

L+V32/44CR

Four-Stroke Diesel Engine



MAN Diesel



907



MAN Diesel

The Responsible Way In Leading Technology

MAN Diesel is the world's leading designer and manufacturer of low and medium speed engines – engines from MAN Diesel cover an estimated 50% of the power needed for all world trade. We develop two-stroke and four-stroke engines, auxiliary engines, turbochargers and propulsion packages that are manufactured both within the MAN Diesel Group and at our licensees.

More than ever before, MAN Diesel's development focus is the environmental performance of our engines. Using our unrivalled grasp of large engine technology, we aim to make our engines progressively cleaner, more powerful and more efficient.

Our absolute commitment to reducing emissions while increasing fuel efficiency and power density starts with our active partnership in the emissions law making process and ends with the delivery of engines that achieve an ideal synthesis of prime mover characteristics.

Efficient, Clean And Compact

NO_x Reduction Measures L+V32/44CR

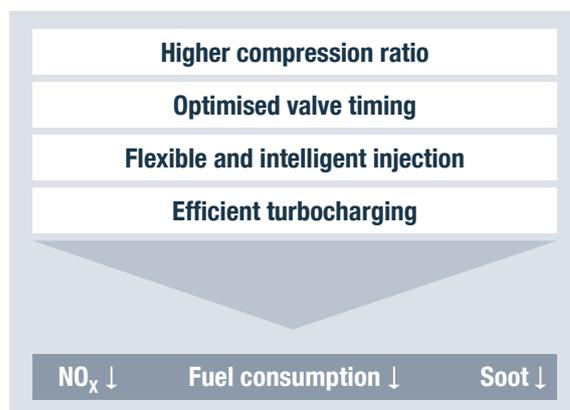
A notable reduction in NO_x, CO₂ and soot emissions is a strategical factor for success of modern diesel engines. Therefore it is the entire aim of MAN Diesel to develop and use the best technologies and measures to fulfil the appropriate exhaust emission limits of the International Maritime Organisation – IMO Tier II –.

Increased Compression Ratio

The use of the highest point provides a higher compression ratio gives a faster reduction in temperature after the ignition of the fuel, thus reducing NO_x formation. The increase in compression ratio also compensates the reduction in firing temperature due to retarded injection and hence the associated increase in SFOC.

Miller Valve Timing

To reduce the temperature peaks which promote the formation of NO_x, early closure of the inlet valve causes the charge air to expand and cool before start of compression. The resulting reduction in combustion temperature reduces NO_x emissions.



Overview of the advantages of the L+V32/44CR

High Pressure Ratio Turbocharger

The use of MAN Diesel turbochargers equipped with the latest high efficiency compressor wheels can alleviate the NO_x-SFOC trade off. The higher pressure ratio increases the efficiency of the engine and thus compensates the increase in SFOC normally associated with lower NO_x emissions. The higher pressure ratio also increases the scope for Miller valve timing.

VVT Variable Valve Timing

Variable valve timing enables variations in the opening and closing of the inlet and exhaust valves. It can be used to compensate the increase in SFOC associated with lower NO_x emissions. VVT is an enabling technology of variable Miller valve timing. A strong Miller effect under high load operation results in an improvement in the NO_x-SFOC trade-off. At low load the Miller valve timings are reduced to attain higher combustion temperatures and thus lower soot emissions.

Common Rail Injection

The 32/44 common rail injection system uses the latest MAN Diesel common rail technology which allows flexible setting of injection timing, duration and pressure for each cylinder. This flexibility allows the fuel consumption and emissions of the 32/44CR to be optimised on its operating profile. Due to constant development of our safety concept the redundant high pressure pumps guarantee further operation of the engine even in the event of high pressure pump malfunction.



Committed to the future

Technologies which promise compliance with the IMO Tier III round of emissions limits due in 2016 combined with further optimised fuel consumption and new levels of power and flexibility are already under development at MAN Diesel. With this level of commitment MAN Diesel customers can plan with confidence.

