



Commercial Marine

WE MOVE YOU.
WITH RELIABLE POWER.

www.rolls-royce.com



A Rolls-Royce
solution



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A FORCE FOR PROGRESS

01

We at Rolls-Royce provide world-class power solutions and complete lifecycle support under our product and solution brand **mtu**. Fully utilizing the potential of digitalization and electrification, we strive to develop climate-neutral drive and power generation solutions that are even cleaner and smarter and thus provide answers to the challenges posed by climate change and the rapidly growing societal demands for energy and mobility. We deliver and service comprehensive, powerful and reliable systems, based on both gas and diesel engines, as well as electrified hybrid systems.



A solution provider

mtu systems power the strongest tugboats, the most modern yachts and the biggest land vehicles and provide energy for the world's most important mission-critical applications. With advanced solutions such as microgrids we integrate renewable energies and manage the power needs of our customers.

For over 110 years we have provided innovative solutions for our customers – meeting even the most demanding drive and power requirements. Our products and services span a wide range of applications and power needs, with both standard and customized options.

An expert in technology

mtu products are known for cutting-edge innovation and technological leadership. That same spirit of innovation inspires our sustainability efforts. Our focus is on developing and implementing system solutions that both maximize efficiency and reduce emissions – which in turn helps to reduce our impact on the environment.

A passionate and reliable partner

We at Rolls-Royce spend every day working together with our customers, to deliver engines, systems and complete lifecycle solutions that best fit their needs. We understand that each application is different and has its own specific demands. Our engineers embrace the challenge of finding the perfect solution for your unique power requirements. Every step of the way – from project planning, through design, delivery and commissioning; to the lifetime care of your equipment – we are dedicated to helping you get the most from your **mtu** investment.

Our
Main
engine series
are ready for
sustainable
fuels.



- 1 Starnav Ursus
4x 16V 4000 M33S
- 2 FRS Halunder Jet Helgoland Katamaran
4x 16V 4000 M63L + **mtu** NautIQ Foresight
- 3 PSA Tallan
2x 16V 4000 M63L

THE MARITIME FORCE

For Propulsion. For Systems. For Solutions.

From propulsion and onboard power to automation, digital services and lifecycle support, *mtu* marine solutions keeps your profitability in focus.

Our dedicated marine engineering experts analyze load profiles and business cases to develop integrated, future-ready solutions that safeguard the long-term value of your investment.

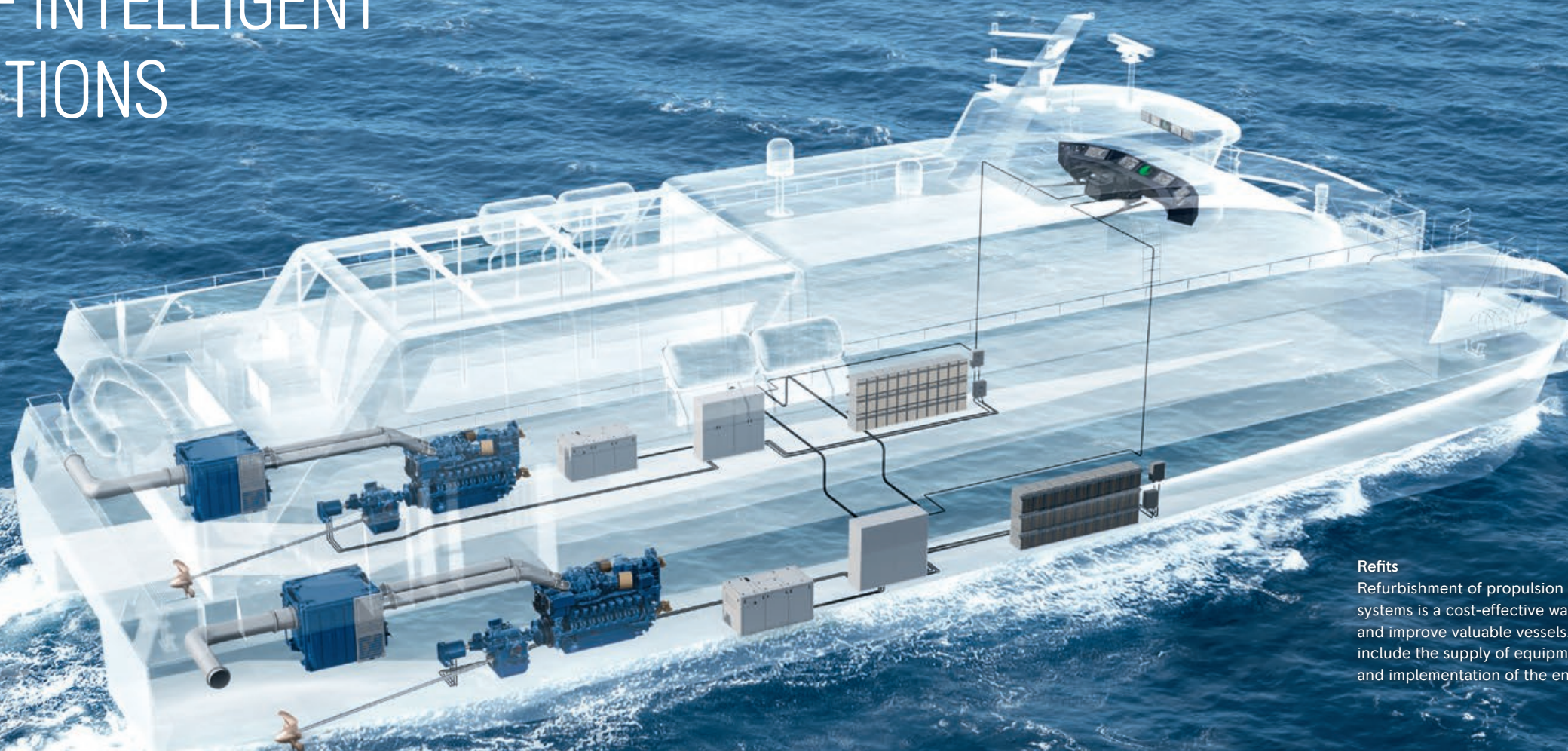


System solutions

PULLING MORE THAN
100,000 TONS OF STEEL
TAKES MORE THAN
A POWERFUL ENGINE

02

System solutions

A LIFETIME OF INTELLIGENT
POWER SOLUTIONS**Planning**

We supply a complete propulsion concept. Our engineers provide extensive analysis, documentation and risk mitigation services, as well as integrated mechanical, electrical and electronic interfaces.

Propulsion System Integration

We provide comprehensive engineering and technical support for the design and implementation of a vessel's propulsion system. Our application engineering team helps reduce design, installation and commissioning costs.

Propulsion Systems

mtu engines and propulsion systems are characterized by high power density, low weight, compact design, and mechanical and thermal robustness, as well as simple operation, straightforward maintenance and low lifecycle costs.

Refits

Refurbishment of propulsion and automation systems is a cost-effective way to preserve and improve valuable vessels. Our service include the supply of equipment, planning and implementation of the entire refit.

ValueCare services

mtu ValueCare ensures maximum performance and lasting value, with a complete portfolio of service and support solutions starting from genuine spare parts, training, **mtu** qualified technicians up to various overhaul solutions and our ValueCare Agreements (VCA).

Integrated Automation System

Our Integrated Automation System **mtu** NautIQ allow operators to monitor and control the whole propulsion plant, the onboard power supply and the entire vessel. Our Automation Systems are versatile, user-friendly and modular.

Application overview

PROPULSION SYSTEMS TAILORED TO YOUR NEEDS

03

Offshore service and supply vessels

No matter how rough conditions are at sea: You have to get out there, and your vessels' availability must be guaranteed. So what you need are propulsion systems that are 100% reliable, punctual and safe. We make sure they are: with engines braving even the harshest conditions, with preventive maintenance concepts designed for continuous heavy duty service and, with comprehensive support 24/7.

Coastal cargo, inland cargo and pusher towboats

Your competitive position and financial success depend on reliable, timely operation. We provide the foundation for this with high quality products, preventive maintenance programs, 24/7 service and as a result, maximum uptime.

Passenger vessels and ferries

Reliable operation of your fleet is a crucial factor in the success of your business. We lay the foundation by supplying high-quality products and delivering preventive maintenance programs designed to ensure continuous heavy-duty service. You can rely on our 24/7 service – and on securing maximum uptime for your vessel.

Offshore wind park crew boats

With its long-standing, strong commitment to the marine sector, we have always felt a particular responsibility for the environment – and have lived up to that responsibility in all aspects. That's what makes us the ideal partner for companies active in similar, forward-looking sectors – such as power generation from renewables.

Special vessels

From fire and rescue boats to research and survey vessels: No matter what specialized task your vessel performs, we can provide exactly the right propulsion solution – involving both high quality products and preventive maintenance programs for the highest level of reliability

Pilot boats

No matter how rough the sea state, ships have to be guided to harbor, so your vessel's availability must be beyond doubt. You need propulsion systems that are safe, powerful and fully reliable. We make sure your engines can brave even the harshest conditions.

Tugboats

Harbor and escort tugs must maneuver with high power, precision and speed in all situations. Our engines help you meet these requirements with broad performance maps, proven common-rail technology and sequential turbocharging. The result: impressive bollard pull figures.

Offshore converter platforms

Maritime conditions demand everything from the technology of offshore converter platforms. Around the clock, all systems must be redundant, low-maintenance and remotely operable. Our marine generator sets are reliable and proven for emergencies and are available with various safety designs and certifications.

