



Oil & Gas

PARTNERSHIP BUILT ON  
RELIABLE ENGINES,  
SYSTEMS AND SERVICE.



A Rolls-Royce  
solution



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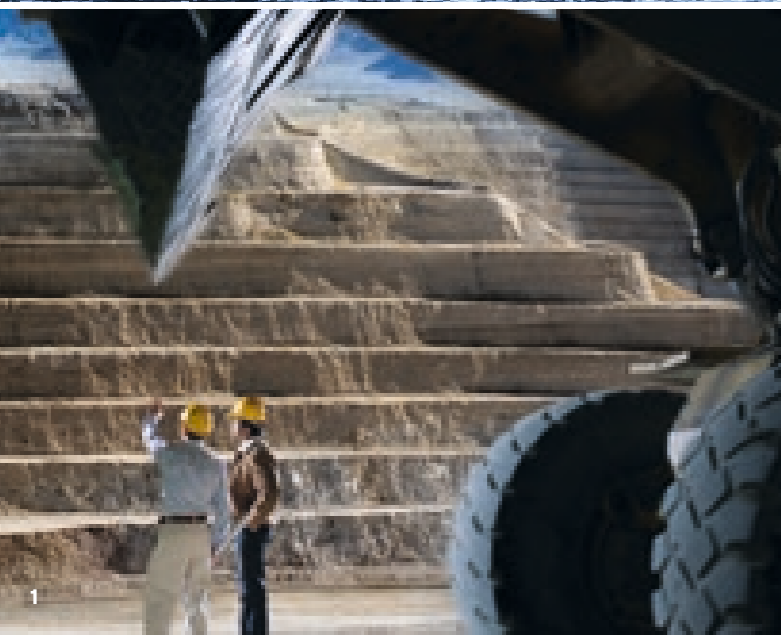
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# PIONEERING THE POWER THAT MATTERS.

# 01

Rolls-Royce provides world-class power solutions and complete life-cycle support under our product and solution brand MTU. Through digitalization and electrification, we strive to develop drive and power generation solutions that are even cleaner and smarter and thus provide answers to the challenges posed by 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. These clean and technologically-advanced solutions serve our customers in the marine and infrastructure sectors worldwide.



#### A solution provider

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

Our customized service offerings help you maximize uptime and performance and are supported by our digital solutions, which enable remote monitoring, predictive maintenance and a range of other benefits that keep your systems running at their best.

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

#### An expert in technology

As part of Rolls-Royce, we have long been known for cutting-edge innovation and technological leadership in product development. 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 work 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 life-cycle solutions that best fit your 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.



#### 1 Technological leader

As a supplier of high-quality performance drive solutions, we stand for the highest level of technological expertise.

#### 2 Passion

We are passionate about fulfilling the needs of its customers with the utmost professionalism and precision.



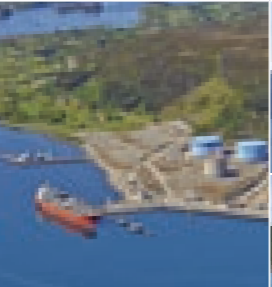

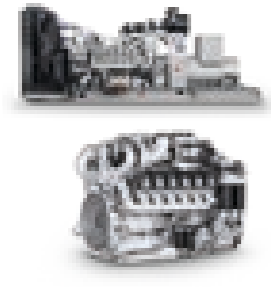
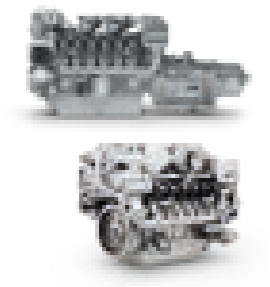
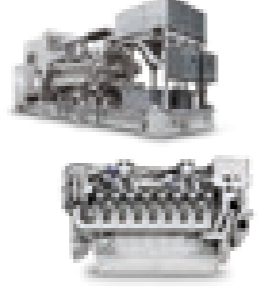
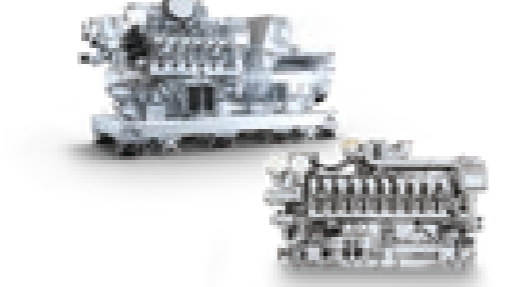
#### 3 Partnership

We are a reliable and trend-setting partner that acts with foresight in a results-oriented manner.

# ON- AND OFFSHORE PORTFOLIO OVERVIEW.

# 02

Our comprehensive solutions for all oil and gas applications – whether on- or offshore.

Onshore		Offshore	
Upstream		Downstream	Upstream
Drilling / Production	Well Servicing	Power Generation	Drilling Platforms, Substation Platforms (wind farm) and FPSO (Floating Production, Storage and Offloading)
			
Engines and systems for the exploitation of oil and gas wells	Engines and systems for the stimulation of oil and gas wells	Engines and systems for power generation	Engines and systems for power generation and firewater pumps in safety-sensitive areas
			
Electric Drilling Package (EDP) and Series 2000 Tier 4i	MTU FracPack and Frac Engine Series 4000 Tier 4 final	MTU Genset and Gendrive Engine Series 4000	Modularized Generator Set and Engine Plus System specifically built for offshore applications

On- and offshore areas are important for energy generation, whether it's for producing fossil fuels like oil or natural gas. The infrastructure is being continuously developed and its efficiency increased. Our engines, drive systems, and gensets are playing a key role in this field. In non-stop everyday operation under the harshest conditions, they ensure that the flow of energy is guaranteed at all times.

We are your global partner offering solutions for all emissions requirements as well as the full power range from 75 – 9100 kW (101 – 12205 bhp). Our engines set the benchmark for what diesel engines must deliver in oil and gas applications. Their uncompromising

operational availability ensures that oil and gas operations run with absolute reliability, while their exceptional efficiency is a key factor in the economic success of oil and gas operators.



## Power for Oil &amp; Gas

OUR EXPERTISE IS OUR GREATEST  
NATURAL RESOURCE.

For more than 70 years, we have been powering the oil and gas industry through engineering leadership and innovation. We supply reliable engines and systems for Oil & Gas operations all over the world, working in tough conditions. Ideal for stationary or mobile operation, drives for pumps or generators, onshore or offshore, our engines and systems offer the highest standards in reliability and durability.

Whether it's electric power for drilling operations or mechanical drives for pumps and fracturing equipment, consistent reliability and high availability are essential. As the technology leader, our products offer exceptional uptime, fuel economy and time between overhauls, which adds up to low lifecycle costs.

**Experience in the field**

Our unique wealth of experience and expertise makes us a partner who can do a lot more than simply build efficient, compact, durable and powerful engines. We offer complete systems, including standardized and customized package solutions to meet customer specifications.

**Forward thinking**

We have established ourselves as a leader in environmentally friendly solutions. We're proud to offer a complete lineup of products that meet and exceed worldwide emissions standards. Our mission is to satisfy these standards with the best engineering and design solutions for our customers. For complete emissions qualifications details for our Oil & Gas product line, please refer to page 40.

**A world of support**

With more than 1200 service locations worldwide – and a full portfolio of MTU ValueCare parts and service products to maximize performance, uptime and productivity – you can count on our reliability, expertise and legendary high standards around the world and around the clock.



## Onshore installations

# BREAKING NEW GROUND.

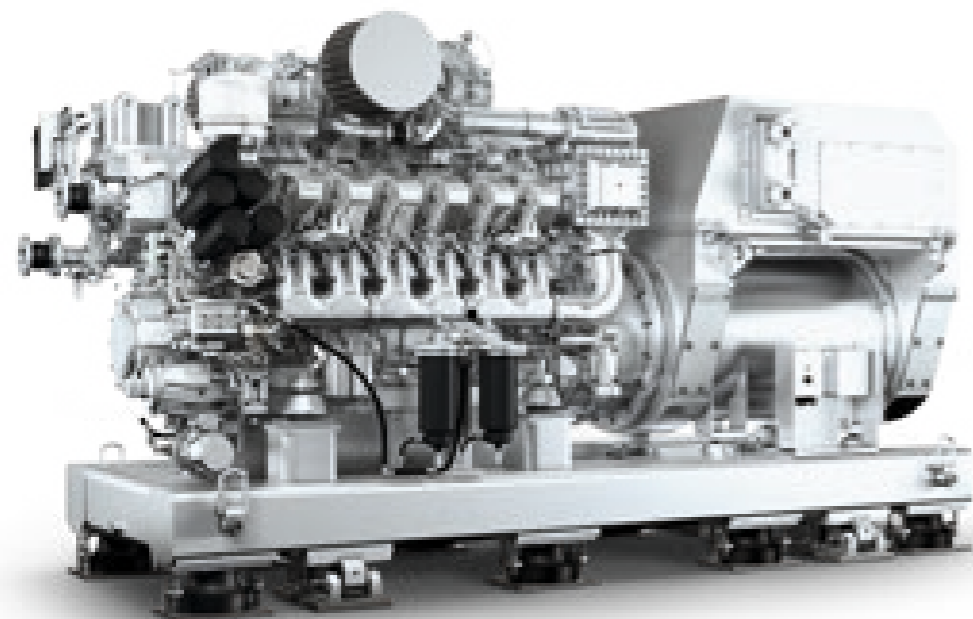
Extracting oil and gas presents a number of challenges. Operational conditions are difficult and the demands for performance and efficiency are uncompromising. We bring over 70 years of experience to a variety of oil and gas drilling applications all over the world.

We offer a complete range of products and services – from diesel-electric and diesel-hydraulic units to skid-runner and container gensets.

