



Four-  
stroke  
marine  
systems

# Cruise and ferry

**MAN Energy Solutions**  
Future in the making

Intelligent and  
reliable engine  
solutions





# Moving big things to zero

MAN Energy Solutions is the world's leading provider of large-bore engines, turbomachinery, and integrated power systems. 250 years of experience in advanced engineering has prepared us well for our biggest challenge yet: to provide the technical solutions that will drive the global economy into a new carbon-neutral era.

The industries we serve are crucial for the world economy. Most of them are also hard to decarbonize. By providing sustainable solutions for marine transport, power generation, and industrial engineering we boost business and help to bring the world to net zero.

For the cruise and ferry sector we offer newbuild engines that run on green fuels and retrofits that enable alternative fuels. Besides powerful engines, our portfolio covers emission reduction, complete propulsion packages, electric propulsion, battery hybrid power solutions, dual fuel engines, and digitized services.

**MAN Energy Solutions: Future in the making.**







# Certainty for your sector

## Planning a safe course through the maritime transition

Global shipping is advancing towards a more sustainable future, pushed by stricter emissions regulations and pulled by end-customer demand. The destination is clear: cruise and ferry vessels must achieve the goal of net-zero greenhouse gas (GHG) emissions by 2050. But which is the best course? We have answers now that can carry you into the long-term future.

## Adaptable engines, green fuels, and retrofits

Our dual fuel engines already provide many paths for emissions compliance. We have engines running on SNG and biofuels, we have raised efficiency levels, and made significant advances in the prevention of methane slip. Further decarbonization depends on synthetically manufactured, low carbon fuels, that much is clear.

But which green fuel will be the right one? We are working on hydrogen, ammonia, and methanol variants. Green methanol is an ideal candidate that can take us towards net zero. Unfortunately, it is not widely available yet. That is why our strategy is to be ready for future fuels by designing engines that are easily adaptable.

The built-in flexibility of our engines allows you to convert to the appropriate fuel when the market is ready. Until then, you can operate highly efficient and emission compliant engines. We believe that retrofitting brings significant results fast. Together with our MAN PrimeServ experts, we can get your engines ready for alternative fuels and extend the service life of your assets.



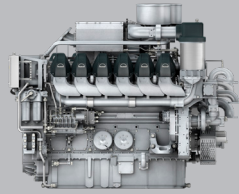






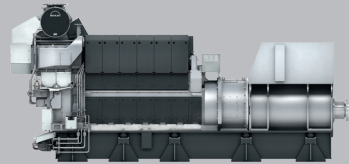
# Four-stroke engines for cruise ships and ferries





