Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W S60ME-C10-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	160.5	158.0	165.0
Part load	EGB	161.5	160.5	167.5
Low load	EGB	159.5	161.5	167.5

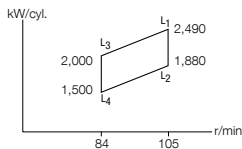
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	130.4 (7.9)	129.9 (6.0)	136.7 (5.0)
Part load	EGB	131.1 (8.0)	132.0 (6.1)	138.8 (5.0)
Low load	EGB	129.4 (8.0)	132.8 (6.1)	138.8 (5.0)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW
5	12,450
6	14,940
7	17,430
8	19,920

Stroke: 2,400 mm



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W S60ME-C10-EGRBP

L₁ 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-HPSCR

L₁ 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-LPSCR

L₁ SFOC [g/kWh]

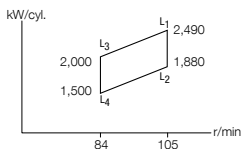
	50%	75%	100%
Tier II mode	159.5	161.5	167.5
Tier III mode	160.5	162.5	168.5

MAN B&W S60ME-C10

Tier III

Cyl.	L ₁ kW
5	12,450
6	14,940
7	17,430
8	19,920

Stroke: 2,400 mm



Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W S60ME-C10-GI-EGRBP

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

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

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	129.3 (8.1)	132.7 (6.2)	139.1 (5.1)
Tier III mode	136.1 (8.1)	136.6 (6.2)	141.7 (5.1)

MAN B&W S60ME-C10-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

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

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	129.3 (8.0)	132.8 (6.1)	138.7 (5.0)
Tier III mode	130.6 (8.0)	133.7 (6.1)	139.2 (5.0)

MAN B&W S60ME-C10-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

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

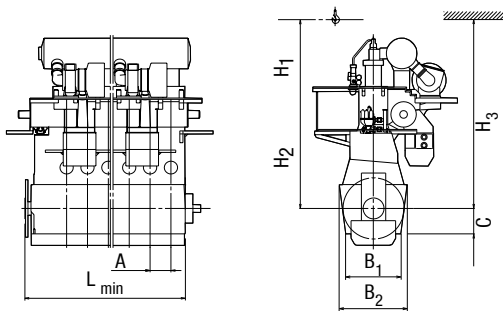
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	129.4 (8.0)	132.8 (6.1)	138.7 (5.1)
Tier III mode	130.2 (8.0)	133.7 (6.1)	139.6 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₂	H ₃
mm	970	3,500	3,580	1,325	*	*	*

Cylinders:	5	6	7	8
L _{min} mm	6,455	7,425	8,395	9,365

Tier II

Dry mass:	t	-	-	-	-
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Tier III

Dry mass (added):					
EGR	t	-	-	-	-
HP SCR	t	-	-	-	-
LP SCR	t	-	-	-	-

* Data is available on request.

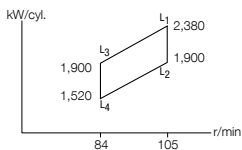


MAN B&W S60ME-C8

Tier II

Cyl.	L ₁ kW
5	11,900
6	14,280
7	16,660
8	19,040

Stroke: 2,400 mm



Fuel Oil

L₁ MEP: 20.0 bar

MAN B&W S60ME-C8

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	167.5	165.0	169.0
Part load	EGB	164.5	163.5	170.5
Low load	EGB	162.5	164.5	170.5

Dual Fuel Mode for GI (Methane)

L₁ MEP: 20.0 bar

MAN B&W S60ME-C8-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	164.5	162.0	168.0
Part load	EGB	164.5	163.5	170.5
Low load	EGB	162.5	164.5	170.5

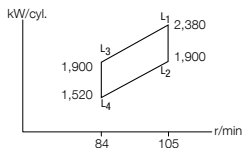
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	133.7 (8.0)	133.2 (6.1)	139.2 (5.0)
Part load	EGB	133.6 (8.1)	134.4 (6.2)	141.2 (5.1)
Low load	EGB	131.8 (8.1)	135.3 (6.2)	141.2 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW
5	11,900
6	14,280
7	16,660
8	19,040

Stroke: 2,400 mm



Fuel Oil

L₁ MEP: 20.0 bar

MAN B&W S60ME-C8-EGRBP

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	162.5	164.5	171.0
Tier III mode	170.5	169.0	174.0

MAN B&W S60ME-C8-HPSCR

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	162.5	164.5	170.5
Tier III mode	164.0	165.5	171.0

MAN B&W S60ME-C8-LPSCR

L₁ SFOC [g/kWh]

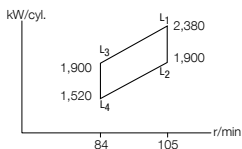
	50%	75%	100%
Tier II mode	162.5	164.5	170.5
Tier III mode	163.5	165.5	171.5

MAN B&W S60ME-C8

Tier III

Cyl.	L ₁ kW
5	11,900
6	14,280
7	16,660
8	19,040

Stroke: 2,400 mm



Dual Fuel Mode for GI (Methane)

L₁ MEP: 20.0 bar

MAN B&W S60ME-C8-GI-EGRBP

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	162.5	164.5	171.0
Tier III mode	170.5	169.0	174.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	131.7 (8.3)	135.2 (6.3)	141.6 (5.2)
Tier III mode	138.5 (8.3)	139.0 (6.3)	144.1 (5.2)

MAN B&W S60ME-C8-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	162.5	164.5	170.5
Tier III mode	164.0	165.5	171.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	131.8 (8.2)	135.3 (6.2)	141.2 (5.1)
Tier III mode	133.1 (8.2)	136.1 (6.2)	141.7 (5.1)

MAN B&W S60ME-C8-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	162.5	164.5	170.5
Tier III mode	163.5	165.5	171.5

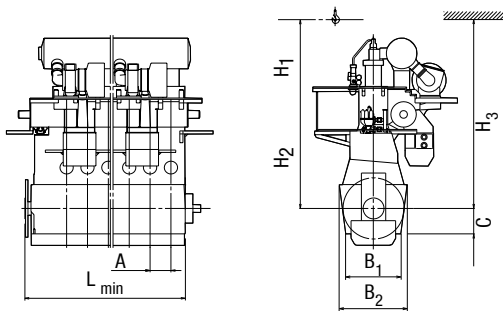
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	131.8 (8.2)	135.3 (6.2)	141.2 (5.1)
Tier III mode	132.7 (8.2)	136.1 (6.2)	142.1 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₂	H ₃
mm	1,020	3,770	3,840	1,300	10,800	10,000	9,775

Cylinders:	5	6	7	8
L _{min} mm	6,668	7,688	8,708	9,728

Tier II

Dry mass:	t	308	350	393	452
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Tier III

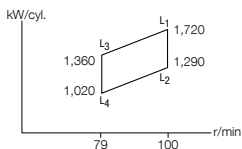
Dry mass (added):

EGR	t	14	14	15	16
HP SCR	t	3	4	5	5
LP SCR	t	-	-	-	-



Cyl.	L ₁ kW
5	8,600
6	10,320
7	12,040
8	13,760
9	15,480

Stroke: 2,500 mm



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W G50ME-C9

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	166.5	164.0	168.0
Part load	EGB	163.5	162.5	169.5
Low load	EGB	161.5	163.5	169.5

Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W G50ME-C9-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*L₁ MEP: 21.0 bar

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	162.5	160.0	167.0
Part load	EGB	163.5	162.5	169.5
Low load	EGB	161.5	163.5	169.5

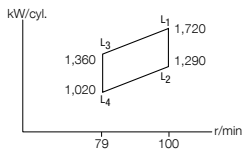
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	132.0 (8.0)	131.6 (6.1)	138.3 (5.0)
Part load	EGB	132.7 (8.1)	133.6 (6.2)	140.4 (5.1)
Low load	EGB	131.0 (8.1)	134.5 (6.2)	140.4 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW
5	8,600
6	10,320
7	12,040
8	13,760
9	15,480

Stroke: 2,500 mm



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W G50ME-C9-EGRBP

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	161.5	163.5	170.0
Tier III mode	169.5	168.0	173.0

MAN B&W G50ME-C9-HPSCR

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	161.5	163.5	169.5
Tier III mode	163.0	164.5	170.0

MAN B&W G50ME-C9-LPSCR

L₁ SFOC [g/kWh]

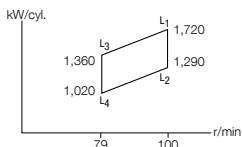
	50%	75%	100%
Tier II mode	161.5	163.5	169.5
Tier III mode	162.5	164.5	170.5

MAN B&W G50ME-C9

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



Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W G50ME-C9-GI-EGRBP

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	161.5	163.5	170.0
Tier III mode	169.5	168.0	173.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	130.9 (8.2)	134.4 (6.3)	140.7 (5.2)
Tier III mode	137.7 (8.2)	138.2 (6.3)	143.3 (5.2)

MAN B&W G50ME-C9-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	161.5	163.5	169.5
Tier III mode	163.0	164.5	170.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	131.0 (8.1)	134.4 (6.2)	140.4 (5.1)
Tier III mode	132.2 (8.1)	135.3 (6.2)	140.8 (5.1)

MAN B&W G50ME-C9-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	161.5	163.5	169.5
Tier III mode	162.5	164.5	170.5

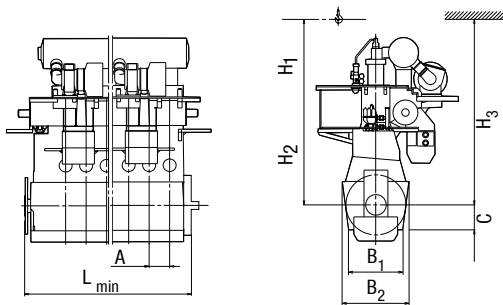
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	131.0 (8.1)	134.4 (6.2)	140.4 (5.1)
Tier III mode	131.8 (8.1)	135.3 (6.2)	141.2 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₂	H ₃
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

Tier II

Dry mass:	t	210	245	275	310	345
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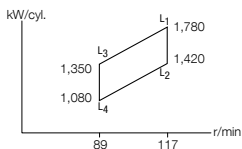
Tier III

Dry mass (added):						
EGR	t	6	8	9	10	12
HP SCR	t	4	4	5	6	6
LP SCR	t	-	-	-	-	-



Cyl.	L ₁ kW
5	8,900
6	10,680
7	12,460
8	14,240
9	16,020

Stroke: 2,214 mm



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W S50ME-C9

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	167.5	165.0	169.0
Part load	EGB	164.5	163.5	170.5
Low load	EGB	162.5	164.5	170.5

Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W S50ME-C9-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	163.5	161.0	168.0
Part load	EGB	164.5	163.5	170.5
Low load	EGB	162.5	164.5	170.5

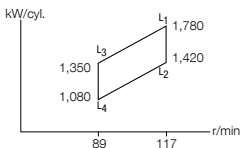
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	132.8 (8.0)	132.4 (6.1)	139.2 (5.0)
Part load	EGB	133.5 (8.1)	134.4 (6.2)	141.2 (5.1)
Low load	EGB	131.8 (8.1)	135.3 (6.2)	141.2 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW
5	8,900
6	10,680
7	12,460
8	14,240
9	16,020

Stroke: 2,214 mm



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W S50ME-C9-EGRBP

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	162.5	164.5	171.0
Tier III mode	170.5	169.0	174.0

MAN B&W S50ME-C9-HPSCR

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	162.5	164.5	170.5
Tier III mode	164.0	165.5	171.0

MAN B&W S50ME-C9-LPSCR

L₁ SFOC [g/kWh]

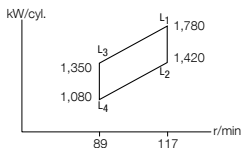
	50%	75%	100%
Tier II mode	162.5	164.5	170.5
Tier III mode	163.5	165.5	171.5

MAN B&W S50ME-C9

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



Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W S50ME-C9-GI-EGRBP

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	162.5	164.5	171.0
Tier III mode	170.5	169.0	174.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	131.7 (8.3)	135.2 (6.3)	141.6 (5.2)
Tier III mode	138.5 (8.3)	139.0 (6.3)	144.1 (5.2)

MAN B&W S50ME-C9-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	162.5	164.5	170.5
Tier III mode	164.0	165.5	171.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	131.8 (8.2)	135.3 (6.2)	141.2 (5.1)
Tier III mode	133.1 (8.2)	136.1 (6.2)	141.7 (5.1)

MAN B&W S50ME-C9-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	162.5	164.5	170.5
Tier III mode	163.5	165.5	171.5

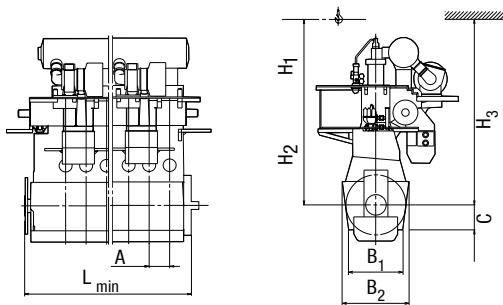
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	131.8 (8.2)	135.3 (6.2)	141.2 (5.1)
Tier III mode	132.7 (8.2)	136.1 (6.2)	142.1 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₂	H ₃
mm	875	3,350	3,290	1,190	9,775	9,200	8,900

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

Tier II

Dry mass:	t	190	220	255	285	315
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Tier III

Dry mass (added):						
EGR	t	7	8	9	11	12
HP SCR	t	4	4	5	6	7
LP SCR	t	-	-	-	-	-

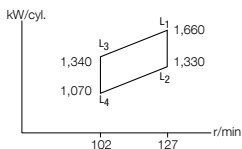


MAN B&W S50ME-C8

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



Fuel Oil

L₁ MEP: 20.0 bar

MAN B&W S50ME-C8

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	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

Dual Fuel Mode for GI (Methane)

MAN B&W S50ME-C8-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

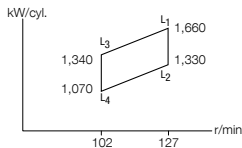
SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	164.5	162.0	169.0
Part load	EGB	165.5	164.5	171.5
Low load	EGB	163.5	165.5	171.5

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	133.6 (8.0)	133.2 (6.1)	140.0 (5.1)
Part load	EGB	134.4 (8.2)	135.3 (6.2)	142.1 (5.1)
Low load	EGB	132.7 (8.2)	136.1 (6.2)	142.1 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW	Stroke: 2,000 mm
5	8,300	
6	9,960	
7	11,620	
8	13,280	
9	14,940	



Fuel Oil

L₁ MEP: 20.0 bar

MAN B&W S50ME-C8-EGRBP

L₁ 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-HPSCR

L₁ 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-LPSCR

L₁ SFOC [g/kWh]

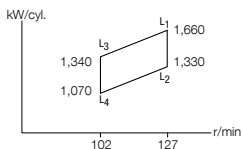
	50%	75%	100%
Tier II mode	163.5	165.5	171.5
Tier III mode	164.5	166.5	172.5

MAN B&W S50ME-C8

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



Dual Fuel Mode for GI (Methane)

L₁ MEP: 20.0 bar

MAN B&W S50ME-C8-GI-EGRTC

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	163.5	165.5	172.0
Tier III mode	171.5	170.0	175.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	132.5 (8.3)	136.0 (6.4)	142.4 (5.3)
Tier III mode	139.3 (8.3)	139.9 (6.4)	145.0 (5.3)

MAN B&W S50ME-C8-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	163.5	165.5	171.5
Tier III mode	165.0	166.5	172.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	132.6 (8.2)	136.1 (6.3)	142.1 (5.2)
Tier III mode	133.9 (8.2)	136.9 (6.3)	142.5 (5.2)