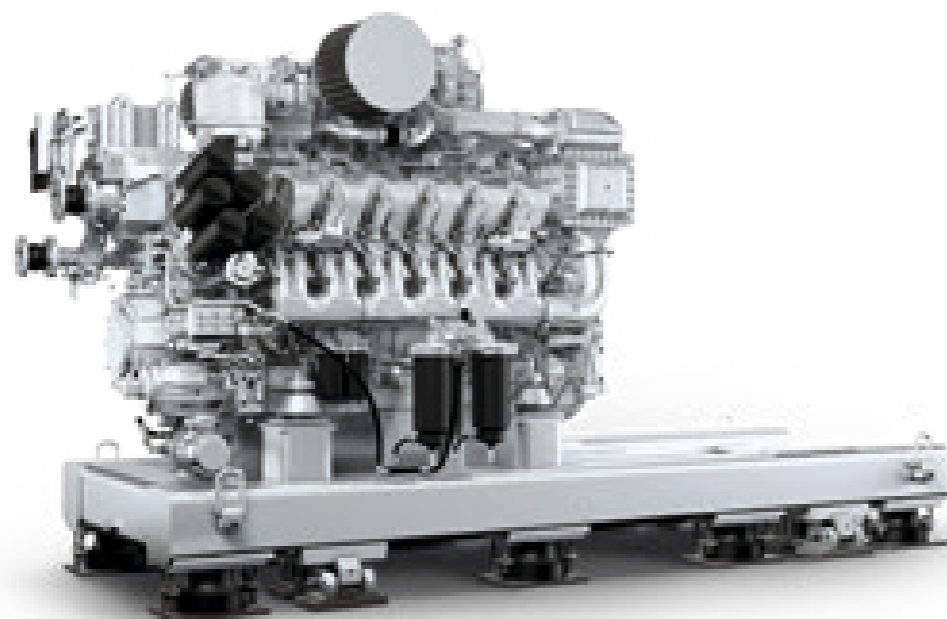
**Our onshore product range includes diesel engines and systems for:**

- Power units for mechanical and hydraulic drives for rotary tables, draw works, mud pumps and other well services
- Generator sets for electric drilling rigs for rotary tables, draw works and mud pumps
- Generator sets for continuous duty and prime power
- Fracturing units
- Nitrogen vaporizing/generating units
- Cement pumps
- Blenders
- Coil tubing





Modularized Generator Set



Modularized Generator Drive

## Offshore installations

# WHEN YOU CAN'T COMPROMISE ON SAFETY, CHOOSE US.

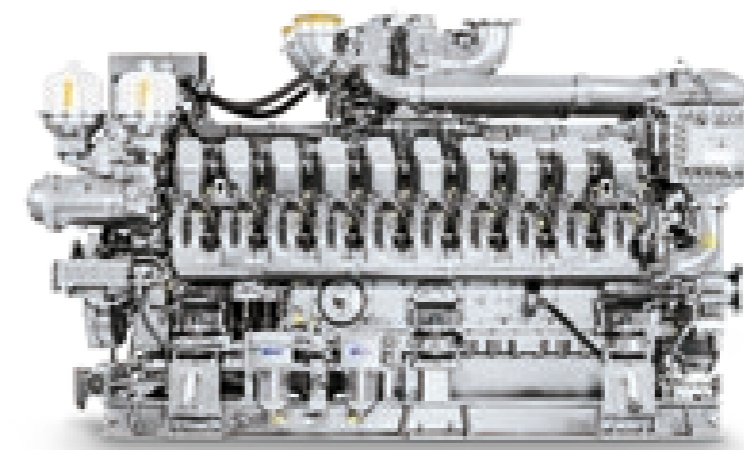
As drilling for new reserves of oil and natural gas onshore becomes more challenging, the search for large reserves is moving offshore. Freeing and processing these fossil fuels requires equipment engineered to meet the unique safety demands of the high seas. We provide a broad range of reliable, compact, and lightweight diesel engines and systems that can be customized to meet your specific requirements – and to provide you with maximum safety!

We offer complete solutions from a single supplier. All components are integrated, thoroughly tested and supported. Everything is designed to work together, which prolongs preventive maintenance and overhaul intervals. Decades of experience as an offshore specialist gives us the expertise and flexibility you need to keep your drilling operation productive and profitable.

### Our offshore product range includes diesel engines and systems for:

- Generator sets for emergency, essential, auxiliary and main power
- Fire pump drivers for mechanical/hydraulic/electric installations
- Mud pump drivers
- Wellserve power packs
- Nitrogen units
- Cranes
- Cement pumps
- Hydraulic power packs

We also offer customized offshore documentation according to project specific requirements.



Engine Plus System

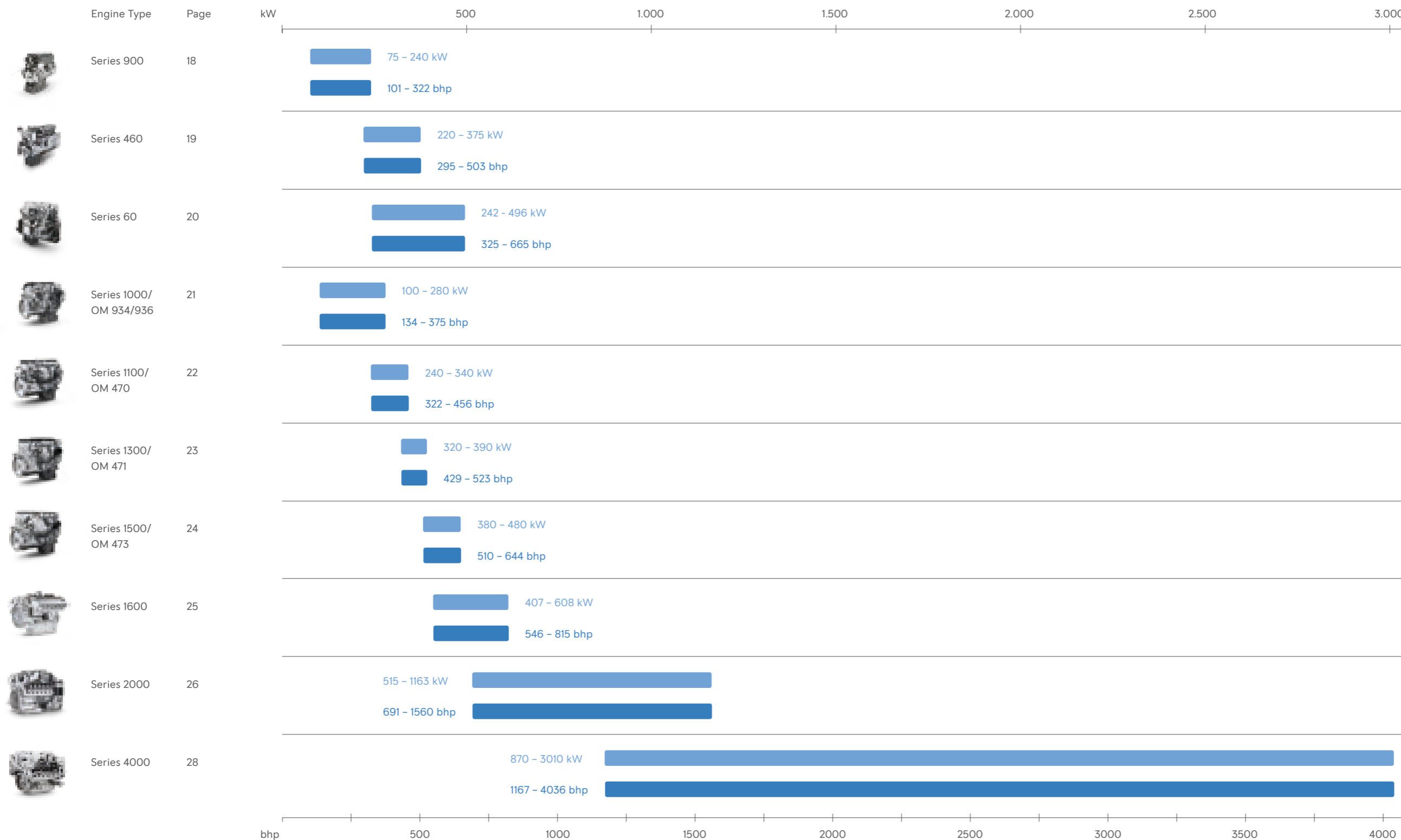
We are your global partner offering solutions for all emissions requirements as well as the full power range from 75 – 3010 kW (101 – 4036 bhp). Our engines set the benchmark for what diesel engines must deliver in oil & gas applications. Their uncompromising

operational availability ensures that oil & gas operations run with absolute reliability, while their exceptional efficiency is a key factor in the economic success of oil & gas operators.

### Diesel engines

# ALL ENGINES AT A GLANCE.

03





## Diesel engines

## PRODUCTIVITY STARTS HERE.

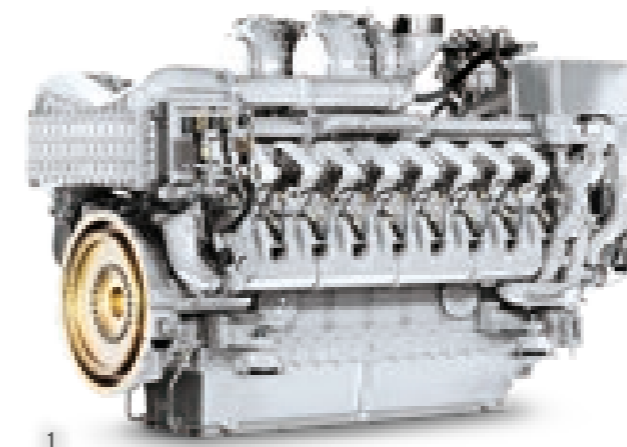
Our engines are ready for just about any challenge. Backed by decades of expertise and experience, we develop optimal solutions that fit the precise requirements of oil and gas operations. We offer a broad range of specialized engines – ideal for meeting the most demanding needs for power. Every engine is designed for high performance combined with maximum availability, safety, environmental friendliness and optimum fuel economy.

