Systems Solutions

You define it.
We realize it.

For us, being your partner means: We do not just work for you first and foremost, we work together with you. From the very beginning onwards, we are at your side. Together, we define the mission, the objective, the requirements. And together, we develop the solution which is customized for you: From an individually tailored propulsion system to a perfectly fitting after-sales package. The basis for this is having all core competencies bundled within our company as well as benefitting from decades of practical experience. From system engineering to implementation, from operation and maintenance to major overhaul of your MTU propulsion: Trust MTU as your powerful and reliable partner.

Systems Solutions

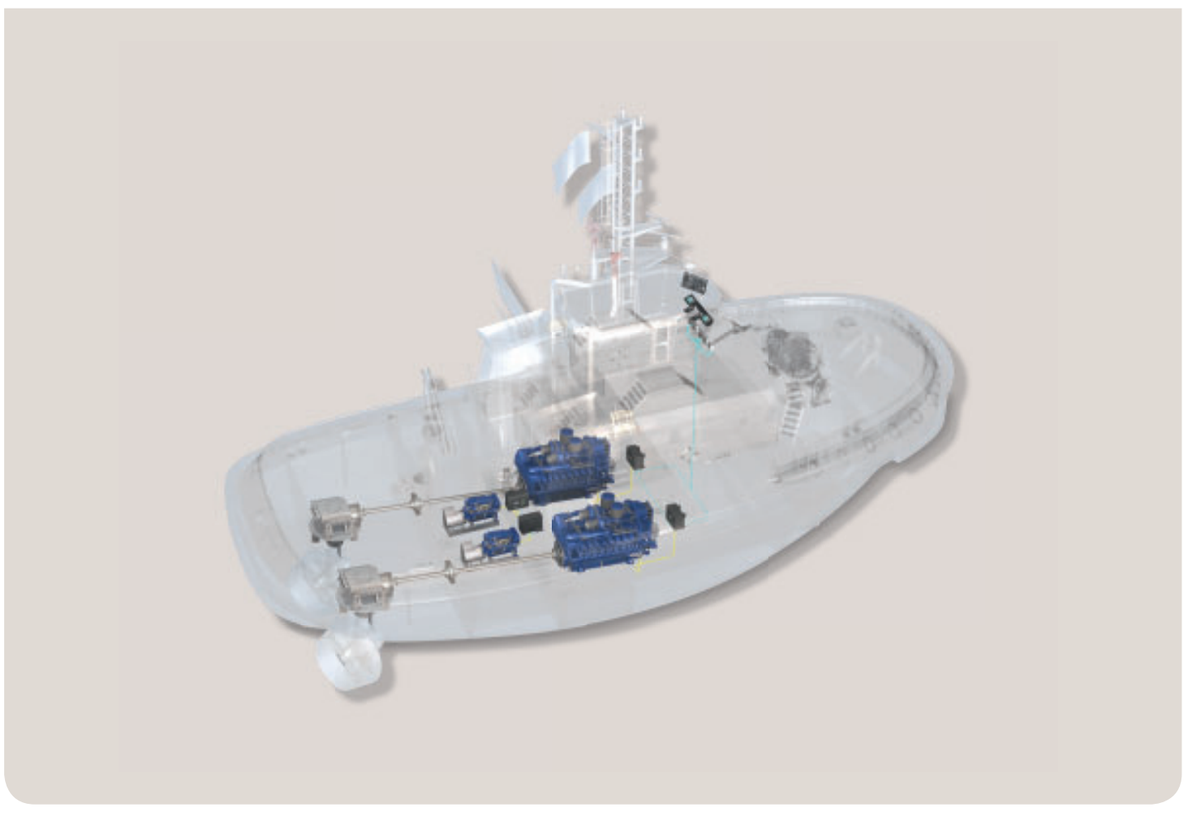
Diesel-mechanic propulsion systems

MTU delivers diesel-mechanical drive propulsion systems – comprised of an engine, coupling, and transmission – packaged as a complete series system. The diesel engine's power is either applied directly to the ship's propeller or through a transmission.

The system can also be upgraded to included other drive components, such as the shafting and a propulsor, if so desired. Whether waterjet, fixed pitch propeller, controllable pitch propeller, Voith Schneider, or any other type of propulsor – MTU has the expertise to integrate it into the complete system in the optimal way.

In addition, MTU offers matching accessories, such as:
– Fuel treatment plant
– Coolant pre-heater
– Lube oil priming pump
– Exhaust muffler

Two diesel engines directly power two rudder propellers – either fixed pitch propellers (FPP) or controllable pitch propellers (CPP). The engines are monitored by the automation system. In addition to the main engines, onboard power is also supplied by the gensets.