MAN B&W S50ME-C8-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	163.5	165.5	171.5
Tier III mode	164.5	166.5	172.5

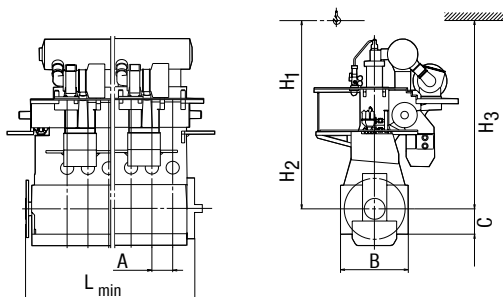
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	132.6 (8.2)	136.1 (6.3)	142.0 (5.2)
Tier III mode	133.5 (8.2)	136.9 (6.3)	142.9 (5.2)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, LGIM and LGIP, except GIE and EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B	C	H ₁	H ₂	H ₃
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

Tier II

Dry mass:	t	180	210	240	270	295
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Tier III

Dry mass (added):						
EGR	t	6	7	9	10	11
HP SCR	t	3	4	5	5	6
LP SCR	t	-	-	-	-	-

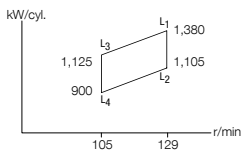


MAN B&W S46ME-B8

Tier II

Cyl.	L ₁ kW
5	6,900
6	8,280
7	9,660
8	11,040

Stroke: 1,932 mm



Fuel Oil

L₁ MEP: 20.0 bar

MAN B&W S46ME-B8

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	169.5	167.0	170.0
Part load	EGB	166.5	165.5	171.5
Low load	EGB	164.5	166.5	171.5

Dual Fuel Mode for GI (Methane)

L₁ MEP: 20.0 bar

MAN B&W S46ME-B8-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	169.5	167.0	170.0
Part load	EGB	166.5	165.5	171.5
Low load	EGB	164.5	166.5	171.5

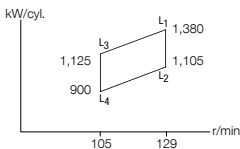
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	137.8 (8.1)	137.6 (6.2)	140.8 (5.1)
Part load	EGB	135.2 (8.2)	136.2 (6.2)	142.1 (5.1)
Low load	EGB	133.5 (8.2)	137.1 (6.2)	142.1 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW
5	6,900
6	8,280
7	9,660
8	11,040

Stroke: 1,932 mm



Fuel Oil

L₁ MEP: 20.0 bar

MAN B&W S46ME-B8-EGRBP

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	164.5	166.5	172.0
Tier III mode	172.5	171.0	175.0

MAN B&W S46ME-B8-HPSCR

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	164.5	166.5	171.5
Tier III mode	166.0	167.5	172.0

MAN B&W S46ME-B8-LPSCR

L₁ SFOC [g/kWh]

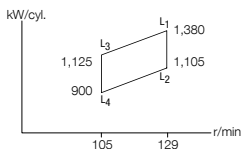
	50%	75%	100%
Tier II mode	164.5	166.5	171.5
Tier III mode	167.5	167.5	172.5

MAN B&W S46ME-B8

Tier III

Cyl.	L ₁ kW
5	6,900
6	8,280
7	9,660
8	11,040

Stroke: 1,932 mm



Dual Fuel Mode for GI (Methane)

L₁ MEP: 20.0 bar

MAN B&W S46ME-B8-GI-EGRBP

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	164.5	166.5	172.0
Tier III mode	172.5	171.0	175.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	133.4 (8.3)	137.0 (6.4)	142.4 (5.3)
Tier III mode	140.2 (8.3)	140.8 (6.4)	145.0 (5.3)

MAN B&W S46ME-B8-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	164.5	166.5	171.5
Tier III mode	166.0	167.5	172.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	133.4 (8.2)	137.0 (6.3)	142.1 (5.2)
Tier III mode	134.7 (8.2)	137.9 (6.3)	142.5 (5.2)

MAN B&W S46ME-B8-GI-LPSCR

L₁ MEP: 20.0 barL₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	164.5	166.5	171.5
Tier III mode	167.5	167.5	172.5

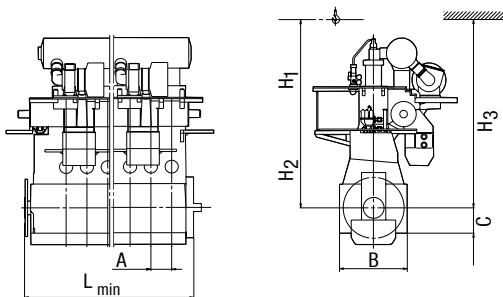
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	133.4 (8.3)	137.0 (6.3)	142.0 (5.2)
Tier III mode	135.9 (8.3)	137.9 (6.3)	142.9 (5.2)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, except GIE with EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B	C	H ₁	H ₂	H ₃
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

Tier II

Dry mass:	t	159	177	199	219
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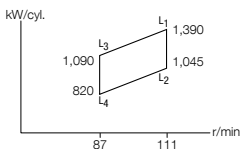
Tier III

Dry mass (added):					
EGR	t	5	6	7	8
HP SCR	t	3	3	4	5
LP SCR	t	-	-	-	-



Cyl.	L ₁ kW
5	6,950
6	8,340
7	9,730
8	11,120

Stroke: 2,250 mm



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W G45ME-C9

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	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

Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W G45ME-C9-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	164.5	162.0	169.0
Part load	EGB	165.5	164.5	171.5
Low load	EGB	163.5	165.5	171.5

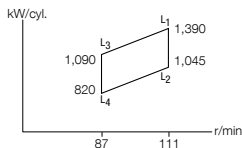
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	133.6 (8.0)	133.2 (6.1)	140.0 (5.1)
Part load	EGB	134.4 (8.2)	135.3 (6.2)	142.1 (5.1)
Low load	EGB	132.7 (8.2)	136.1 (6.2)	142.1 (5.1)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Cyl.	L ₁ kW
5	6,950
6	8,340
7	9,730
8	11,120

Stroke: 2,250 mm



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W G45ME-C9-EGRBP

L₁ 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-HPSCR

L₁ 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-LPSCR

L₁ SFOC [g/kWh]

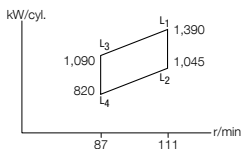
	50%	75%	100%
Tier II mode	163.5	165.5	171.5
Tier III mode	164.5	166.5	172.5

MAN B&W G45ME-C9

Tier III

Cyl.	L ₁ kW
5	6,950
6	8,340
7	9,730
8	11,120

Stroke: 2,250 mm



Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W G45ME-C9-GI-EGRBP

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	163.5	165.5	172.0
Tier III mode	171.5	170.0	175.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	132.5 (8.3)	136.0 (6.4)	142.4 (5.3)
Tier III mode	139.3 (8.3)	139.9 (6.4)	145.0 (5.3)

MAN B&W G45ME-C9-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	163.5	165.5	171.5
Tier III mode	165.0	166.5	172.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	132.6 (8.2)	136.1 (6.3)	142.1 (5.2)
Tier III mode	133.9 (8.2)	136.9 (6.3)	142.5 (5.2)

MAN B&W G45ME-C9-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	163.5	165.5	171.5
Tier III mode	164.5	166.5	172.5

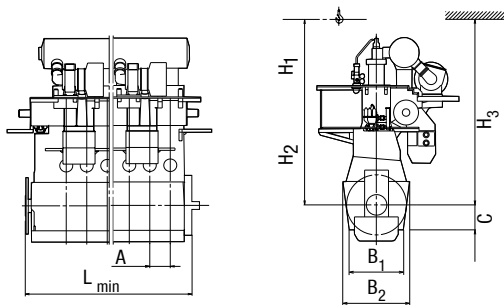
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	132.6 (8.2)	136.1 (6.3)	142.0 (5.2)
Tier III mode	133.5 (8.2)	136.9 (6.3)	142.9 (5.2)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, except GIE with EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₂	H ₃
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

Tier II

Dry mass:	t	163	183	206	234
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Tier III

Dry mass (added):					
EGR	t	5	6	7	8
HP SCR	t	3	3	4	5
LP SCR	t	-	-	-	-

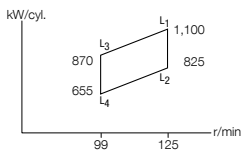


MAN B&W G40ME-C9

Tier II

Cyl.	L ₁ kW
5	5,500
6	6,600
7	7,700
8	8,800

Stroke: 2,000 mm



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W G40ME-C9

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	173.5	171.0	175.0

Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W G40ME-C9-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

SFOC-optimised load range	Tuning	50%	75%	100%
High load	EGB	169.5	167.0	174.0

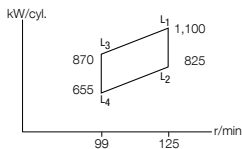
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	EGB	137.7 (8.3)	137.3 (6.3)	144.1 (5.2)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE.

Cyl.	L ₁ kW	Stroke: 2,000 mm
5	5,500	
6	6,600	
7	7,700	
8	8,800	



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W G40ME-C9-EGRBP

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	169.5	172.0	180.0
Tier III mode	176.5	175.0	180.0

MAN B&W G40ME-C9-HPSCR

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	173.5	171.0	175.0
Tier III mode	175.0	172.0	175.5

MAN B&W G40ME-C9-LPSCR

L₁ SFOC [g/kWh]

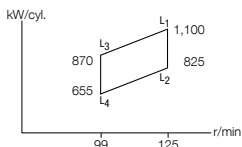
	50%	75%	100%
Tier II mode	173.5	171.0	175.0
Tier III mode	174.0	171.5	175.5

MAN B&W G40ME-C9

Tier III

Cyl.	L ₁ kW
5	5,500
6	6,600
7	7,700
8	8,800

Stroke: 2,000 mm



Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W G40ME-C9-GI-EGRBP

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	169.5	172.0	180.0
Tier III mode	176.5	175.0	180.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	137.4 (8.6)	141.4 (6.5)	149.1 (5.4)
Tier III mode	143.4 (8.6)	144.0 (6.5)	149.1 (5.4)

MAN B&W G40ME-C9-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	173.5	171.0	175.0
Tier III mode	175.0	172.0	175.5

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	141.0 (8.4)	140.7 (6.4)	145.0 (5.3)
Tier III mode	142.3 (8.4)	141.5 (6.4)	145.4 (5.3)

MAN B&W G40ME-C9-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	173.5	171.0	175.0
Tier III mode	174.0	171.5	175.5

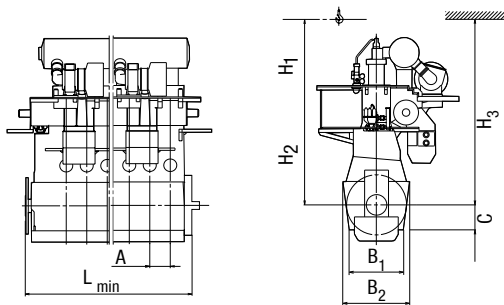
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	141.0 (8.4)	140.7 (6.4)	145.0 (5.3)
Tier III mode	141.5 (8.4)	141.1 (6.4)	145.4 (5.3)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, except GIE with EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₂	H ₃
mm	700	3,020	2,942	1,039	8,700	*	*

Cylinders:	5	6	7	8
L _{min} mm	5,012	5,712	6,412	7,112

Tier II

Dry mass:	t	119	135	153	173
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Tier III

Dry mass (added):					
EGR	t	4	5	6	7
HP SCR	t	2	3	3	4
LP SCR	t	-	-	-	-

* Data is available on request.

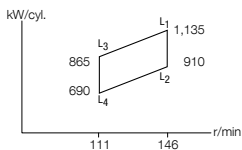


MAN B&W S40ME-B9

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



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W S40ME-B9

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	173.5	171.0	174.0

Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W S40ME-B9-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

SFOC-optimised load range	Tuning	50%	75%	100%
High load	EGB	173.5	171.0	174.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

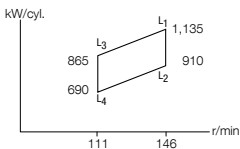
SFOC-optimised load range	Tuning	50%	75%	100%
High load	EGB	141.1 (8.3)	140.8 (6.3)	144.1 (5.2)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

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



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W S40ME-B9-EGRBP

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	169.5	172.0	179.0
Tier III mode	176.5	175.0	179.0

MAN B&W S40ME-B9-HPSCR

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	173.5	171.0	174.0
Tier III mode	175.0	172.0	174.5

MAN B&W S40ME-B9-LPSCR

L₁ SFOC [g/kWh]

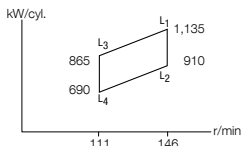
	50%	75%	100%
Tier II mode	173.5	171.0	174.0
Tier III mode	174.0	171.5	174.5

MAN B&W S40ME-B9

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



Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W S40ME-B9-GI-EGRBP

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	169.5	172.0	179.0
Tier III mode	176.5	175.0	179.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	137.5 (8.5)	141.5 (6.5)	148.3 (5.4)
Tier III mode	143.5 (8.5)	144.1 (6.5)	148.3 (5.4)

MAN B&W S40ME-B9-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	173.5	171.0	174.0
Tier III mode	175.0	172.0	174.5

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	141.0 (8.4)	140.8 (6.4)	144.1 (5.2)
Tier III mode	142.3 (8.4)	141.7 (6.4)	144.6 (5.2)

MAN B&W S40ME-B9-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	173.5	171.0	174.0
Tier III mode	174.0	171.5	174.5

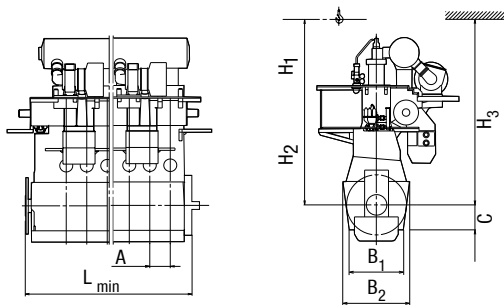
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	141.1 (8.3)	140.8 (6.3)	144.1 (5.2)
Tier III mode	141.5 (8.3)	141.3 (6.3)	144.6 (5.2)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, except GIE with EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₂	H ₃
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

Tier II

Dry mass:	t	112	131	148	163	195
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Tier III

Dry mass (added):						
EGR	t	4	5	6	7	7
HP SCR	t	2	3	3	4	4
LP SCR	t	-	-	-	-	-

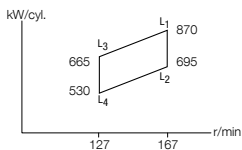


MAN B&W S35ME-B9

Tier II

Cyl.	L ₁ kW
5	4,350
6	5,220
7	6,090
8	6,960

Stroke: 1,550 mm



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W S35ME-B9

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	174.5	172.0	175.0

Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W S35ME-B9-GI

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

SFOC-optimised load range	Tuning	50%	75%	100%
High load	EGB	174.5	172.0	175.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

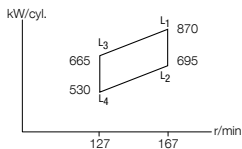
SFOC-optimised load range	Tuning	50%	75%	100%
High load	EGB	141.9 (8.3)	141.7 (6.4)	145.0 (5.3)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE.

