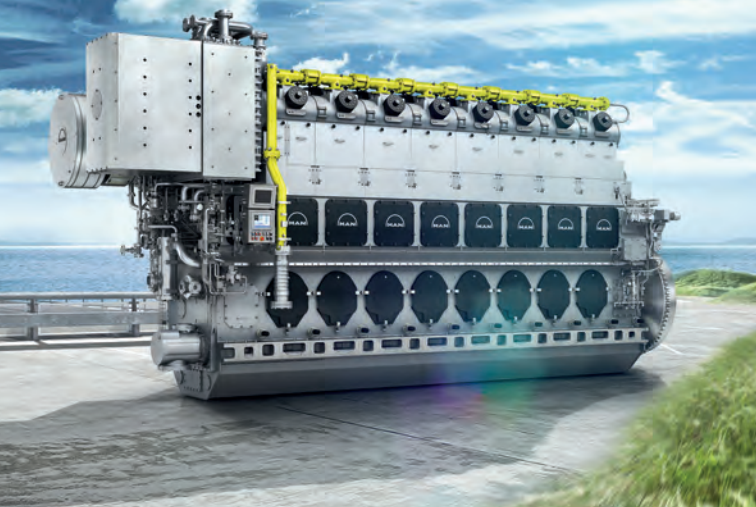


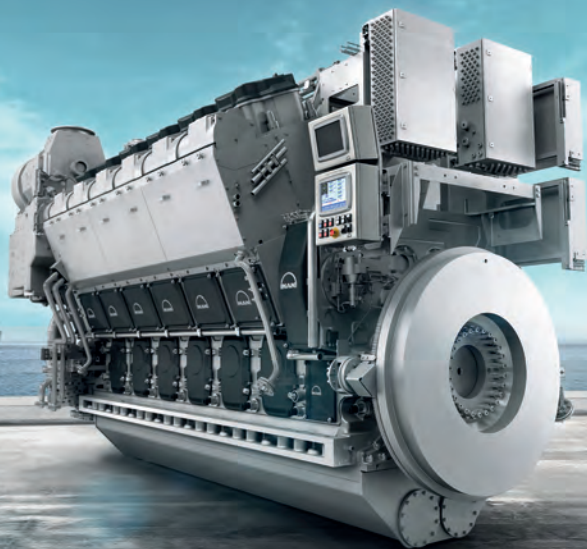
MAN Four-Stroke Propulsion Engines



Engineering the Future – since 1758.

MAN Diesel & Turbo





MAN Four-Stroke Propulsion Engines

MAN Four-Stroke Propulsion Engines – All Emission Requirements

Besides the 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

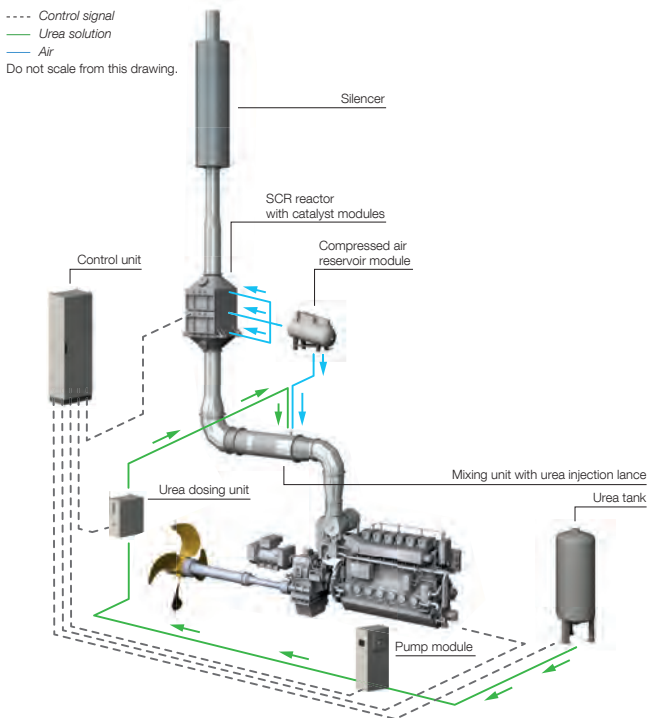
For operation in emission control areas (ECA), MAN Diesel & Turbo has developed a comprehensive range of selective catalytic reduction (SCR) systems that tremendously reduces NO_x levels surpassing IMO Tier III requirements.