Core technologies in-house

As well as its expertise in engine design, development and manufacture MAN Diesel is also a leading manufacturer of the key technologies which determine the economic and ecological performance of a diesel engine:

- high-efficiency exhaust gas turbochargers
- advanced electronic fuel injection equipment
- electronic hardware and software for engine control, monitoring and diagnosis

Our impressive array of computer-aided design tools and one of the engine industry's largest, best-equipped foundries allow us decisively to shorten product development, and application engineering processes. Our mastery of these engine technologies – and, the best brains in the large engine industry – are the firm foundation for

- low emissions
- low operating costs
- low life cycle costs
- long service life

The range of technical measures employed comprises:

- Improved charge air cooling
- Enhanced turbocharging
- Miller valve timing
- Revised injection timing
- Higher compression ratios
- Low swirl inlet ports
- Variable valve timing (VVT)

Engine Specifications

High Specific Power Output Meets High Availability

The actual 32/44CR engine represents the newest technologies in the area of medium speed operated industrial sized diesel engines. By the use of electronic injection, high efficiency turbochargers, electronic hardware and variable valve timing the 32/44CR is a synthesis of the most advanced large engine technologies available.

Injection

The patented common rail injection system from MAN Diesel is based on the following principle: High pressure pumps compress the fuel to the required pressure and deliver it to the inline accumulator units (common rail). At the accumulator units are connections for the injection valves and also the components for fuel distribution and injection control. The common rail system achieves its high level of flexibility by consistent separation of pressure generation and injection control.

Electronics

The 32/44CR is equipped with the newest generation of proven MAN Diesel engine management system. For the first time, SaCoS_{one} breaks down all functions of modern engine management into one complete system. Through integration on the engine, it forms one unit with the drive assembly. SaCoS_{one} offers:

- Integrated self-diagnosis functions
- Maximum reliability and availability
- Simple use and diagnosis
- Quick exchange of modules (plug in)
- Trouble-free and time-saving commissioning

Fuels

The common rail injection system of the 32/44CR was designed for operation with heavy fuel oil (HFO) in accordance with specification DIN ISO 8217 (viscosities up to 700 cSt at 50 °C) and fuel temperatures up to 150 °C.

Components

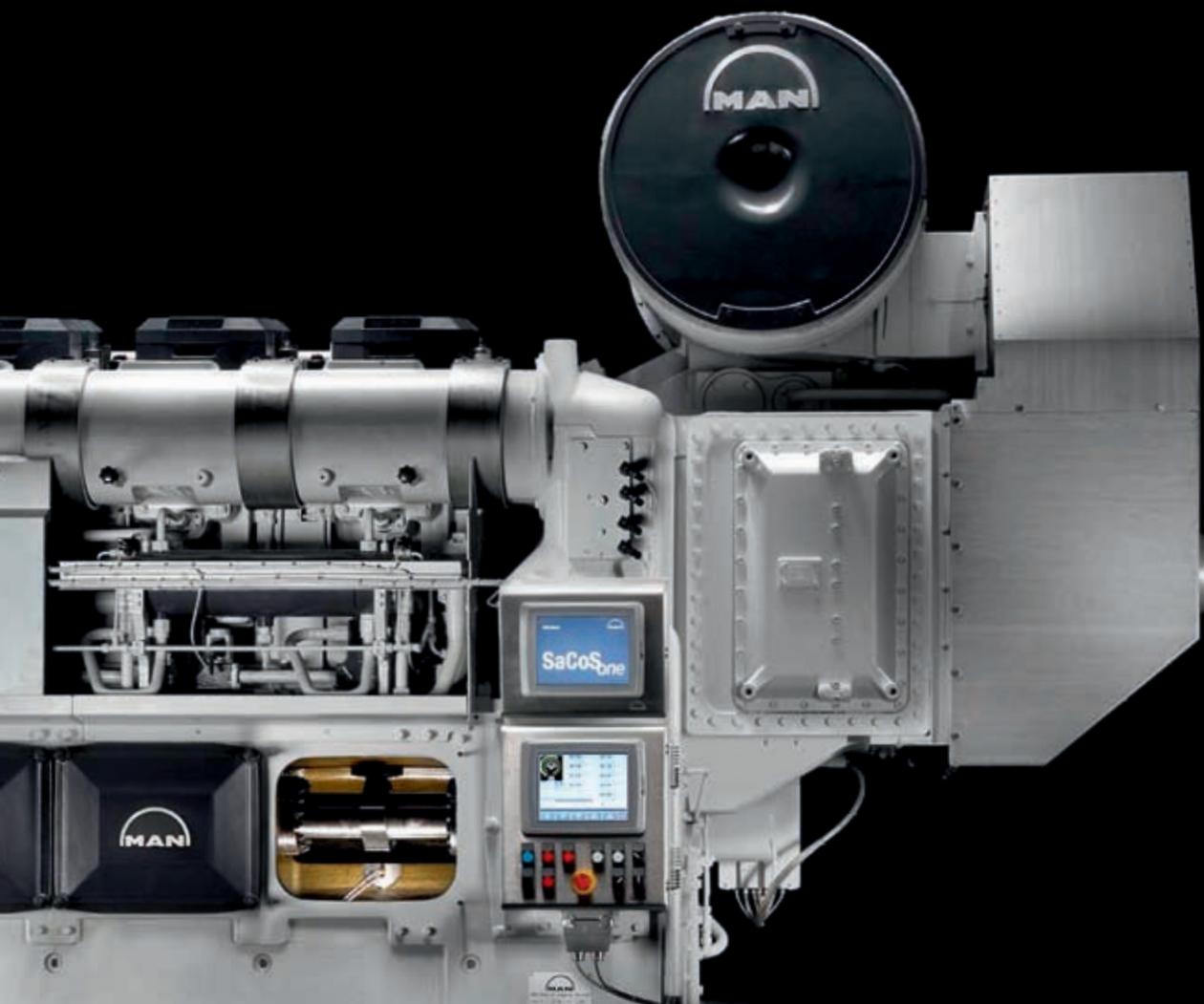
The 32/44CR is equipped with the newest generation of MAN Diesel turbochargers (TCR). Based on positive experiences from the 32/40, important power unit components, such as crankshaft, conrod and piston, were optimised for increased performance. It was ensured in this way that the 560 kW/cyl. engine has the tried and tested good wear properties for which MAN Diesel engines are well known throughout the world.