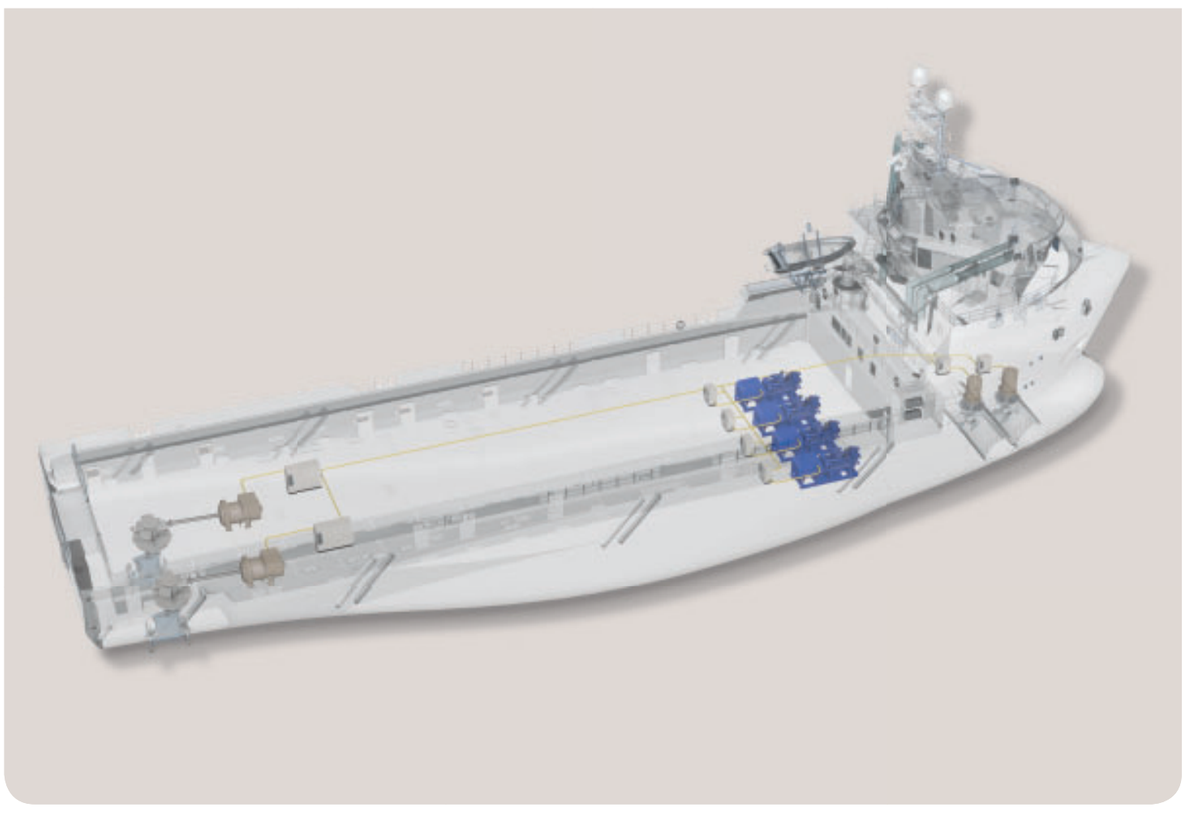


Systems Solutions

Diesel-electric propulsion systems

In addition to diesel-mechanical propulsion, MTU offers gensets for diesel-electric propulsion systems and onboard power generation based on Series 60, Series 2000 and Series 4000 engines. In this case, the mechanical energy produced by the diesel engine is converted into electricity using a generator, and then transmitted to the ship's propellers – with a range of benefits:
– Highly fuel-efficient
– Lower emissions
– High operating safety through the use of multiple gensets, in most cases
– The design of the installation, its placement on the ship and its operating modes are all highly flexible
– Low life-cycle-costs
– Compact design
– Reduced vibrations during operation through double-elastic mounted systems
– Reduced noise during operation through the use of high-quality insulating capsules

Four marine diesel generator sets provide electrical power to the electrical-driven propellers and to the onboard power supply. The marine generator sets are monitored by the automation system.