Cyl.	L ₁ kW
5	4,350
6	5,220
7	6,090
8	6,960

Stroke: 1,550 mm



Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W S35ME-B9-EGRBP

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	170.5	173.0	180.0
Tier III mode	177.5	176.0	180.0

MAN B&W S35ME-B9-HPSCR

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	174.5	172.0	175.0
Tier III mode	176.0	173.0	175.5

MAN B&W S35ME-B9-LPSCR

L₁ SFOC [g/kWh]

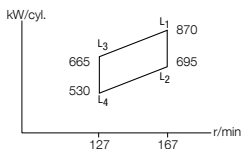
	50%	75%	100%
Tier II mode	174.5	172.0	175.0
Tier III mode	175.0	172.5	175.5

MAN B&W S35ME-B9

Tier III

Cyl.	L ₁ kW
5	4,350
6	5,220
7	6,090
8	6,960

Stroke: 1,550 mm



Dual Fuel Mode for GI (Methane)

L₁ MEP: 21.0 bar

MAN B&W S35ME-B9-GI-EGRBP

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	170.5	173.0	180.0
Tier III mode	177.5	176.0	180.0

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	138.3 (8.6)	142.4 (6.5)	149.1 (5.4)
Tier III mode	144.3 (8.6)	144.9 (6.5)	149.1 (5.4)

MAN B&W S35ME-B9-GI-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	174.5	172.0	175.0
Tier III mode	176.0	173.0	175.5

L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	141.8 (8.4)	141.6 (6.4)	145.0 (5.3)
Tier III mode	143.1 (8.4)	142.5 (6.4)	145.4 (5.3)

MAN B&W S35ME-B9-GI-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	174.5	172.0	175.0
Tier III mode	175.0	172.5	175.5

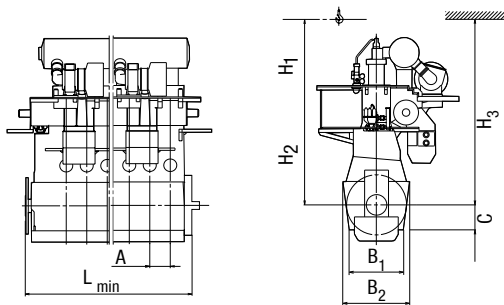
L₁ SGC 50,000 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	141.9 (8.4)	141.7 (6.4)	145.0 (5.3)
Tier III mode	142.3 (8.4)	142.1 (6.4)	145.4 (5.3)

* Gas fuel LCV (50,000 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with fuel oil operated engine.

Note: Also available for GIE, except GIE with EGR, see pages 10-12.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₂	H ₃
mm	612	2,300	2,288	830	6,925	6,625	6,275

Cylinders:	5	6	7	8
L _{min} mm	4,378	4,990	5,602	6,214

Tier II

Dry mass:	t	81	90	99	111
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Tier III

Dry mass (added):					
EGR	t	3	4	5	5
HP SCR	t	2	2	3	3
LP SCR	t	-	-	-	-

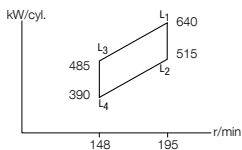


MAN B&W S30ME-B9

Tier II Tier III

Cyl.	L ₁ kW
5	3,200
6	3,840
7	4,480
8	5,120

Stroke: 1,328 mm



Tier II Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W S30ME-B9

L₁ SFOC [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	175.5	173.0	176.0

Tier III Fuel Oil

L₁ MEP: 21.0 bar

MAN B&W S30ME-B9-EGRBP

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	171.5	174.0	181.0
Tier III mode	178.5	177.0	181.0

MAN B&W S30ME-B9-HPSCR

L₁ SFOC [g/kWh]

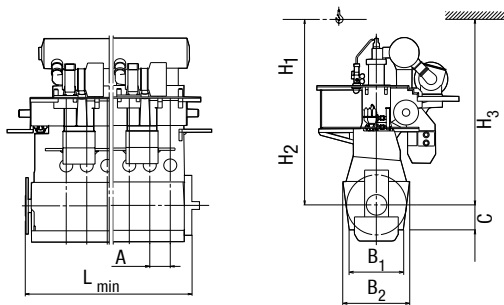
	50%	75%	100%
Tier II mode	175.5	173.0	176.0
Tier III mode	177.0	174.0	176.5

MAN B&W S30ME-B9-LPSCR

L₁ SFOC [g/kWh]

	50%	75%	100%
Tier II mode	175.5	173.0	176.0
Tier III mode	176.0	173.5	176.5

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₂	H ₃
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

Tier II

Dry mass: t	61	69	77	86
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Tier III

Dry mass (added):				
EGR t	2	3	3	4
HP SCR t	1	2	2	2
LP SCR t	-	-	-	-



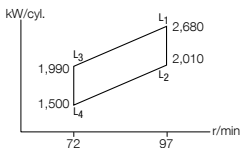




Alternative fuels
Tier II and Tier III

Cyl.	L ₁ kW
5	13,400
6	16,080
7	18,760
8	21,440

Stroke: 2,790 mm



Dual Fuel Mode for GIE (Ethane)

L₁ MEP: 21.0 bar

MAN B&W G60ME-C9-GIE

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	168.5	168.0	172.0
Part load	EGB	165.5	166.5	173.5
Low load	EGB	163.5	167.5	173.5

L₁ SGC 47,500 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	144.1 (8.2)	145.5 (6.2)	150.0 (5.2)
Part load	EGB	141.3 (8.3)	144.1 (6.3)	151.3 (5.2)
Low load	EGB	139.5 (8.3)	145.0 (6.3)	151.3 (5.2)

Dual Fuel Mode for LGIM (Methanol)

L₁ MEP: 21.0 bar

MAN B&W G60ME-C9-LGIM

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

SFOC-optimised load range	Tuning	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

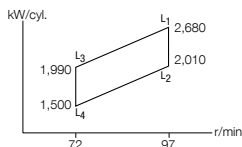
L₁ SGC 19,900 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	326.7 (13.3)	328.3 (10.1)	340.4 (8.4)
Part load	EGB	320.0 (13.4)	324.9 (10.2)	343.5 (8.4)
Low load	EGB	315.7 (13.4)	327.1 (10.2)	343.5 (8.4)

* Gas fuel LCV (47,500/19,900 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with a fuel oil operated engine.

Cyl.	L ₁ kW
5	13,400
6	16,080
7	18,760
8	21,440

Stroke: 2,790 mm



Dual Fuel Mode for GIE (Ethane)

L₁ MEP: 21.0 bar

MAN B&W G60ME-C9-GIE-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	163.5	167.5	173.5
Tier III mode	165.0	168.5	174.0

L₁ SGC 47,500 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

	50%	75%	100%
Tier II mode	139.5 (8.3)	145.0 (6.3)	151.3 (5.2)
Tier III mode	140.8 (8.3)	145.9 (6.3)	151.7 (5.2)

MAN B&W G60ME-C9-GIE-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	163.5	167.5	173.5
Tier III mode	164.5	168.5	174.5

L₁ SGC 47,500 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

	50%	75%	100%
Tier II mode	139.5 (8.3)	145.0 (6.3)	151.3 (5.2)
Tier III mode	140.4 (8.3)	145.9 (6.3)	152.2 (5.2)

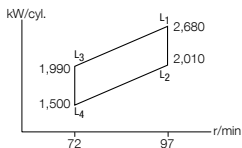
* Gas fuel LCV (47,500 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with a fuel oil operated engine.

MAN B&W G60ME-C9

Tier III

Cyl.	L ₁ kW
5	13,400
6	16,080
7	18,760
8	21,440

Stroke: 2,790 mm



Dual Fuel Mode for LGIM (Methanol)

L₁ MEP: 21.0 bar

MAN B&W G60ME-C9-LGIM-EGRBP

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	160.5	162.5	169.0
Tier III mode	168.5	167.0	172.0

L₁ SGC 19,900 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	315.1 (13.7)	326.6 (10.4)	344.2 (8.6)
Tier III mode	332.3 (13.7)	336.3 (10.4)	350.6 (8.6)

MAN B&W G60ME-C9-GI-LGIM-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	160.5	162.5	168.5
Tier III mode	162.0	163.5	169.0

L₁ SGC 19,900 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	315.4 (13.5)	326.9 (10.3)	343.4 (8.5)
Tier III mode	318.7 (13.5)	329.1 (10.3)	344.5 (8.5)

MAN B&W G60ME-C9-LGIM-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

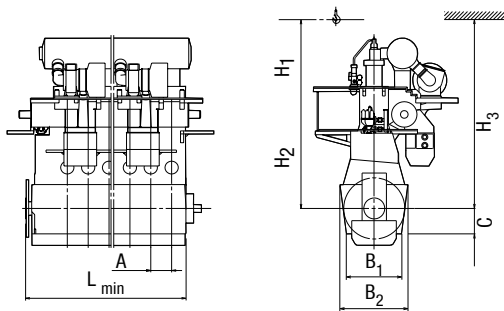
	50%	75%	100%
Tier II mode	160.5	162.5	168.5
Tier III mode	161.5	163.5	169.5

L₁ SGC 19,900 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	315.5 (13.5)	326.9 (10.3)	343.4 (8.5)
Tier III mode	317.7 (13.5)	329.1 (10.3)	345.5 (8.5)

* Liquid gas fuel LCV (19,900 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with a fuel oil operated engine.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₂	H ₃
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

Tier II

Dry mass:	t	395	439	491	543
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Tier III

Dry mass (added):					
EGR	t	14	14	15	16
HP SCR	t	3	4	5	5
LP SCR	t	-	-	-	-

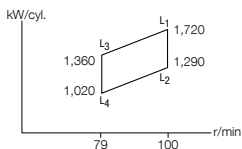


MAN B&W G50ME-C9

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



Dual Fuel Mode for GIE (Ethane)

L₁ MEP: 21.0 bar

MAN B&W G50ME-C9-GIE

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	169.5	169.0	173.0
Part load	EGB	166.5	167.5	174.5
Low load	EGB	164.5	168.5	174.5

L₁ SGC 47,500 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	145.0 (8.2)	146.4 (6.3)	150.9 (5.2)
Part load	EGB	142.2 (8.3)	145.0 (6.3)	152.2 (5.2)
Low load	EGB	140.4 (8.3)	145.9 (6.3)	152.2 (5.2)

Dual Fuel Mode for LGIM (Methanol)

L₁ MEP: 21.0 bar

MAN B&W G50ME-C9-LGIM

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	166.5	164.0	168.0
Part load	EGB	163.5	162.5	169.5
Low load	EGB	161.5	163.5	169.5

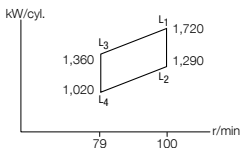
L₁ SGC 19,900 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

SFOC-optimised load range	Tuning	50%	75%	100%
High load	-	328.6 (13.3)	330.3 (10.2)	342.5 (8.4)
Part load	EGB	321.9 (13.5)	326.9 (10.3)	345.5 (8.5)
Low load	EGB	317.7 (13.5)	329.0 (10.3)	345.5 (8.5)

* Gas fuel LCV (47,500/19,900 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with a fuel oil operated engine.

Cyl.	L ₁ kW
5	8,600
6	10,320
7	12,040
8	13,760
9	15,480

Stroke: 2,500 mm



Dual Fuel Mode for GIE (Ethane)

L₁ MEP: 21.0 bar

MAN B&W G50ME-C9-GIE-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	164.5	168.5	174.5
Tier III mode	166.0	169.5	175.0

L₁ SGC 47,500 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	140.3 (8.4)	145.8 (6.4)	152.1 (5.3)
Tier III mode	141.7 (8.4)	146.7 (6.4)	152.6 (5.3)

MAN B&W G50ME-C9-GIE-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	164.5	168.5	174.5
Tier III mode	165.5	169.5	175.5

L₁ SGC 47,500 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	140.4 (8.4)	145.8 (6.4)	152.1 (5.3)
Tier III mode	141.3 (8.4)	146.7 (6.4)	153.0 (5.3)

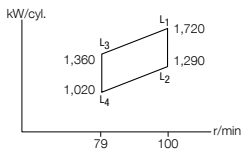
* Gas fuel LCV (47,500 kJ/kg) is converted to diesel fuel LCV (42,700 kJ/kg) for comparison with a diesel operated engine.

MAN B&W G50ME-C9

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



Dual Fuel Mode for LGIM (Methanol)

L₁ MEP: 21.0 bar

MAN B&W G50ME-C9-LGIM-EGRBP

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	161.5	163.5	170.0
Tier III mode	169.5	168.0	173.0

L₁ SGC 19,900 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	317.1 (13.7)	328.6 (10.5)	346.2 (8.7)
Tier III mode	334.2 (13.7)	338.3 (10.5)	352.7 (8.7)

MAN B&W G50ME-C9-GI-LGIM-HPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

	50%	75%	100%
Tier II mode	161.5	163.5	169.5
Tier III mode	163.0	164.5	170.0

L₁ SGC 19,900 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	317.4 (13.6)	328.9 (10.3)	345.5 (8.5)
Tier III mode	320.6 (13.6)	331.1 (10.3)	346.5 (8.5)

MAN B&W G50ME-C9-LGIM-LPSCR

L₁ SFOC equivalent gas + pilot fuel (42,700 kJ/kg) [g/kWh]*

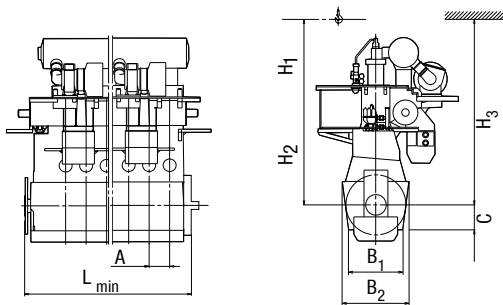
	50%	75%	100%
Tier II mode	161.5	163.5	169.5
Tier III mode	162.5	164.5	170.5

L₁ SGC 19,900 kJ/kg (SPOC pilot fuel 42,700 kJ/kg) [g/kWh]

Tier II mode	317.5 (13.5)	328.9 (10.3)	345.4 (8.5)
Tier III mode	319.6 (13.5)	331.1 (10.3)	347.6 (8.5)

* Liquid gas fuel LCV (19,900 kJ/kg) is converted to fuel oil LCV (42,700 kJ/kg) for comparison with a fuel oil operated engine.

Engine Dimensions



Specifications

Dimensions:	A	B ₁	B ₂	C	H ₁	H ₂	H ₃
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

Tier II

Dry mass:	t	210	245	275	310	345
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Tier III

Dry mass (added):						
EGR	t	6	8	9	10	12
HP SCR	t	4	4	5	6	6
LP SCR	t	-	-	-	-	-



CEAS

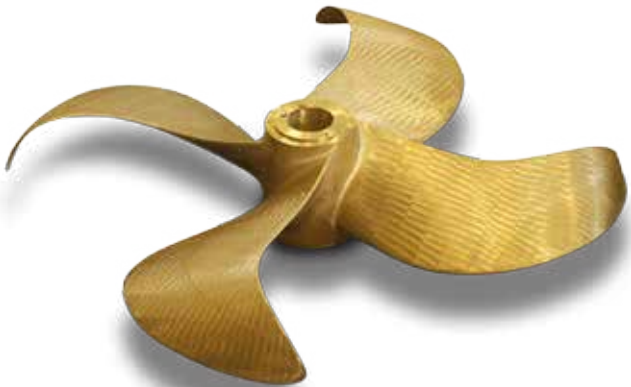


MAN B&W Two-Stroke Propulsion Systems



MAN Alpha

Propeller Programme – FPP and CPP



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

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.

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 TVC, alignment and control systems.