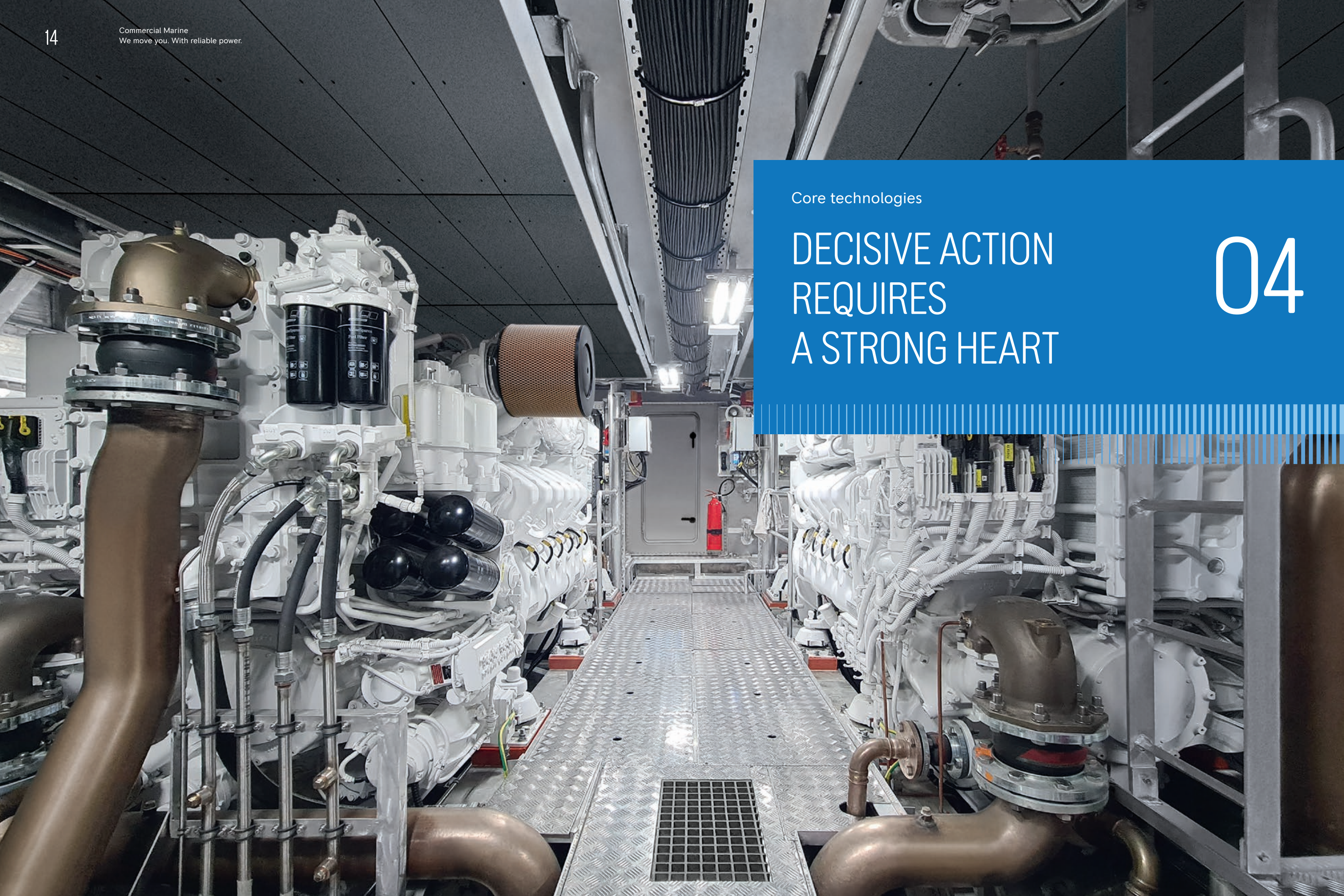
FPSO, semi-submersible rigs, fixed and jack-up platforms

Our compact, powerful and reliable offshore power generator sets are designed to meet the demanding requirements of the offshore platform power supply where safety is paramount and where engines with high starting and operating reliability minimize the risk of personal injury and material damage.

Core technologies

DECISIVE ACTION REQUIRES A STRONG HEART

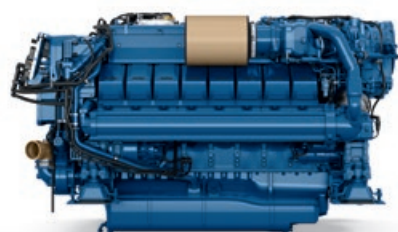
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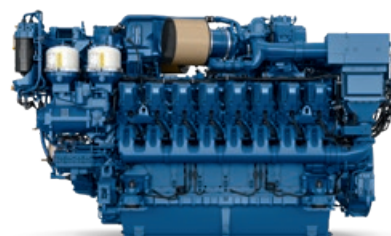
Core technologies

ALL ENGINES AT A GLANCE

For decades, thousands of our engines have been at sea, in rivers and lakes around the world. They perform reliably and efficiently as main or auxillary drive systems and provide energy as onboard power supply systems. Their performance, power and reliability has been proven time and time again. **mtu** engines for commercial marine are available in the power range of 720 - 10,000 kW (966 - 13,410 bhp).



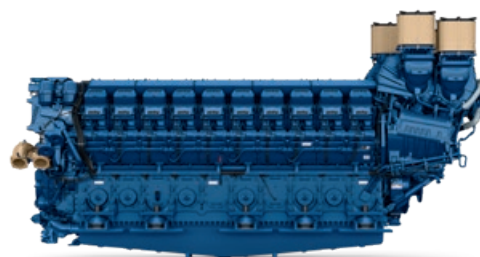
mtu Series 2000
The powerful heart for maximum agility



mtu Series 4000
One of the most successful heavy-duty engines ever



mtu Series 1163
The proven, evolved engine for the marine industry



mtu Series 8000
The most powerful highspeed engine for the highest demands



For detailed technical data
scan the QR code.

Analytics

We use the most diverse analysis and simulation tools to develop state-of-the-art propulsion solutions. These include vibration analyses, component strength verification and dynamic response simulations of entire propulsion systems.

Electronics

The latest generation of our electronic management system, ADEC (Advanced Diesel Engine Control) controls key systems such as fuel injection and turbocharging that affect engine consumption and emission levels as well as performance.

Fuel injection

We optimize fuel combustion in the cylinder by means of its electronically controlled common rail fuel injection system in combination with other technologies such as turbocharging.

Turbocharging

We develop and produce our own turbochargers for high-performance applications. Turbocharging helps achieve low fuel consumption and high performance across a broad range of running speeds.

Sustainable fuels

Fuels are key to a carbon-neutral future for energy and propulsion. We rely on HVO, methanol, and on other sustainable fuels produced using green, renewable electricity.

Low Lifecycle Costs

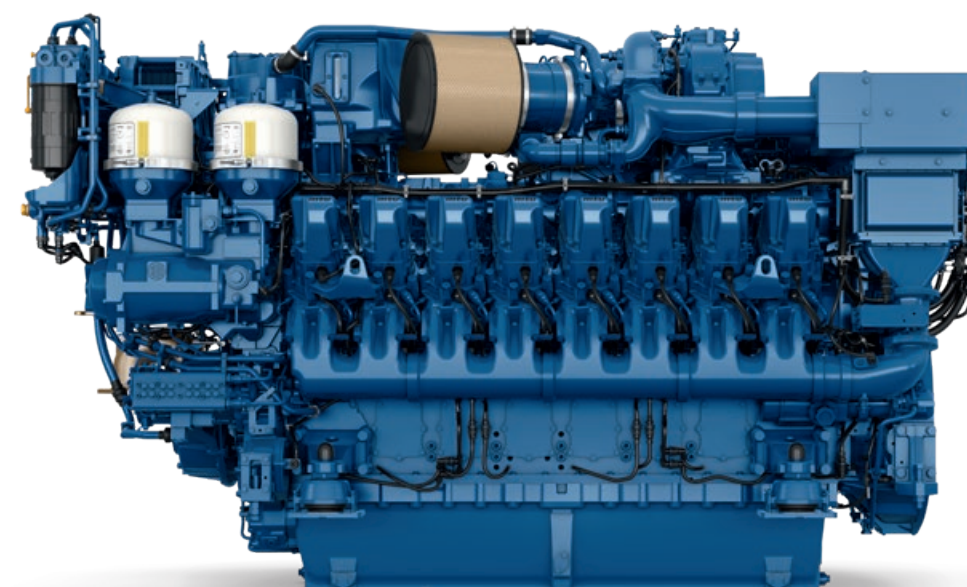
Our engines are fine-tuned to provide maximum uptime. Our long overhaul intervals of up to 96,000 hours ensure economical operation and reliable performance.

Mountings

Our engines are installed on special rubber mountings to reduce the transmission of structure-borne noise to the vessel's hull. Double resilient mountings are available as an option, and assist the single resilient mountings in achieving even more effective noise reduction.

Aftertreatment

As installation space is always restricted inside the engine room, our inhouse developed airless dosing SCR (Selective Catalytic Reduction) solution is compact and maintenance friendly.