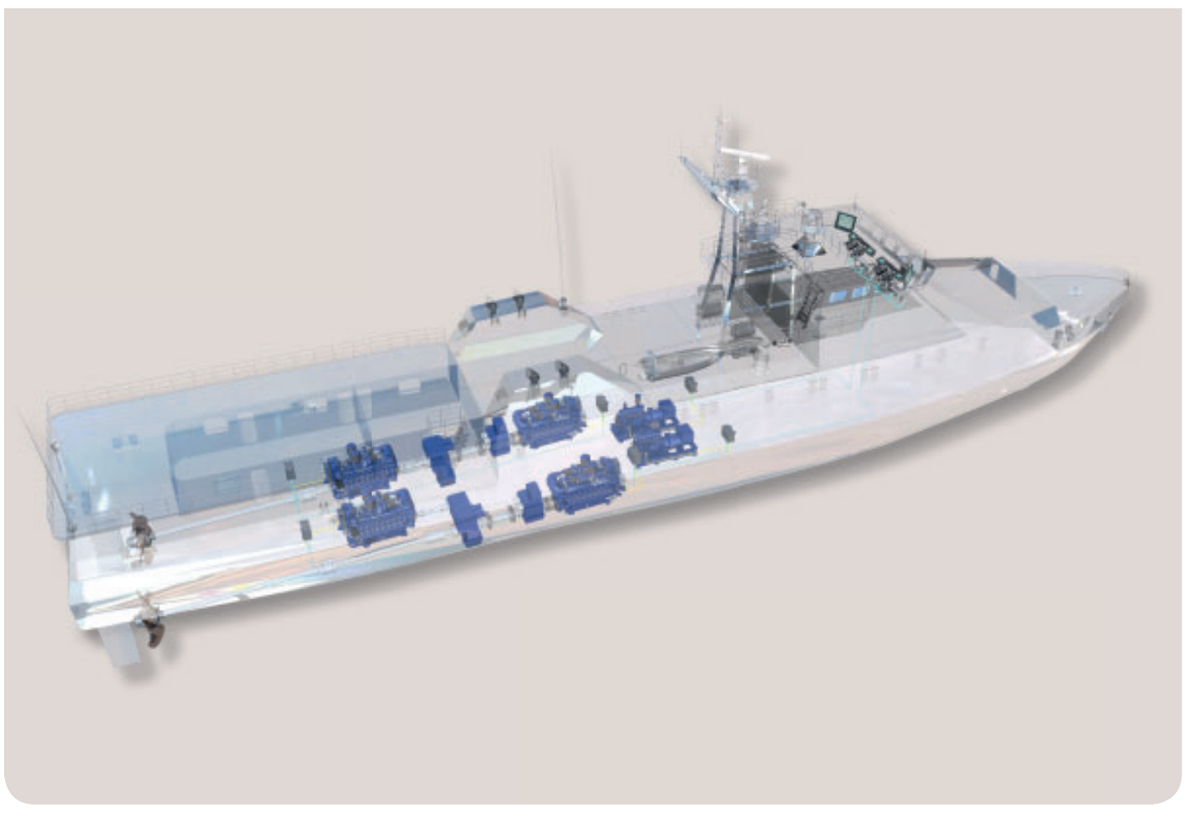
Systems Solutions

Combined Propulsion Systems

In some cases, combined systems with several diesel engines or hybrid propulsion systems are the preferred propulsion systems for commercial vessels. With our long-time expertise, we engineer the propulsion systems for your specific application. All the components – engines, gas turbines, gearboxes, automation and accessories – come from one source and are combined into an integrated complete system.

Four diesel engines power two controllable pitch propellers (CPP) via four main gearboxes (two for each side). Adapted to each operation mode, the vessel can always be operated in the most economic way – either with two or four engines.

The propulsion system is controlled by the automation and control system.
In addition to the main engines, onboard power is also supplied by the gensets.



Noise Reduction Technologies

Reducing noises. Raising comfort.

Squaring the circle
The reduction of sounds and vibrations that are inevitably caused by engines, pumps, and propellers in operation is something that is requested for different reasons. On the one hand, certain special ships require the sound which is propagated into the water to be reduced to a bare minimum. On the other hand, everyone wants to have the least amount of stress possible while working on board, including stress caused by noise.

With well-engineered concepts for noise reduction on board, MTU has a number of possibilities at its disposal to fulfill both the desire for more power and the need for optimum comfort. Running at over 2000 rpm, MTU engines are perfectly suited for implementing noise-reducing measures. For this purpose, we offer both standard systems as well as complex customized solutions.

Standard mounting concepts
Significant noise reduction can be achieved with our standard mounting systems. Generally speaking, all MTU marine engines are elastically mounted. Here are some typical configurations:
– Flange mounted gearbox, resilient mounts
– Freestanding gearbox; rigid or resilient
– Suitable coupling systems

Customized mounting concepts
For higher acoustic demands, MTU offers complex systems that are customized for the respective vessel in order to fit the needs of the owner. Our proven systems make use of state-of-the-art technologies, utilize special concepts, and incorporate acoustic improvements:

– With the **double elastic mounting system**, the soundproof engine sits elastically on a frame that is also elastic-mounted. This leads to significantly less structure-borne noise being passed into the ship's structure as is the case with single elastic mounts.

– **The innovative active mounting system** combines and complements proven high-quality conventional mounting technologies with special active elements derived from the automobile and aerospace industries. The active element contains the actuators and sensors required for noise reduction. The adjustment and control electronics which are optimized accordingly works on a stand-alone basis that is set up separately.

– Integrating the entire engine into a **sound-reducing capsule** also reduces airborne noise.

Photo courtesy of Wasser- und Schifffahrtsamt Stralsund

Gas-Protected Operation

Built-in safety.

Security - in all circumstances
In order to maintain a high level of safety in dangerous, explosive environments, some engines in the 396, 4000, and 8000 series can be equipped for gas protection around flammable or explosive gasses. Engines are equipped with a safety package that meets with the related operational conditions.

The following demands are thus satisfied:
– Prevention of retro-ignition in the atmosphere (engine is not to function as an ignition source).
– Controlled diesel-engine operation when drawing in high-energy gasses (protection for the engine to avoid overspeed).
– Approval by Germanischer Lloyd (GL).

An engine management system includes the control units for the engine speed regulation, register loading, starting automatic, gas-protected operation including an engine safety stop system that responds if any of the following criteria are present:
– Engine overspeed and engine speed gradient
– Engine oil-pressure too low
– Engine coolant temperature too high
– Engine coolant pressure too low
– Controller failure
– Impermissible operation in gas-protected mode

The following additional shipside measures are to be carried out:
– Exhaust cooling with temperature monitoring
– Exhaust silencer with spark arrestor
– Keel cooling system for engine-coolant
– Flame-retarder in the air-intake ducting
– Sealed engine-room citadel

Emissions Reduction Technologies

Working with a clear conscience.

MTU – a leader in assuming responsibility
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. MTU has 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 space. MTU engines are an embodiment of the most state-of-the-art technology available. Running at above 2000 rpm, they are, in comparison to engines with lower rpm ranges, generally more environmentally friendly and emit less nitrogen oxides. The greenest engines are high-speed engines – and so it is logical that MTU engines comply with all current emission regulations.

Optimizing the combined package
In addition to low emission diesel engines, MTU offers customized exhaust after treatment systems such as:
– Diesel particle filters (DPF) with active or passive regeneration
– Selective catalytic reduction (SCR) units
– Combined DPF+SCR

V

MTU Workboat Automation Systems

Automatically more reliability.