**Special features (examples):**

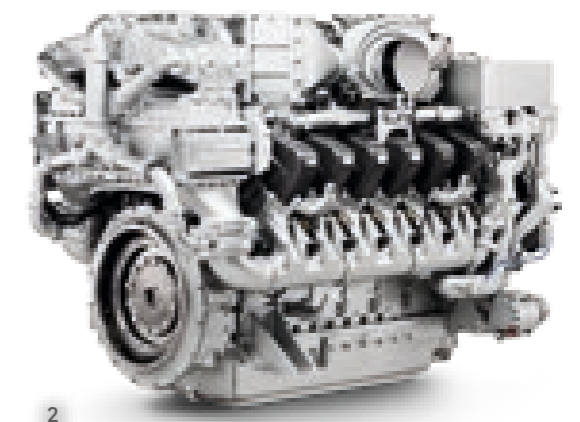
- Water-cooled exhaust manifolds and turbochargers
- Combustion air shut-off flaps
- Double-walled injection pipes
- Dual fuel filter arrangement
- Dual lube oil filter arrangement or automatic filters
- Special lube oil sump for increased inclinations

**Benefits:**

- Reliability
- Compact, lightweight design that minimizes the deck surface and supporting structures
- Ease of maintenance
- Low fuel consumption
- Emission control in compliance with the latest statutory regulations
- Comprehensive range of optional engine and system accessories



1 20V Series 4000 P83



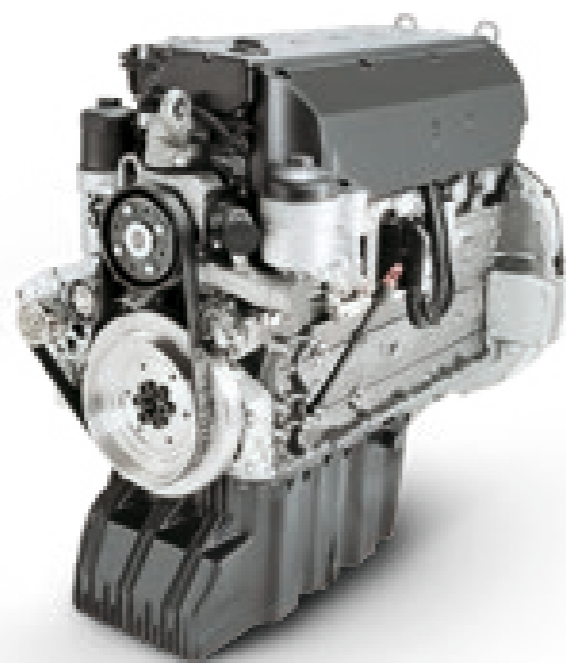
2 12V Series 4000 T94

Diesel engines for mechanical drive

# SERIES 900

Series	900		
Engine model	4, 6 cyl. In-Line		
Application	Rated power		Speed
Variable speed	kW	bhp	rpm
Heavy duty	75-195	101-261	2200
Medium duty	110-240	147-322	2200
Emissions qualification	EU Nonroad St IIIA Comp (97/68/EC), EU Nonroad St IIIB Comp (97/68/EC), EPA Nonroad T3 Comp (40CFR89), EPA Nonroad T4i Comp (40CFR1039), China NRMM Stage III (GB20981-2014)		

These engines are also available for vehicle main drive applications (application group 5).



manufactured by



customized by



Diesel engines for mechanical drive

# SERIES 460

Series	460		
Engine model	6 cyl. In-Line		
Application	Rated power		Speed
Variable speed	kW	bhp	rpm
Heavy duty	220-295	295-396	1800
Medium duty	315-375	422-503	1800
Emissions qualification	EU Nonroad St IIIA Comp (97/68/EC), EU Nonroad St IIIB Comp (97/68/EC), EPA Nonroad T3 Comp (40CFR89), EPA Nonroad T4i Comp (40CFR1039), China Onroad Stage V (GB17691-2005), China NRMM Stage III (GB20981-2014)		

These engines are also available for vehicle main drive applications (application group 5).



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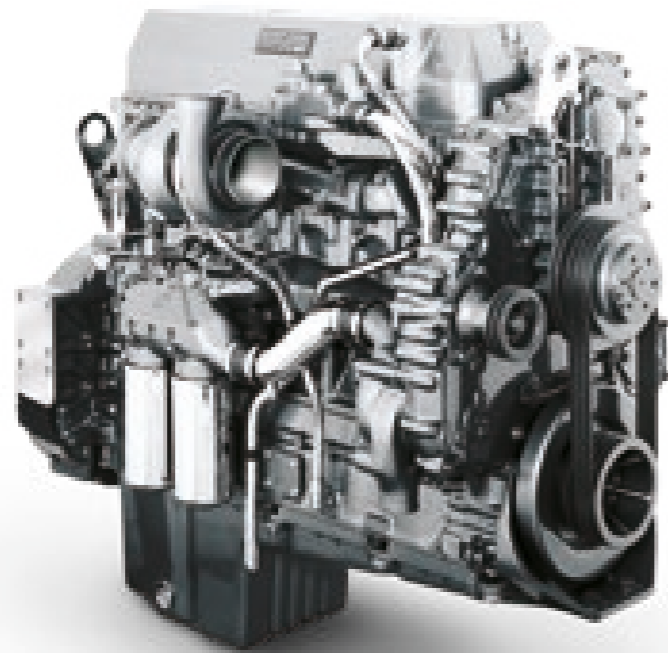


Diesel engines for mechanical drive

# SERIES 60

Series	60		
Engine model	6 cyl. In-Line		
Application	Rated power		Speed
Variable speed	kW	bhp	rpm
Heavy duty	242-336	325-450	2100/2200
Medium duty	354-410	475-550	2100
Short-time duty	447-496	600-665	2100/2300
Emissions qualification	EU Nonroad St IIIA Comp (97/68/EC), EPA Nonroad T3 Comp (40CFR89), China NRMM Stage III (GB20981-2014)		

These engines are also available for vehicle main drive applications (application group 5).

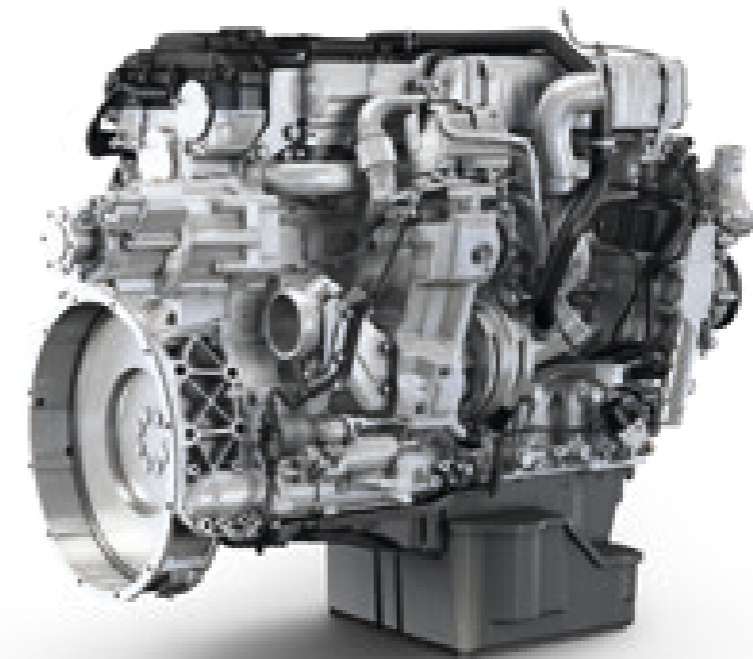


Diesel engines for mechanical drive

# SERIES 1000/OM 934/936

Series	1000		
Engine model	4, 6 cyl. In-Line		
Application	Rated power		Speed
Variable speed	kW	bhp	rpm
Heavy duty	100-210	134-282	2200
Medium duty	150-280	201-375	2200
Emissions qualification	EU Nonroad St IV (97/68/EC) comp, EPA Nonroad T4 (40CFR1039), EU Nonroad St V (2016/1628) + EPA Nonroad T4, UN ECE R96 Emission Flex Package (EFP)		

These engines are also available for vehicle main drive applications (application group 5).



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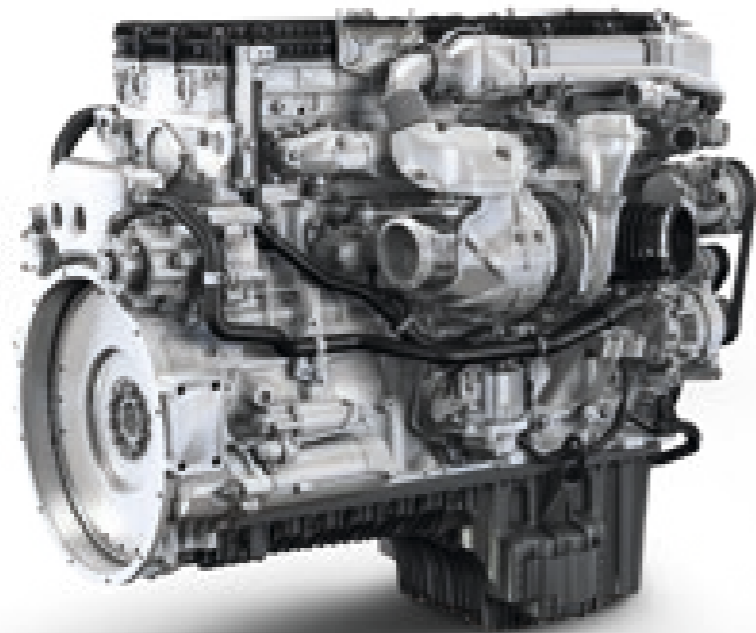


Diesel engines for mechanical drive

# SERIES 1100/OM 470

Series	1100		
Engine model	6 cyl. In-Line		
Application	Rated power		Speed
Variable speed	kW	bhp	rpm
Heavy duty	240-280	322-375	1600/1700
Medium duty	300-340	402-456	1600/1700
Emissions qualification	EU Nonroad St IV (97/68/EC) comp, EPA Nonroad T4 (40CFR1039), EU Nonroad St V (2016/1628) + EPA Nonroad T4, UN ECE R96 Emission Flex Package (EFP)		

These engines are also available for vehicle main drive applications (application group 5).