Generator sets

GENERATING
POWER

05

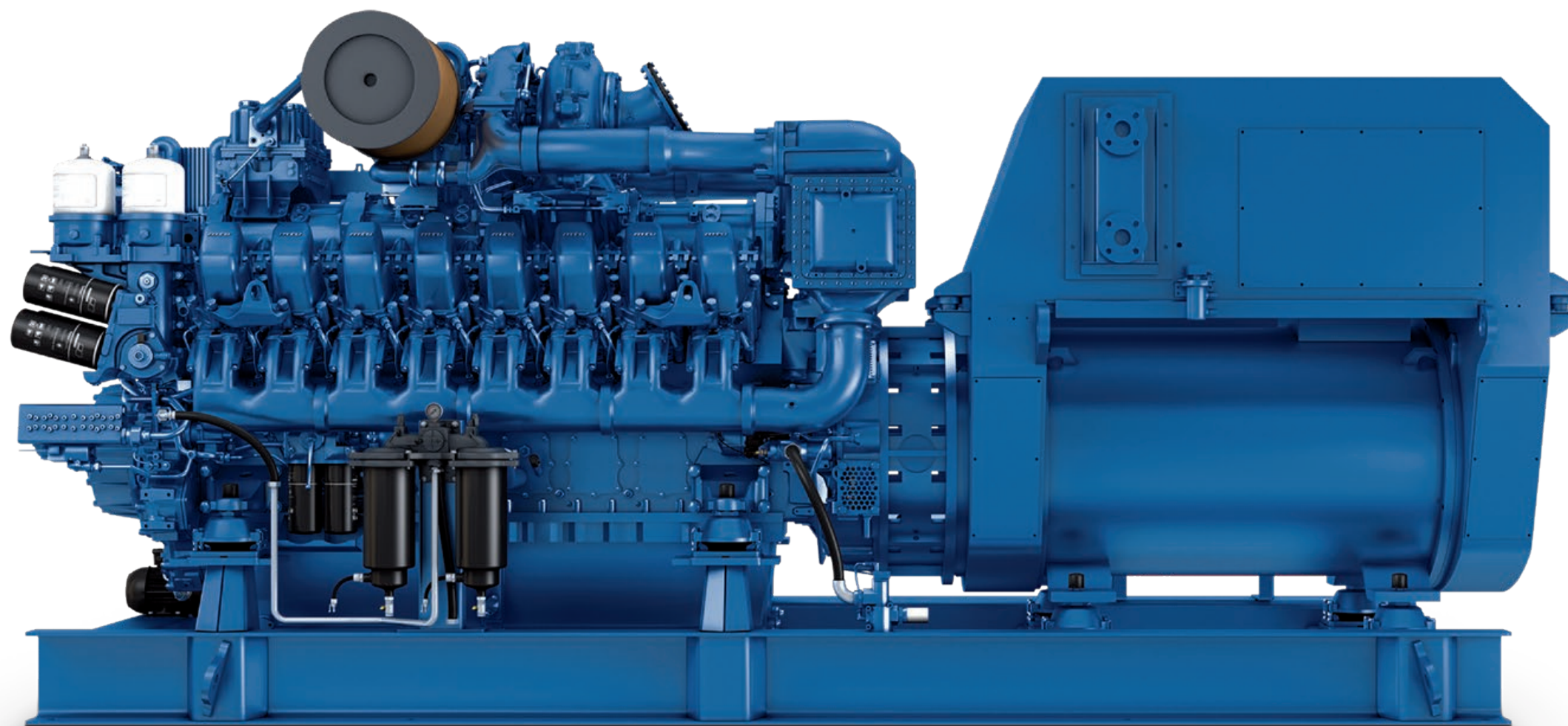
With power ratings from 675 kWe to 3,100 kWe and a wide range of configurations, our generator sets can be tailored to individual vessel and operating requirements. High availability and long time between overhauls (TBO) support reliable and economical operation even in demanding applications.

As a system supplier with extensive expertise in generator sets and automation, we engineer and configure power and propulsion solutions around the specific requirements of each vessel and operating profile. Engineered at our headquarters and based on proven, standardized designs, our portfolio ranges from cost-efficient constant-speed generator sets to customized solutions and advanced variable-speed systems for modern vessel concepts.

Decades of field experience and proven engineering expertise provide the reliability and lifecycle support required for demanding marine applications.

mtu NautIQ ePower is our integrated automation solution for onboard power generation plants and is available for both **mtu** Series 2000 and Series 4000. It is designed to optimize the interaction between engine and generator across a wide range of operating conditions.

For applications requiring proven, readily available solutions, we provide modular constant-speed generator sets based on standardized, factory-engineered designs for straightforward configuration and short project lead times. Our global manufacturing and partner network enables efficient project execution, flexible local content solutions and consistent quality worldwide.



Variable speed generator sets

FLEXIBLE POWER FOR LOWER LIFECYCLE COSTS

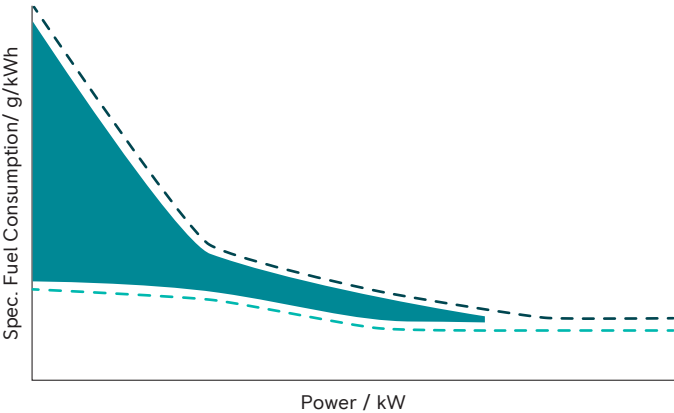
Vessel electrification is a key pillar of marine decarbonization – and combustion-engine-driven generator sets remain an integral part of modern vessel power and propulsion systems. Their role is evolving beyond traditional power generation and diesel-electric propulsion to support and enhance battery-electric vessel concepts through emergency backup, range extension and hybrid operation.

In DC grid architectures, gensets are no longer tied to a fixed nominal frequency. This enables variable speed operation and allows the engine to run closer to its optimum operating point across changing load conditions – opening up significant potential for higher efficiency, lower operating costs and reduced emissions.

- **Up to 15% lower fuel consumption and CO₂ emissions**
Higher efficiency at part load through optimized variable speed operation.*
- **Longer TBO and lower maintenance costs**
Optimized engine operation can extend maintenance intervals and reduce lifecycle costs.*
- **Approx. 6 dB lower noise and vibration levels**
At typical operating loads, resulting in a noticeably quieter operating environment.*
- **Maximum power density when required**
Variable speed operation enables the genset to meet peak power demand and, where applicable, operate above 1,800 rpm.
- **Optional IMO Tier III-compliant configuration**
Available for applications requiring compliance with IMO Tier III emission limits.

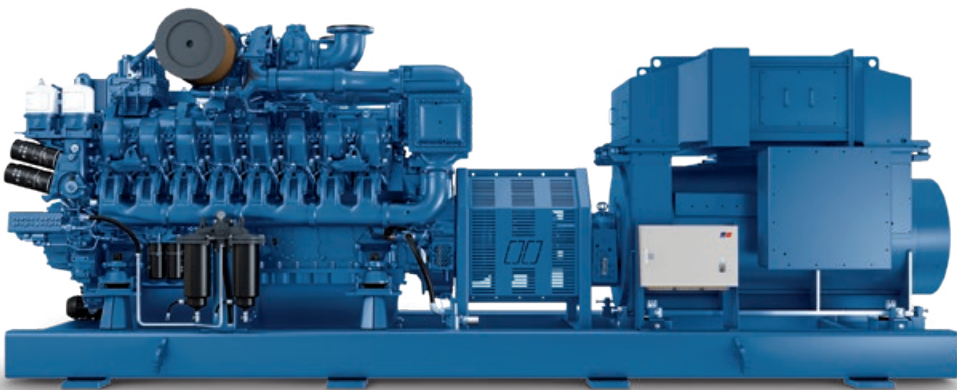
* Benefits may vary depending on vessel configuration, system architecture and operational profile.

Comparison of fuel consumption



- Constant speed
- Variable speed
- Potential fuel savings

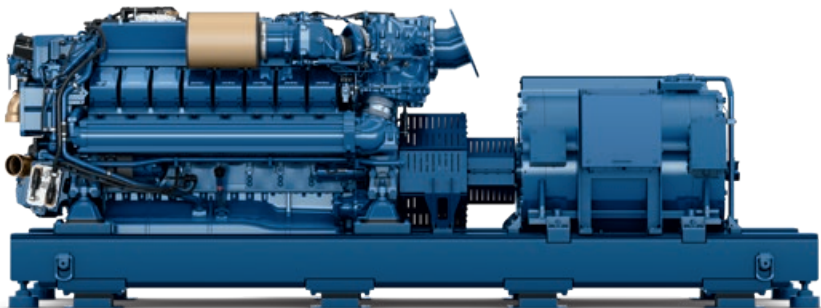
Rev counter showing variable range of RPM



Proven performance for demanding marine applications

Based on *mtu* Series 4000, our variable speed generator sets combine field-proven reliability, extensive operating experience and high power density. They are a robust solution for vessels with demanding and highly variable load profiles.

- Power range from 960 to 3,100 kWe
- Ideal for electric propulsion and auxiliary power in vessels with varying load profiles
- Selected Series 4000 M05RN models also available as variable-speed gas generator sets from 670 to 1,400 kWe



Compact power with maximum flexibility

Based on *mtu* Series 2000, our compact variable speed generator sets combine high power density with a space-saving design and flexible installation options. They are particularly well suited for vessel concepts where space, weight and system flexibility are key.