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 medium speed engines. Customized 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 standardization are significant cost reduction and simplification of installation.



The modular SCR component kit

Typical urea consumption values for IMO Tier III compliance

Engine type	Engine speed	Specific urea consumption*
	[r/min]	[g/kWh]
48/60CR	514	13.4
32/44CR	750	12.3
28/33D STC	1,000	11.4

*Tolerance 5%

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 choice solution and prime movers of 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 Tier II. Another feature is our patented Boost Injection. Our engine control system senses a load increase at a very early stage and tremendously improves 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 8217-2010 DMA, DMZ, and DMB, and on residual fuels up to 700cSt (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. Its 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. The possibility to switch over seamlessly from gas to diesel operation and vice versa provides full flexibility in multiple applications.

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

MAN Four-Stroke Propulsion Engines

Engine Power

Engine brake power is stated in kW.

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

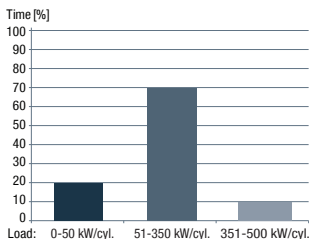
According to ISO 15550:2002, the power figures in the tables remain valid within a range of $\pm 3\%$ up to tropical conditions at sea level, i.e.:

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

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

For the load profile type Navy, for 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 8217-2010). For engines with conventional fuel injection, SFOC figures are based on DMB-grade fuel oil (ISO 8217-2010). 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.

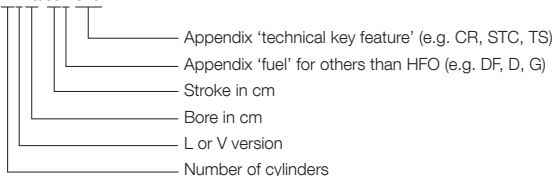
For auxiliary engines (gensets), the weights correspond to the unit (including alternator). The weight of the GenSets may vary depending on the alternator make. All weights given are without lube oil and cooling water.

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.

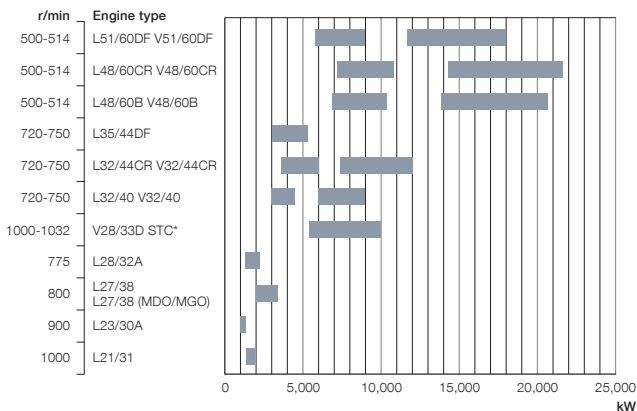
The centreline distance for twin engine installation is given as a minimum value. Specific requirements to the passageway (e.g. of classification societies or flag state authority), kind of seating or a mounted gallery can lead to higher values.