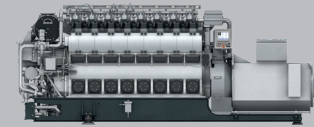
**MAN 175D**  
Propulsion

1,499 – 4,400 kW



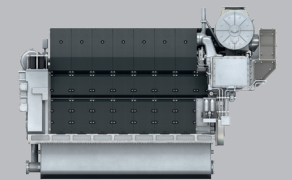
**MAN 21/31**  
GenSet

1,000 – 1,980 kW



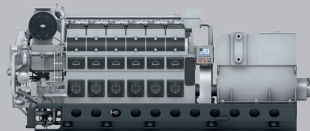
**MAN 23/30DF**  
GenSet

625 – 1,200 kW



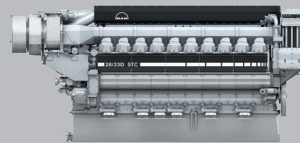
**MAN 27/38**  
Propulsion

2,040 – 3,285 kW



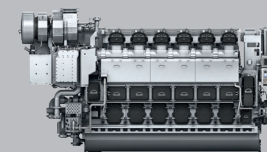
**MAN 28/32DF**  
GenSet

1,000 – 1,800 kW



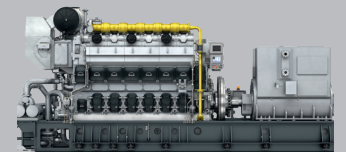
**MAN 28/33D STC**  
Propulsion

5,460 – 9,100 kW



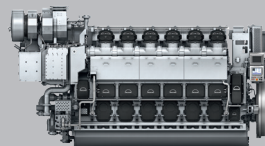
**MAN 32/44CR**  
Propulsion

3,600 – 6,000 kW  
7,200 – 12,000 kW



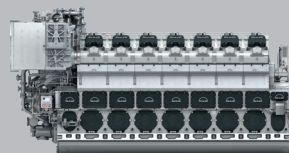
**MAN 35/44DF**  
GenSet

3,060 – 5,300 kW



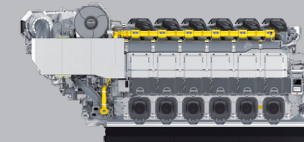
**MAN 35/44DF**  
Propulsion

3,060 – 5,300 kW



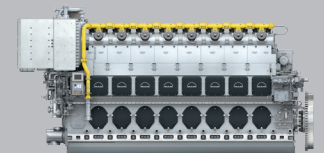
**MAN 48/60CR**  
Propulsion

7,200 – 10,800 kW  
14,400 – 21,600 kW



**MAN 49/60DF**  
Propulsion

7,800 – 13,000 kW  
15,600 – 18,200 kW



**MAN 51/60DF**  
Propulsion

6,300 – 18,900 kW  
6,900 – 20,700 kW





# Powering people's leisure

Cruise ships

Cruise ships

08–11

MAN L35/44DF	<div></div>	3,060 – 5,300 kW
MAN L32/44CR	<div></div>	3,600 – 6,000 kW
MAN L51/60DF	<div></div>	6,300 – 10,350 kW
MAN L48/60CR	<div></div>	7,200 – 10,800 kW
MAN V32/44CR	<div></div>	7,200 – 12,000 kW
MAN L49/60DF	<div></div>	7,800 – 13,000 kW
MAN V49/60DF	<div></div>	15,600 – 18,200 kW
MAN V51/60DF	<div></div>	12,600 – 20,700 kW
MAN V48/60CR	<div></div>	14,400 – 21,600 kW

Fast ferries

12–15

MAN V175D	<div></div>	1,499 – 4,400 kW
MAN V28/33D STC	<div></div>	5,460 – 9,100 kW

RoRo passenger vessels

16–19

MAN L23/30DF GenSet	<div></div>	625 – 1,200 kW
MAN L28/32DF GenSet	<div></div>	1,000 – 1,800 kW
MAN L21/31 GenSet	<div></div>	1,000 – 1,980 kW
MAN L27/38	<div></div>	2,040 – 3,285 kW
MAN L35/44DF GenSet	<div></div>	3,060 – 5,300 kW
MAN L35/44DF	<div></div>	3,060 – 5,300 kW
MAN L32/44CR	<div></div>	3,600 – 6,000 kW
MAN L51/60DF	<div></div>	6,300 – 10,350 kW
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MAN L49/60DF	<div></div>	7,800 – 13,000 kW
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MAN V51/60DF	<div></div>	12,600 – 20,700 kW
MAN V48/60CR	<div></div>	14,400 – 21,600 kW

RoRo cargo ferries

20–23

MAN L23/30DF GenSet	<div></div>	625 – 1,200 kW
MAN L28/32DF GenSet	<div></div>	1,000 – 1,800 kW
MAN L21/31 GenSet	<div></div>	1,000 – 1,980 kW
MAN L27/38	<div></div>	2,040 – 3,285 kW
MAN L35/44DF GenSet	<div></div>	3,060 – 5,300 kW
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MAN V49/60DF	<div></div>	15,600 – 18,200 kW
MAN V51/60DF	<div></div>	12,600 – 20,700 kW
MAN V48/60CR	<div></div>	14,400 – 21,600 kW





Once the preserve of the wealthy, cruises are now affordable to many and this segment is experiencing significant growth. Cruise lines are building spectacularly complex ships that operate all day, practically every day of the year.