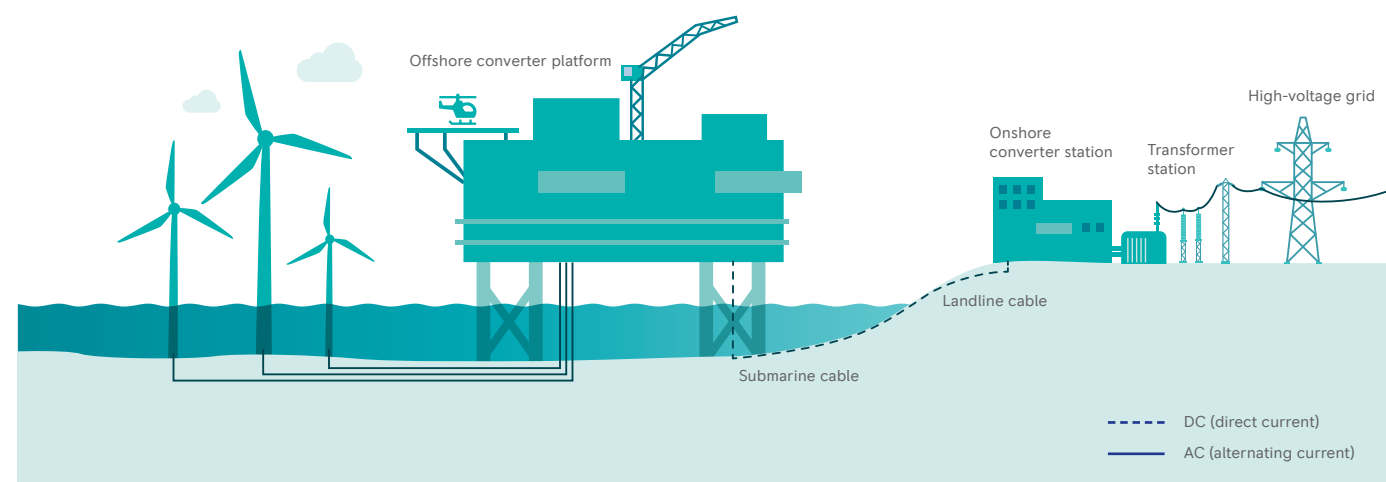
- Power range from 675 to 1,400 kWe for medium duty and up to 1,850 kWe for light duty, e.g. as range extenders for battery-electric vessels
- Compact footprint for space-optimized installations
- Frameless versions available for additional weight optimization
- Designed for easy in-vessel serviceability

Offshore wind converter stations

SAFEGUARDING SEA
WIND ENERGY STABILITY

Innovative grid connection designs enable modern wind energy operations at sea to transmit power to the mainland much more efficiently. Offshore converter stations now play a key role as does the safe, sustainable and reliable supply of power.

That's where our power generation solutions enter the picture.



Our offshore wind energy portfolio comprises engines, generator sets, SCR packages and more.

Leveraging the skills and expertise gained from decades of offshore project experience, **mtu** diesel engines and generator sets are specifically designed to ensure the uninterrupted power supply of offshore converter stations.

Light, compact, rugged and highly efficient, they pack a lot of performance in very little space, making them an excellent choice for auxiliary/emergency backup power on the high seas.

Low emissions

Incorporating advanced selective catalytic reduction (SCR) exhaust aftertreatment technology, **mtu** Series 4000 engines are IMO Tier III certified to meet all relevant local emissions and environmental standards.

All-around support

With service sites located around the world, our team of experts is able to provide 24/7 support wherever and whenever needed, including with our specially trained offshore wind operations staff. In addition to maintenance and repair support, we also offer a range of data analysis as well as remote services.

We specialize in complete, integrated and thoroughly tested power generation solutions from a single source. Everything we develop is designed to ensure optimal long-term performance, thereby prolonging preventive maintenance and overhaul intervals.

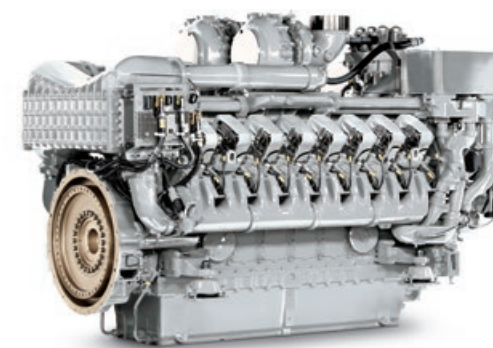
Flexibly customizable

Featuring a modular design, **mtu** generator sets can be customized to seamlessly integrate with virtually every type of offshore converter platform setup. Our comprehensive offshore power generation portfolio also includes compact and highly flexible SCR packages that can be tailored for individual needs.

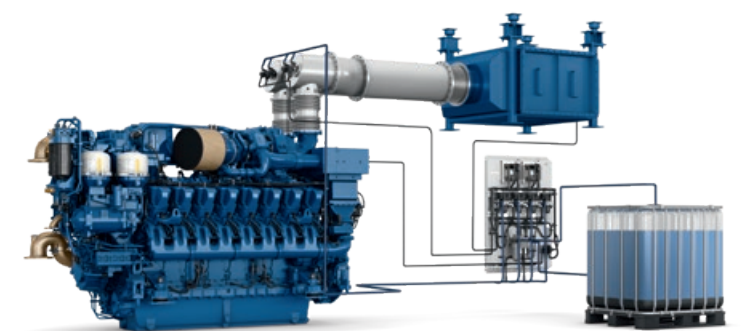
Our offshore wind farm portfolio

- Diesel engines
- Generator sets
- SCR packages
- Documentation of hardware & software configurations
- Offshore wind park crew boats*

* For more on our mobile offshore wind park solutions, see pgs. 12 and 13



mtu Series 4000 P marine engine
for offshore wind and exploration & production



mtu Series 4000 marine generator
set with SCR solution

Marine automation solutions

POWER UNDER CONTROL

06

mtu NAUTIQ PORTFOLIO

THE FUTURE OF MARINE CONTROL

PERFORMANCE & EQUIPMENT HEALTH MANAGEMENT

mtu Go

Track, analyze and improve your vessel operations.

mtu NautIQ Foresight

Our fleet & engine health management system allows you to monitor and have real-time awareness of the technical condition of your vessel from bridge to propeller. The system maximizes the availability of your vessel, and you can even use it to monitor your whole fleet. With **mtu** NautIQ Foresight you can collect and analyze data from **mtu** systems and key third-party components on the vessel, considering additional factors such as navigational data.

POWER AND PROPULSION CONTROL & MONITORING SOLUTIONS

mtu NautIQ Drive

NautIQ Drive systems offer precise control and monitoring for **mtu** propulsion plants. The modular scope of supply offers a selection of local operating panels, compact displays, touchscreen monitors, and propulsion control solutions, in classified or non-classified configurations. **mtu** NautIQ Drive can also be interfaced to third-party systems, or seamlessly integrated with **mtu** NautIQ vessel automation or integrated bridge systems.

mtu NautIQ ePower

Our genset automation solutions enable reliable operation, control and monitoring of onboard power generation on ships.

The latest generation combines a modern, cost-efficient COTS-based design with future-ready technology built to meet cyber security requirements.

VESSEL AUTOMATION AND INTEGRATED BRIDGE

mtu NautIQ Master Unlimited

As an Integrated Platform Management System (IPMS), **mtu** NautIQ Master Unlimited offers optimal solutions for complex vessels requiring highly flexible, redundant, and integrated solutions.

mtu NautIQ Master Advanced

This Alarm, Monitoring and Control System (AMCS) is an entry-level system that offers a reliable and highly cost-effective solution, designed using pre-engineered building blocks and specifically created to deliver COTS (Commercial Off-The-Shelf) solutions for all marine sectors.

mtu NautIQ Master Essential

This Alarm, Monitoring and Control System (AMCS) is a proven, cost-effective solution designed for different types of vessels with straightforward automation requirements. Its compact, modular architecture provides reliable alarm handling, monitoring and essential control functions, while allowing easy integration and future system expansion.

mtu NautIQ Bridge

The navigation equipment and all electronic subsystems necessary to monitor and control the entire vessel can be seamlessly integrated on one platform. There is no need to modify third-party equipment or subsystems when integrating them into **mtu** NautIQ Bridge.



Scan the QR-code for more details about our **mtu** NautIQ portfolio.

mtu NautIQ Master Unlimited

INTEGRATED SHIP AUTOMATION WITH IPMS

mtu NautIQ Master Unlimited is an Integrated Platform Management System and offers the optimal solutions to meet a wide range of requirements for all types and sizes of vessels. Typically used on complex commercial projects.

Integrated Platform Management System (IPMS)

With marine design becoming more sophisticated, and more capability being integrated with fewer people onboard, only proven designs and software functionality can truly meet the demands within modern project time scales and risk profiles. As world experts in the field of integration, we introduce **mtu** NautIQ Master Unlimited, the latest evolution of our powerful IPMS solution, allowing more COTS product integration. It is a true System of Systems capable platform.

This powerful mix of **mtu** NautIQ Master Unlimited distributed processing and highly redundant architecture, coupled to industry standard equipment and protocols allows for a truly supportable platform, with minimal obsolescence risk. This reduces platform cost, integration time and commissioning/installation issues, whilst retaining the survivability and power of the original **mtu** NautIQ Master Unlimited, with its scalability and flexibility in terms of system architecture.



Integrated Vessel Control & Automation

Combines multiple operator workstations, remote data collection and control units, propulsion control (PCS) and automatic power management system (PMS) in one integrated environment. This enables centralized monitoring and control of essential vessel systems while supporting efficient and coordinated operations.