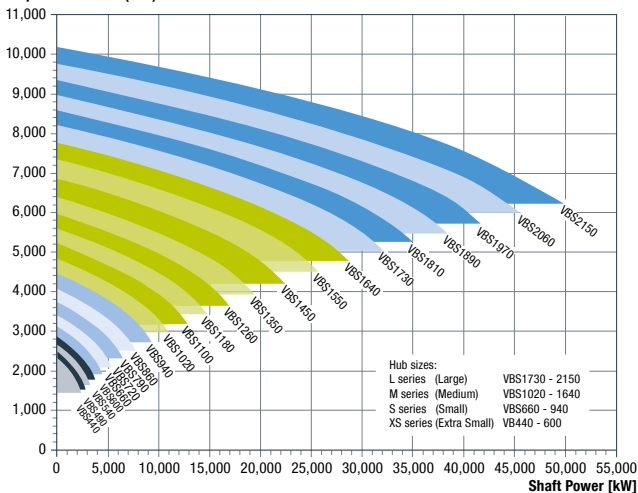
MAN B&W Two-Stroke Propulsion Systems

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 below standard programme is based on 'no ice'.

VBS Mk 5 CPP Programme

Propeller diameter (mm)



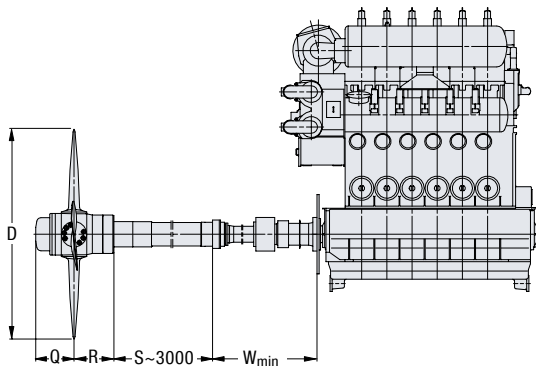
MAN B&W Standard Package Examples

Cyl.	kW	Prop. speed r/min	D ¹⁾ mm	Hub VBS mm	Q mm	R mm	Wmin mm	Prop. mass t ²⁾
G70ME-C9/-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⁾

S70ME-C8/-GI								
5	16,350	91	7,450	1,810	1,375	1,413	3,700	72.8
6	19,620	91	7,750	1,890	1,436	1,500	3,700	84.0
7	22,890	91	8,050	1,970	1,497	1,550	3,700	93.4
8	26,160	91	8,250	2,060	1,565	1,630	3,700	101.3

S65ME-C8/-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/-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

S60ME-C8/-GI								
5	11,900	105	6,500	1,550	1,278	1,289	3,000	53.4
6	14,280	105	6,750	1,640	1,367	1,362	3,000	59.7
7	16,660	105	6,950	1,730	1,367	1,367	3,000	63.2
8	19,040	105	7,150	1,810	1,458	1,450	3,000	72.0

G50ME-C9/-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/-GI								
5	8,900	117	5,650	1,460	1,100	1,141	2,700	35.7
6	10,680	117	5,850	1,560	1,175	1,202	2,700	41.3
7	12,460	117	6,050	1,560	1,175	1,202	2,700	44.5
8	14,240	117	6,200	1,680	1,278	1,279	2,700	50.5
9	16,020	117	6,350	1,800	1,367	1,332	2,900	58.0

S50ME-C8/-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⁾
S46ME-B8/-GI								
5	6,900	129	5,200	1,260	975	1,035	2,650	27.4
6	8,280	129	5,400	1,350	1,030	1,082	2,650	29.9
7	9,660	129	5,550	1,350	1,100	1,145	2,650	34.0
8	11,040	129	5,700	1,450	1,175	1,233	2,650	38.9

G45ME-C9/-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

G40ME-C9/-GI								
5	5,500	125	5,000	1,180	897	1,054	2,520	24.1
6	6,600	125	5,250	1,260	975	1,070	2,600	28.0
7	7,700	125	5,400	1,260	975	1,170	2,520	29.7
8	8,800	125	5,550	1,350	1,026	1,138	2,520	32.9

S40ME-B9/-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/-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/-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

We are the world's leading designer of large-bore diesel engines. Our engines have unit power outputs of up to 103,000 horsepower.

The MAN B&W 11G95ME-C9.5 is the largest and most powerful engine from the MAN Diesel & Turbo portfolio ever designed and built.





MAN Four-Stroke Propulsion Engines



The diesel engine has always been the most efficient system for converting fuel into mechanical energy.

MAN Diesel & Turbo will ensure it stays that way. Advanced inhouse technologies for efficiency and ecology enable MAN diesel engines to comply with the most stringent emission limits.



MAN Four-Stroke Propulsion Engines

MAN Four-Stroke Propulsion Engines – All Emission Requirements

Besides focus on power density and fuel economy, MAN Diesel & Turbo 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 Diesel & Turbo has significantly decreased NO_x emissions. Our four-stroke propulsion engines are IMO Tier II compliant with internal engine measures alone.

IMO Tier III

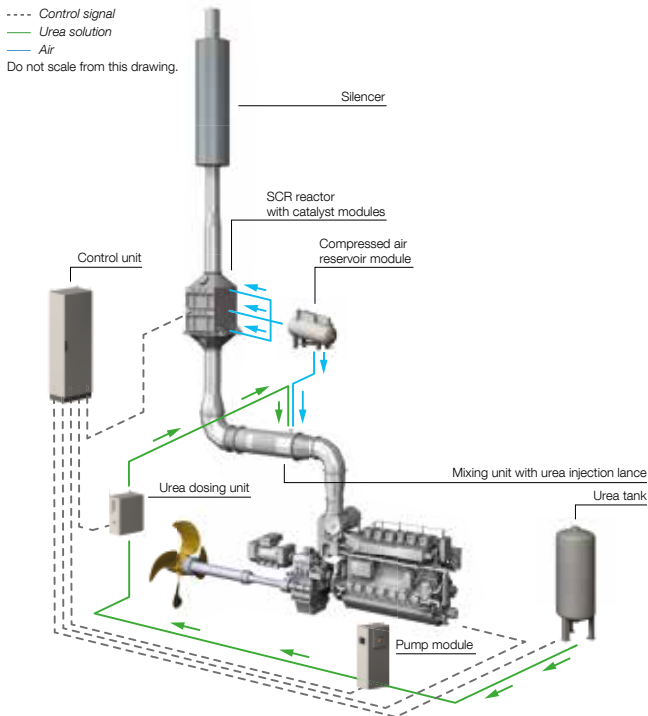
For operation in emission control areas (ECA), MAN Diesel & Turbo has developed a comprehensive range of selective catalytic reduction (SCR) systems that tremendously reduce NO_x levels surpassing IMO Tier III requirements.

MAN Diesel & Turbo 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 Diesel & Turbo was awarded the first IMO Tier III EIAPP certificate together with the classification society DNV-GL.

MAN Four-Stroke Propulsion Engines

MAN Diesel & Turbo's 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 for 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 propulsion plant with complete SCR system

MAN Four-Stroke Propulsion Engines

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 Diesel & Turbo with your project specific request.

MAN Four-Stroke Propulsion Engines

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 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 in our 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 8217-2012 DMA, DMZ, and DMB, and on residual fuels (HFO) up to 700 cSt (in compliance with ISO-F-RMK 700).

MAN Four-Stroke Propulsion Engines

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 Diesel & Turbo 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 Diesel & Turbo 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 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 HFO or 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 Diesel & Turbo can deliver well-adapted solutions. The optimised combustion chamber ensures very low fuel consumption in both operational modes.

MAN Four-Stroke Propulsion Engines

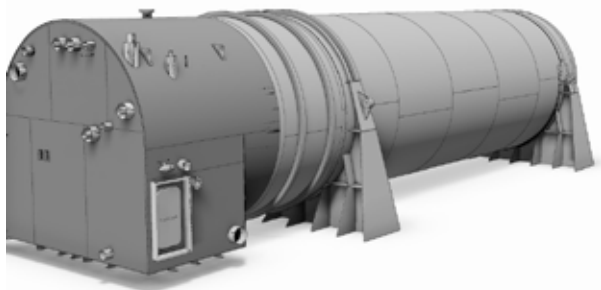
MAN Cryo Fuel Gas Supply Systems

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

In order to deliver cost-optimised systems with shortest delivery times, MAN Diesel & Turbo 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.

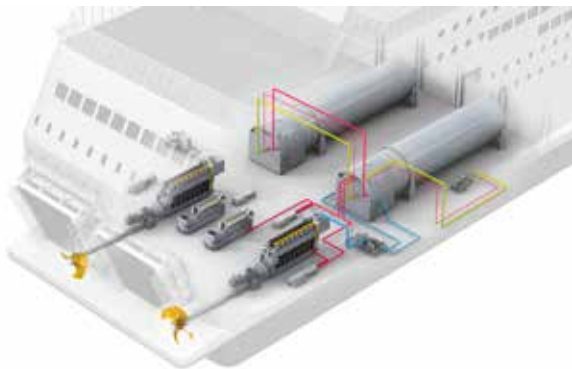


Vacuum-insulated type-C LNG tank including cold box

MAN Four-Stroke Propulsion Engines

MAN Cryo LNG Standard Packages (example sizes)

Volume [m ³]	Diameter [m]	Length [m]
75	3.6	10.8
100	3.6	13.9
125	3.6	17.0
150	4.2	14.8
175	4.2	17.0
200	4.2	19.2
250	5.3	16.2
300	5.3	19.1
350	5.3 </td <td>22.0</td>	22.0
400	6.0	20.0
450	6.0	22.3
500	6.0	24.6
500	6.9	19.8
600	6.9	23.2
700	6.9	26.6



Dual fuel propulsion package including fuel gas storage and supply system

MAN Four-Stroke Propulsion Engines

Engine Power

Engine brake power is stated in kW.

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

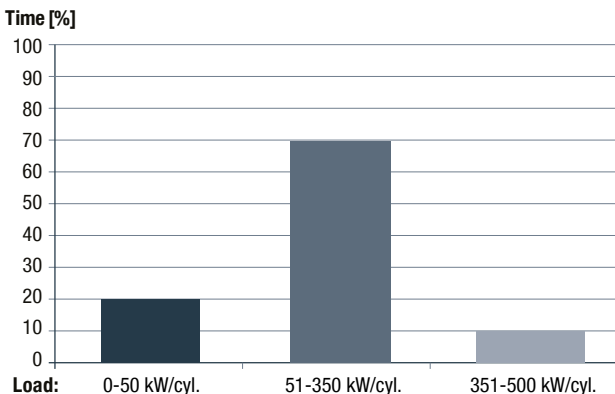
According to ISO 15550:2002, the power figures in the tables are valid within a range of $\pm 3\%$ up to tropical conditions at sea level, i.e.:

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

For all four-stroke propulsion engines, the power is defined according to the ICN¹ (MCR) definition (ISO 3046-1:2002:ISO standard power) with one exception.

For the load profile type Navy, of the engine types V28/33D STC, the rated power of the engine is stated according to the ICFN¹ power definition (ISO 3046:2002:ISO standard fuel stop power).

Load profile type: Navy (ICFN)



Typical use: fast yachts, corvettes, frigates and OPV

¹ I = ISO power

C = continuous power output

[F = fuel stop power]

N = net

MAN Four-Stroke Propulsion Engines

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 8217-2012). For engines with conventional fuel injection, SFOC figures are based on DMB-grade fuel oil (ISO 8217-2012). For further details, please refer to our engine specific project guides available from MAN Diesel & Turbo.

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.

MAN Four-Stroke Propulsion Engines

Weights and Dimensions

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

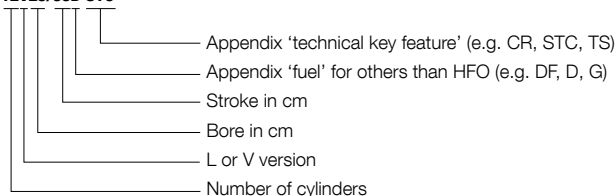
For auxiliary engines (GenSets), weights refer to the unit (including alternator). The weight of the GenSet may vary depending on the alternator make. All weights given are without lube oil and cooling water.

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.

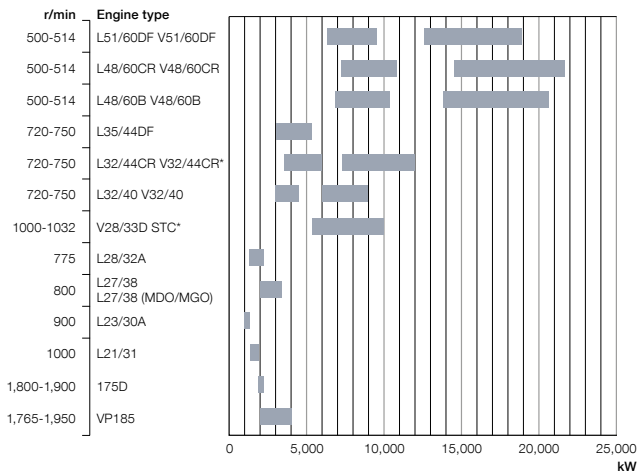
The centreline distance for twin engine installation is given as a minimum value. Specific requirements to the passageway (e.g. of classification societies or flag state authority), seating type or a gallery can lead to higher values.

Engine Type Designation

12V28/33D STC



MAN Four-Stroke Propulsion Engines



* The engine complies with EPA Tier 2

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 $\geq 28,000$ kJ/Nm³(Nm³ 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⁾		182.0 g/kWh ³⁾	177.0 g/kWh ³⁾
Heat rate ²⁾		7,190 kJ/kWh ³⁾	7,200 kJ/kWh ³⁾

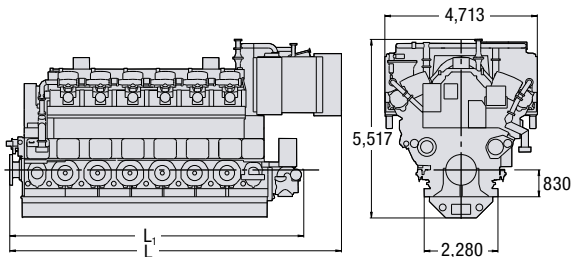
Specific lube oil consumption 0.4 g/kWh

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

¹⁾ Liquid fuel operation²⁾ Gas operation (including pilot fuel), gas fuel: methane no. ≥ 80 ³⁾ Electric propulsion**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

Project
Guide

Tier III in gas mode

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 $\geq 28,000$ kJ/Nm³

(Nm³ 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⁾		182.0 g/kWh ³⁾	177.0 g/kWh ³⁾
Heat rate ²⁾		7,190 kJ/kWh ³⁾	7,200 kJ/kWh ³⁾

Specific lube oil consumption 0.4 g/kWh

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

¹⁾ Liquid fuel operation

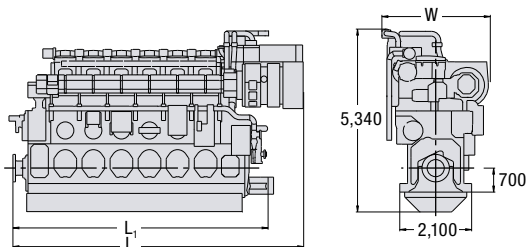
²⁾ Gas operation (including pilot fuel), gas fuel: methane no. ≥ 80

³⁾ Electric propulsion

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



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

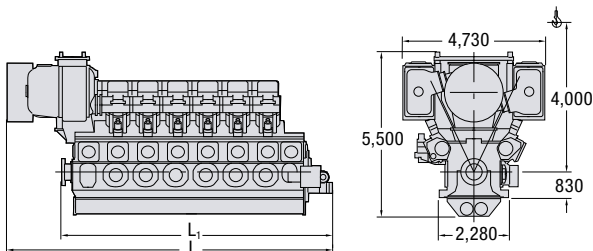
MCR	100%	85%
V48/60CR	181 g/kWh	173 g/kWh

Specific lube oil consumption 0.5 g/kWh

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

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 mmProject
Guide

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	183 g/kWh	175 g/kWh

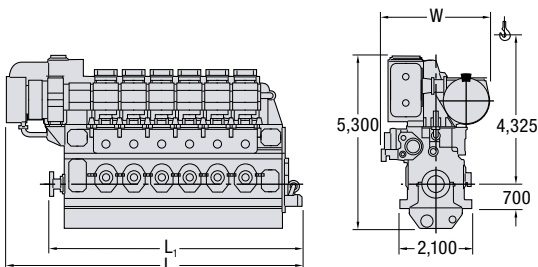
Specific lube oil consumption 0.5 g/kWh

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

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



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

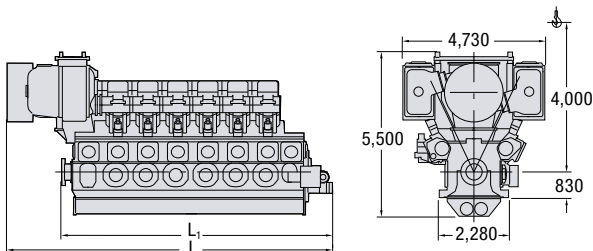
MCR	100%	85%
V48/60B	184 g/kWh	180 g/kWh

Specific lube oil consumption 0.6 g/kWh

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

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 mmProject
Guide

Tier III with SCR
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

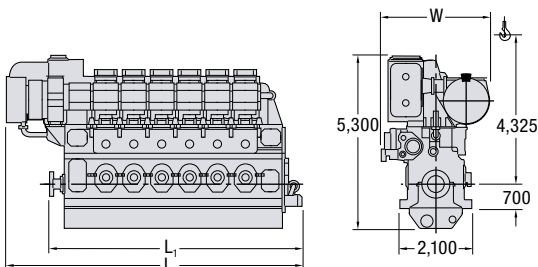
Specific lube oil consumption 0.6 g/kWh

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

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





Engineering the Future – since 1758.