Engine Type Designation

12V28/33D STC



MAN Four-Stroke Propulsion Engines



* The engine complies with EPA Tier 2

MAN V51/60DF

Tier II Tier III

Tier III in gas mode

Bore: 510 mm, Stroke: 600 mm

Speed	r/min	514	500
mep	bar	19.1	19.1
		kW	kW
12V51/60DF		12,000	11,700
14V51/60DF		14,000	13,650
16V51/60DF		16,000	15,600
18V51/60DF		18,000	17,550

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⁾	180.0 g/kWh ³⁾ 180.0 g/kWh ⁴⁾	179.0 g/kWh ³⁾ 179.0 g/kWh ⁴⁾
Heat rate ²⁾	7,400 kJ/kWh ³⁾ 7,520 kJ/kWh ⁴⁾	7,390 kJ/kWh ³⁾ 7,570 kJ/kWh ⁴⁾

Specific lube oil consumption 0.4 g/kWh

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

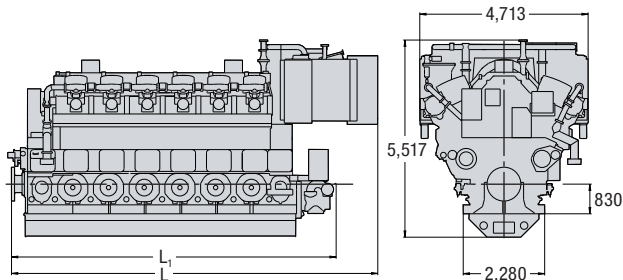
¹⁾ Liquid fuel operation²⁾ Gas operation (including pilot fuel), gas fuel: methane no. ≥ 80 ³⁾ Electric propulsion⁴⁾ Mechanical propulsion with CPP

Speed 500 r/min for generator drive only

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



Tier III in gas mode
Bore: 510 mm, Stroke: 600 mm

Speed	r/min	514	500
mep	bar	19.1	19.1
		kW	kW
6L51/60DF		6,000	5,850
7L51/60DF		7,000	6,825
8L51/60DF		8,000	7,800
9L51/60DF		9,000	8,775

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⁾	180.0 g/kWh ³⁾ 180.0 g/kWh ⁴⁾	179.0 g/kWh ³⁾ 179.0 g/kWh ⁴⁾
Heat rate ²⁾	7,360 kJ/kWh ³⁾ 7,470 kJ/kWh ⁴⁾	7,350 kJ/kWh ³⁾ 7,520 kJ/kWh ⁴⁾

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

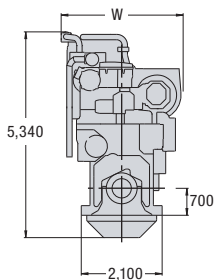
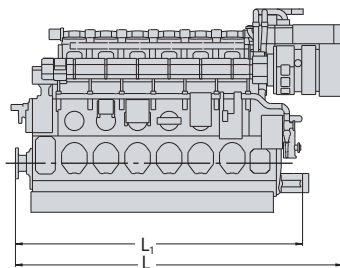
⁴⁾ Mechanical propulsion with CPP

Speed 500 r/min for generator drive only

Dimensions

Cyl. No.		6	7	8	9
L	mm	8,494	9,314	10,134	11,160
L ₁	mm	7,455	8,275	9,095	9,915
W	mm	3,165	3,165	3,165	3,283
Dry mass	t	106	119	135	148

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



MAN V48/60CR

Tier II Tier III

Tier III with SCR

Bore: 480 mm, Stroke: 600 mm

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

Specific Fuel Oil Consumption (SFOC) to ISO conditions

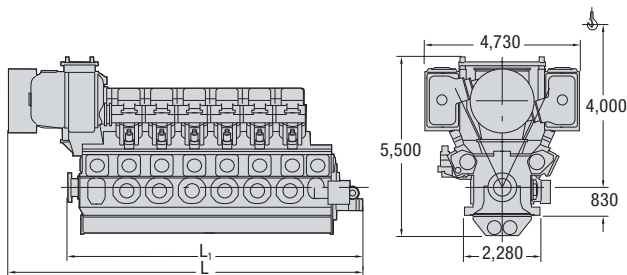
MCR	100%	85%
V48/60CR	181 g/kWh	173 g/kWh