Resilient & Reliable System Architecture

A multi-level redundant network architecture, including fibre optics, ensures reliable communication and system availability across the vessel. Together with the Damage Control System (DCS), it supports operational continuity and system resilience even under demanding conditions.



Operational Readiness & System Intelligence

Equipment Health Monitoring and Dynamic Analysis provide continuous insight into system condition and performance, helping operators identify issues at an early stage. The integrated On Board Training System (OBTS) additionally supports crew readiness and familiarization directly onboard.

mtu NAUTIQ MASTER ADVANCED

mtu NautIQ Master Advanced is an entry-level alarm, monitoring and control system (AMCS) that provides a reliable and highly cost-effective solution. Based on pre-engineered building blocks, the system offers built-in expansion capabilities to support future requirements. A range of display options is available to meet specific operational needs and console design requirements.



Cost Efficient

- Placing Remote Terminal Units (RTU) near the process reduces cabling
- Pre-engineered solution reduces engineering costs
- Self-diagnostic features help to improve maintenance scheduling



Flexible

- Option to interface with external systems
- Modular design allows for customisation
- Up to 50% expansion available within each RTU



User-Friendly

- Unified interface across devices
- Intuitive HMI
- Simple modular design

mtu NAUTIQ MASTER ESSENTIAL

mtu NautIQ Master Essential is an Alarm, Monitoring and Control System (AMCS) providing a proven and cost-effective vessel automation solution for yachts and other vessels with straightforward automation requirements. Its modular architecture delivers reliable monitoring, alarm handling and essential control functions while allowing future system expansion.



Cost Efficient

- Proven off-the-shelf automation solution
- Reduced engineering, installation and commissioning effort
- Lower lifecycle costs through reliable, easy-to-maintain system design



Flexible

- Modular architecture tailored to individual vessel requirements
- Seamless integration with third-party equipment and unique feature for **mtu** systems deep monitoring
- Scalable platform supporting future upgrades and expansion



User-Friendly

- Enhanced and intuitive HMI for efficient vessel operation
- Clear alarm management with comprehensive system overview
- Easy operation and maintenance throughout the vessel lifecycle



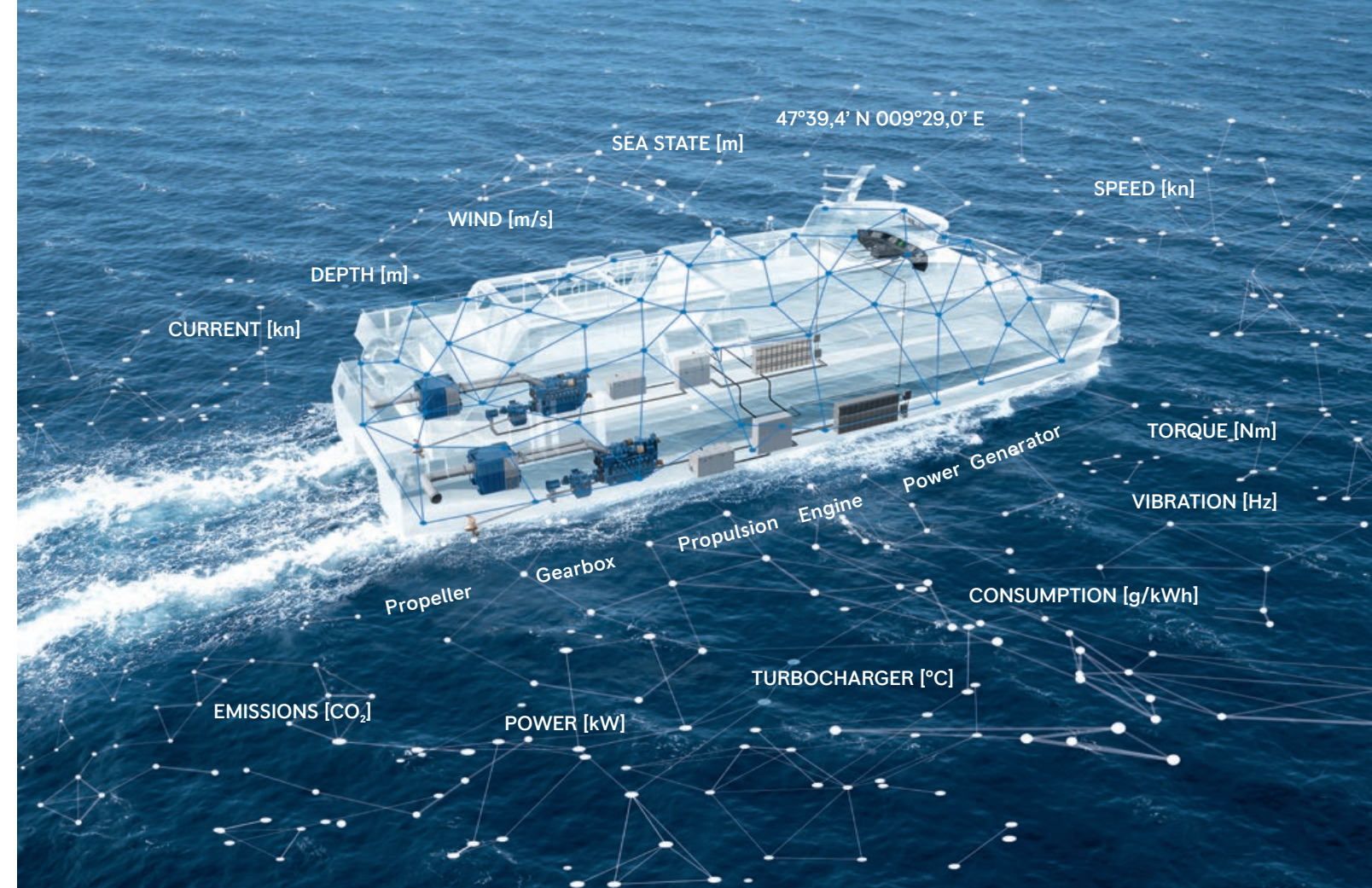
mtu NautIQ Foresight

VESSEL INSIGHTS FROM BRIDGE TO PROPELLER

Our Fleet & Engine Health Management System allows you to monitor and have full control over the technical condition of your vessel from bridge to propeller.

The system maximizes the availability of your vessel, and you can even use it to monitor a whole fleet. By providing system status at a click, **mtu** NautIQ Foresight makes availability management easier than ever before. It provides support for the maintenance and upkeep 24 hours a day, 7 days a week – and thus helps minimize vessel downtime.

With **mtu** NautIQ Foresight you can collect and analyze data from **mtu** systems and third-party key components on the vessel, considering additional factors, such as navigational data.



Improved vessel availability

It's all about uptime. Real-time data analytics combined with artificial intelligence and machine learning techniques reduce unplanned downtime and maximize asset availability. The real-time sensor data on vibration, pressure, and temperature is compared with long-term figures for the respective operating conditions and ideal characteristic curves. The results enable optimum operation.

Optimized lifecycle costs

Maximized availability and peaked performance optimize lifecycle costs. Due to the improved plannability, downtimes are reduced to a minimum and unplanned maintenance is turned into planned maintenance.

Peaked performance

Monitoring fuel oil consumption and measuring torque is the first step to understanding the state of the vessel. This information, combined with the health monitoring data, allows you to analyze and improve the vessel's performance. Weather and navigational data let you draw conclusions about factors such as hull condition. Additionally, the optimal speed can be determined. This performance monitoring system enables fuel cost optimization and contributes to reduced emissions.

Reduced emissions

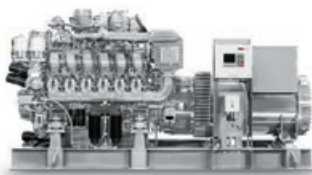
mtu NautIQ Foresight bundles all operational data in one system. The combination of engine, power generation, navigational and weather data enable in-depth analytics of the vessel's movement and its performance. In the next step, the operation of the vessel can be adjusted to run in a more efficient and environment-friendly manner.

mtu NautIQ ePower

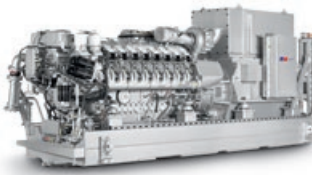
AUTOMATION FOR ONBOARD POWER GENERATION

mtu NautIQ ePower is an automation system for onboard power generation plants, offered in both classified and non-classified configurations. The modular system design enables optimal matching of the diesel engine and generator to diverse onboard operating conditions. It is designed for **mtu** Series 2000 and Series 4000 engines.