As your systems partner, MTU not only provides you with the perfect workboat engine, but also an automation system which is exactly suited to it. Our systems automatically monitor and control the reliable and efficient operation of your propulsion system in every case, so that you can concentrate on the real important thing: performing your tasks.

Simply perfect: MTU workboat automation systems.

Standard systems – customized to workboats.
MTU standard automation systems are delivered ready-made to be installed in your vessel, meaning they are perfectly matched to your MTU propulsion system. So you get a complete package where everything is just right: not only powerful engine performance, but also maximum efficiency, uncompromising reliability and environmental compatibility.

Following the motto "as comprehensive as necessary, as simple as possible", the new system **BlueVision | NewGeneration** makes workboat automation more convenient than ever before: easy to customize, easy to integrate, easy to operate.

BlueVision | NewGeneration is available both in the straightforward non-classifiable version **BlueVision_Basic | NewGeneration** and in the expanded classifiable version **BlueVision_Advanved | NewGeneration** – meeting different requirements according to boat design and customer budgets. The modular system design allows a flexible configuration; intelligent data bus technology ensures reliable data exchange and reduces cable efforts.
Optimized interfaces between the propulsion and automation systems result in ideal all-round solutions that guarantee you security, efficiency and reliability.

With **BlueVision | NewGeneration** MTU offers you a complete and convenient system solution individually optimized for your ship, as well as comprehensive service – all from one source.

Thanks to "plug & play", the system is as easily installed as it is operated.

Simple interfaces connect the Monitoring & Control System **BlueVision | NewGeneration** with the MTU diesel engine (via EIM) and the gearbox.

All components are type-approved und type-examination tested in shake / vibration / stress tests.

BlueVision | NewGeneration now already contains the proven ZF autotroll for the control of ZF gearboxes with trolling function.

Customer Benefits
BlueVision_Basic | **NewGeneration** and BlueVision_Advanved | **NewGeneration** are automation systems for propulsion plants especially in workboats with MTU Series 2000 or 4000 engines.

BlueVision | NewGeneration offers the following benefits:
- High operational availability and reliability of the propulsion plant
- High flexibility thanks to modular system structure and open architecture
- Simple, classifiable system in line with current directives
- Quicker and easier commissioning via structured user dialogue
- Type-tested components
- Development in accordance with current standards
- Optimized operation and visualization of the propulsion plant
- Uniform spare part concept across all MTU Series
- Global sales and service network
- Self-learning "Improved Crash-Stop" in order to stop the ship as quickly as possible

System features:

- Monitoring of the propulsion plant on commanding control stands and locally (engine, gearbox, as well as propulsion-specific periphery)
- Control of the propulsion plant on commanding control stands and locally (engine and gearbox)
- 1 – 4 shafts
- 1 – 6 commanding control stands
- Fixed pitch propeller
- Interface for remote control systems from external manufacturers
- Classifiable
- ZF autotroll inside

BlueVision_Basic | NewGeneration

Entry at high level.

BlueVision_Basic | NewGeneration is an MTU “non-classifiable” monitoring and propulsion remote control system for MTU Series 2000 and 4000 engines. It incorporates a deliberately simple design and provides a complete basic functionality.
The system is available at particularly favorable conditions and quick to install.

An elementary feature of **BlueVision_Basic | NewGeneration** is its hardware compactness. As the central system component, the Local Operational Panel (LOP) integrates all basic functions available in this version, simplifying installation, operation and maintenance significantly.

This version is delivered with the Color Graphic Display Basic DIS as standard. Besides a dashboard page, the Basic DIS also offers an overview of all relevant measured values as well as an alarm page.

The scope of supply also includes a Portable Operator Unit, enabling the captain to control the ship from up to 4 selected connection points (e.g. for berthing from the stern if the view from the bridge is limited).