Specific lube oil consumption 0.5 g/kWh

Engine type specific reference charge air temperature before cylinder 34 °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 mm

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

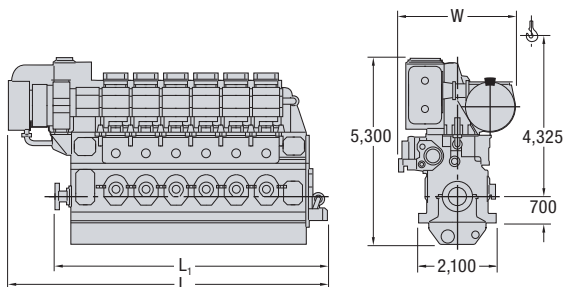
Specific lube oil consumption 0.5 g/kWh

Engine type specific reference charge air temperature before cylinder 34 °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



MAN V48/60B

Tier II Tier III

Tier III with SCR

Bore: 480 mm, Stroke: 600 mm

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

Specific Fuel Oil Consumption (SFOC) to ISO conditions

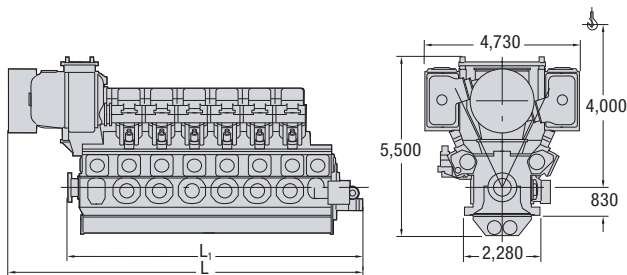
MCR	100%	85%
V48/60B	184 g/kWh	180 g/kWh

Specific lube oil consumption 0.6 g/kWh

Engine type specific reference charge air temperature before cylinder 34 °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 mm