MAN Diesel & Turbo



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 $\geq 28,000$ kJ/Nm³

(Nm³ 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⁾	175.5 g/kWh	175.5 g/kWh
Heat rate ²⁾	7,470 kJ/kWh	7,515 kJ/kWh
Specific lube oil consumption	0.5 g/kWh	
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

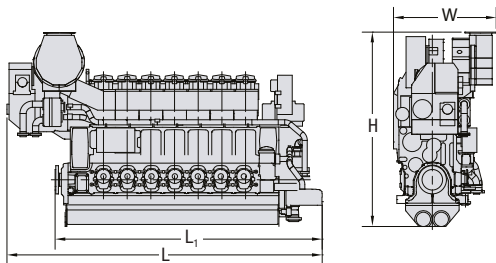
Dimensions

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 ³⁾	t	43.1	48.2	53.3	57.6	62.3

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

³⁾ Including built-on lube oil automatic filter, fuel oil filter and electronic equipment

Speed 720 r/min for generator drive only


 Project
Guide


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⁾		7,840	7,840
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	174.0 g/kWh	172.0 g/kWh
14V32/44CR	177.5 g/kWh	175.0 g/kWh
V32/44CR FPP	179.0 g/kWh	173.0 g/kWh

Specific lube oil consumption 0.5 g/kWh

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

Dimensions

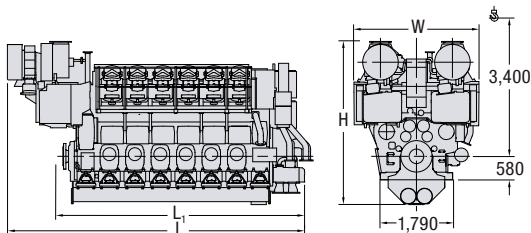
Cyl. No.		12	14	16	18	20
L	mm	7,195	7,970	8,600	9,230	9,860
L ₁	mm	5,795	6,425	7,055	7,685	8,315
W	mm	3,100	3,100	3,100	3,100	3,100
H	mm	4,039	4,262	4,262	4,262	4,262
Dry mass ³⁾	t	70	79	87	96	104

Minimum centreline distance for twin engine installation: 4,000 mm

Speed 720 r/min for generator drive/constant speed operation only

¹⁾ 560 kW/cyl²⁾ 18V 32/44CR available rigidly mounted only³⁾ Including built-on lube oil automatic filter, fuel oil filter and electronic equipment

Fixed pitch propeller: 510 kW/cyl, 750 r/min

Project
Guide

Tier III with SCR

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⁾		3,920	3,920
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	174.0 g/kWh	172.0 g/kWh
7L32/44CR	177.5 g/kWh	175.0 g/kWh
L32/44CR FPP	179.0 g/kWh	173.0 g/kWh

Specific lube oil consumption 0.5 g/kWh

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 ²⁾	t	39.5	44.5	49.5	53.5	58.0

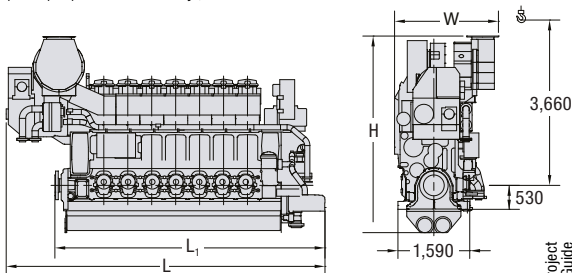
Minimum centreline distance for twin engine installation: 2,500 mm

Speed 720 r/min for generator drive/constant speed operation only

¹⁾ 560 kW/cyl

²⁾ Including built-on lube oil automatic filter, fuel oil filter and electronic equipment

Fixed pitch propeller: 510 kW/cyl, 750 r/min



Project
Guide



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 0.5 g/kWh

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

Dimensions

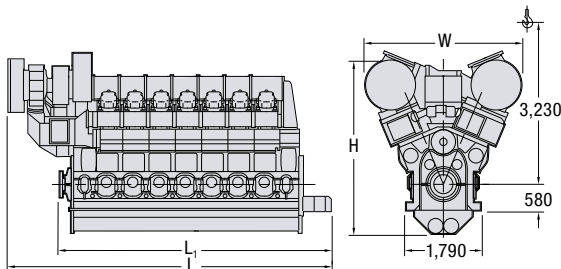
Cyl. No.		12	14	16	18
L	mm	6,915	7,545	8,365	8,995
L ₁	mm	5,890	6,520	7,150	7,780
W	mm	3,140	3,140	3,730	3,730
H	mm	4,100	4,100	4,420	4,420
Dry mass	t	61	68	77	85

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

Project
Guide

Tier III with SCR
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 0.5 g/kWh

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

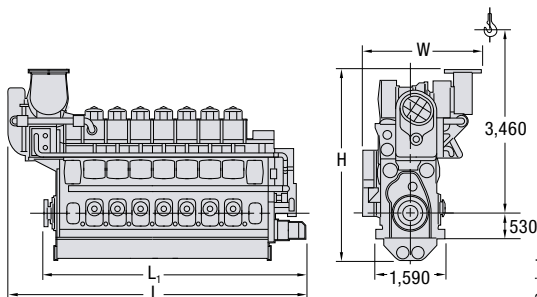
Dimensions

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 mm¹⁾

Speed 720 r/min for generator drive/constant speed operation only

Fixed pitch propeller: 450 kW/cyl, 750 r/min

¹⁾ Please contact MAN Diesel & Turbo for the precise information about the centreline distance for two engines with the same cylinder number standing near each other

 Project
Guide


Bore: 280 mm, Stroke: 330 mm

			Load profile 'Navy'	
Speed	r/min	1000	1032	
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

ICFN fuel stop power	-	194.0 g/kWh
MCR 100%	189.0 g/kWh (193.0 g/kWh ¹⁾)	189.0 g/kWh
MCR 85%	184.5 g/kWh (189.5 g/kWh ¹⁾)	194.5 g/kWh
Specific lube oil consumption	0.4 g/kWh	

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

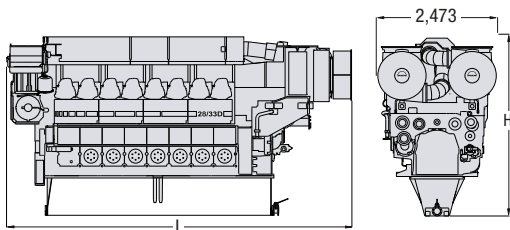
Cyl. No.		12	16	20
L	mm	6,217	7,137	8,057
H ²⁾	mm	3,417	3,417	3,417
H ³⁾	mm	3,683	3,683	3,683
Dry mass *	t	36.3	43.5	52.3

¹⁾ Engine is EPA Tier 2 compliant²⁾ With low oil sump³⁾ With deep oil sump

Weight and performance parameters refer to engine with flywheel, TC silencer, attached pumps, oil filters and lube oil cooler

* Tolerance: 5%

V28/33D STC as marine main engine to be applied for multi-engine plants only

Project
Guide

Bore: 280 mm, Stroke: 320 mm

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

Specific Fuel Oil Consumption (SFOC) to ISO conditions

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

Specific lube oil consumption 1.0 g/kWh

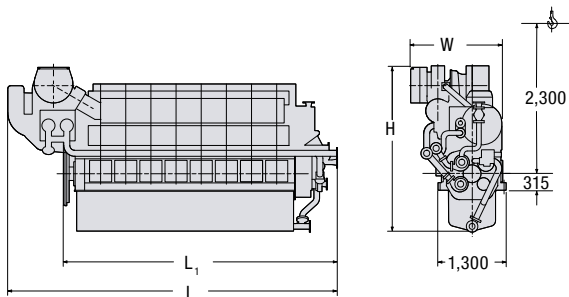
Engine type specific reference charge air temperature before cylinder 40 °C

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

* Not available for fixed pitch propeller (FPP)



Bore: 270 mm, Stroke: 380 mm

Speed	r/min	800	800 (MDO*/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%	
	kW	g/kWh	kW	g/kWh
L27/38	340 kW	188 g/kWh	340 kW	185 g/kWh
L27/38 FPP	365 kW	191 g/kWh	365 kW	186 g/kWh
	187 g/kWh	191 g/kWh	181 g/kWh	185 g/kWh

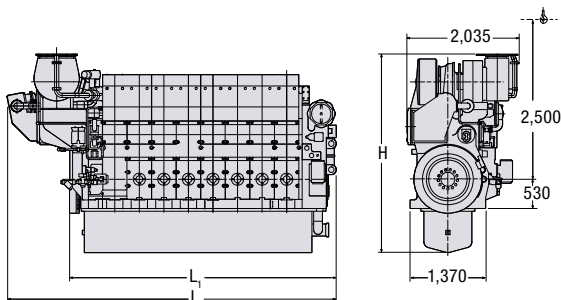
Specific lube oil consumption 0.8 g/kWh

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

* MDO viscosity must not exceed 6 mm²/s = cSt at 40 °C.

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

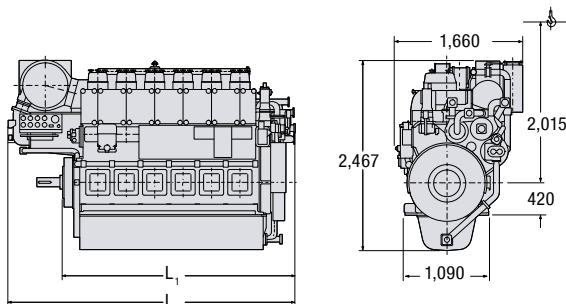
Specific Fuel Oil Consumption (SFOC) to ISO conditions

MCR	100%	85%
L23/30A	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



Bore: 210 mm, Stroke: 310 mm

Speed	r/min	1000
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	195 g/kWh	192 g/kWh

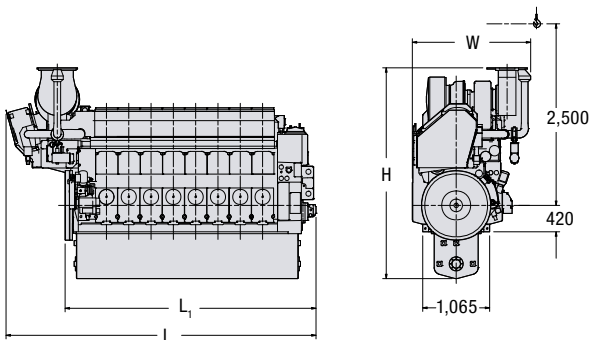
Specific lube oil consumption 0.8 g/kWh


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





Increasing the competitiveness of its products, MAN Diesel & Turbo has developed into a leading think tank and owner of the relevant key technologies driving the economic and ecological performance of its products.

Bore: 185 mm, Stroke: 196 mm

Engine Model	Rating Definition	kW	rpm	SFOC at 100% MCR	SFOC at 75% MCR
12VP185TM	B: Unrestricted Marine	2,000	1,765	208 g/kWh	202 g/kWh
12VP185TM	A2: Unrestricted Marine	2,300	1,860	211 g/kWh	203 g/kWh
12VP185TM	A1: Limited Time	2,720	1,950	216 g/kWh	205 g/kWh
18VP185TM	B: Unrestricted Marine	3,000	1,765	208 g/kWh	202 g/kWh
18VP185TM	A2: Unrestricted Marine	3,500	1,860	211 g/kWh	203 g/kWh
18VP185TM	A1: Limited Time	4,000	1,950	216 g/kWh	205 g/kWh

Specific fuel oil consumption according to ISO3046-1:2002 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

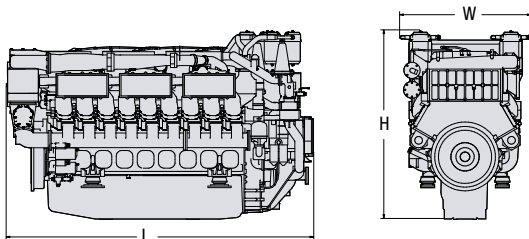
Typically for longer range displacement vessels where 70% to 100% of the rated power is likely to be used for >70% of the operating profile.

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*	t	7.8	11.1

* Approximately

Engine dry weight includes the engine mounted sea water heat exchanger and oil cooler. The dimensions given are for guidance only.



Tier III with SCR

Bore: 175 mm, Stroke: 215 mm

Engine Model	Rating Definition	kW	rpm	SFOC at 100% MCR	SFOC at 75% MCR
12V175D-MH	Heavy Duty	1,740	1,800	-	-
12V175D-MM	Medium Duty	2,220	1,900	199 g/kWh	203 g/kWh

For multi-engine arrangement only.

SFOC figures for distillates according to ISO 8217 DMA, with attached lube oil, HT and LT-cooling water pumps and engine specification fulfilling IMO Tier II emission limitations.

Rating definitions:**Marine Heavy Duty**

- Recommended for vessels with an annual operating time of up to 5,000 hours
- Typical applications include, but are not limited to, work boats, offshore vessels and ferries
- Average load: up to 85%

Marine Medium Duty

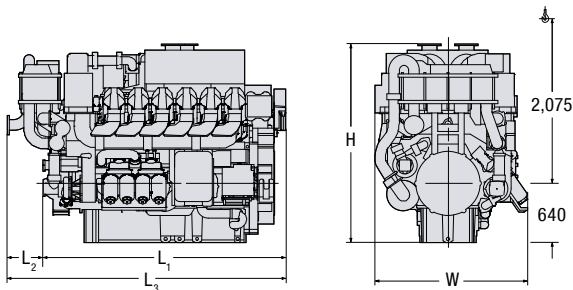
- Recommended for vessels with an annual operating time of up to 3,000 hours
- Typical applications include, but are not limited to, work boats, offshore vessels, patrol boats and yachts
- Average load: up to 65%

Dimensions

L ₁	mm	2,678
L ₂	mm	334
L ₃	mm	3,012
H	mm	2,115
W	mm	1,633
Dry weight*	t	8.5

* 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

MAN Four-Stroke Marine GenSets – All Emission Requirements

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

IMO Tier II

MAN Diesel & Turbo 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 Diesel & Turbo 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.