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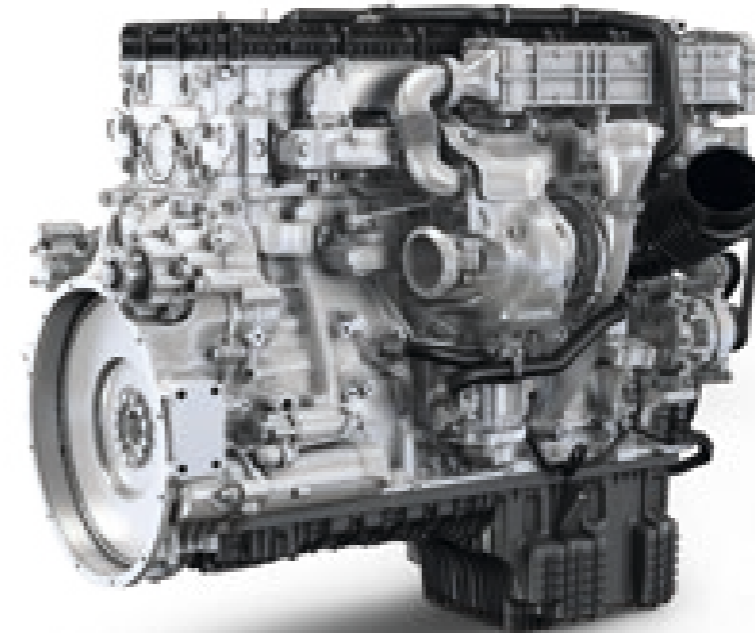


Diesel engines for mechanical drive

# SERIES 1300/OM 471

Series Engine model Cylinders	1300		
Engine model	6 cyl. In-Line		
Application	Rated power		Speed
Variable speed	kW	bhp	rpm
Heavy duty	320-340	429-456	1600/1700
Medium duty	360-390	483-523	1600/1700
Emissions qualification	EU Nonroad St IV (97/68/EC) comp, EPA Nonroad T4 (40CFR1039), EU Nonroad St V (2016/1628) + EPA Nonroad T4, UN ECE R96 Emission Flex Package (EFP)		

These engines are also available for vehicle main drive applications (application group 5).



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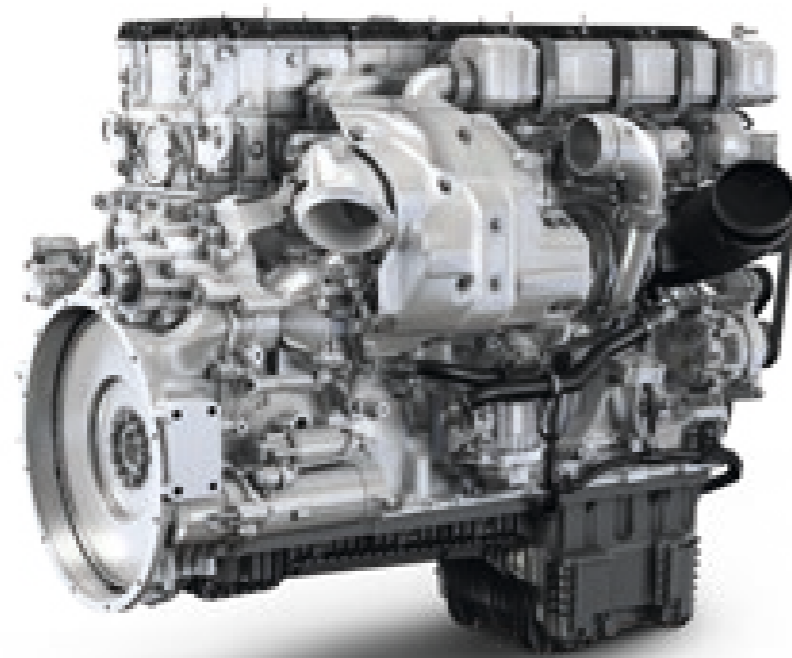


Diesel engines for mechanical drive

# SERIES 1500/OM 473

Series	1500		
Engine model	6 cyl. In-Line		
Application	Rated power		Speed
Variable speed	kW	bhp	rpm
Heavy duty	380-400	510-536	1600/1700
Medium duty	430-480	577-644	1600/1700
Emissions qualification	EU Nonroad St IV (97/68/EC) comp, EPA Nonroad T4 (40CFR1039), EU Nonroad St V (2016/1628) + EPA Nonroad T4, UN ECE R96 Emission Flex Package (EFP)		

These engines are also available for vehicle main drive applications (application group 5).



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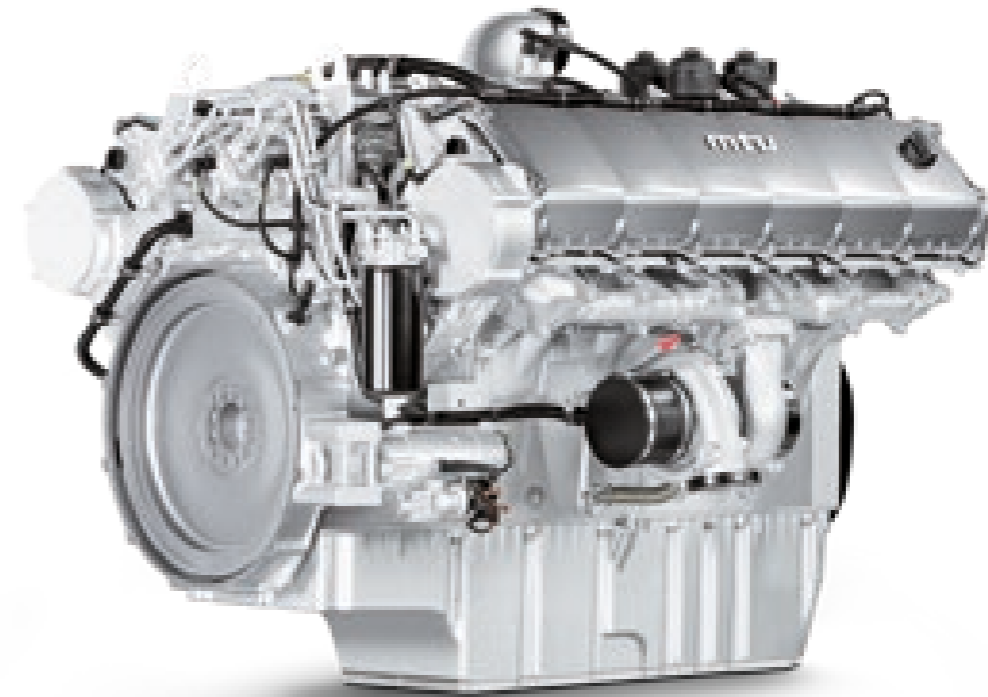