#### **Engineering for environmentally friendly holidays**

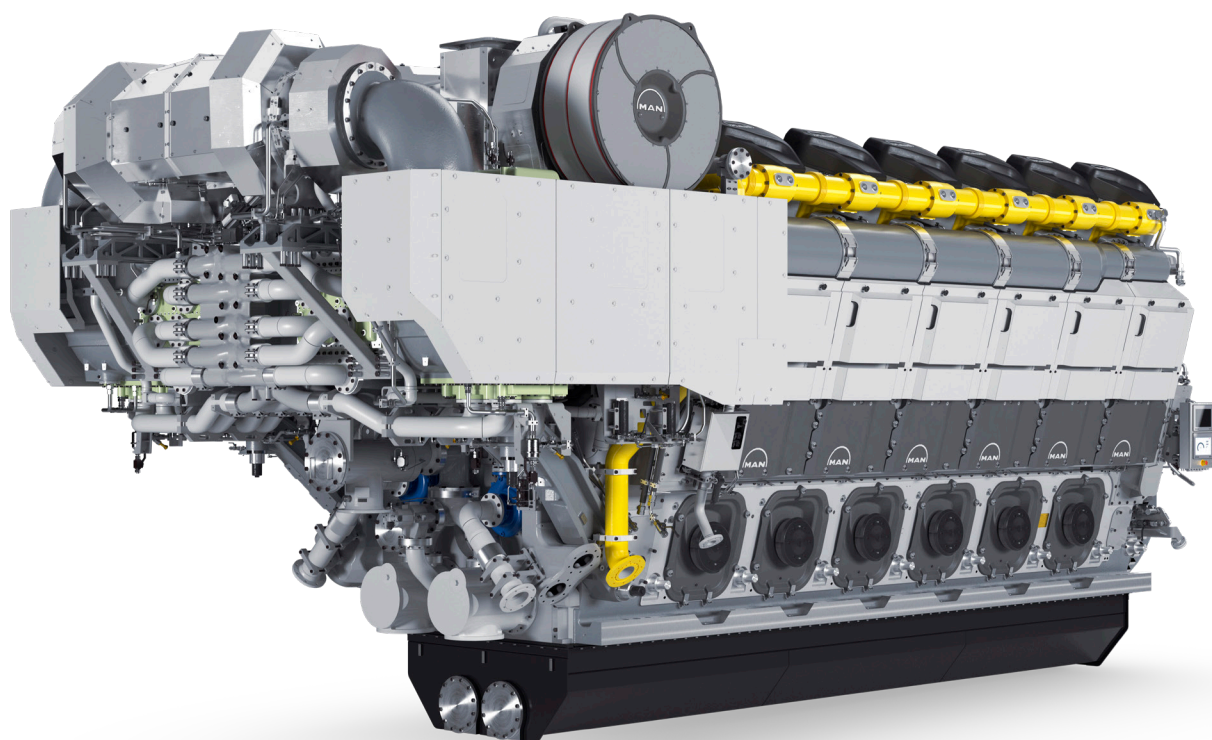
The growing awareness of the cruise industry's environmental impact together with ever more stringent emission regulations, especially in coastal areas, is an important factor in the design of new cruise ships. The ships must also be economical to operate, so as to keep holiday prices attractive.

Today's cruise ships must accommodate high demands for non-stop reliable, comfortable and silent power generation onboard. We offer highly efficient and reliable common rail (CR) propulsion engines and GenSets, which – thanks to their fully electronic injection system – allow the highest possible degree of freedom of optimization in fuel consumption, reducing NO<sub>x</sub> and smoke emissions while ensuring the utmost passenger comfort.



# An engine for change

**MAN  
49/60DF**





**The MAN 49/60DF resets the efficiency benchmark and ensures the lowest fuel costs for cruise vessels and ferries thanks to its fuel flexibility, enabling it to run on LNG or diesel. Looking to the future, its efficiency and low methane slip assure compliance with emissions legislation well into the 2030s. Beyond that, the flexibility of its dual fuel design creates multiple paths for emissions compliance through to 2050.**

#### Benefits

##### New benchmark in efficiency

171.0 g/kWh liquid fuel  
consumption at 85 % MCR\*

6,990 kJ/kWh gas  
consumption at 85 % MCR\*

\*Higher values apply for 8L and 10L

##### Long-term CO<sub>2</sub> emissions compliance

Thanks to benchmark efficiency, low  
methane emissions and fuel flexibility

##### Ready for further digitalization

With next-generation engine  
automation

##### Compact design

By increased power density

#### Alternative paths for emission compliance

Low methane slip and benchmark  
efficiency ensure vessels are emissions-  
compliant until approximately 2035.

Solutions in response to more stringent  
regulations, are easy to implement and  
include retrofittable exhaust gas after-  
treatment systems, replacing natural gas  
with bio gas or synthetic natural gas,  
and future fuels such as green methanol.

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##### MAN SaCoS 5000 and ACC 2.0

The MAN 49/60DF features the new  
MAN SaCoS 5000 engine automation  
system, and the new Advanced  
Combustion Control ACC 2.0. Both  
features future-proof your vessel  
for the digital age. While ACC 2.0 is  
essential for improved efficiency  
and robust in-field performance, the  
new MAN SaCoS offers enhanced  
remote support features and options  
to attain the highest levels of  
cybersecurity.

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#### Further power solutions

**MAN 35/44DF**

**MAN 32/44CR**

**MAN 51/60DF**

**MAN 48/60CR**

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# Combining comfort and speed

**Fast ferries**





**When quick shore-to-shore connections become too long for bridges or inconvenient to be reached by driving around the coast, that's where fast ferries come in. Their task: to transport passengers and vehicles quickly, safely, reliably, and on time.**