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

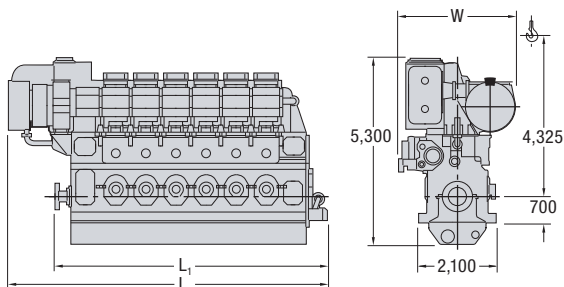
Specific lube oil consumption 0.6 g/kWh

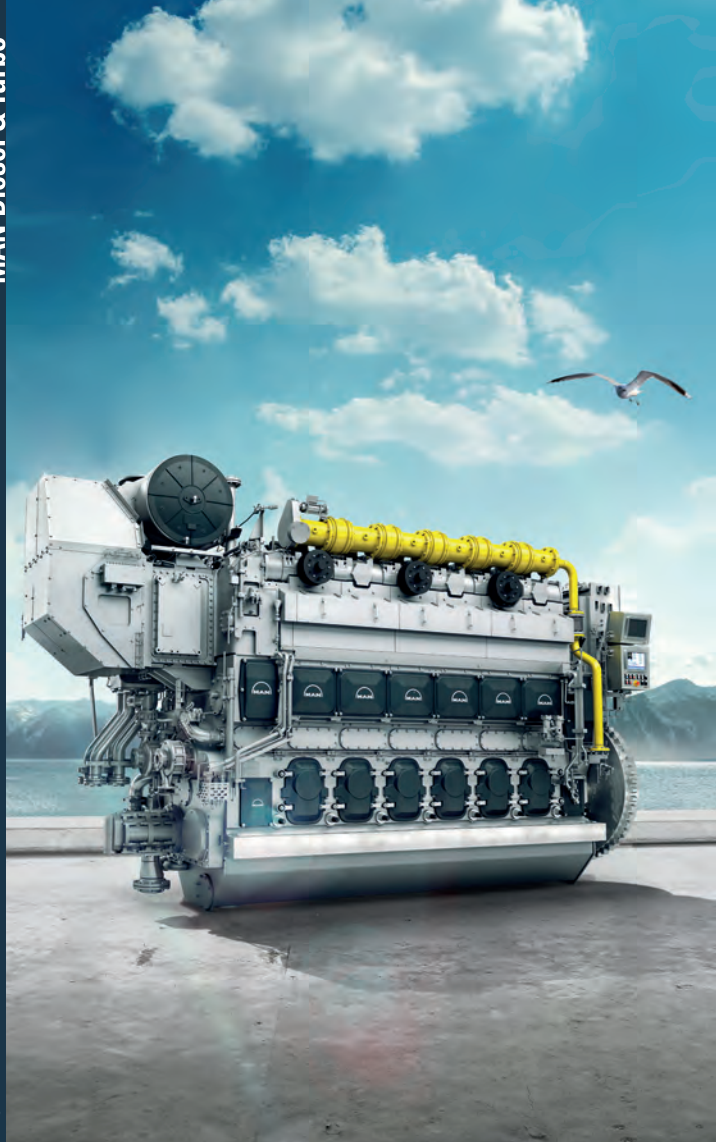
Engine type specific reference charge air temperature before cylinder 34 °C

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





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⁾	182 g/kWh	181 g/kWh
Heat rate ²⁾	7,530 kJ/kWh	7,615 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

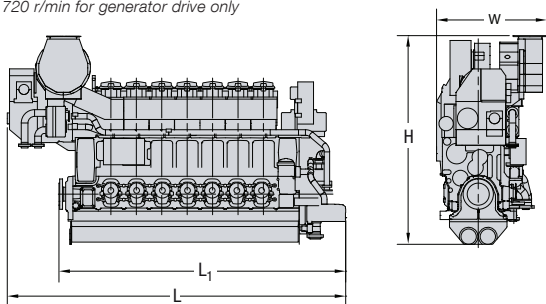
Cyl. No.		6	7	8	9	10
L	mm	6,485	7,015	7,545	8,075	8,605
L ₁	mm	5,265	5,877	6,407	6,937	7,556
W	mm	2,539	2,678	2,678	2,678	2,678
H	mm	4,163	4,369	4,369	4,369	4,369
Dry mass ³⁾	t	42.1	47.5	52.9	57.4	62.4

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

V-engine type under preparation

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

Speed 720 r/min for generator drive only



MAN V32/44CR

Tier II Tier III EPA Tier 2

Tier III with SCR

Bore: 320 mm, Stroke: 440 mm

Speed	r/min	750	720
mep	bar	27.1	28.3
		kW	kW
12V32/44CR		7,200	7,200
14V32/44CR ¹⁾		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

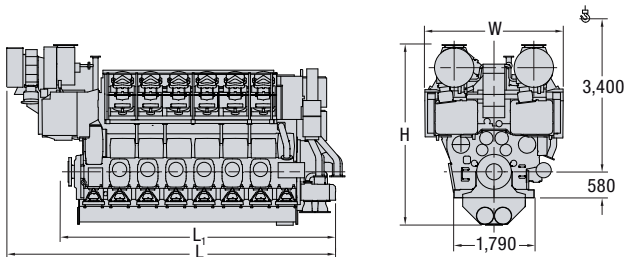
Cyl. No.		12	14	16	18	20
L	mm	7,195	7,970	8,600	9,230	9,860
L ₁	mm	5,795	6,425	7,055	7,685	8,315
W	mm	3,100	3,100	3,100	3,100	3,100
H	mm	4,039	4,262	4,262	4,262	4,262
Dry mass ³⁾	t	70	79	87	96	104