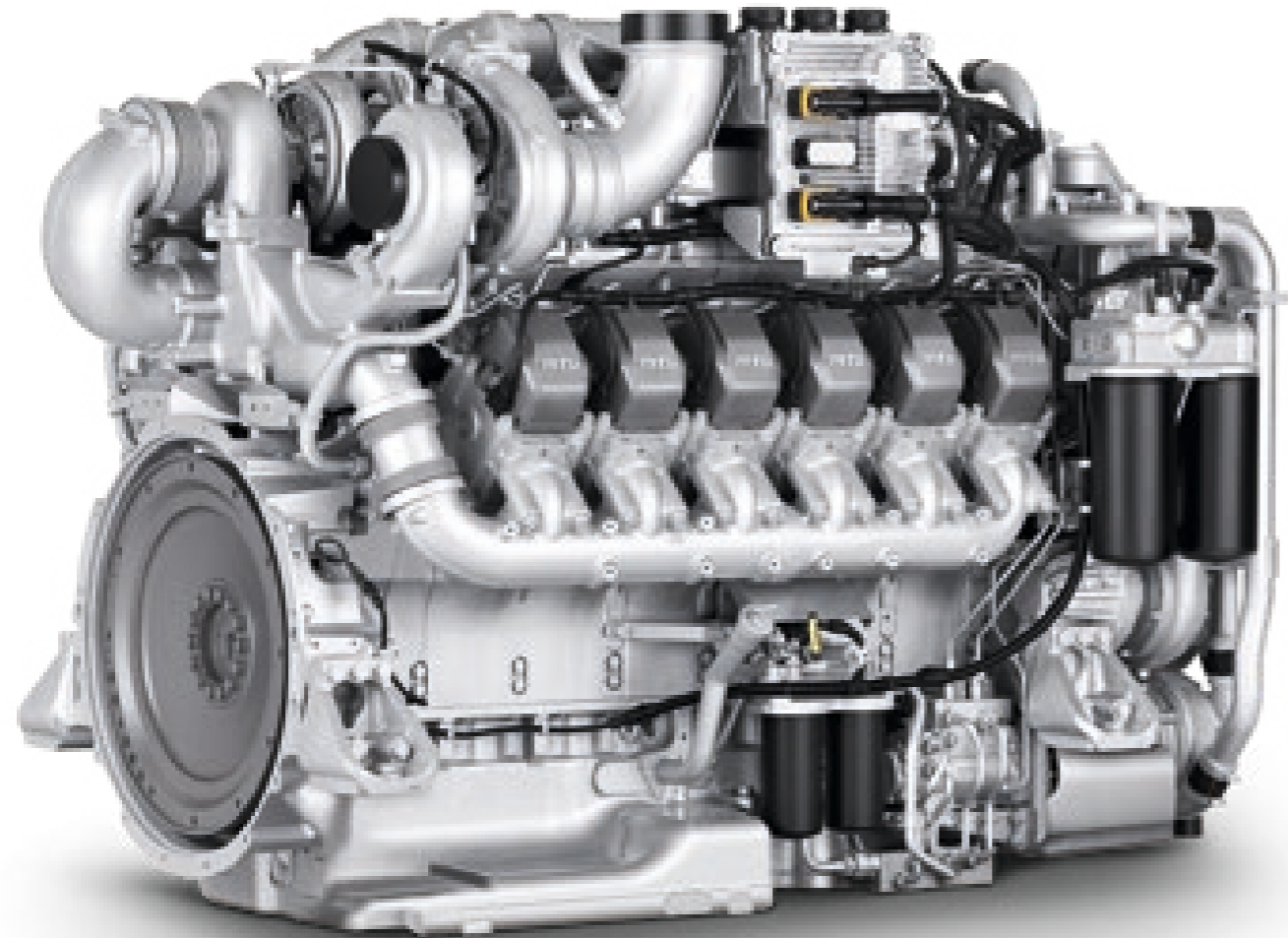
Diesel engines for generator drive

# SERIES 1600

Series	1600		
Engine model	10, 12 cyl./90°V		
Application	Rated power		Speed
Variable speed	kW	bhp	rpm
Constant speed 50 Hz			
Prime power	407-576	546-772	1500
Constant speed 60 Hz			
Prime power	465-608	624-815	1800
Emissions qualification	Fuel consumption optimized, TA-Luft optimized (Diesel), EU Nonroad St IIIA (97/68/EC), EPA Nonroad T2 Comp (40CFR89), EPA Stationary EMERG T2 (40CFR60), NEA Singapore for ORDE, MoEF India/CPCB Stage II		

These engines are also available for vehicle main drive applications (application group 5).



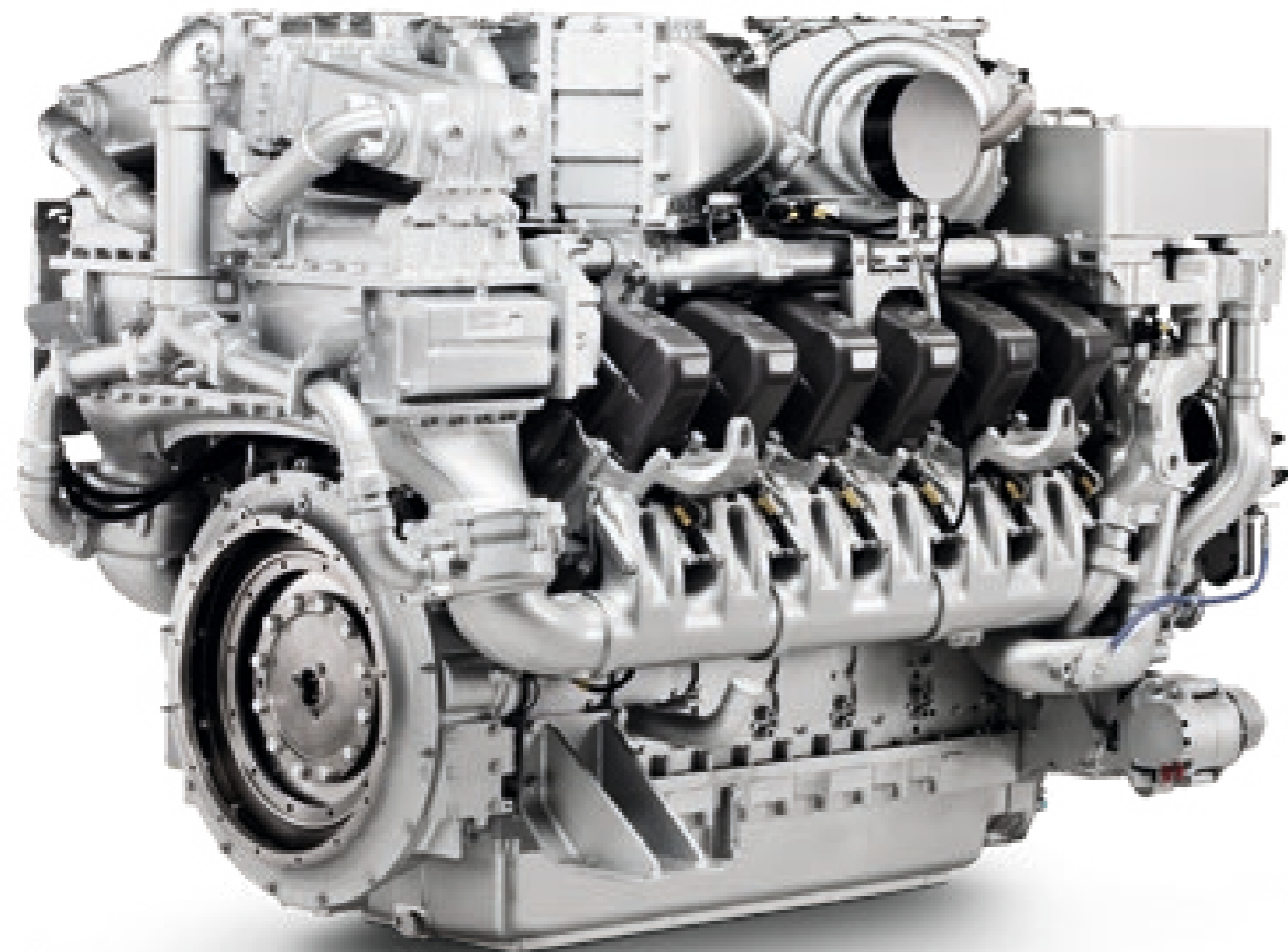


Diesel engines for generator drive and mechanical drive

# SERIES 2000

Series	2000		
Engine model	12, 16, 18 cyl./90°V		
Application	Rated power		Speed
	kW	bhp	rpm
<b>Constant speed 50 Hz</b>			
Continuous power	515-720	691-966	1500
Prime power	580-1000	778-1341	1500
<b>Constant speed 60 Hz</b>			
Prime power	695-1010	932-1354	1800
Prime power limited	710-810	952-1086	1800
<b>Variable speed</b>			
Medium duty	783-970	1050-1301	1800/2100
Frac operation	858-1163	1150-1560	2100
Emissions qualification	Fuel consumption optimized, TA-Luft optimized (Diesel), EPA Nonroad T2 Comp (40CFR89), EPA Nonroad T4i Comp (40CFR1039), China NRMM Stage III (GB20981-2014)		

Ratings for vehicle main drive applications (application group 5) are available upon request. Please consult your distributor.



Diesel engines for generator drive and mechanical drive

# SERIES 4000

Series	4000		
Engine model	12, 16, 18 cyl./90°V		
Application	Rated power		Speed
	kW	bhp	rpm
<b>Constant speed 50 Hz</b>			
Continuous power	1310-2200	1757-2950	1500
Prime power	1205-2807	1616-3764	1500
Prime power limited	1560-2600	2092-3487	1500
<b>Constant speed 60 Hz</b>			
Continuous power	870-2490	1167-3339	1200/1800
Prime power	1105-3010	1482-4036	1200/1800
Prime power limited	1680-2800	2253-3755	1800
<b>Variable speed</b>			
Heavy duty	1193-1865	1600-2500	1800-2100
Frac operation	1678-2461	2250-3300	1900
Emissions qualification	Fuel consumption optimized, TA-Luft optimized (Diesel), EPA Nonroad T1 Comp (40CFR89), EPA Nonroad T2 Comp (40CFR89), EPA Nonroad T4i Comp (40CFR1039), EPA Nonroad T4 (40CFR1039), NEA Singapore for ORDE, China NRMM Stage III (GB20981-2014) IMO II		

Ratings for vehicle main drive applications (application group 5) are available upon request. Please consult your distributor.

## Emissions reduction technology

LOW EMISSIONS.  
HIGH PERFORMANCE.

We have long established ourselves as a leader in the development of solutions for emissions reduction. This challenge involves key technologies which we carry out in-house.

In oil & gas the aim is to collect natural resources while generating profit. One basic condition for efficient operations is to comply with emissions regulations. We care for the technology you need.

In order to achieve advanced emissions reductions, we have invested our comprehensive expertise in core technologies: fuel injection, turbocharging, cooled exhaust gas recirculation, electronic engine controls for optimizing engine processes and preventing soot formation, as well as external optimization.

Advanced emissions regulations like EU Stage IV/EPA Tier 4 final demand further significant reduction in the pollutants emitted. Our engines and systems meet current legislative requirements with proven technologies.

We care for the optimal solution for the special demands of each application and power range by choosing the ideal technology.

**Aftertreatment technology below 560 kW (750 bhp)**

Beside our emissions reduction technologies like EGR, common-rail-fuel-injection and charge-air-cooling our engines below 560 kW (750 bhp) are equipped with SCR aftertreatment technology.

**Advantages**

The advantages of SCR in our engines:

- Low fuel consumption
- Uncompromising engine availability and operational safety
- Substantial reduction in nitrogen oxide and greenhouse gas emissions
- No DPF and no DOC required

The perfect interplay of different technologies facilitates optimal results and the most important aim is achieved – a decrease in harmful emissions, along with a reduction in fuel consumption. A win-win situation for your earnings and the environment.

**No aftertreatment above 560 kW (750 bhp)**

Our engines above 560 kW (750 bhp) don't use any exhaust aftertreatment technology. Instead our latest engines are equipped with state of the art EGR technology combined with our core technologies. In combination those technologies enable engine compliance with the most stringent emission regulations such as EPA Tier 4 final. That means optimum engine characteristics and cost-efficient operation while meeting emissions standards.