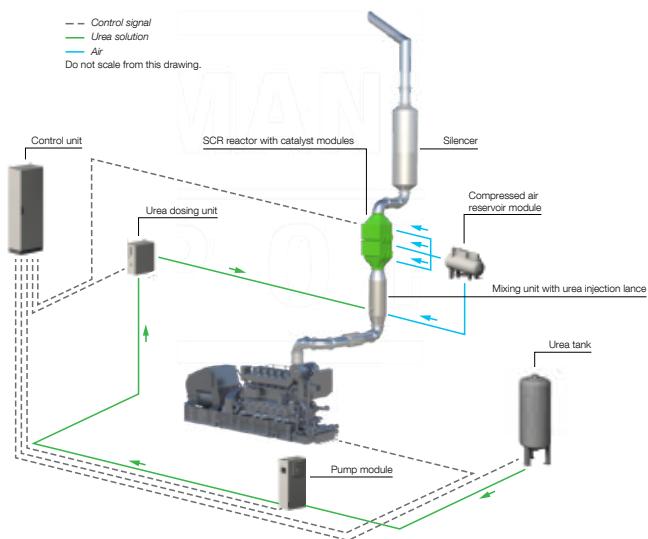
MAN Diesel & Turbo is the first manufacturer to successfully produce and offer IMO Tier III compliant four-stroke marine engines based on a fully modular SCR kit covering our entire four-stroke engine portfolio.

In 2014 MAN Diesel & Turbo was awarded the first IMO Tier III EIAPP certificate together with the classification society DNV-GL.

MAN Four-Stroke Marine GenSets

MAN Diesel & Turbo's 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

MAN Four-Stroke Marine GenSets

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)

MAN Four-Stroke Marine GenSets

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.

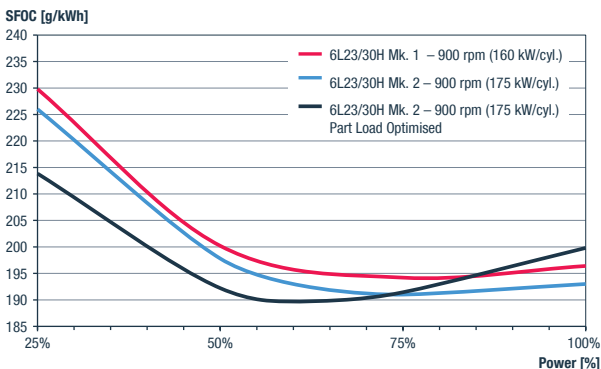
The new tuning method, referred to as part-load optimisation, optimises the engine performance at approx. 60-65% MCR, as this is often the load range in which the GenSet is operating, but it can also be customised to other specific operating conditions.

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 Diesel & Turbo.



Based on Project Guide figures for IMO Tier II engines – 60Hz:

ISO reference condition, HFO/MDO, without pumps, tolerance +5% (not included)

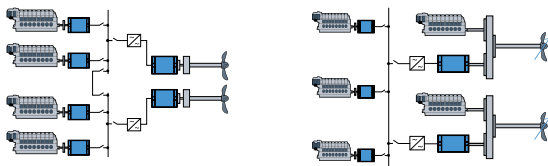
MAN Four-Stroke Marine GenSets

Diesel-Electric and Hybrid Propulsion Power Trains (HyProp ECO)

MAN Diesel & Turbo offers a full range of diesel-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 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 diesel-electric propulsion power trains as well as hybrid systems ensure the optimal technical and economical solution while maximising power demand flexibility.

With HyProp ECO, a new hybrid propulsion system has been developed combining the best propulsion performance with low investment costs.



High-efficient and customised power trains for diesel-electric and hybrid propulsion applications



HyProp ECO: Hybrid propulsion system

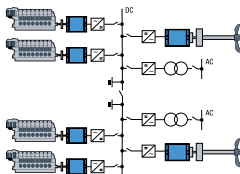
MAN Four-Stroke Marine GenSets

Energy Saving Electric Propulsion (EPROX)

Recent developments in diesel-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 Diesel & Turbo offers this advanced package solution in close cooperation with leading E-suppliers.



EPROX energy-saving diesel electric propulsion plant



EPROX propulsion solution on anchor handling tug supply vessel

MAN Four-Stroke Marine GenSets

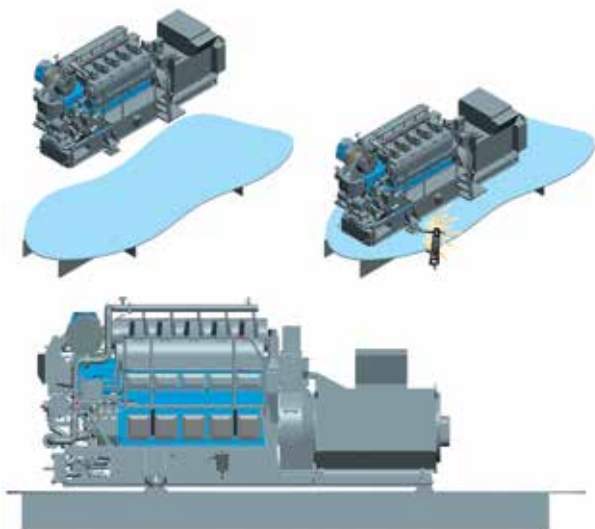
MAN L23/30H Monocoque GenSet – Continued development

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.

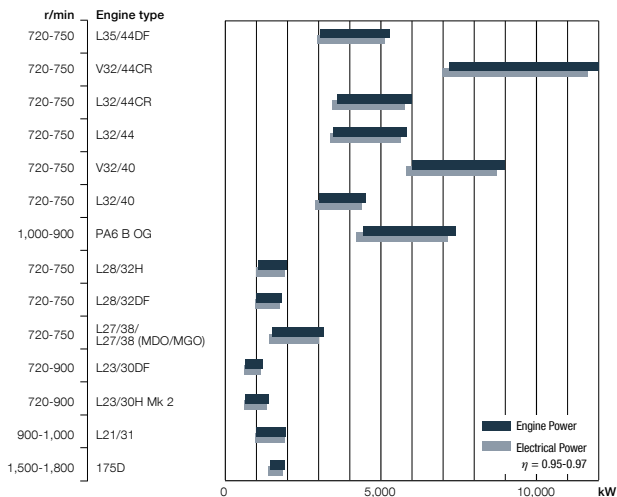
The most significant update is that the alternator is now a load-bearing component, with a 'top brace' connection to the engine. This enables up to 63% weight reduction of the base frame, which again results in weight reduction of up to 13% of the GenSet and a lower vibration level.

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.



MAN Four-Stroke Marine GenSets



GenSets

GenSets can be applied as auxiliary GenSets, GenSets for diesel-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.

MAN Diesel & Turbo has been building auxiliary engines since 1929. More than 20,000 GenSets, both from own production and from licensees, have been delivered over the years. Ever since, these engines have set the benchmark for the whole industry as an example of reliability and user friendliness.



Tier III in gas mode

Bore: 350 mm, Stroke: 440 mm

Speed	r/min	750		720	
Frequency	Hz	50		60	
		Eng. kW	Gen. kW*	Eng. kW	Gen. kW*
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

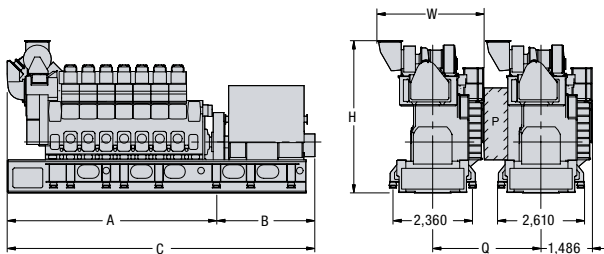
Dimensions***

Cyl. No.		6	7	8	9	10
A	mm	6,270	6,900	7,480	8,110	8,690
B**	mm	3,900	4,100	4,400	4,600	4,800
C**	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**	t	85	94	103	110	118

* Based on nominal generator efficiencies of 96.5%

** Depending on alternator applied

*** Dimensions are not finally fixed



P Free passage between the engines, width 600 mm and height 2,000 mm

Q -Min. distance between centre of engines: 3,400 mm (with gallery)

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⁾		7,840	7,605	7,840	7,605
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

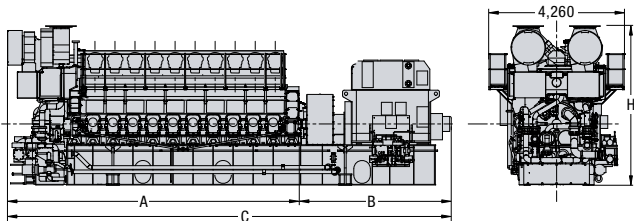
Dimensions

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⁾ 560 kW/cyl

³⁾ 18V 32/44CR available rigidly mounted only



Tier III with SCR

Bore: 320 mm, Stroke: 440 mm

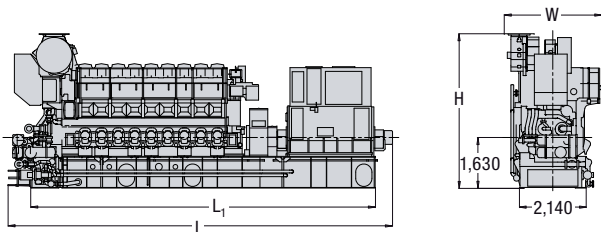
Speed	r/min	750		720	
Frequency	Hz	50		60	
		Eng. kW	Gen. kW ¹⁾	Eng. kW	Gen. kW ¹⁾
6L32/44CR		3,600	3,474	3,600	3,474
7L32/44CR ²⁾		3,920	3,783	3,920	3,783
8L32/44CR		4,800	4,632	4,800	4,632
9L32/44CR		5,400	5,211	5,400	5,211
10L32/44CR		6,000	5,790	6,000	5,790

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⁾ 560 kW/cyl



P Free passage between the engines, width 600 mm and height 2,000 mm

Q ~Min. distance between centre of engines: 2,835 mm (without gallery) ~3,220 mm (with gallery)



With optimised fuel consumption at part load and high power density, MAN Diesel & Turbo designed GenSets for container vessels represent a new industry benchmark.

Exclusively for auxiliary GenSet operation. High power density and space saving GenSet with conventional injection and optimised SFOC for part-load operation.

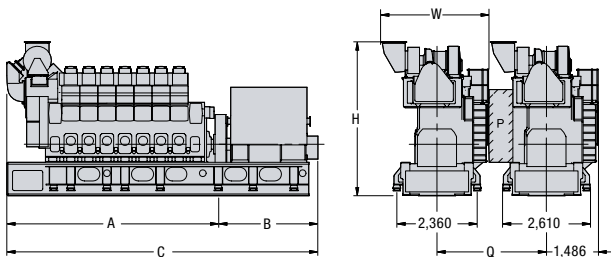
Bore: 320 mm, Stroke: 440 mm

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 -Min. distance between centre of engines: 2,835 mm (with gallery)



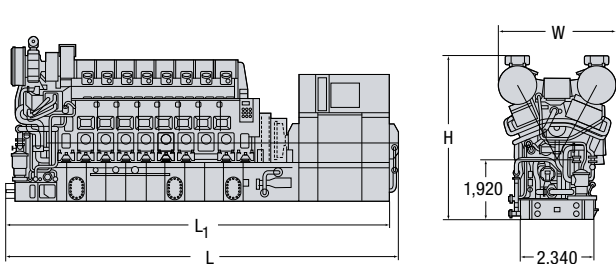
Bore: 320 mm, Stroke: 400 mm

Speed	r/min	750		720	
Frequency	Hz	50		60	
		Eng. kW	Gen. kW*	Eng. kW	Gen. kW*
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

* Based on nominal generator efficiencies of 97%



Bore: 320 mm, Stroke: 400 mm

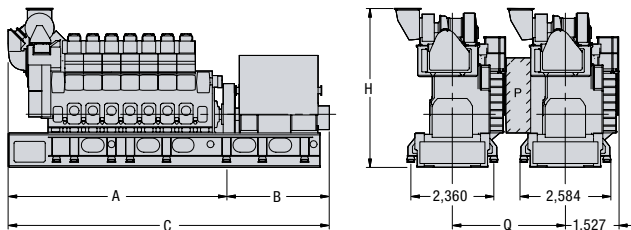
Speed	r/min	750		720	
Frequency	Hz	50		60	
		Eng. kW	Gen. kW*	Eng. kW	Gen. kW*
6L32/40		3,000	2,895	3,000	2,895
7L32/40		3,500	3,380	3,500	3,380
8L32/40		4,000	3,860	4,000	3,860
9L32/40		4,500	4,345	4,500	4,345

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

* Based on nominal generator efficiencies of 96.5%

GenSet also available with L32/40CR engine



P Free passage between the engines, width 600 mm and height 2,000 mm

Q ~Min. distance between centre of engines: 2,835 mm (without gallery) ~3,220 mm (with gallery)

Bore 280 mm, Stroke 330 mm

Speed	r/min	1,000		900	
Frequency	Hz	50		60	
		Eng. kW	Gen. kW*	Eng. kW	Gen. kW*
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**

Cyl. No.		12	16	18	20
A	mm	4,070	4,427	4,432	4,470
B	mm	4,600	5,637	6,097	6,557
C	mm	8,987	10,283	10,748	11,247
H	mm	3,695	3,695	3,695	3,679
E	mm	2,670	2,670	2,670	2,740
Dry mass***	t	60	72	80	85

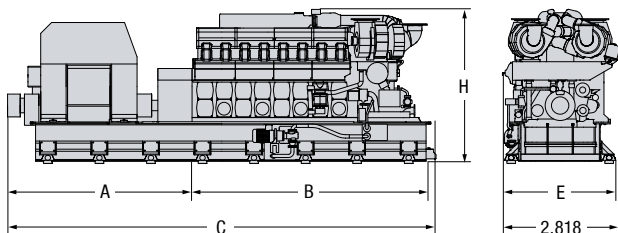
* Nominal generator efficiencies: 97%

** Dimensions are based on operation under inclination up to 25 degrees in any direction

***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



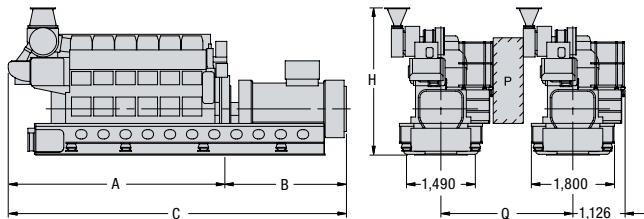
Bore: 280 mm, Stroke: 320 mm

Speed	r/min	750		720	
Frequency	Hz	50		60	
		Eng. kW	Gen. kW*	Eng. kW	Gen. kW*
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

* Based on nominal generator efficiencies of 95%



P Free passage between the engines, width 600 mm and height 2,000 mm

Q ~Min. 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*	Eng. kW	Gen. kW*
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