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



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

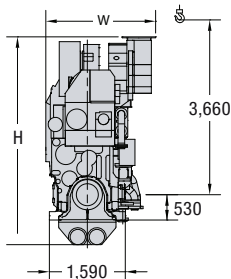
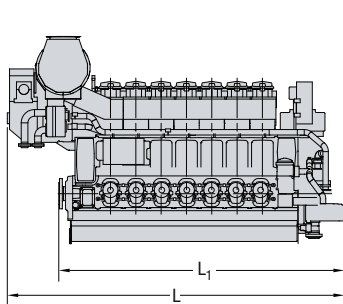
Cyl. No.		6	7	8	9	10
L	mm	6,312	6,924	7,454	7,984	8,603
L ₁	mm	5,265	5,877	6,407	6,937	7,556
W	mm	2,174	2,359	2,359	2,359	2,359
H	mm	4,163	4,369	4,369	4,369	4,369
Dry mass ²⁾	t	39.5	44.5	49.5	53.5	58.0

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

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

¹⁾ 560 kW/cyl²⁾ Including built-on lube oil automatic filter, fuel oil filter and electronic equipment

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



MAN V32/40

Tier II Tier III

Tier III with SCR

Bore: 320 mm, Stroke: 400 mm

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

Specific Fuel Oil Consumption (SFOC) to ISO conditions

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

Specific lube oil consumption 0.5 g/kWh

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

Dimensions

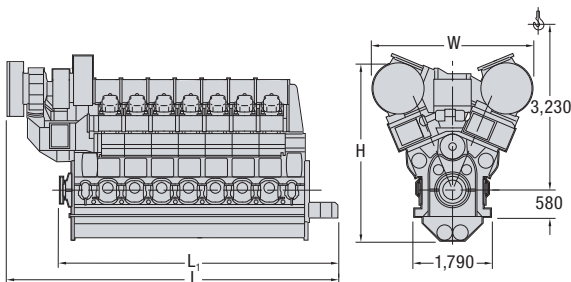
Cyl. No.		12	14	16	18
L	mm	6,915	7,545	8,365	8,995
L ₁	mm	5,890	6,520	7,150	7,780
W	mm	3,140	3,140	3,730	3,730
H	mm	4,100	4,100	4,420	4,420
Dry mass	t	61	68	77	85

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



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

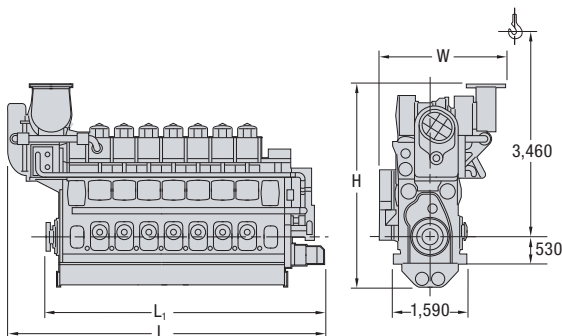
Cyl. No.		6	7	8	9
L	mm	5,940	6,470	7,000	7,530
L ₁	mm	5,140	5,670	6,195	6,725
W	mm	2,630	2,630	2,715	2,715
H	mm	4,010	4,010	4,490	4,490
Dry mass	t	38	42	47	51

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



MAN V28/33D STC**Tier II Tier III EPA Tier 2****Tier III with SCR****Bore: 280 mm, Stroke: 330 mm**

				Load profile 'Navy'	
Speed	r/min	1000		1032	
mep	bar	26.9		28.6	
Rated power output	- ICN	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	-		192.5 g/kWh	
MCR 100%	190 g/kWh (194 g/kWh ¹⁾)		189.0 g/kWh	
MCR 85%	188 g/kWh (188 g/kWh ¹⁾)		194.5 g/kWh	