Depending on the engine operating point, a certain quantity of exhaust gas is conveyed to the EGR cooler. As it passes through the cooler, the hot exhaust gas is cooled and then mixed with charge air. Mixing the exhaust gas with charge air results in a significant reduction in combustion temperature by comparison with engines that are not using EGR. In return, much lower raw emissions levels of nitrogen oxide are generated inside the engine. The highly efficient EGR combustion process developed by us ensures compliance with EPA Tier 4 final emissions legislation without the need for aftertreatment.

**Advantages**

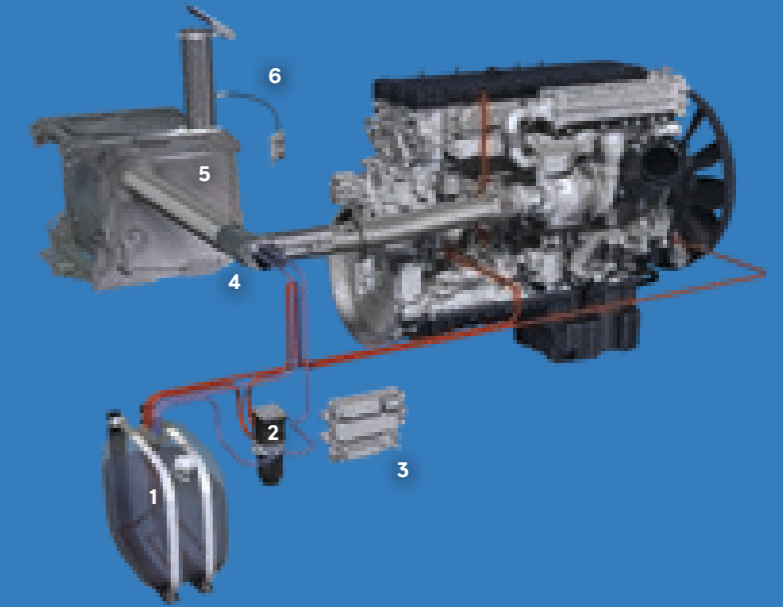
The combination of core technologies like EGR offers many advantages:

- Low fuel consumption
- Wide engine performance map – full torque curve
- Exceptionally high torque at low speeds
- Excellent transient behaviour (load acceptance/speed jumps)
- Full power output available even at high altitudes
- Full power output available even at high ambient temperatures

No need for exhaust aftertreatment also means no need for additional operating fluids such as DEF, nor for DPF or DOC, nor for hydrocarbon dosing.

Aftertreatment technology below 560 kW (750 bhp) – example Series 1300 EU Stage IV/EPA Tier 4 final

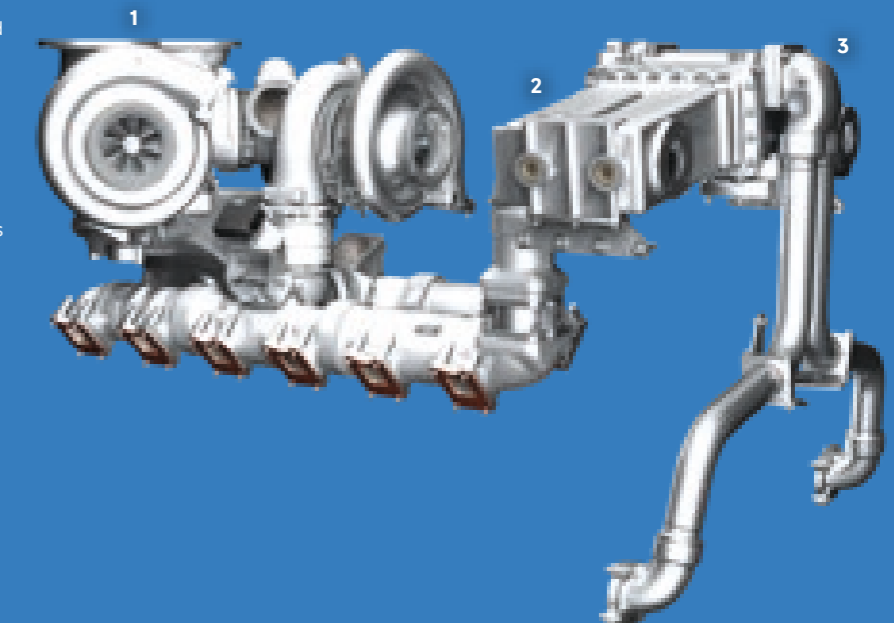
- 1 Urea tank with urea fluid
- 2 DEF Urea Supply Unit (pump) pumps liquid urea from the tank to the dosing unit
- 3 Aftertreatment Control Module (ACM) controls and regulates functions of the aftertreatment system
- 4 Dosing unit with Urea Nozzle prepares correct urea quantity in relation to untreated engine emissions and provides for optimal spraying of urea/air mixture into exhaust line
- 5 SCR-catalyst converts nitrogen oxides in exhaust gas into harmless air components
- 6 NOx-sensors measure respective engine emissions in exhaust system



We will be available as a partner to help design your optimal SCR system.

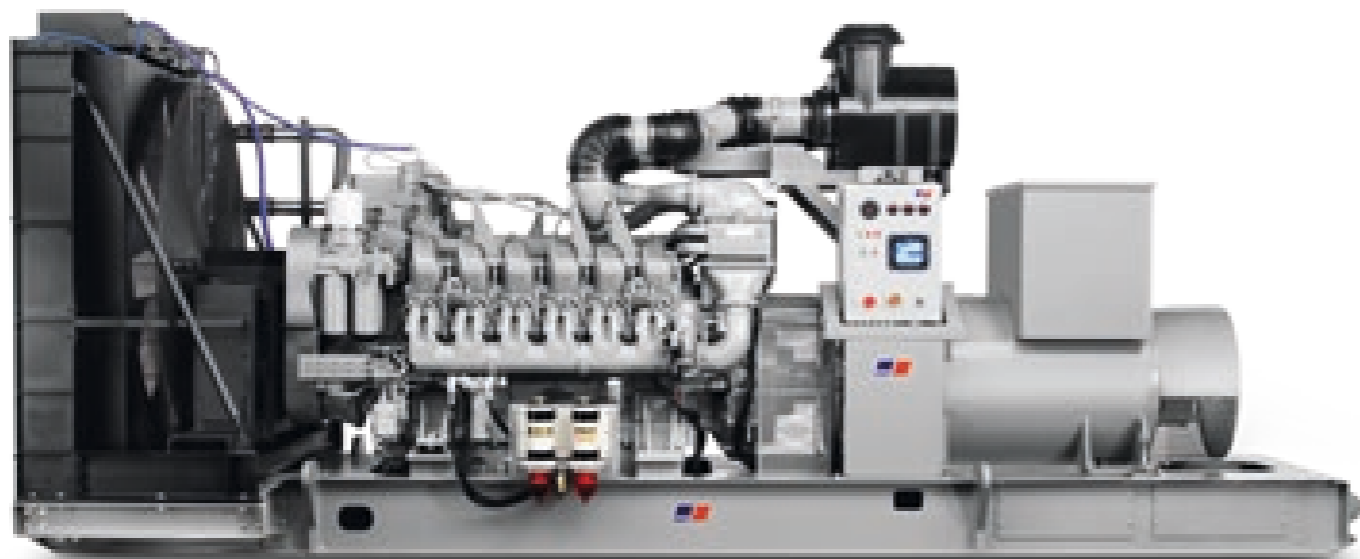
No Aftertreatment technology above 560 kW (750 bhp) – example Series 4000 EPA Tier 4i

- 1 Two-stage controlled turbocharging assures low fuel consumption across wide speed range, exceptionally high torque at low speeds, and clean combustion
- 2 EGR coolers bring about a lowering of the combustion temperature (and subsequently of nitrogen oxides generated in-engine) and are integrated into the high-temperature cooling circuit so that less heat is introduced, which in turn permits lower cooler dimensions
- 3 EGR rate EGR valve regulates recirculated exhaust gas quantities. EGR rate is optimized for all operating modes
- 4 Common-Rail-Fuel-Injection\* with common rail fuel injection, the combustion process can be optimized to achieve low pollutant levels combined with lower fuel consumption. Fuel is injected into the combustion chamber from a common rail under high pressure.



\*not displayed in the graphic





Systems solutions for well stimulation & drilling applications

## BUILT-IN POWER AND PERFORMANCE.

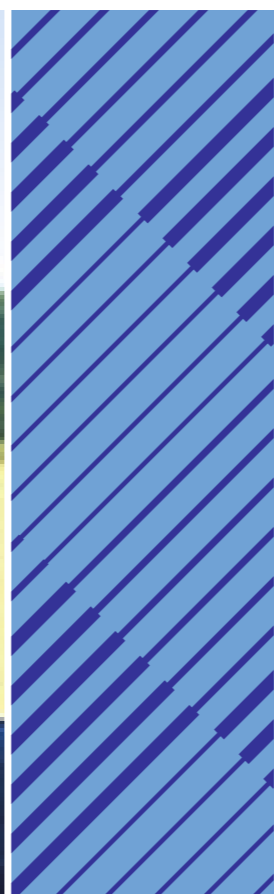
# 04

Drilling, frac or well servicing operations have extremely high demands for power, performance and reliability – under the toughest conditions. Our systems solutions for the oil and gas industry are the result of decades of expertise from countless successful projects. Our systems and support services are designed to meet your requirements and exceed your expectations.

Our wealth of expertise makes us a valuable partner. We are well acquainted with all the conditions, specifications and legislation of the oil and gas industry. Right from the start, we'll provide comprehensive support stretching from technical consultation to special assistance with technical documentation. In addition, we can supply complete project management for you, including full execution of engineering, procurement, manufacturing, assembly and commissioning. As your partner, we provide the engineering for the entire system, including support throughout the service life of the engines.