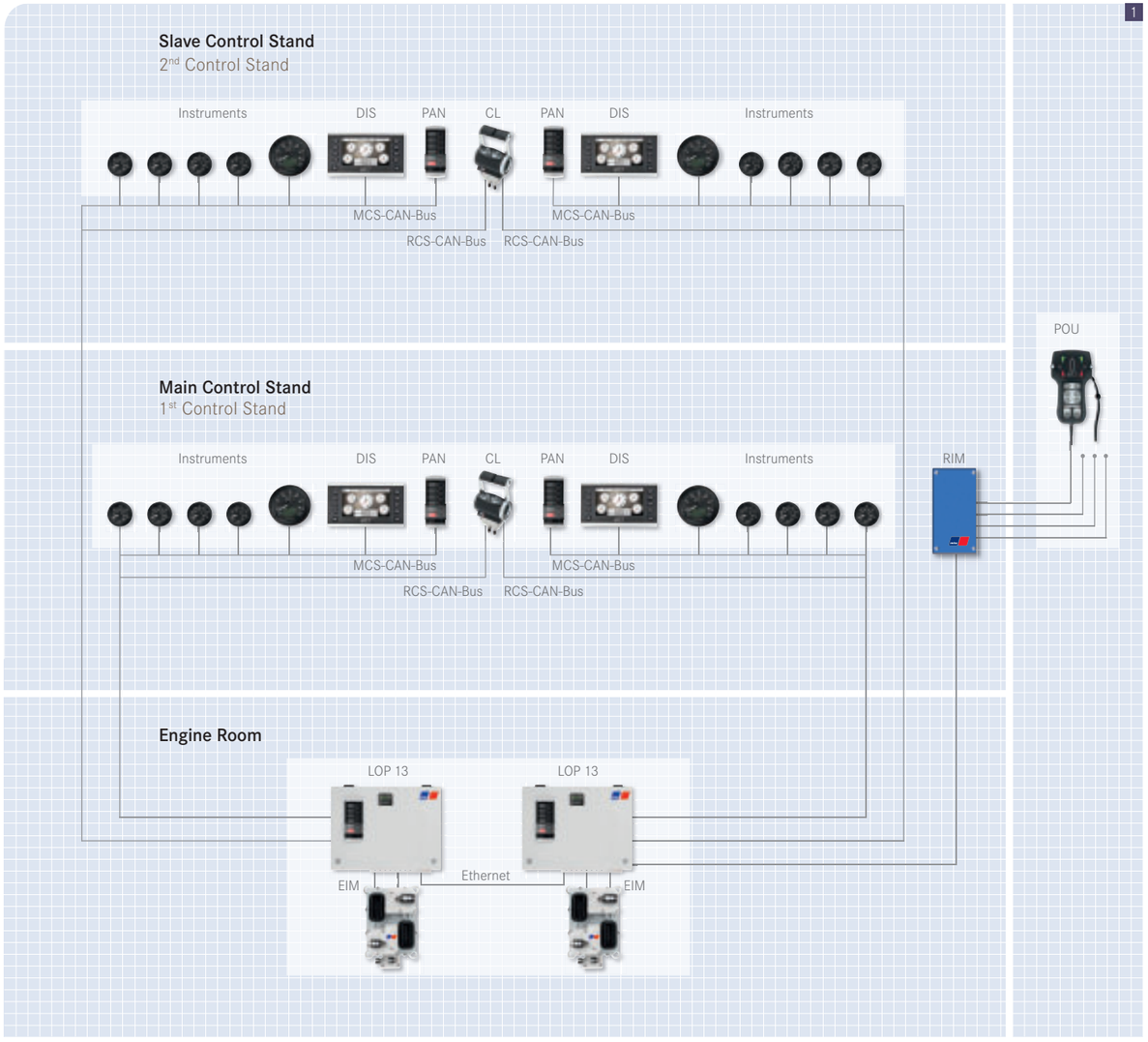
Key features:
– Compact hardware for easy installation and commissioning

– Local Operating Panels (LOP) with basic functionality like start, stop, combined alarm/horn off, for installation in the engine room

– All control stand components installed throughout the ship are connected to the associated LOP via CAN bus

– Integrated ZF autotroll function for ZF gearboxes

1



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1 **Typical scope of supply for** BlueVision_Basic | NewGeneration

2 **Operating Panel (PAN) Control Lever (CL)**

3 **Display Basic (DIS)**

Demanding more. Getting more.

BlueVision_Advanced | NewGeneration is an MTU “classifiable” monitoring and remote control system for workboats, offering a comprehensive standard automation system solution.
It is available for MTU Series 2000 and 4000 engines.

An elementary feature of BlueVision_Advanced | NewGeneration is the system bus. The data transmission between the LOP and the commanding control stands is carried out via a redundant Ethernet based field bus. This ensures an absolutely secure communication on the one hand and highest flexibility of the overall system – also with regard to future upgrading – on the other.

This version is delivered with the Color Graphic Display MFD as standard, which has been optimized for the operation in classifiable ships. Besides various dashboard pages, the MFD also offers the possibility to show all of the propulsion system’s relevant measured values. All active alarms are comprehensively displayed on a separate page.

BlueVision_Advanced | NewGeneration is a classifiable system in line with major classification societies.

Key features:

– Type-approved components, such as LOP, control lever, display and instruments

– Designed according to all major classification societies

– Local Operating Panels (LOP) with color display and advanced functionalities like clutch and speed control