More output at lower fuel consumption

Development of the 32/44CR has benefited from many years of experience of industrial sized diesel engine architecture and also knowledge from detailed research and developed plans. As a result, the output of the engine was substantially increased and at the same time the fuel consumption was significantly reduced.

High efficiency turbochargers

MAN Diesel turbochargers with increased pressure ratios compensate the shorter inlet valve opening times of the Miller cycle. This ensures that the quantity of combustion air entering the cylinder and thus engine performance and efficiency remain unaffected. Paralleling the fuel injection flexibility of common rail systems is the air management flexibility of the MAN Diesel's high efficiency turbocharger systems with variable output.



General performance definition for diesel engines as per ISO 30461/1-2002

ISO reference conditions:

Air temperature: 298 K (25 °C)

Air pressure: 1 bar

Fresh water temperature upstream of charge-air cooler: 298 K (25 °C)

Relative humidity: 30 %

For maritime engines, no power reduction required below:

Air temperature: 318 K (45 °C)

Air pressure: 1 bar

Fresh water temperature upstream of charge-air cooler: 311 K (38 °C)

IMO requirements:

The engine detailed herein will comply with the emission limits referred to as IMO Tier II.

Engine data for 32/44CR

General

Engine cycle: Four-stroke

Turbocharging system: Constant pressure

No. of cylinders, In-line engine: 6, 7, 8, 9, 10

No. of cylinders, V-engine: 12, 14, 16, 18, 20

Bore: 320 mm

Stroke: 440 mm

Displacement per cyl.: 35.4 dm³

Power-to-weight ratio (MCR)

In-line engine: 10.4 – 11.8 kg/kW, 7.6 – 8.7 kg/bhp

V-engine: 9.3 – 10.4 kg/kW, 6.8 – 7.6 kg/bhp

Cylinder output (MCR)

at 750/720*) rpm: 560 kW / 760 bhp

Cooling

Cylinder cooling: Cooling water

Charge-air cooling (two-stage): Fresh water

Fuel injector cooling: Cooling water

Starting method

In-Line and V-engine: air (turbine) starter

The fuel consumption is based on a lower calorific value (LHV) of the fuel of 42,700 kJ/kg without engine driven pumps. Tolerance 5%.

Lubricating oil consumption value is given with a tolerance of 20%.

*) For generator drive only

L+V32/44CR Technical Data

Specific fuel consumption

	100% load	85% load
L+V32/44CR	179 g/kWh	177 g/kWh
	132 g/PSh	130 g/PSh

Specific lubricating oil consumption

	g/kWh (g/PSh)
L+V32/44CR	0.5 (0.4 g)

Outputs MCR (maximum continuous rating)

Engine speed	750 rpm	720*) rpm
Mean piston speed	11.0 m/s	10.6 m/s
Mean effective pressure	25.3 bar	26.4 bar