### **One source fits all.**

Our system solutions provide a complete solution – engine, components and control systems – from one trusted source. Exceptional engineering improves operational reliability and availability, minimizing costs associated with downtime. The compact design and high power-to-weight ratio of our engines provides more power using less space. This reduces the high costs of installation space and supports structures on offshore platforms.



## FracPack System

# NEVER HAS PERFORMANCE BEEN SO PERFECTLY ALIGNED.

### Low weight. High performance.

The new MTU FracPack is a complete solution, built to meet the high demands and tough conditions of the well service industry. While all of its components are engineered to work together to ensure optimum performance and maximum uptime, the true strength of the MTU FracPack comes from its powerful Series 4000 engine and lightweight ZF transmission.

With a power output of 2,250-2,500 resp. 2,600 bhp (Series 4000 S83/S83L resp. T95) the engines provide more low-end torque, thereby improving acceleration and expanding the utilization of the frac pump's performance map. Due to its sophisticated combustion concept, the Series 4000 T95 is the only frac engine that meets Tier 4 standards without aftertreatment.

The lightweight and durable ZF transmission is the perfect complement, providing a wide, full range of gears (speeds) and maximum input torque of 7,744 lb-ft (10,500 Nm). Working seamlessly together, these key components give the MTU FracPack reliable, outstanding performance – even under the toughest fracking conditions.

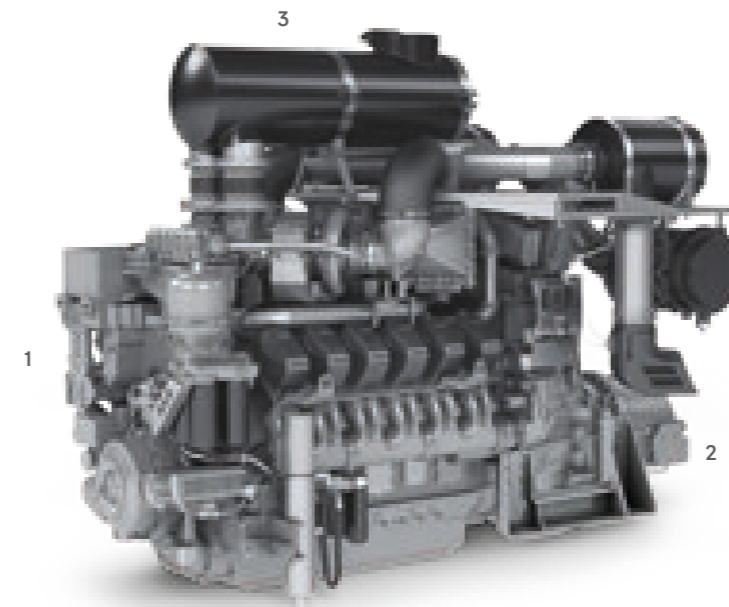
### Efficient – in every respect.

In addition to the overall advantages, each MTU FracPack has its own special benefits. So the MTU FracPack with Series 4000 T95 delivers thus so far unsurpassed transmission efficiency from up to 97%.

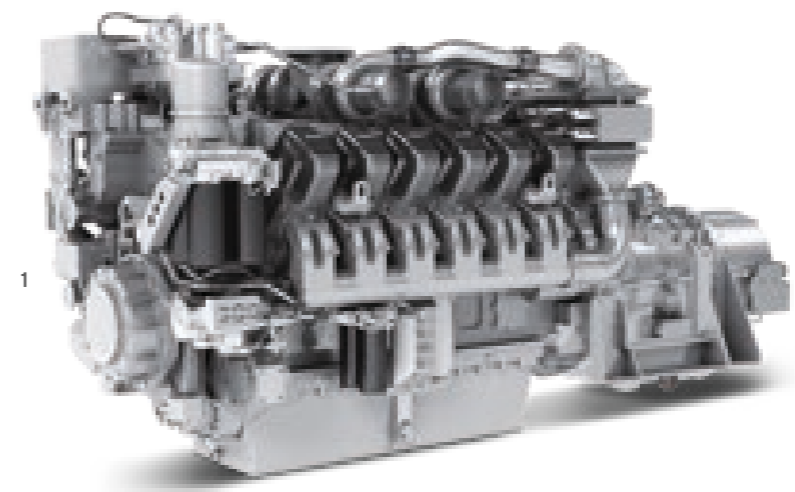
Having fewer components reduces the complexity of the transmission as a whole, thus allowing for simpler maintenance and lower costs. Significant cost reduction, especially in engineering, also characterises the FracPack version with Series S83/S83L engine. Thanks to the compact design and simple footprint, this package is easy to integrate in your existing equipment.

### FracPack benefits:

- Up to 97% transmission efficiency (Series 4000 T95)
- Very lightweight thanks to S4000 engine and transmission
- Maximum utilization of frac pump due to
  - optimized engine performance map
  - transmission's high input torque
- Lower lifecycle costs<sup>1)</sup>
- Minimized engineering costs thanks to simple and compact footprint
- Exceptional durability and reliability for maximum uptime
- Specifically designed for the toughest fracking conditions
- One complete system from one trusted source
- All components engineered to work together seamlessly
- Long component life



- 1 **Series 4000 Frac Engine**
  - Tier 4 final certified
  - No aftertreatment, no additives needed for emissions control
  - New power output: 2,250-2,600 bhp (1,678-1,939 kW)
  - Optimized performance map for frac application: better utilization of frac pump
  - Full performance available up to 13,000 ft (4,000 m)<sup>2</sup>
  - Easy integration in O&G equipment thanks to compact and simple footprint
  - Optimized power-to-weight ratio
  - Also available with Tier 2 compliant engine
- 2 **ZF transmission**
  - Full and wide range of gears (speeds)
  - High input torque: up to 7,744 lb ft (10,500 Nm) - utilizing full engine torque curve
  - Lightweight
  - Durable
- 3 **Optional Equipment (back pack)**
  - Additional frame
  - Muffler
  - Intake tubes
  - Air filters



- 1 **Series 4000 S83/S83L Frac Engine**
  - EPA Tier 2 compliant
  - Power output: 2,250-2,500 bhp (1,678-1,865 kW)
  - Optimized performance map for frac application: better utilization of frac pump
  - Easy integration in O&G equipment thanks to compact and simple footprint
  - Also available with Tier 4-certified engine
- 2 **ZF transmission**
  - Full and wide range of gears (speeds)
  - High input torque: 7,744 lb ft (10,500 Nm): utilizing full engine torque curve
  - Durable
  - Lightweight

1 Compared to Tier 2 engine

2 Dependent on air intake temperature. Subject to be confirmed.

Diesel engine gensets for electric drilling application

# EVERYTHING YOU NEED IN ONE PACKAGE.

**All-powerful. And all-in-one.**

Built to suit the needs of today's drilling operations, the MTU Electric Drilling Package (EDP) delivers high performance, efficiency and reliability from a single source. The self-contained package integrates diesel engine, generator, radiator and other components seamlessly.

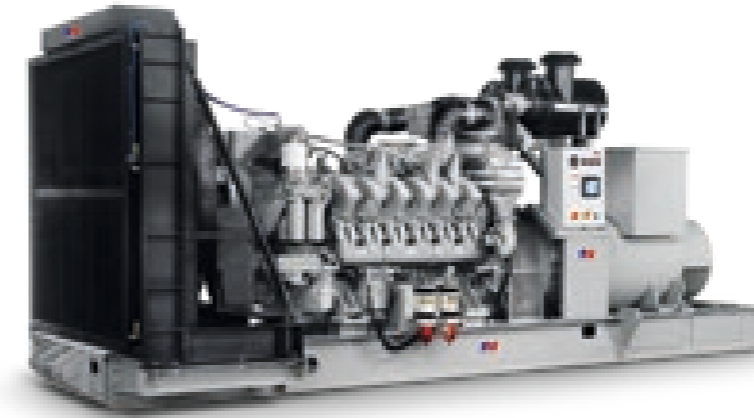
The EDP is powered by a Series 4000 engine. It is built to last, with industry-leading technology, common rail injection system and outstanding fuel economy.

An engine this powerful needs a sturdy base. The EDP's base frame is built for maximum durability, proven by extensive FEA stress testing. Other components are included in the EDP, from tow bars to fuel system. All are engineered with the latest technology and designed for easy serviceability. To meet your specific work needs, several EDP options are also available.

## Electric Drilling Package (EDP)

Electric Drilling Package					
Application	Rated power		Speed	Frequency	Emission qualification
	kW	bhp	rpm		
Prime power operation					
4000 G73	1105	1482	1200	60	EPA Nonroad T2 Comp (40CFR89)
4000 G14F	1420	1904	1500	50	Emission optimized (TA-Luft) Fuel consumption optimized NEA Singapore for ORDE
4000 T25L	1500	2012	1800	60	EPA Nonroad T4 (40CFR1039)

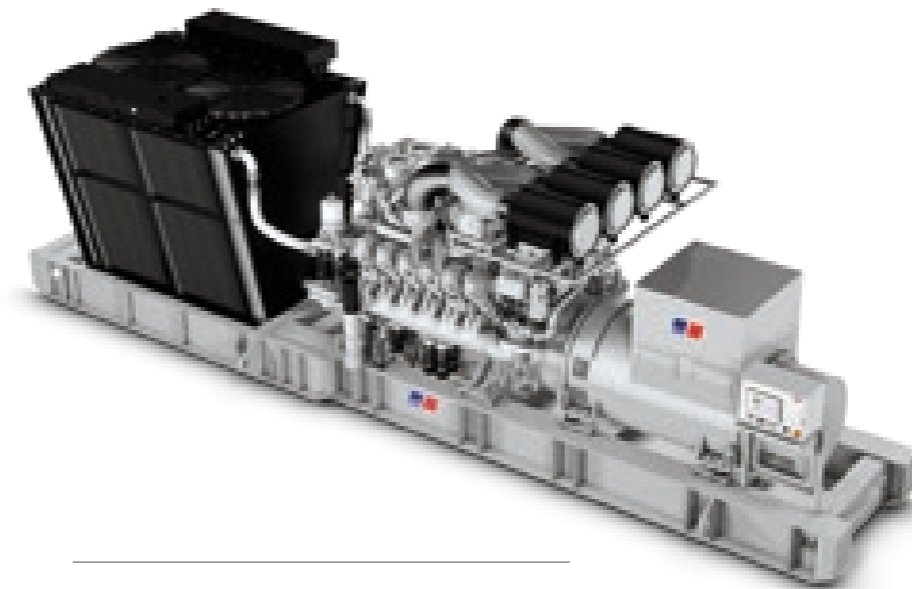
12V engine with starting system, fuel system, base frame and generator.