#### **Improving performance**

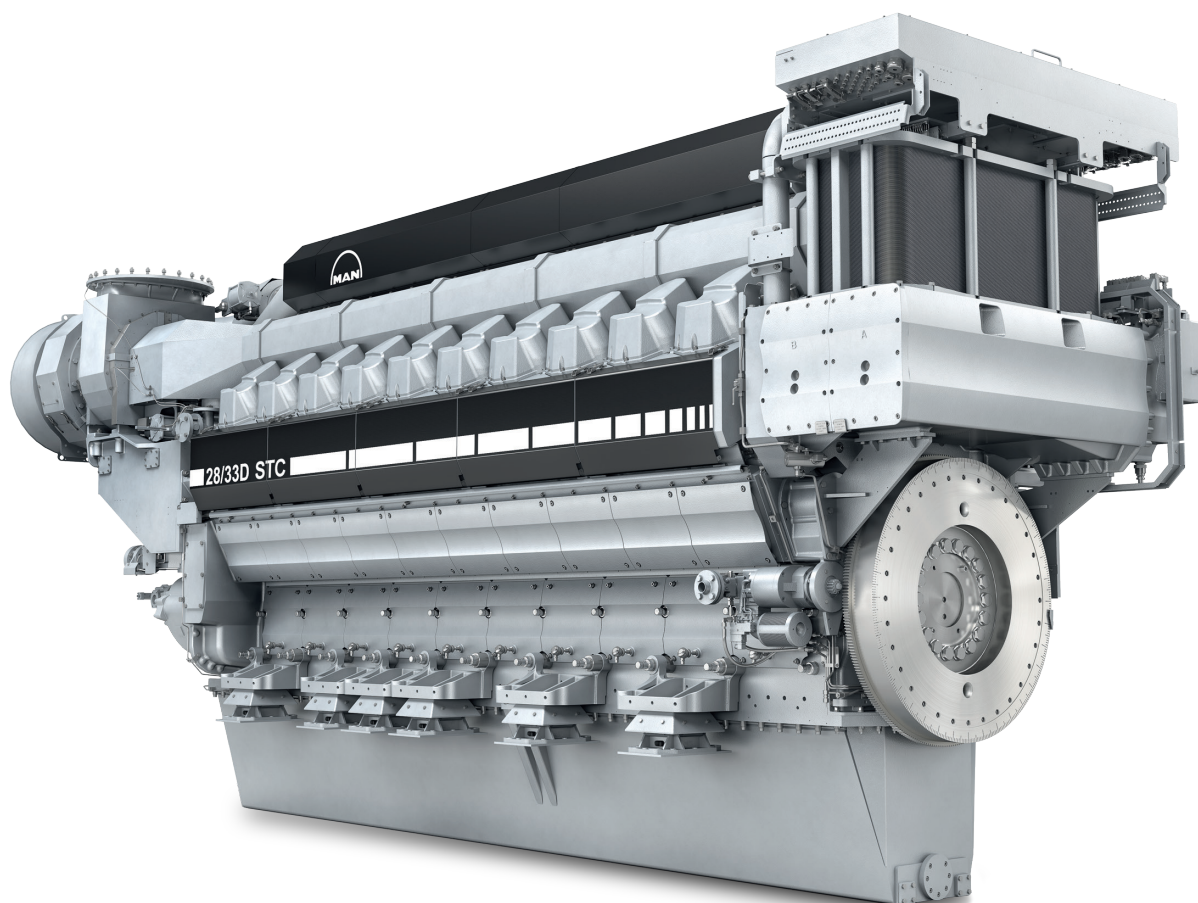
Fast-ferry operators provide rapid shore-to-shore connections with high power, low-weight ship designs that ensure their economic viability compared to other means of transportation. At the same time, they have to ensure passenger comfort with low noise and vibration levels as well as compliance with stringent emission limits in their typical areas of operation.

Our answer is a set of engines that deliver the necessary power quietly with minimum impact on payload and operating costs.



# High- speed economy

**MAN  
28/33D STC**





**High speed, fast acceleration, and continuously high power – the MAN 28/33D STC really moves. The compact yet powerful engine has a high power-to-weight ratio and is fully compliant with current environmental standards, producing NO<sub>x</sub> emissions that adhere to IMO Tier II and EPA Tier II regulations.**

#### **Benefits**

##### **Economic operation**

Lowest TCO (total cost of ownership) on the market

##### **Low maintenance costs**

Due to long TBO (time between overhauls) intervals and on-board maintenance

##### **Best power-to-weight ratio in its class**

5.7 kg/kW, unequaled by any other medium-speed engine

#### **Easy on maintenance and costs**

Maintenance costs are kept low thanks to high engine availability. And with main overhauls only necessary every 32,000 hours, servicing downtime is kept to a minimum. As a result, you can count on low overall operating costs and best-in-class SFOC.

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##### **Sequential turbocharging (STC)**

Two identical yet independent turbochargers provide high torque at low rpm. Fuel injection quantity, rate, and timing are precisely managed by micro-processors. For perfect torque and acceleration control.

##### **MAN SaCoS<sub>one</sub> (safety and control system on engine)**

Combines all functions of modern engine management into one complete system. Fully integrated it forms one unit with the drive assembly.