– Data communication via redundant Ethernet ring bus

– Integrated ZF autotroll function for ZF gearboxes

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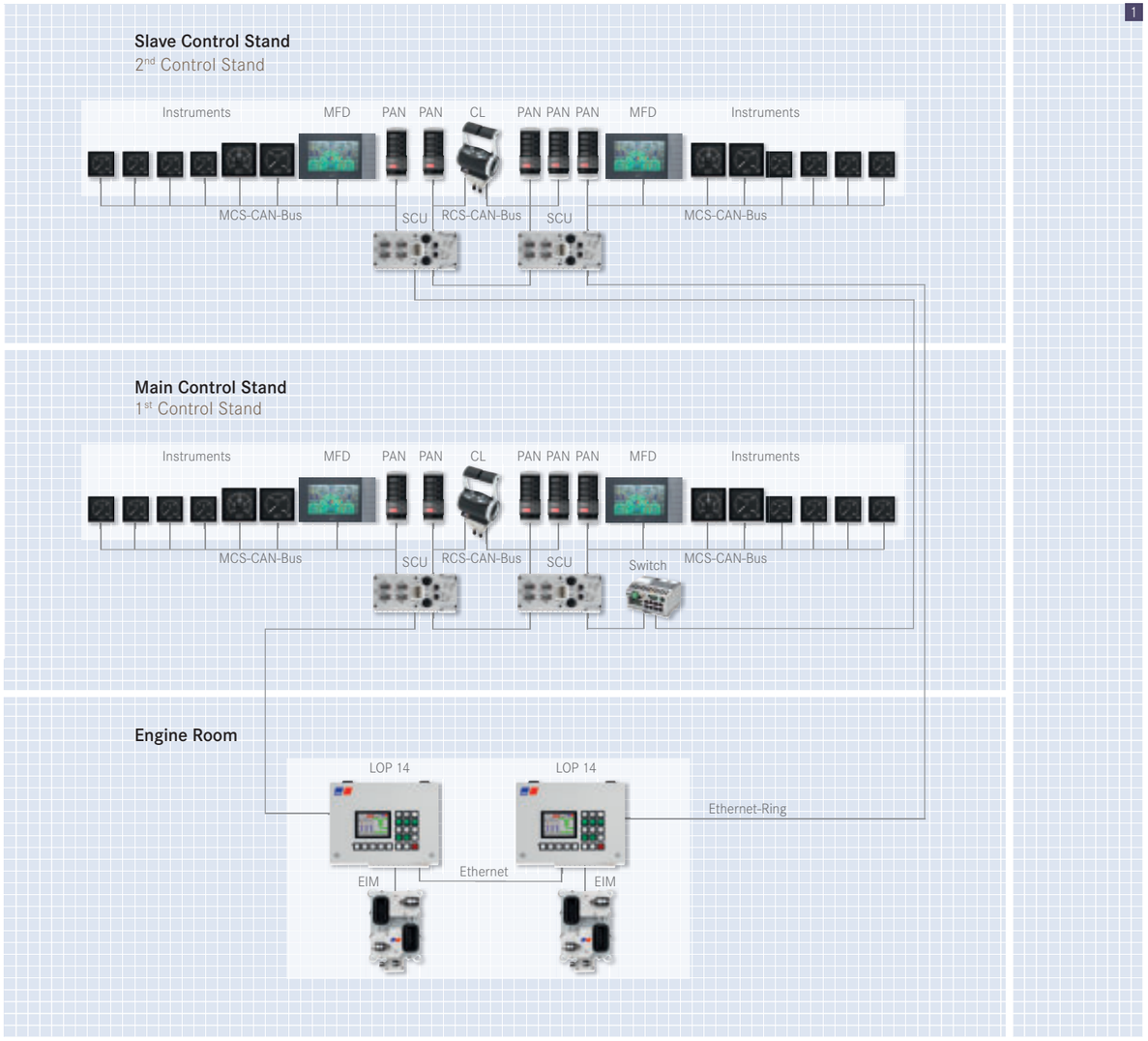

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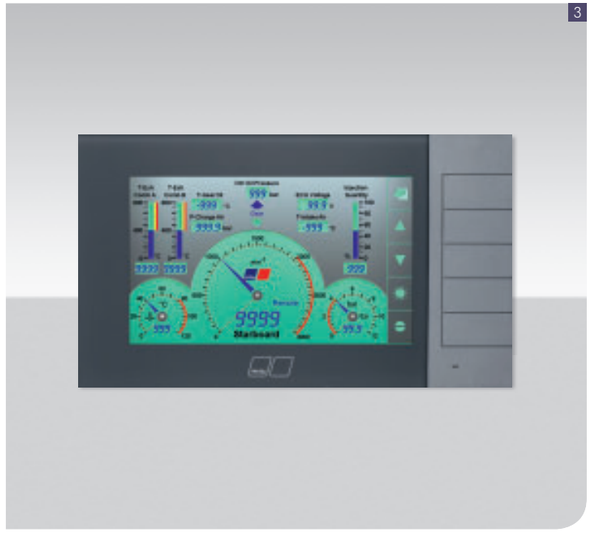


1 **Typical scope of supply for** BlueVision_Advanced | NewGeneration

2 **Operating Panel (PAN) Control Lever (CL)**

3 **Multi Function Display (MFD)**

MTU **Value**Care

Keep going.

We have a strong commitment to our commercial marine customers. With MTU **Value**Care, this focus extends beyond the sale of our engines and systems. From maintenance to spare parts to remanufactured engines, MTU offers a full range of support to help you keep going.

Designed for maximum performance, uptime and value, MTU **Value**Care is a diverse portfolio of products and services that can help you get the most from your equipment.

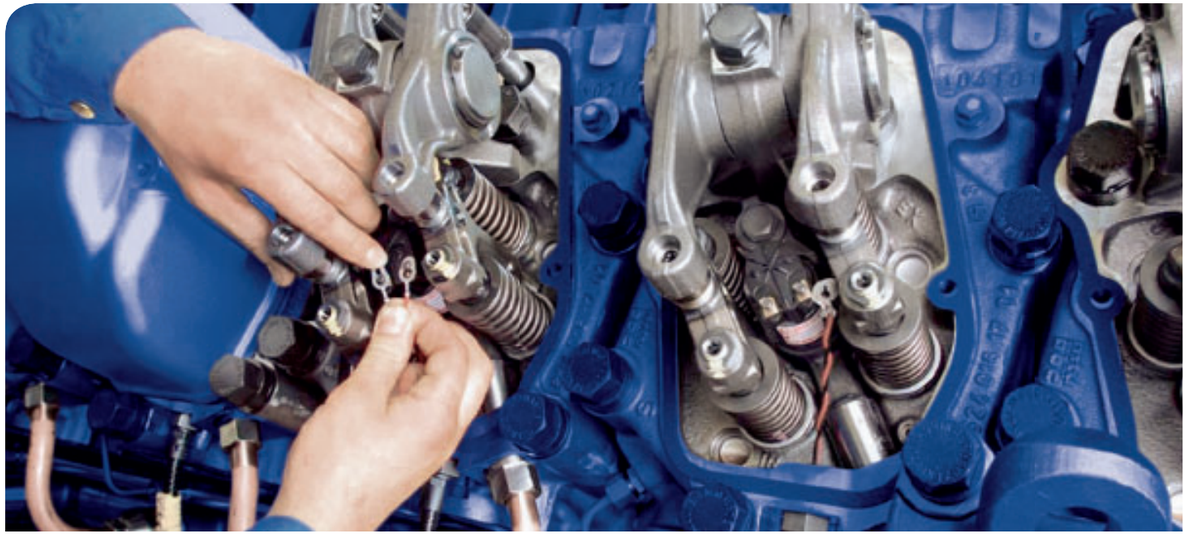
MTU **Value**Care includes three product lines:

– **Value**Service:
Extensive global service and support to help you protect your investment

– **Value**Spares:
Genuine spare parts and top-quality consumables designed specifically for MTU engines and systems

– **Value**Exchange:
Remanufactured engines, systems and service parts engineered with the same high-quality standards as new products

MTU **Value**Care products and services are available anywhere in the world through our extensive network of authorized distributors and service dealers. For more information, please contact your local MTU service center or visit www.mtu-online.com.



ValueService and **Value**Spares

Full support. For full performance.

Engines and systems are put to the test on the open waters. Reliability and top performance are essential throughout the engine's or system's lifecycle. Through **Value**Service and **Value**Spares, MTU provides comprehensive support, customized to meet your unique needs, to protect the value and productivity of your vessel or fleet for years to come.

Professional maintenance plans, designed to your needs.
Customized Care – professional maintenance solutions from MTU – makes it easy to plan the cost of maintenance throughout your engine's lifecycle. The details, terms and periods of each package are precisely tailored to match your individual needs, ensuring cost certainty and maximum availability. Professional maintenance is performed by MTU certified technicians, using only genuine MTU new or remanufactured spare parts.

Coverage tailored to your unique requirements.
Extended Coverage delivers peace of mind by providing coverage of unexpected repairs beyond your standard warranty – tailored specifically to meet your needs. During the extended coverage period, the cost of materials and labor are covered. Repairs with troubleshooting and fault clearance, provision of required components and replacement of failed components are included. To ensure quality, all repairs are conducted by knowledgeable MTU professionals.

Expert assistance. For longer engine life..
Annual Check is a yearly professional inspection of your MTU engines and systems by MTU experts, allowing you to identify and address problems early. It ensures effective preventive maintenance, helping you save on repairs or unexpected downtime, optimizing your engine's performance and longevity. The MTU service technicians inspect the maintenance condition and determine whether any additional maintenance or repairs are required. The process includes visual engine inspection; test run and leak check; on-site engine oil and coolant analysis; and diagnostic evaluation and reporting.

Monitor your engines activity, no matter where it is.
Save valuable service time and make informed operational decisions quickly with Remote Services. This powerful diagnostic solution displays a record of your MTU engines and systems activity in near real-time or at predetermined intervals through a secure Internet connection. Important engine data such as oil temperature, current location and operating hours can be conveniently retrieved for analysis – even from thousands of miles away .

Know your engines and systems, inside and out.
From timely preventative maintenance to efficient diagnostics and repair, our training programs are designed to make your service personnel proficient with MTU engines and systems. We offer a wide range of customized training programs to maximize your return on investment. MTU Training Centers, located around the world, are equipped with engines, sub-assemblies and electronics systems for a hands-on learning experience.

Genuine parts and consumables. For maximum performance.
To keep your equipment running at optimum efficiency, choose from a full line of **Value**Spares genuine parts and consumables, including filters, oil and coolant. They're designed, tested and approved specifically for MTU engines and systems. Only MTU can guarantee genuine quality, with parts and consumables that are designed to work seamlessly with your product. Superior design and top-quality materials result in maximum power, torque, longevity and low total-cost of operation.

ValueExchange

Rebuilt to last.

Whether replacing a single component or an entire engine, quality is essential. **Value**Exchange provides a full range of genuine remanufactured MTU products, engineered to ensure robust, reliable performance. Choose from remanufactured parts or engines and systems that utilize genuine new and remanufactured MTU parts. A rigorous reconditioning process ensures the same high standards of performance, service life and quality as new products – including design and model-related updates. As a result, genuine **Value**Exchange products feature technological advancements similar to new products – with identical warranty coverage.

The **Value**Exchange process is designed to save you time and money, while benefiting the environment through the reuse of existing materials. To help you work more efficiently, **Value**Exchange products are readily available. And for your convenience, they're offered worldwide from our MTU service network.

Remanufactured parts
When you choose **Value**Exchange parts for your engine service, you get genuine MTU quality, speed and peace of mind while lowering costs. Thanks to precise remanufacturing and inspection processes, genuine **Value**Exchange parts share the same high standards of performance, service life and quality as new parts.