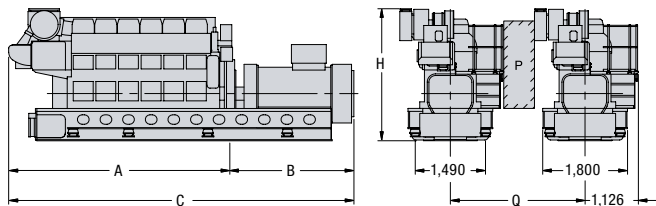
Cyl. No.		5	6	7	8	9
A	mm	4,321	4,801	5,281	5,761	6,241
B	mm	2,400	2,510	2,680	2,770	2,690
C	mm	6,721	7,311	7,961	8,531	8,931
H	mm	2,835	3,009	3,009	3,009	3,009
Dry Mass	t	32.6	36.3	39.4	40.7	47.1

* Based on nominal generator efficiencies of 95%

Gas / fuel ratio:

- at load: 20-100% 93 / 7 (Tier II)
- at load: 20-100% 99 / 1 (Tier III)

Gas methane number ≥ 80



P Free passage between the engines, width 600 mm and height 2,000 mm

Q -Min. distance between centre of engines: 2,655 mm (without gallery) ~2,850 mm (with gallery)



Project
Guide

Tier III with SCR

Bore: 270 mm, Stroke: 380 mm

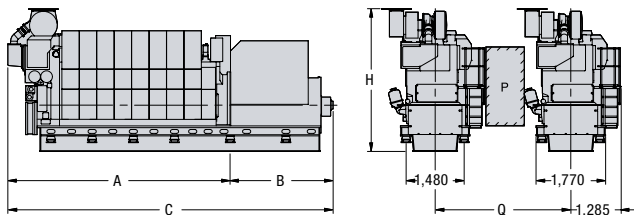
Speed	r/min	750/720		750/720 (MDO**/MGO)	
Frequency	Hz	50/60		50/60	
		Eng. kW	Gen. kW*	Eng. kW	Gen. kW*
5L27/38		1,600/1,500	1,536/ 1,440	-	-
6L27/38		1,980	1,900	2,100	2,016
7L27/38		2,310	2,218	2,450	2,352
8L27/38		2,640	2,534	2,800	2,688
9L27/38		2,970	2,851	3,150	3,024

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

* Based on nominal generator efficiencies of 96%

** MDO viscosity must not exceed 6 mm²/s = cSt @ 40 °C



P Free passage between the engines, width 600 mm and height 2,000 mm

Q ~Min. distance between centre of engines: 2,900 mm (without gallery) ~3,100 mm (with gallery).



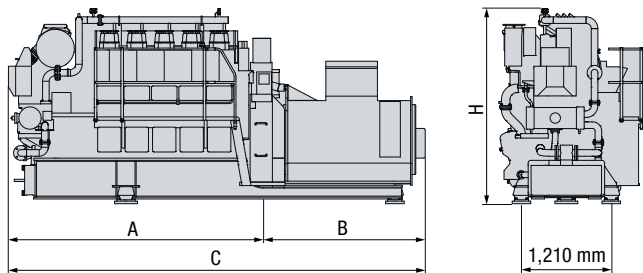
Bore: 225 mm, Stroke: 300 mm

	750		720		900	
	Eng. kW	Gen. kW*	Eng. kW	Gen. kW*	Eng. kW	Gen. kW*
Speed r/min	750		720		900	
Frequency Hz	50		60		60	
5L23/30H ECR	525	500	525	500	-	-
5L23/30H	675/740	641/703	650/710	618/675	-	-
6L23/30H	888	844	852	809	1,050	998
7L23/30H	1,036	984	994	944	1,225	1,164
8L23/30H	1,184	1,125	1,136	1,079	1,400	1,330

Dimensions

Cyl. No.	r/min	5	6	6	7	7	8	8
		720/750	720/750	900	720/750	900	720/750	900
A	mm	3,415	3,785	3,785	4,155	4,276	4,525	4,896
B	mm	2,130	2,130	2,130	2,130	2,130	2,130	2,130
C	mm	5,545	5,915	5,915	6,285	6,406	6,655	7,025
H	mm	2,625	2,625	2,625	2,625	2,625	2,625	2,625
Dry Mass	t	16.8	18.3	18.3	20.1	20.1	21.4	21.4

* Based on nominal generator efficiencies of 95%



P Free passage between the engines, width 600 mm and height 2,000 mm

Q ~Min. distance between centre of engines: 2,250 mm (without gallery) 2,600 mm (with gallery)

Project
Guide

Tier III in gas mode
Bore: 225 mm, Stroke: 300 mm

Speed	r/min	750		720		900	
Frequency	Hz	50		60		60	
		Eng. kW	Gen. kW*	Eng. kW	Gen. kW*	Eng. kW	Gen. kW*
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

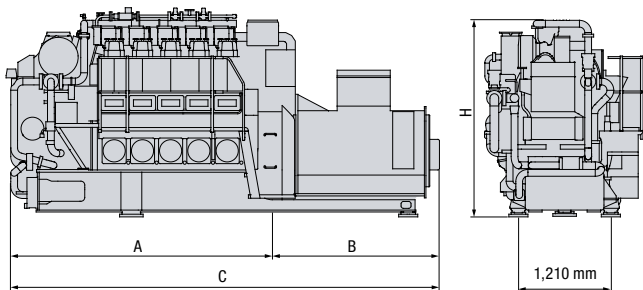
Cyl. No.		5	6	6	7	7	8	8
	r/min	720/750	720/750	900	720/750	900	720/750	900
A	mm	3,469	3,839	3,839	4,209	4,276	4,579	4,896
B	mm	2,202	2,252	2,252	2,302	2,302	2,352	2,352
C	mm	5,671	6,091	6,091	6,511	6,578	6,931	7,241
H	mm	2,749	2,749	2,749	2,749	2,749	2,749	2,749
Dry Mass	t	17.3	19.0	19.2	21.4	21.4	23.3	23.4

* Based on nominal generator efficiencies of 95%

Gas / fuel ratio:

▪ at load: 20-100% 99 / 1 (Tier III)

Gas methane number ≥ 80



P Free passage between the engines, width 600 mm and height 2,000 mm

Q ~Min. distance between centre of engines: 2,250 mm (without gallery) 2,600 mm (with gallery)



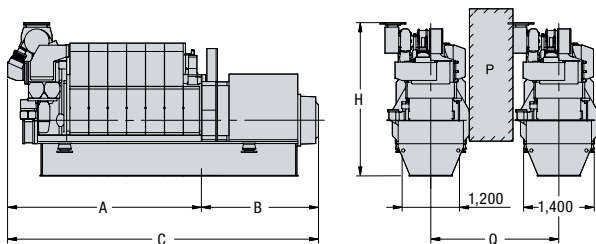
Bore: 210 mm, Stroke: 310 mm

Speed	r/min	1,000		900	
Frequency	Hz	50		60	
		Eng. kW	Gen. kW*	Eng. kW	Gen. kW*
5L21/31		1,000	950	1,000	950
6L21/31		1,320	1,254	1,320	1,254
7L21/31		1,540	1,463	1,540	1,463
8L21/31		1,760	1,672	1,760	1,672
9L21/31		1,980	1,881	1,980	1,881

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

* Based on nominal generator efficiencies of 95%



P Free passage between the engines, width 600 mm and height 2,000 mm

Q ~Min. distance between centre of engines: 2,400 mm (without gallery) ~2,600 mm (with gallery).

Project
Guide

Tier III with SCR

Bore: 175 mm, Stroke: 215 mm

Engine Model	Rating Definition	kWm		rpm (freq.)	SFOC at 100% MCR	SFOC at 75% MCR
		kWm	kWe*			
12V175D-MEM	Diesel-Electric	1,440	1,376	1,500 (50 Hz)	192	197
	Medium Duty	1,800	1,720	1,800 (60 Hz)	195	203
12V175D-MEL	Diesel-Electric	1,620	1,548	1,500 (50 Hz)	191	194
	Light Duty	1,920	1,834	1,800 (60 Hz)	195	201
12V175D-MA	Auxiliary Duty	1,620	1,548	1,500 (50 Hz)	191	194
		1,920	1,834	1,800 (60 Hz)	195	201

* 3-phase, 0.8 p.f., assumes alternator efficiency of 95.5%.

SFOC figures related to mechanical output and for distillates according to ISO 8217 DMA, with attached lube oil, HT and LT-cooling water pumps and engine specification fulfilling IMO Tier II emission limitations

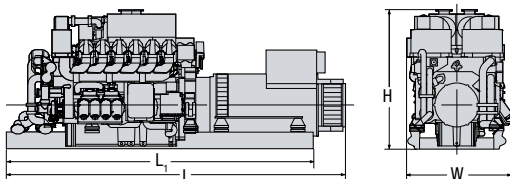
Rating definitions:

Marine Diesel-Electric Medium Duty	<ul style="list-style-type: none"> For continuous power generation with variable load aboard vessels for diesel-electric drives Typical applications include, but are not limited to navy, offshore vessels and ferries Average load: up to 75%
Marine Diesel-Electric Light Duty	<ul style="list-style-type: none"> For continuous power generation with variable load aboard vessels for diesel-electric drives Typical applications include, but are not limited to navy, offshore vessels and yachts Average load: up to 50%
Marine Auxiliary	<ul style="list-style-type: none"> For continuous power generation with variable load aboard vessels for auxiliary use Average load: up to 50%

Dimensions

L ₁	mm	5,350
L	mm	5,530
W	mm	1,641
H	mm	2,365
Dry weight	t	15.95

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

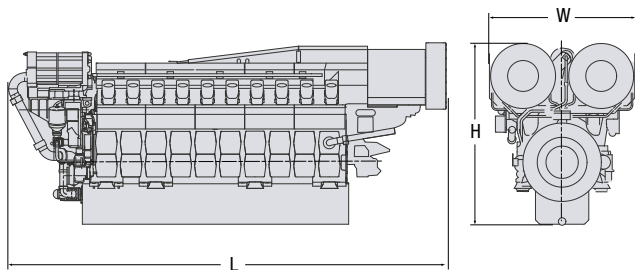
Speed	r/min	1,050
mep	bar	22.8
		kW*
12PA6 B STC		4,860
16PA6 B STC		6,480
20PA6 B STC		8,100

Specific Fuel Oil Consumption (SFOC) to ISO conditions

MCR	100%	85%
PA6 B STC	-1)	-1)

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*** 110% load for one in six operating hours on navy vessels, with approval according to HSVR from DNV, available on special request**1) SFOC values are project specific. Please contact MAN Diesel & Turbo for further information.*

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

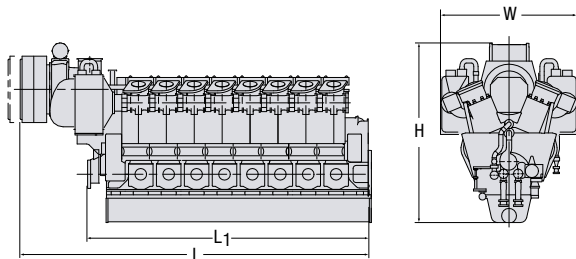
Specific Fuel Oil Consumption (SFOC) to ISO conditions

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 Diesel & Turbo for further information.





MAN Four-Stroke Propulsion Systems



MAN Alpha

Propeller Programme – FPP and CPP



MAN Alpha Kappel propeller – four-bladed CP with fairing cone for rudder bulb

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 TVC, alignment and control systems.

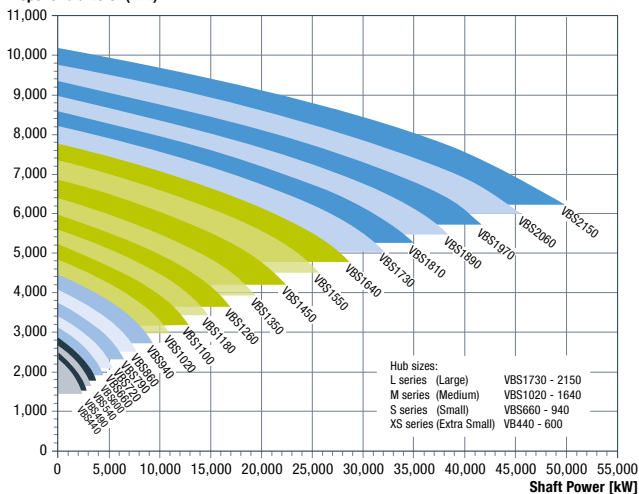
MAN Four-Stroke Propulsion Systems

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 below standard programme, is based on 'no ice'.

VBS Mk 5 CPP Programme

Propeller diameter (mm)



MAN Standard Package Examples

Cyl.	kW	Prop. speed r/min	D mm	Hub VBS mm	Q mm	R mm	Wmin mm	K mm	Gear mass t	Prop. mass t ¹⁾
L51/60DF										
6	6,000	160	4,250	1,020	795	879	1,650			15.2
6	6,000	140	4,800	1,180	914	964	1,650			18.6
6	6,000	100	5,600	1,260	975	1,036	1,700			23.1
7	7,000	160	4,400	1,100	851	920	1,700			17.3
7	7,000	130	5,000	1,180	914	989	1,700			21.3
7	7,000	100	5,850	1,350	1,037	1,096	1,700			26.7
8	8,000	160	4,550	1,180	914	989	1,700			20.2
8	8,000	130	5,150	1,260	975	1,036	1,700			23.8
8	8,000	100	6,000	1,450	1,114	1,148	1,750			30.1
9	9,000	160	4,700	1,180	914	989	1,700			21.9
9	9,000	130	5,300	1,260	975	1,036	1,700			25.4
9	9,000	100	6,200	1,450	1,114	1,148	1,800			33.4

V48/60CR

12	14,400	160	4,950	1,350	1,037	1,096	1,800	2,620	19.9	26.7
12	14,400	130	5,600	1,450	1,114	1,163	1,850	2,770	27.0	33.2
12	14,400	100	6,600	1,640	1,260	1,256	1,900	3,140	42.9	42.2
14	16,800	160	5,100	1,450	1,114	1,163	1,850	2,775	23.5	31.7
14	16,800	130	5,850	1,550	1,187	1,208	1,900	2,905	31.9	38.1
14	16,800	100	6,850	1,730	1,330	1,307	1,950	3,355	48.2	48.5
16	19,200	160	5,260	1,450	1,114	1,163	1,850	2,805	26.8	32.9
16	19,200	130	6,050	1,640	1,260	1,256	1,950	3,155	37.1	43.9
16	19,200	100	7,100	1,730	1,330	1,367	2,000	3,455	57.8	56.3
18	21,600	160	5,400	1,550	1,187	1,213	1,900	2,905	30.9	37.3
18	21,600	130	6,200	1,640	1,260	1,266	1,950	3,155	37.4	45.5
18	21,600	100	7,300	1,810	1,390	1,420	2,000	3,655	68.3	61.4

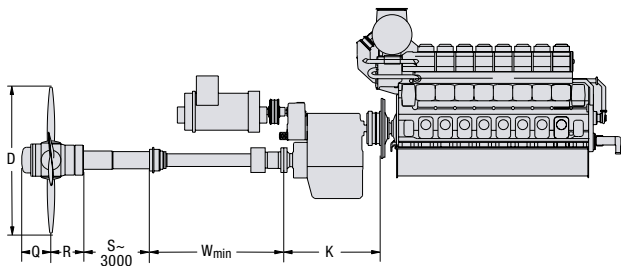
L48/60CR

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

MAN Standard Package Examples

Cyl.	kW	Prop. speed r/min	D mm	Hub VBS mm	Q mm	R mm	W _{min} mm	K mm	Gear mass t	Prop. mass t ¹⁾
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	Gear mass t	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	7,840	199	3,950	1,020	795	879	1,650			15.2
14	7,840	162	4,550	1,180	914	989	1,700			19.7
14	7,840	125	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	4,200	200	3,500	860	653	750	1,520			9.7
7	4,200	167	3,950	940	714	886	1,520			11.2
7	4,200	130	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