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**Further power solutions**  
**MAN 175D**

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# The advance of clean technologies

**RoRo passenger vessels**





Singapore Technologies Marine Ltd

**Modern ferries place high demands for reliability and comfort on their main engines. Growing public awareness with respect to ship emissions and, in particular, the expected increase of future NO<sub>x</sub> emission control areas in important regions of ferry operation have made environmental compliance another key factor for modern RoRo passenger vessel designs.**

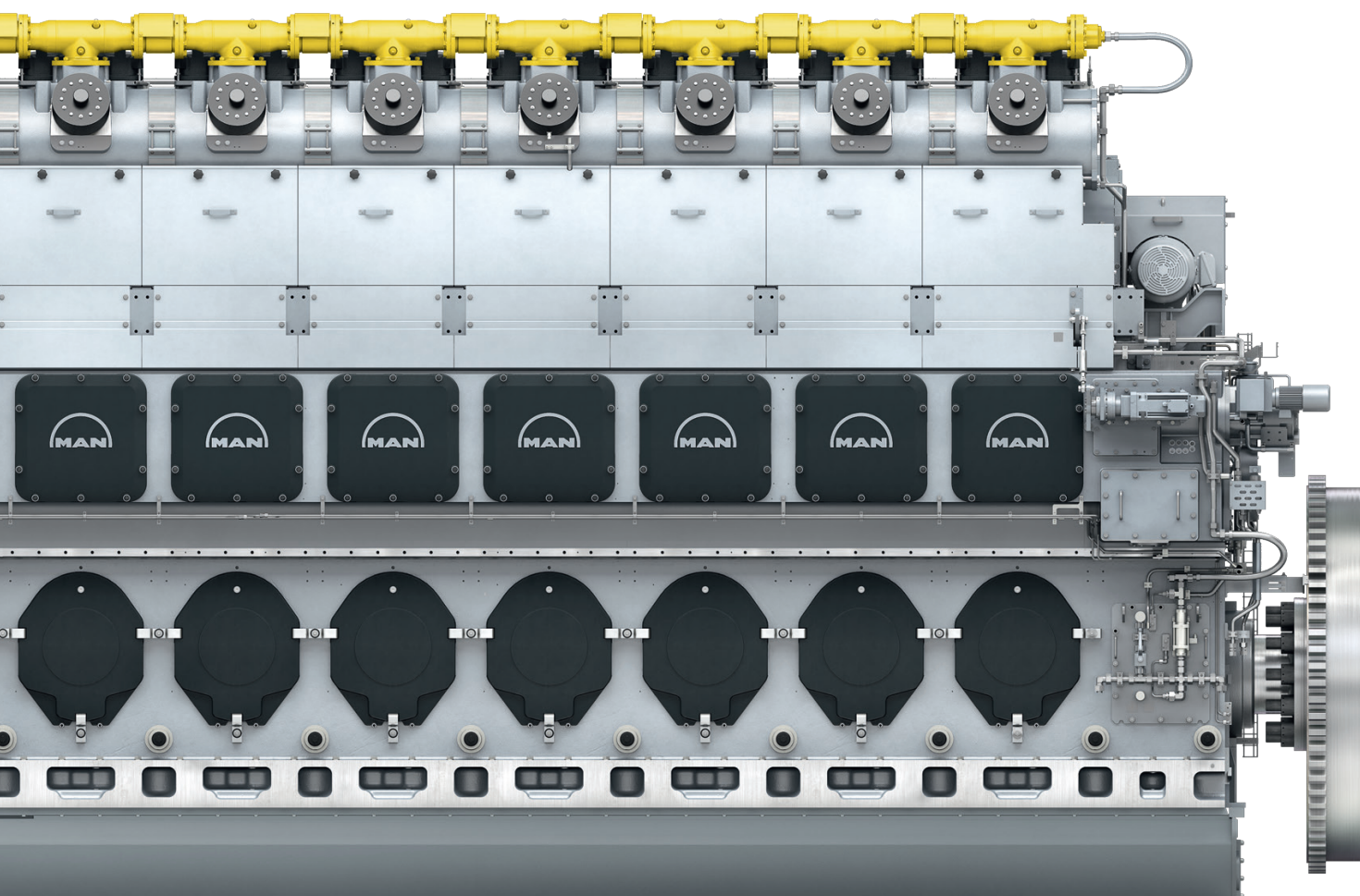
#### **Improving economic performance**

As well as dealing with environmental concerns, ferry operators have to keep operating costs at a low level to ensure their viability in a very competitive business environment.

We offer a wide choice of efficient diesel engines (running on heavy fuel or distillate) that make an economic difference and comply with IMO Tier III NO<sub>x</sub> limits through the addition of our MAN SCR system for cleaning exhaust gas. Our closed-loop system control, supplemented by an intelligent regeneration algorithm for the MAN SCR, enables the engine and the catalyst to operate with minimum urea consumption and the best possible fuel efficiency. Of course, we also offer dual fuel engines that are IMO Tier III-compliant when running on gas.