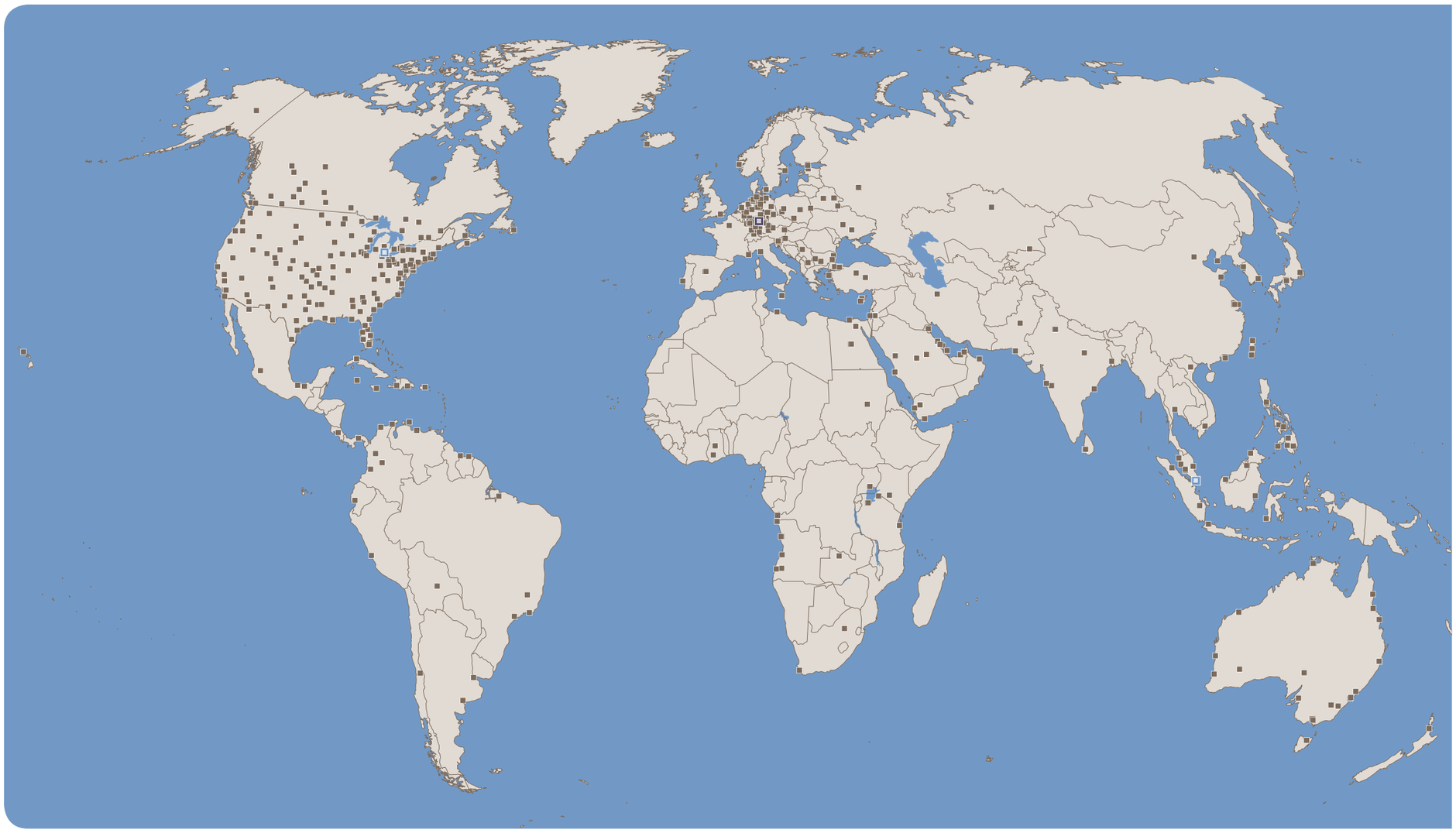
Remanufactured engines and systems
ValueExchange engines and systems can put your equipment back to work faster compared to an individual overhaul, and they're less expensive than purchasing new products – since your "cores" still have value. The process is simple. Rather than waiting for your original product to complete an overhaul, you are supplied with a remanufactured unit – with a core credit upon receipt of your usable core. With our no-hassle core acceptance policy, we provide the total costs to replace your product upfront – preventing unplanned costs. It's that simple.

Local support. Worldwide.

The reliability and performance of your engines and systems are crucial for your success and competitiveness. We are committed to your support. Our convenient global service network provides you this assurance.

Whenever and wherever you need expert support, MTU specialists are available. This continuous and long-term care ensures high availability, dependability and efficiency throughout the lifecycle of your engines and systems.

To find your local MTU distributor, visit www.mtu-online.com.



Local support. Worldwide.
We ensure that you receive individualized support from our global network of more than 1,200 service centers – anywhere, anytime.

- Global Headquarters
- Regional Headquarters
- Sales and Customer Service Center

MTU quality is something you can measure – and feel.

We are uncompromising when it comes to quality. True to our corporate philosophy of total quality management, we assure the quality of our products throughout the entire process of development and production. Every one of our staff is responsible in this respect – and thinks and acts accordingly.

Certified quality
Tognum with its core company MTU Friedrichshafen GmbH satisfies the international requirements of ISO 9001:2008 and 14001:2009. We conduct acceptance testing, including type tests, according to the rules and regulations of all the relevant classification bodies (e.g. ABS, BV, CCS, DNV, GL, JG, KRS, LR, NKK, RINA). All MTU electronics products bear the CE mark.

Quality you can feel
To us, quality is measured by more than just a certificate. We measure it by the degree of our customers' satisfaction, and by the number of years they continue to place their trust in us. Quality of that kind cannot be achieved with average objectives. You rightly expect everything of us – and we offer you even more. More reliability, more innovation, more specialization, more safety. If you share these aspirations, then together we will achieve a lot: a quality partnership.

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