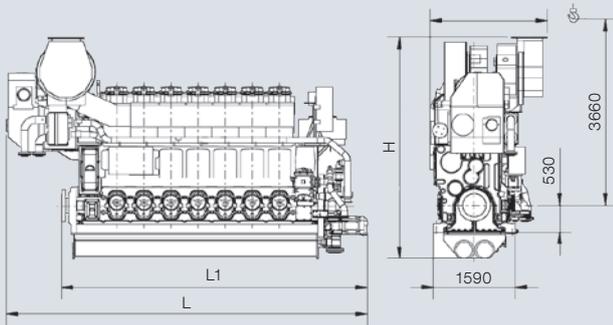
		kW / bhp
6L32/44CR	6 cyl.	3,360 / 4,568
7L32/44CR	7 cyl.	3,920 / 5,330
8L32/44CR	8 cyl.	4,480 / 6,092
9L32/44CR	9 cyl.	5,040 / 6,852
10L32/44CR	10 cyl.	5,600 / 7,614
12V32/44CR	12 cyl.	6,720 / 9,137
14V32/44CR	14 cyl.	7,840 / 10,659
16V32/44CR	16 cyl.	8,960 / 12,182
18V32/44CR	18 cyl.	10,080 / 13,705
20V32/44CR	20 cyl.	11,200 / 15,228

*) For generator drive only

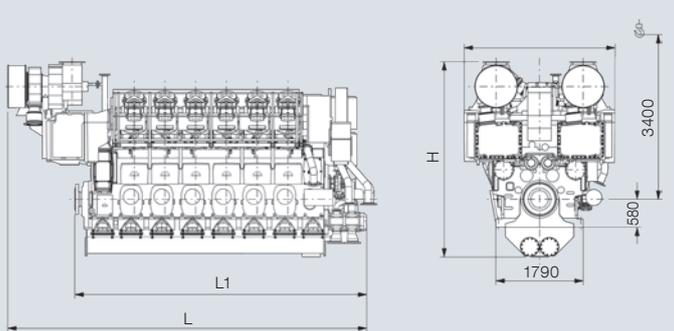
Dimensions And Weights

All Cylinder Numbers

L32/44CR



V32/44CR



In-line engine L32/44CR

Engine type	No. of cyl.	L mm	L1 mm	W mm	H mm	Weight t
6L32/44CR	6	6,312	5,265	2,174	4,163	39.5
7L32/44CR	7	6,924	5,877	2,359	4,369	44.5
8L32/44CR	8	7,454	6,407	2,359	4,369	49.5
9L32/44CR	9	7,984	6,937	2,359	4,369	53.5
10L32/44CR	10	8,603	7,556	2,359	4,369	58.0

V-engine V32/44CR

Engine type	No. of cyl.	L mm	L1 mm	W mm	H mm	Weight t
12V32/44CR	12	7,195	5,795	3,100	4,039	70
14V32/44CR	14	7,970	6,425	3,100	4,262	79
16V32/44CR	16	8,600	7,055	3,100	4,262	87
18V32/44CR	18	9,230	7,685	3,100	4,262	96
20V32/44CR	20	9,860	8,315	3,100	4,262	104

All weights and dimensions are for guidance only and apply to dry engines without flywheel. Masses include built-on lube oil automatic filter, fuel oil filter and electronic equipment. Minimum centreline distance for twin engine installation: 2,500 mm (L32/44), 4,000 mm (V32/44). More information available upon request.

World Class Service

Marine Propulsion And GenSets



PrimeServ – peace of mind for life

With more than 150 PrimeServ service stations and service partners worldwide, plus our growing network of PrimeServ Academies, the MAN Diesel after-sales organisation is committed to maintaining the most efficient and accessible after-sales organisation in the business.

PrimeServ's aim is to provide:

- Prompt delivery of high demand OEM spare parts within 24 hours
- Fast, reliable and competent customer support.
- Individually tailored O&M contracts
- Ongoing training and qualification of service personnel.
- Global service, open 24 hours-a-day, 365 days-a-year
- Diagnosis and troubleshooting with our high performance Online Service.

The PrimeServ Offering

Based on almost 110 years of service experience with marine Diesel engines, our sophisticated logistics system ensures that all frequently requested spare parts are available worldwide within 24 hours. In addition, MAN Diesel Online Service helps to optimise maintenance cycles by the use of remote engine monitoring, diagnostics and calibration. The resulting condition-based maintenance (CBM) promotes high availability, increases operational safety, shortens downtimes and enhances the performance of MAN Diesel marine engines.

The bottom line: leaner operating costs and better planning for you.

When service is required, the MAN Diesel PrimeServ network responds to organise assistance as fast as possible. This guarantees rapid completion of maintenance work and high availability of MAN Diesel engines, GenSets, turbochargers, gears, propellers and marine propulsion packages.

In short: MAN Diesel PrimeServ gives you the benefit of our specialist expertise in marine power so that you can concentrate on your own core business.



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