# Proven MAN 51/60DF dual-fuel performer





**This highly efficient dual fuel engine with low emissions can switch conveniently from gas mode to liquid fuel mode and vice versa without interruption. In a propulsion system with multiple dual fuel engines, the MAN 51/60DF ensures high reliability and speed flexibility at any time and load. The high efficiency variant offers best-in-class fuel consumption for low operating costs while the high power variant offers best-in-class load pickup for dynamic applications. The engine also provides 100 % MCR even at low gas fuel qualities, down to methane number 70.**

#### **Benefits**

##### **High power output**

Up to 1,150 kW per cylinder

##### **Excellent engine performance**

Best-in-class fuel consumption or load pickup

##### **Operating stability and flexibility**

Seamless switch from HFO to gas mode and vice versa, gas operation even above 100 % MCR and gas start capability

##### **Full environmental compliance**

IMO Tier III in gas mode and liquid mode (with optional MAN SCR)

##### **Lower maintenance costs**

Intelligent use of the engines minimizes annual maintenance costs.

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##### **Safety beyond the standards**

The MAN 51/60DF comes fully equipped with a safety and control system developed for full compliance with classification society standards. MAN SaCoS<sub>one</sub> allows for safe engine operation in liquid fuel or gas mode, offering optimum fuel consumption and very low emissions. In addition to all safety-relevant engine features, we offer an integrated safety solution for the whole engine room, tailor-made for each specific application.

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##### **Further power solutions**

**MAN 23/30DF GenSet**  
**MAN 28/32DF GenSet**  
**MAN 21/31 GenSet**  
**MAN 27/38**  
**MAN 35/44DF**  
**MAN 35/44DF GenSet**  
**MAN 32/44CR**  
**MAN 48/60CR**  
**MAN 49/60DF**

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# Sustainable transport solutions

**RoRo cargo ferries**





**RoRo cargo ferries play an essential role in connecting the roads and railways of regions separated by sea. Loading and unloading take little time, because the cargo is simply driven on and off board. This enables the just-in-time delivery of products such as food.**

#### **Ensuring commercial reliability**

Driven by global growth, the mobility of wheeled cargo – both domestically and internationally – has increased rapidly in recent decades. Sustaining this increase depends on reliability and punctuality.

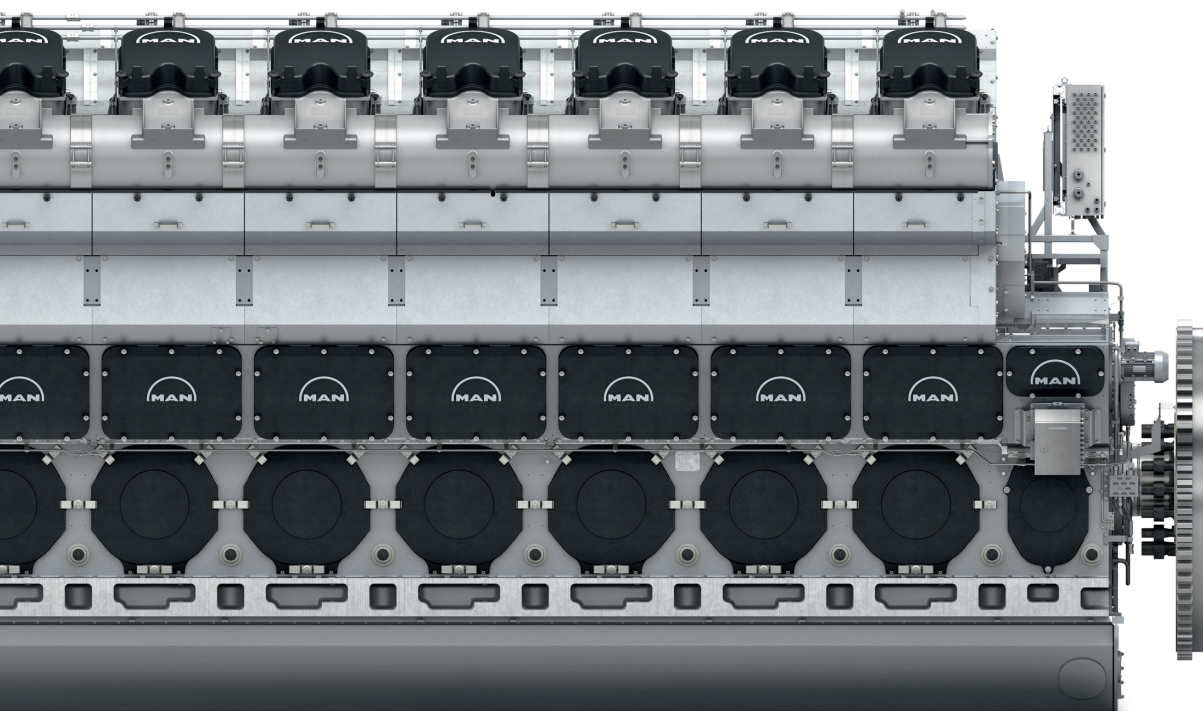
Reliability allows the operator to guarantee departure and arrival times. Without reliability, there can be no planning of local transport logistics or global supply chains.