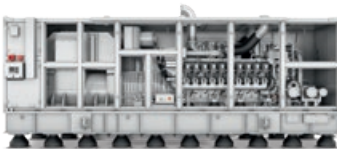
mtu NautIQ ePower offers the following applications



Onboard
service power
non-classified
and classified

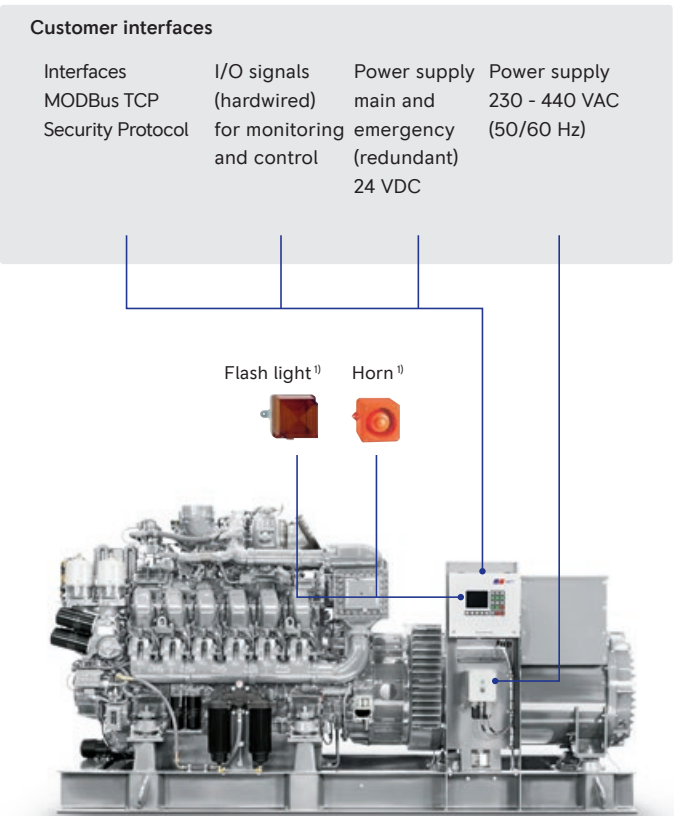


Diesel-electric
propulsion plant
non-classified
and classified



Special
applications
- MIL
- Shock
- EMC etc.

mtu NautIQ ePower automation system is an innovative high-end developed system with LOP (Local Operating Panel).



SUSTAINABILITY MEETS
PERFORMANCE.

07



Hybrid system solutions

HYBRID DRIVE – THE BENEFITS OUT OF TWO WORLDS

The **mtu** Hybrid PropulsionPack offers different propulsion modes for each operation condition which will cause a perfect power availability in every scenario possible.

1 Silent cruising



Imagine a vessel which moves like by magic, with no noise, no vibration & no air pollution resolving into superior comfort. The silent mode offers your customers an enjoyable journey trough costal or nature reserve areas without the side effects of a conventional propulsion system.

2 Performance



Combining the best out of two different worlds, the high torque of an electric machine and the superior power density of an combustion engine, is resolving into an compact high performance system. Even the toughest jobs are not an obstacle for you and your crew.

3 Eco-friendly cruising



Live the green image and be a decarbonization pioneer within the commercial shipping community. Participate of the newest Rolls-Royce developments to lower your carbon and your air pollution footprint.

Hybrid system solutions

QUIET. CLEAN. SMART. **mtu** HYBRID PROPULSIONPACK

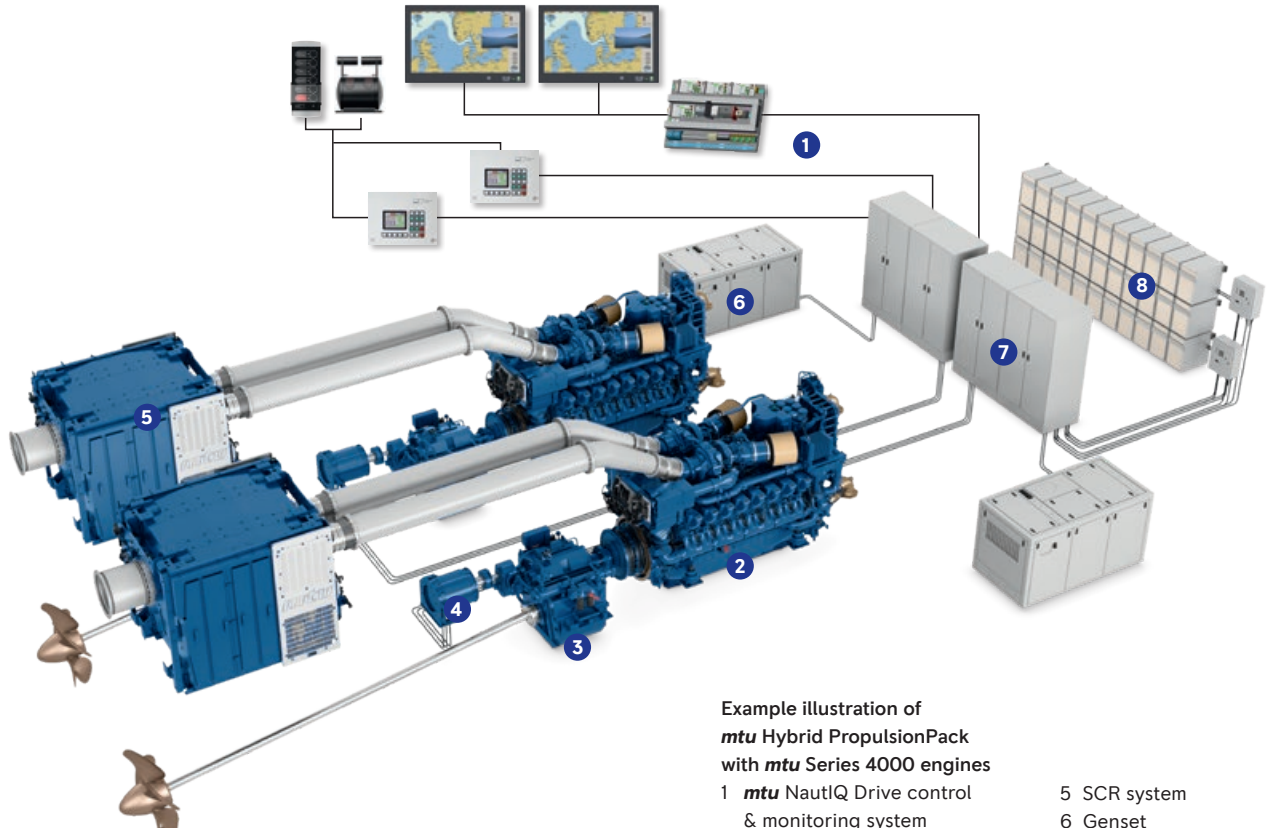
Get the best of two worlds in green, modular and flexible propulsion efficiency. Not only does hybrid power reduce onboard noise levels, emissions and vibrations, it also improves dynamics and comfort.

 Intelligent, intuitive vessel control thanks to cutting-edge automation

 Seamless component integration

 Wide-ranging propulsion options

 Silent, emission-free operation in sensitive areas



Example illustration of **mtu** Hybrid PropulsionPack with **mtu** Series 4000 engines

1 **mtu** NautIQ Drive control & monitoring system

2 **mtu** Series 4000 engine

3 Gearbox

4 Electric machine

5 SCR system

6 Genset

7 Power distribution unit

8 BatteryPack

Emission reduction technologies

WORKING WITH A
CLEAR CONSCIENCE

Operating on the water means working in a sensitive environment. Assuming responsibility for protecting the water and air and keeping them clean is second nature to us. We have always played a leading role in developing environmentally friendly engines and, in particular, solutions for reducing emissions. Since we have all the relevant key technologies bundled within our company in addition to our core business of building engines, we have been and will always be leaders in this field. Our engines are an embodiment of the most state-of-the-art technology available.

SCR solution

Knowing that installation space inside engine rooms is limited, we developed an airless selective catalytic reduction (SCR) solution that is particularly compact and maintenance-friendly. In addition to doors that enable easy access for SCR catalyst replacement, the system features integrated diesel exhaust fluid (DEF) dosing directly in the SCR. By eliminating the need for a separate DEF mixing pipe, it provides tremendous pipework flexibility between the engine and the SCR box. The space needed to fit the exhaust gas aftertreatment is kept to a bare minimum. Ammonia slips are prevented by a closed loop regulated control system.

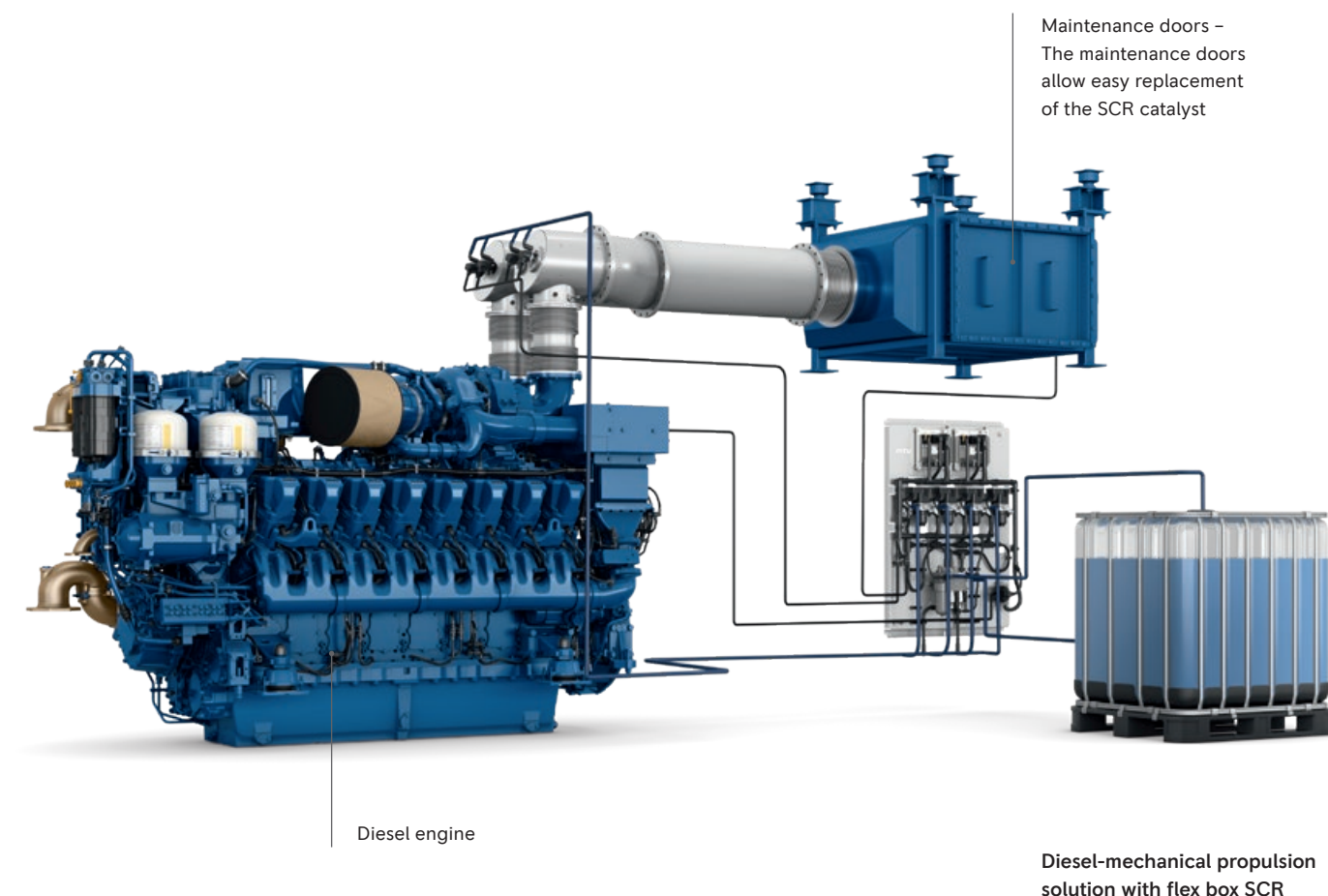
Besides the exhaust emissions related features, our SCR system also reduces noise.