Specific lube oil consumption 0.4 g/kWh

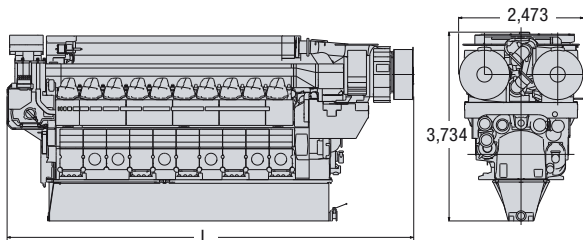
Engine type specific reference charge air temperature before cylinder 40 °C

*Figures on theoretical propeller curve for distillates according to ISO 8217 DMA***Dimensions**

Cyl. No.		12	16	20
L	mm	6,207	7,127	8,047
Dry mass *	t	37.8	45.8	52.9

*For multi-engine arrangement only*¹⁾ Engine is EPA Tier 2 compliant*Weight and performance parameters refer to engine with flywheel, TC silencer, attached pumps, oil filters and lube oil cooler*

* Tolerance: 5%



Tier III with SCR

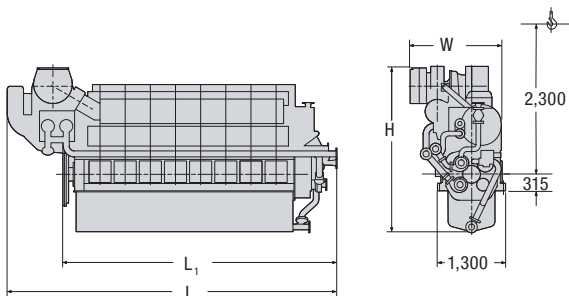
Bore: 280 mm, Stroke: 320 mm

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

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



MAN L27/38

Tier II Tier III

Tier III with SCR

Bore: 270 mm, Stroke: 380 mm

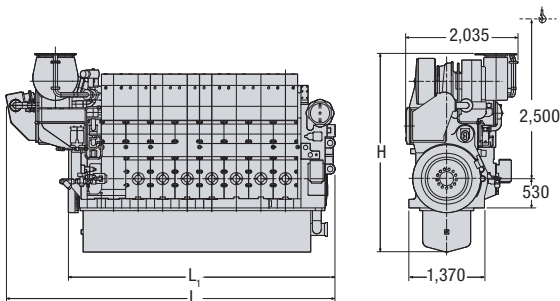
Speed	r/min	800	800 (MDO*/MGO)
mep	bar	23.5	25.2
		kW	kW
6L27/38		2,040	2,190
7L27/38		2,380	2,555
8L27/38		2,720	2,920
9L27/38		3,060	3,285

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.

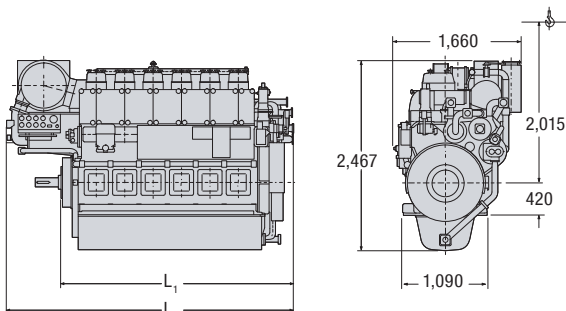


Bore: 225 mm, Stroke: 300 mm

Speed	r/min	900
mep	bar	17.1
		kW
6L23/30A		960
8L23/30A		1,280

Dimensions

Cyl. No.		6	8
L	mm	3,737	4,477
L ₁	mm	3,062	3,802
Dry mass	t	11.0	13.5

Minimum centreline distance for twin engine installation: 1,900 mm


MAN L21/31

Tier II Tier III

Tier III with SCR

Bore: 210 mm, Stroke: 310 mm

Speed	r/min	1000
mep	bar	24.0
		kW
6L21/31		1,290
7L21/31		1,505
8L21/31		1,720
9L21/31		1,935

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