We offer a wide range of highly reliable and efficient engines for powering ferries. Whether large ferries sailing in international waters or smaller ones operating on local routes, they all benefit from our advanced engine portfolio, whether for operation using conventional marine fuels or LNG.



# Power for reliable logistics

**MAN**  
**48/60CR**





**The MAN 48/60CR combines high power output with low fuel consumption. It delivers top performance, operational flexibility and ultimate reliability.**

#### **Benefits**

##### **Fuel savings**

Thanks to common rail technology and our innovative MAN ECOMAP optional feature

##### **Low maintenance costs**

Maintenance-friendly design with long service intervals

##### **High reliability and availability**

Due to established, robust design

#### **Dual fuel option**

Our dual fuel engine derivatives and conversion solutions are safe and powerful. We also offer complete solutions for gas-burning propulsion plants with dual fuel engines, onboard LNG storage and fuel gas supply systems (thanks to the recent acquisition of Cryo AB).

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##### **Common rail safety concept**

All high pressure pipes are screened or have a double wall design. Flow-limiting valves at each cylinder prevent uncontrolled injection. Redundant high pressure pumps and sensors safeguard the operating ability. In single-engine plants, the electronic control units are redundant as well.

##### **MAN SaCoS<sub>one</sub> engine management system**

Ease of operation, outstanding reliability, and fast commissioning are the key features of the MAN SaCoS<sub>one</sub>. The system is highly standardized and its modules can be replaced quickly.

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#### **Further power solutions**

**MAN 23/30DF GenSet**

**MAN 28/32DF GenSet**

**MAN 21/31 GenSet**

**MAN 27/38**

**MAN 35/44DF GenSet**

**MAN 35/44DF**

**MAN 32/44CR**

**MAN 51/60DF**

**MAN 49/60DF**

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# Improving your environmental performance

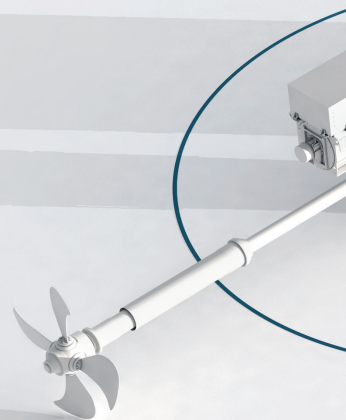
## Equipped for strict emission regulations

We are firmly committed to reducing emissions with minimum impact on your operating costs. This includes an active partnership with environmental institutions and development banks. For our customers, it means engines and system packages that are extremely well matched with integrated, intelligent and dynamic controls.

## Benefit from overall system competence

MAN Energy Solutions unites under one roof the core technologies and competencies which decisively influence the performance of our products: injection systems, turbocharger, controls for both, engine and after-treatment systems. This enables us to design and implement highly efficient emission-reduction packages for both new constructions and retrofits.