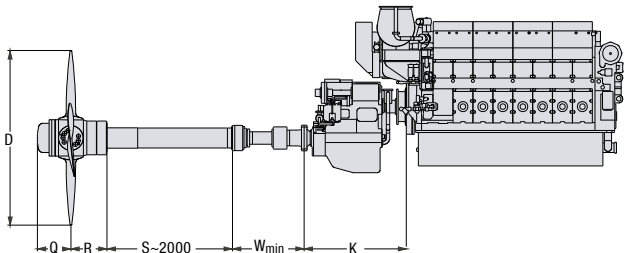
¹⁾ Smin and propeller mass are based on 6,000 mm propeller shaft and 3,000 mm stern tube

MAN Standard Package Examples

Cyl.	kW	Prop. speed r/min	D mm	Hub VBS mm	Q mm	R mm	W _{min} mm	K mm	Gear mass t	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	Gear mass t	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⁾ Smin and propeller mass are based on 6,000 mm propeller shaft and 3,000 mm stern tube

L27/38

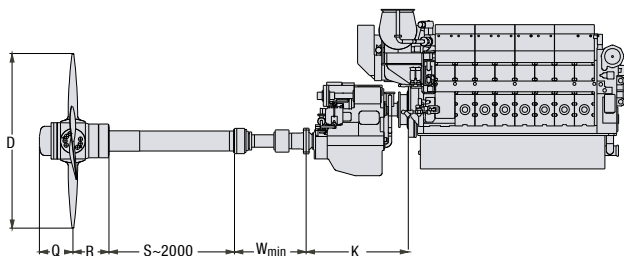
6	2,040	258	2,650	660	501	631	1,320			4.9
6	2,040	218	2,950	720	547	650	1,350			5.7
6	2,040	191	3,200	790	639	692	1,350			6.6
6	2,040	163	3,500	790	639	692	1,350			7.0
6	2,040	152	3,650	860	653	745	1,350			7.8
7	2,380	247	2,800	720	547	513	1,350			5.7
7	2,380	211	3,100	720	547	513	1,350			6.1
7	2,380	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⁾ Smin 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	W _{min} mm	K mm	Gear mass t	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

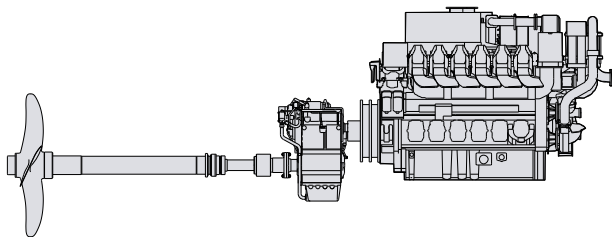


MAN Alpha FPP solutions for MAN 175D

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	155	25
MH	1,740	1,800	702	1,400	FPP	155	25
MH	1,740	1,800	620	1,450	FPP	165	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	185	20
MH	1,740	1,800	360	2,000	FPP	185	20
MH	1,740	1,800	331	2,100	FPP	195	20
MH	1,740	1,800	302	2,250	FPP	195	15
MH	1,740	1,800	288	2,300	FPP	205	15
MH	1,740	1,800	261	2,450	FPP	215	15
MH	1,740	1,800	247	2,500	FPP	215	15
MM	2,220	1,900	741	1,300	FPP	165	25
MM	2,220	1,900	654	1,450	FPP	175	25
MM	2,220	1,900	552	1,550	FPP	185	25
MM	2,220	1,900	475	1,750	FPP	185	20
MM	2,220	1,900	422	1,850	FPP	195	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	215	15
MM	2,220	1,900	304	2,250	FPP	215	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.

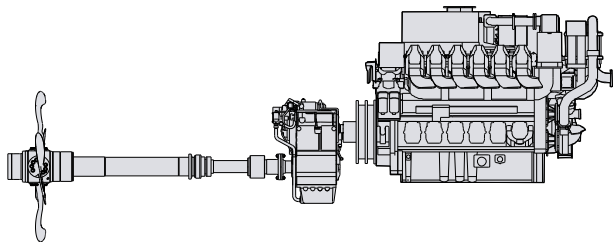


MAN Alpha CPP solutions for MAN 175D

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	155	25
MH	1,740	1,800	702	1,350	440	155	25
MH	1,740	1,800	620	1,450	440	165	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	185	20
MH	1,740	1,800	360	2,000	540	185	20
MH	1,740	1,800	331	2,100	540	195	20
MH	1,740	1,800	302	2,200	540	195	15
MH	1,740	1,800	288	2,300	600	205	15
MH	1,740	1,800	261	2,450	600	215	15
MH	1,740	1,800	247	2,500	600	215	15
MM	2,220	1,900	741	1,350	440	165	25
MM	2,220	1,900	654	1,450	440	175	25
MM	2,220	1,900	552	1,550	490	185	25
MM	2,220	1,900	475	1,750	490	185	20
MM	2,220	1,900	422	1,850	540	195	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	215	15
MM	2,220	1,900	304	2,300	600	215	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.





MAN Exhaust Gas Turbochargers



MAN Exhaust Gas Turbochargers

MAN Diesel & Turbo 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 Diesel & Turbo can offer you world-leading technology that helps you maximise the efficiency of your operations.

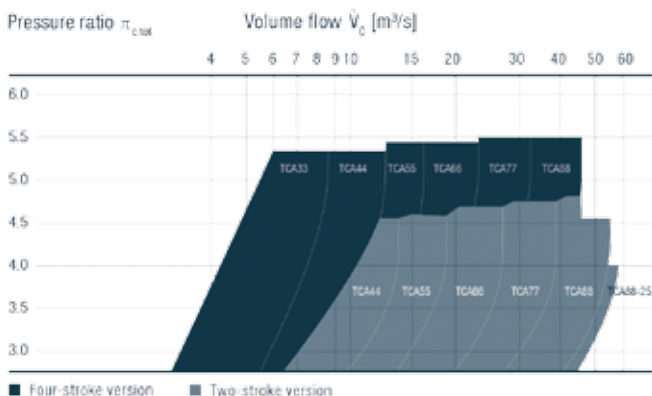
MAN turbochargers are designed to deliver peak performance throughout their working lives – in some of the harshest conditions encountered anywhere in the world. This is achieved by combining three elements: simplicity, flexibility and reliability. For example, we develop and build our turbochargers 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

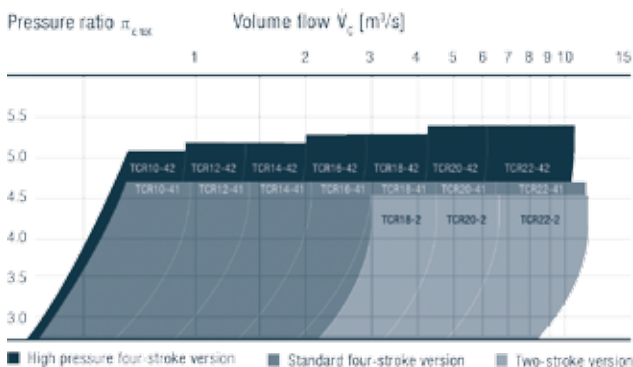
- Marine propulsion
- Marine gensets
- Power generation
- Excavators
- Mining
- Off-road vehicles
- Locomotives
- industrial
- Offshore

MAN Exhaust Gas Turbochargers

TCA application range



TCR application range



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

Type	Max. supercharged engine output kW		Max. permissible	Mass kg
	Two-stroke le* = 8.0 kg/kWh	Four-stroke le* = 6.5 kg/kWh	Speed rpm	
TCA33	-	5,400	27,800	1,370
TCA44	7,000	7,900	22,500	1,950
TCA55	9,600	10,400	20,000	3,200
TCA66	13,700	14,800	16,900	5,300
TCA77	19,400	21,000	14,200	8,330
TCA88	30,000	30,000	12,000	14,000

* Specific air consumption



Project
Guide

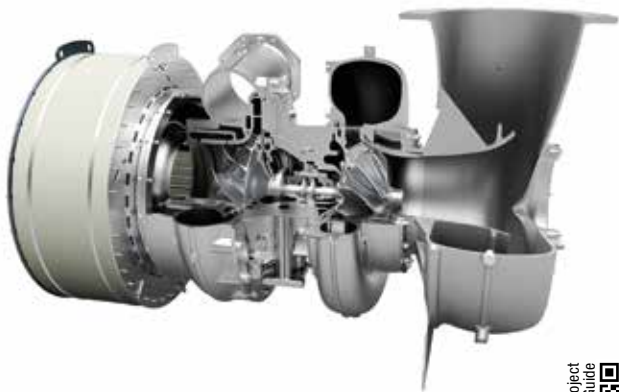
Technical data

Turbine type	Radial flow turbine
Max. permissible temp.	650 °C
Pressure ratio	up to 5.4
Suitable for HFO, MDO, gas	

Turbocharger programme


Type	Max. supercharged engine output kW		Max. permissible	Mass kg
	Two-stroke le* = 7.0 kg/kWh	Four-stroke le* = 6.5 kg/kWh	Speed rpm	
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



Project
Guide



An aerial photograph of a large cargo ship sailing on a vast, deep blue ocean. The ship is positioned in the lower-middle part of the frame, moving towards the right. The water's surface is textured with small, rhythmic waves. The overall scene is serene and emphasizes the scale of maritime transport.

MAN turbocharger technology enables exceptional flexibility when striving to find the perfect blend of performance and energy efficiency.

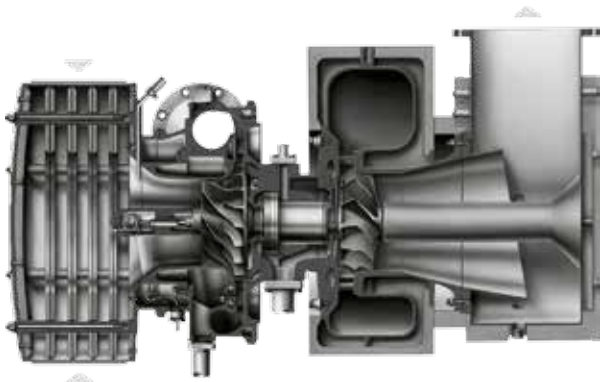
Technical data

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

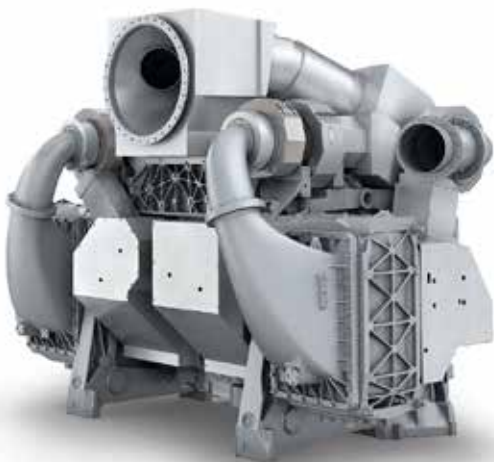
Specific air consumption $l_e = 7 \text{ kg/kWh}$



MAN ECOCHARGE

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 round up the package as low-pressure turbochargers.



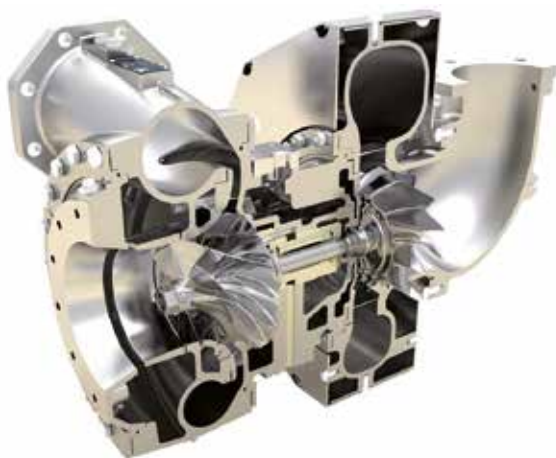
Technical data

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*	Max. permissible speed	Mass kg
	kW	rpm	
TCX17	8,500	40,980	470
TCX19	11,900	34,550	785
TCX21	16,900	29,000	1,325
TCX23	23,900	24,390	2,230

* $l_e = 6 \text{ kg/kWh}$; $p_{HPCin} = 3 \text{ bar}$; $T_{HPCin} = 45 \text{ °C}$



Project
Guide



MAN ETB

The EGR blower MAN ETB is suitable for exhaust gas recirculation (EGR) engines of all fuel types in all application ranges. Specifically designed for EGR systems, the MAN ETB's active control plays an important role in enabling these systems to reach IMO Tier III emission standards. The required EGR operating conditions are achieved by using a high-speed electric motor directly coupled to the compressor wheel and controlled by a frequency converter.

The MAN ETB features a highly efficient blower wheel, optimised for low-pressure ratios. The materials used are designed to withstand corrosive agents. High blower availability and variable speed operation ensure IMO Tier III compliance in emission controlled areas (ECAs).







MAN PrimeServ



MAN | PrimeServ

Service with Passion

MAN Diesel & Turbo is offering 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 **every customer's needs**. We take the best people, qualify them professionally, listen to our customers, and provide optimum flexibility and reliability in the services we offer.

We provide our customers with outstanding services, we apply the three MAN PrimeServ key-concepts in everything we do: Customer Proximity, Solution Orientation and Technical Competence.

Customer Proximity

MAN PrimeServ provides excellent global support through a worldwide network of service facilities. Our local presence ensures the best possible customer proximity. Our aim is to consistently meet and exceed your expectations. Whenever you require spares, technical expertise or qualified repair assistance, feel free to contact your nearest MAN PrimeServ partner.

Solution Orientation

For more than one hundred years, MAN PrimeServ has been a reliable partner for service solutions. We offer tailor-made service and first class technical support for every customer – 365 days a year, 24 hours per day. Your requirements are the benchmark for our activities. Furthermore, we are committed to qualify our customers in the best way possible, so that the equipment and installations we supply can be operated and maintained in the most efficient and safest way.

Technical Competence

Our global network consists of highly-skilled experts using state-of-the-art technology. Performance according to the highest safety and quality standards has caused our technology-leadership as OEM.

Our unique efficiency in service and technical competence shows that we know how to keep our products reliable and productive.

Environment

Environmental protection plays a crucial role to us – as it does for our customers. Our engineers develop technologies to reduce emissions and are working on new ways to increase the efficiency of your installations. MAN PrimeServ provides integral solutions to encounter and embrace complex regulations. We sharply focus on fulfilling all emission standards. Integration comes into play when existing engines need to be retrofitted to modern and clean dual fuel engines.

MAN | PrimeServ

MAN Diesel & Turbo provides dual-fuel retrofit solutions based on the latest state-of-the-art technology.

Our Heritage Brands

MAN PrimeServ is our brand label for high quality after sales support for the complete product portfolio of MAN Diesel & Turbo. Through refinements to our products and repair techniques, we ensure and build on our technological leadership and technical expertise as an original equipment manufacturer (OEM) for the brands united under MAN Diesel & Turbo. Our aim is to consistently meet and exceed your expectations with innovative solutions tailored to your needs. We are the OEM for all MAN Diesel & Turbo brands and heritage brands such as:

- Burmeister & Wain (B&W)
- Mirrlees
- Paxman
- Ruston
- Pielstick
- Alpha Diesel
- Holeby GenSets

MAN | PrimeServ **HOMEPAGE**



MAN | PrimeServ **LOCATION FINDER**





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