SCR – the ideal solution for the marine world

When using EGR (Exhaust Gas Recirculation) technology, the quality of the fuel is essential. Fuel with more than 15 ppm sulfur will lead to the formation of sulfur acid in the EGR cooling process. Sulfur acid will cause substantial engine failures over time. As many vessels operate worldwide, especially in the offshore service and supply business, **mtu** evaluates SCR as the preferred solution to maintain reliability of our engines and the safety of your vessel and crew. SCR technology allows operation with lower fuel quality.

Developing all major key technologies inhouse like, SCR, EGR, turbocharging and common rail fuel injection, means we are able to shape the ideal solution to meet IMO III and EPA Tier 4 emissions regulations.

At **mtu** we treat EGR as the ideal solution for applications like mining or oil&gas onshore, but within the marine world we are convinced that SCR technology grants much higher availability and component lifetime.



Compared with the previous **mtu** cube box, the flex box SCR can be installed horizontally, vertically, upright, or suspended—giving shipyards and operators maximum installation flexibility and seamless integration into any engine room layout.



The images highlight the progress: the new flex box SCR solution, with its space-saving design and flexible mounting points, compared to the previous system.

mtu SERVICE SOLUTIONS – A LIFETIME OF VALUE

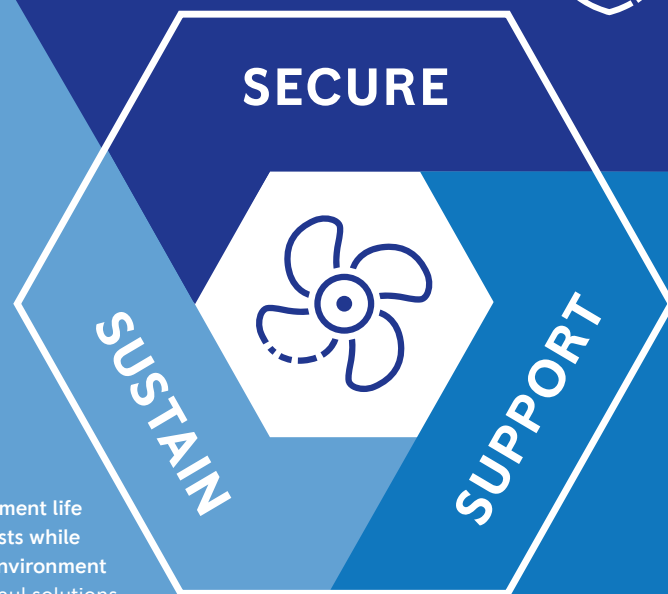
08

Our service solutions for engines and propulsion systems are designed to maximize performance, extend life, and provide expert support. These solutions are categorized into three main value propositions: Secure, Sustain, and Support.



Enjoy peace of mind with maximizing asset performance and reducing operational risks

- Extended coverage
- **mtu** ValueCare Agreements
- Digital solutions



Extending equipment life and reducing costs while protecting the environment

- Reman/overhaul solutions
- New exchange engine
- Upgrades and refits



Expert service from a reliable partner to keep operations running smoothly

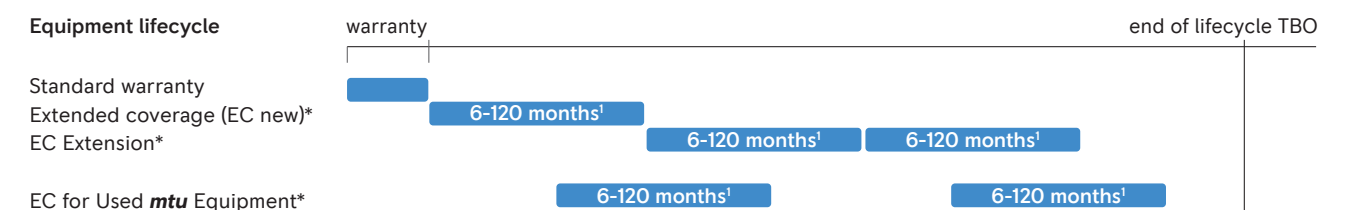
- Maintenance & repair
- Genuine spare parts & consumables
- Training
- Support services

Extended coverage

PROTECT YOUR INVESTMENT



With Extended coverage, you can be assured that the costs of unplanned repairs are covered, with service performed by **mtu** certified technicians – upholding resale value and ensuring longterm confidence in your **mtu** investment.



Costs covered²

In case of a corrective claim:

- Material,
- Labor and
- Travel cost (if applicable)

Covered equipment

Engine or entire system.
Optional:
Exhaust aftertreatment, Gearbox, Automation etc. (only RRS scope of supply)

Place of performance

4 Options³ available, usually "Worldwide" at the next harbor to an authorized **mtu** service partner

Deductible

Customer can choose between no deductible or 750 EUR/USD per product per repair visit, to reduce the EC price



Protection
against unexpected repair costs (corrective maintenance)



100 % genuine
Exclusive use of original and **mtu** remanufactured parts



Discount
when ordering prev. maintenance excl. from any **mtu** service center



Professional Repair
by **mtu**-certified technicians



Enhanced resale value
when coverage is transferred to a new owner



Flexible packages
to suit your needs (e.g. 1-10 years duration)

* See your EC Terms & Conditions for details

¹ Maximum validity period limited by extended coverage end date / EC operating hours / engine lifetime (TBO), whatever occurs first

² Exclusions: Removal & reinstallation of engine, gearbox etc. and all preventive maintenance

³ Place of Performance: Worldwide, USA/CAN, EU or up to three individual countries are possible

mtu ValueCare Agreements

FOCUS ON YOUR OPERATIONS LEAVE THE REST TO US

You've got a tough job. With us as your partner, you'll get the power, performance and peace of mind to get it done right. The digitally connected power systems of our ValueCare Agreements make it easy to keep your business running smoothly and reduce total cost of ownership by maximizing uptime, optimizing lifecycle costs and helping you avoid equipment-related business disruptions through preventive maintenance.

Service solutions designed around your priorities

mtu ValueCare Agreements make it easy to optimize lifecycle costs, maximize uptime and devote more time and resources to your core business, with tailored solutions to move your business forward.



BRONZE

Ensure parts availability
and price stability



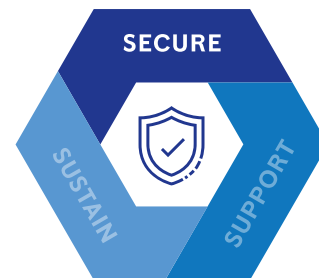
SILVER

Eliminate unexpected
maintenance costs



GOLD

Maximize operational
uptime



Digital solutions

YOUR POWER. YOUR SERVICE. CONNECTED.

**mtuGo**

Delivering actionable insights through digital solutions



Our cloud-based **mtu Go** portfolio aims to enhance your equipment performance through asset-related tools and services. For that, we have tailored packages suited to your needs.

**Connect all your equipment**

Data collection from your fleet, asset,
system and engine

Connectivity is the basis for all the advantages of digitally supported service. Using our edge software connected to the control unit, you and your service network can monitor relevant deviations from the optimum conditions remotely. We offer several ways to collect data, including the creation of interfaces to already existing data sets. In doing so, we always adhere to the highest data privacy and security standards of our industry.

Access your data

- Remote monitoring, available for individual assets, as well as complete fleets worldwide
- Data privacy and security to the highest industry standards

**Asset Management**

Access comprehensive real-time and recent performance data for all assets worldwide, conveniently from one centralized platform

With the **mtu Go** platform, predefined users, such as on-site technicians or managers, can view the system data and perform initial analyses by using diagnostic tools. By accessing the same information, your service network can provide fast support in handling alarms and planning necessary maintenance together with you.