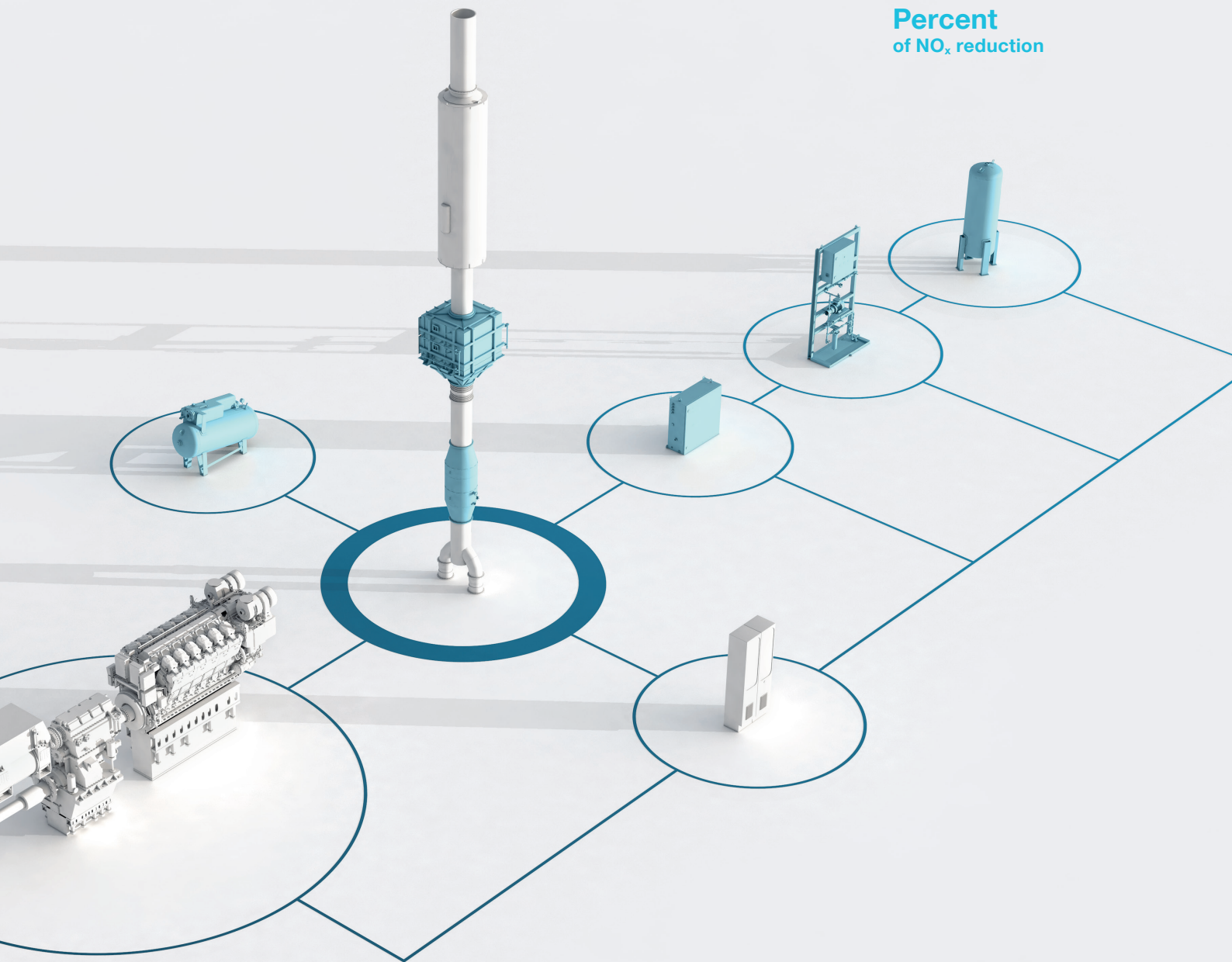
Selective catalytic reduction (MAN SCR) is the most field-tested and reliable system for achieving NO<sub>x</sub> reduction rates of up to 90%. Due to a chain of chemical reactions taking place between catalyst and exhaust gas, harmful NO<sub>x</sub> substances are transformed into ecologically benign constituents.





90

Percent  
of NO<sub>x</sub> reduction





# MAN PrimeServ

# Service with passion

MAN PrimeServ is the dedicated MAN Energy Solutions service brand. Via a network of over 100 service centers worldwide, MAN PrimeServ provides 24/7 service across the globe. Our range of services includes technical support, consulting, and OEM spares, as well as maintenance, repair, and comprehensive individualized service plans.



# 365

days a year

# 24

hours a day





#### MAN PrimeServ provides:

- 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 operators and maintenance staff
- Global service, 24 hours a day, 365 days a year
- Diagnosis and troubleshooting with our high-performance online service

#### MAN Energy Solutions and legacy brands

MAN PrimeServ is our brand name for high-quality aftersales support for the entire MAN Energy Solutions product portfolio. Through refinements to our products and repair techniques, we ensure and reinforce our technological leadership and technical expertise as an original equipment manufacturer (OEM) for the brands united under MAN Energy Solutions.



BABCOCK BORSIG

**SULZER**  
TURBO

B+V Industrietechnik



**MAN Energy Solutions**



*Ruston*

*Paxman*

Mirrlees  
Blackstone

**HALBY**  
GENERATING SETS

**B&W**  
MOTORS



# Worldwide service

**We offer retrofitting and upgrade services to bring engines and turbochargers already in service up to the very latest standards of performance and efficiency.**

Using the latest digital technology, we enable you to maximize the performance and availability of your MAN equipment by accessing real-time data analysis, remote support, and rapid solutions. We also offer an extensive range of training courses at MAN PrimeServ Academies around the world.

Our service does not vary according to location. We know that a vessel may be built in Asia, operated in Europe for ten years and then move to Africa for the next ten years. That does not alter our focus on dedicated training, fast delivery of strategic spare parts, a comprehensive approach, or our tailored maintenance contracts.

**For more information please visit**  
[www.man-es.com/services](http://www.man-es.com/services)





# 100

service centers  
worldwide



MAN PrimeServ



# Get your engines started ...



## **An interactive experience**

Download our MAN Brochure Store app from the App Store or Google Play Store. Use its exciting interactive features to explore our complete range of products and services. Suitable for iPhone, iPad, and Android.







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