Keep track of your data

- All important data and alarms available at a glance for efficient fleet monitoring
- Intuitive and clear design for easy operation
- Visual comparison of data using the diagnostic tools for initial analyses

**Equipment Health Management**

Digital solutions for your detailed data analysis on necessary actions

Supported by **mtu Go** your Service Network is able to analyze all relevant data from your equipment and compare it with data sets from other systems. From this we together can proactively derive recommendations for action. Enhance operational continuity and prevent equipment failure by leveraging proactive monitoring services. Utilize analytics to identify critical states and trends, ensuring optimal availability.

Packages coming soon (under development)

- Maintenance Management: Forecast, plan, and execute service tasks based on maintenance schedules and operating hours
- Guided Troubleshooting: providing a user-friendly and guided fault resolving experience for your technicians

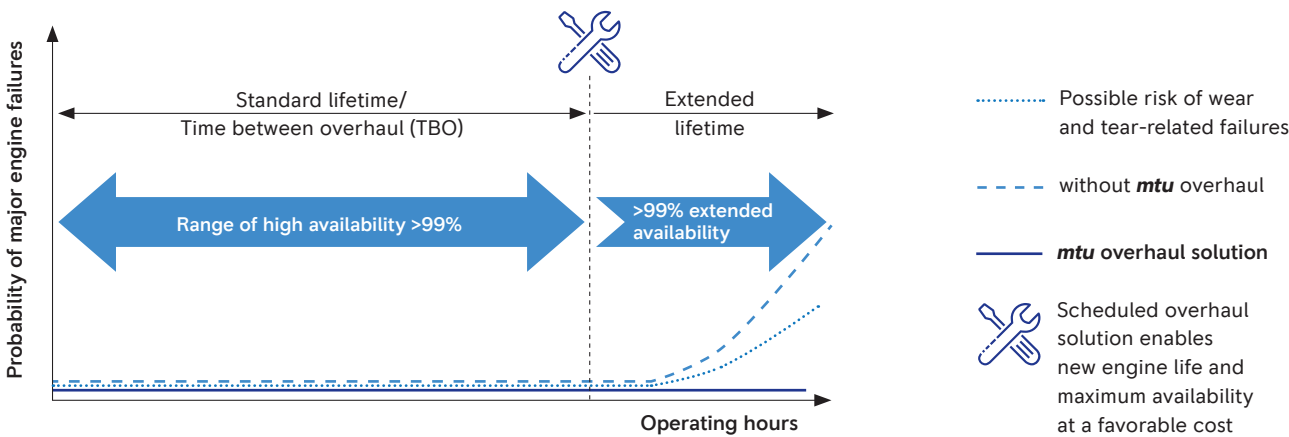
Reman/overhaul solutions

WHATEVER YOUR CIRCUMSTANCE — WE’VE GOT YOU COVERED

mtu engines are built to last thanks to high engineering standards and an unwavering commitment to service and support. At the end of its first service life, we also offer solutions to refurbish your engine to like-new factory condition.

Provided by the same experts that originally built your engine, **mtu** reman and overhaul solutions make it run like new again. How? By delivering the same high standards of performance, service life and quality as with new **mtu** products. What’s more, we offer fixed pricing and turnaround times up front along with a full factory warranty.

In addition to our factory remanufacturing offer, you can also choose from three different overhaul solutions, including in-situ options directly inside the ship. While the decision for a reman or overhaul solution is determined by a variety of factors, including the engine series and type, you can always count on one thing: high-quality results.



mtu reman solutions – optimizing uptime and efficiency

Exchange and save
To reduce downtime, many **mtu** engines can simply be exchanged for a factory remanufactured unit – without waiting. When you return your original core, we give you credit based on its technical condition. We even handle the total costs to replace it, thereby protecting you from any unforeseen costs. We also offer swing engines to keep your operation running if servicing requires engine removal. **mtu** reman is available for the **mtu** Series 2000 and 4000.

Environmental benefits
Restoring end-of-life products rather than discarding them minimizes the need for raw materials and energy to produce new parts. It also significantly reduces waste and CO₂ emissions. This efficient use of resources and energy not only benefits the environment. With many engines, the process can be repeated multiple times to greatly extend the life span of these non-renewable products.



Your engine has a unique history that takes into account everything from its specific operating conditions to how it integrates with your existing equipment. In order to safeguard its continued reliability and performance, a customized overhaul at an **mtu** factory is of vital importance.

mtu factory overhaul solutions are also conducted by the experts that originally built the engine. The same rigorous standards as with our factory remanufacturing process are applied. In essence, we breathe new life into your engine, restoring it to a like-new condition. Whether for **mtu** Series 183, 396, 493, 538, 595, 652, 956 and 1163 or

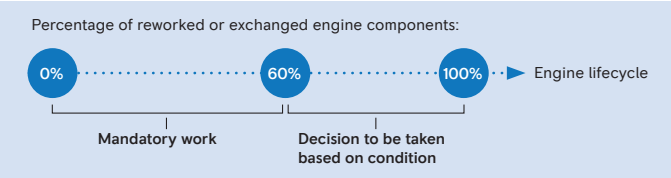
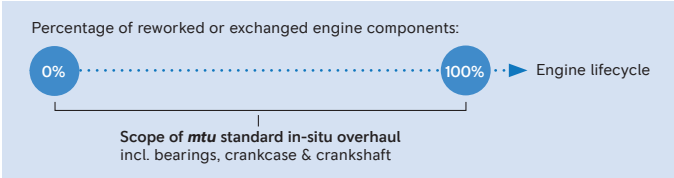
for **mtu** Series 2000 and 4000, you can expect an overhauled product that delivers the same high level of performance, service life and quality as a new one. From the gearbox to the automation, electronics and loose parts (e.g. oil cooler), the entire unit is fully restored.

mtu in-situ overhaul solutions directly inside the ship – saving time and costs while benefitting the environment.

In addition to factory-based overhauls, we also offer in-situ overhaul solutions directly inside the ship. Our in-situ overhaul solutions are ideal when circumstances do not allow engine removal from the vessel. With our in-situ options, you can choose between a comprehensive standard overhaul or a more basic, condition-based service.

mtu standard in-situ overhaul
This comprehensive offer covers the replacement, overhaul and/or reconditioning of all engine components. The work performed fully complies with overhaul manual and maintenance specifications. The engine’s service life is extended by a full cycle before the next scheduled overhaul.

mtu condition-based in-situ overhaul
With this more basic in-situ offer, replacement and overhaul of a defined scope of parts and components is mandatory. A list of other parts and components are also examined to determine whether to overhaul, exchange or continue using them. This option can potentially reduce the work scope, downtime and costs.



Support services

DEMAND GENUINE

Only we can guarantee genuine spare parts that are designed, tested and approved specifically for **mtu** engines and systems to reach maximum uptime.



Genuine parts maximize performance, prolong engine life and meet today's strict requirements (e.g. emission regulations), all thanks to years of intensive research and development, quality audits, and progressive modifications — making them the best possible match for your engine and guaranteeing state-of-the-art technological fit. We offer a supply chain management, optimizing your purchasing and ordering processes.

Take advantage of broad benefits of *mtu* genuine spare parts:

- Engineered to secure high engine reliability and availability
- Value sustainability of your equipment / the only parts that live up to our standards
- Factory / OEM warranty coverage incl. professional service support
- State-of-the-art Parts Logistics Centers

Non-genuine parts are simply not worth the risk of endangering your mission.



THE VALUE OF PROFESSIONAL TRAINING

Count on our experience and expertise

Correct training is the best way for operators and maintenance technicians to become proficient with **mtu** engines and systems so they can get maximum efficiency from the equipment. It is essential for the reliable functioning of the systems, maintaining the value of the investment and preventing breakdowns.

Whether you need operators to learn how to use the equipment effectively or are developing your own on-site maintenance capabilities, count on our experience and expertise to set you up for success.

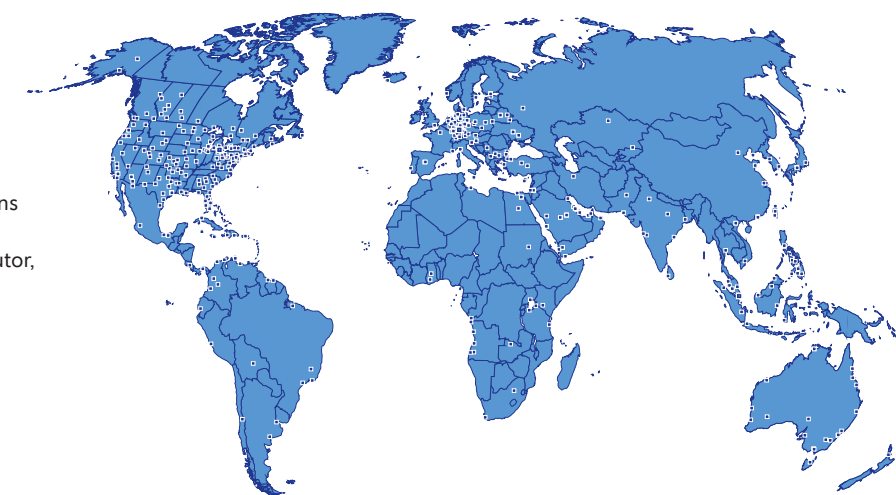


Whenever and wherever you need expert support, our specialists are available.

Our global service network of more than 1,200 locations – backed by our cutting-edge parts logistics centers – provides you this assurance. To find your local distributor, visit www.mtu-solutions.com.

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