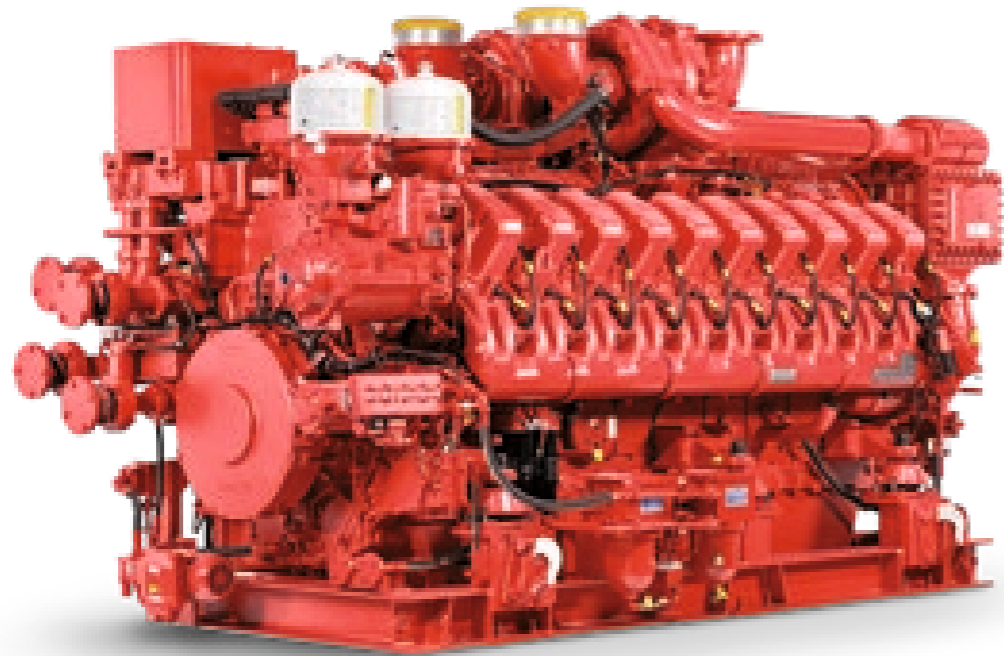
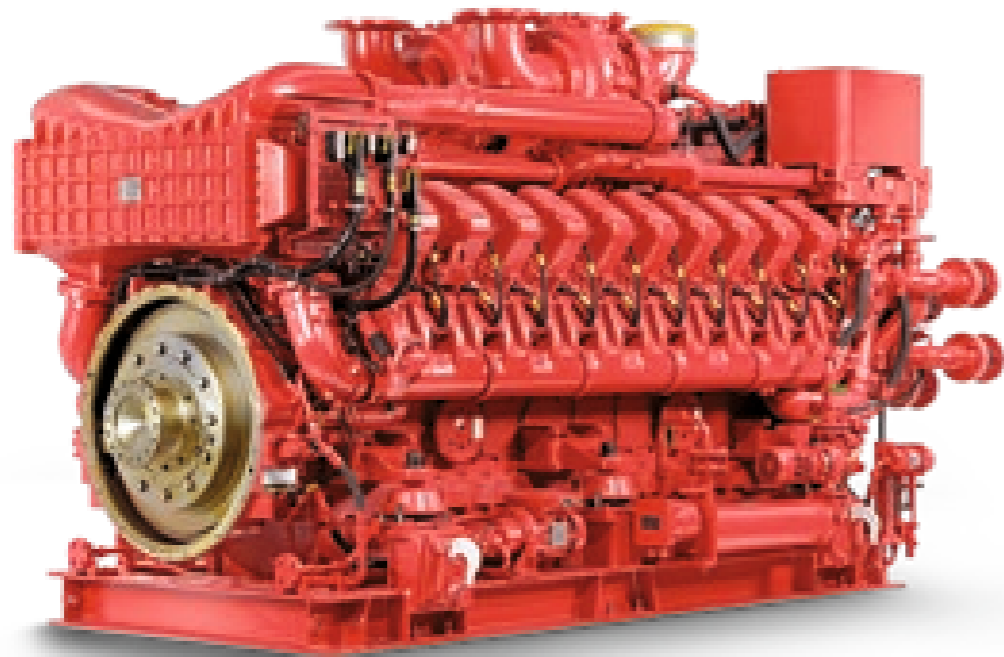
EDP 60Hz with 12V 4000 G73



EDP 50Hz with 12V 4000 G23



EDP 60Hz with 12V 4000 T25L



Systems solutions for marine offshore exploration & production applications

# ENGINE PLUS: COMPACT. COMPLETE. CONVINCING.

# 05

Engine Plus systems are available from 498 – 2800 kW (668 – 3755 bhp) for gendrive and mechanical drive with constant and variable speed. All solutions come from a single source. They are selected and designed to meet your demands for delivering maximum system performance and availability at optimal efficiency. The pre-installed components on the base frame with optimized connecting points permit an easy system installation. Due to reduced engineering and assembly effort, this tailorized plug-and-play system helps you to save time and money. Decades of engineering expertise and several delivered systems ensure that you will get excellent field-proven quality and performance.

#### Benefits at a glance:

- Long-term reliability and availability, thanks to
  - perfectly matched components
  - the delivery of the complete solution from a single trusted source
  - the use of only genuine MTU engines and components
- Optimal power-to-weight ratio for offshore applications
- Pre-installed system that saves engineering costs
- Easy to install due to compact dimensions
- Maximum efficiency
- Available for several safety requirements (NFPA 20) and classifications

#### Basic scope for the Engine Plus System :

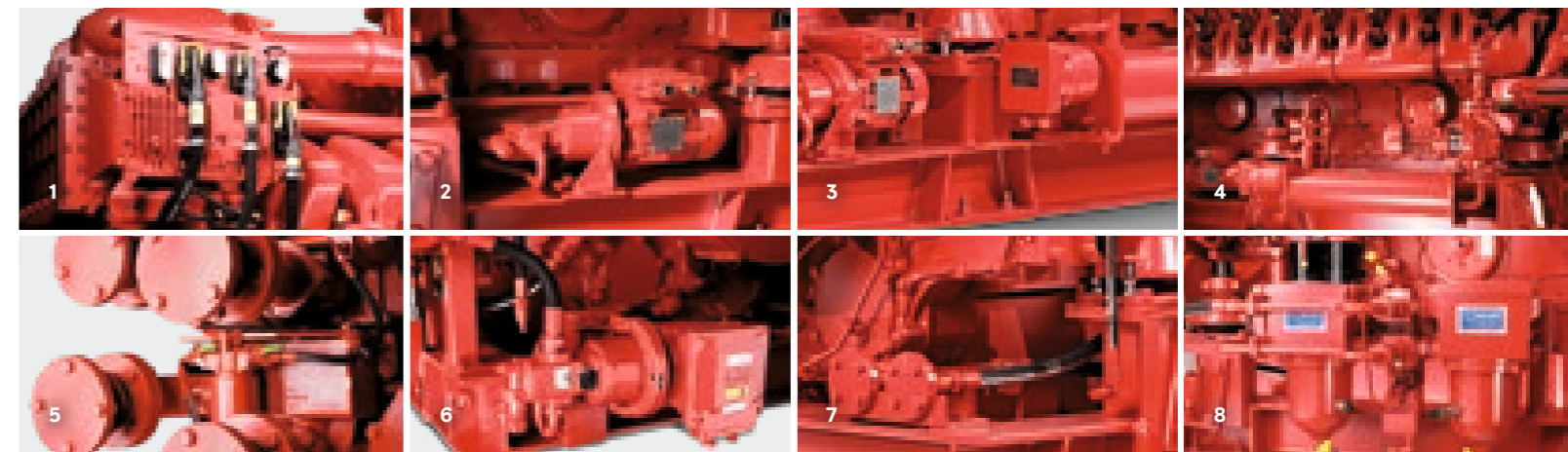
- Engine Series 2000 P02/4000 P03
- Electric starter 24 VDC
- Fuel prefilter with flexible hoses and ANSI connecting flange
- Manual pump for lube oil extraction
- Coolant connections with rubber bellows and ANSI flanges
- Coolant preheater 400 – 690 VAC, 50/60 Hz
- Engine Anti-Vibration Mounts (AVM)
- Baseframe for engine and accessory equipment
- Epoxy Offshore paint system

#### Optional scope:

- Air starter
- Hydraulic starter
- Electric motor driven lube oil extraction pump
- Prelubrication pump 400 – 690 VAC, 50/60 Hz
- Redundant governor acc. to NFPA 20 (power range 498 – 1050 kW acc. to Rev. 2007, power range 1350 – 2800 kW acc. to Rev. 2010)
- Classification acc. to DNV, ABS, BV, LRS, GL, RS, CCS

Illustration using the example of Engine Plus Package with 20V 4000 P03

- 1 ADEC electronic engine controller
- 2 Lube oil extraction pump
- 3 Baseframe
- 4 Coolant preheater
- 5 Coolant connections
- 6 Prelubrication pump
- 7 Fuel connections
- 8 Fuel prefilter

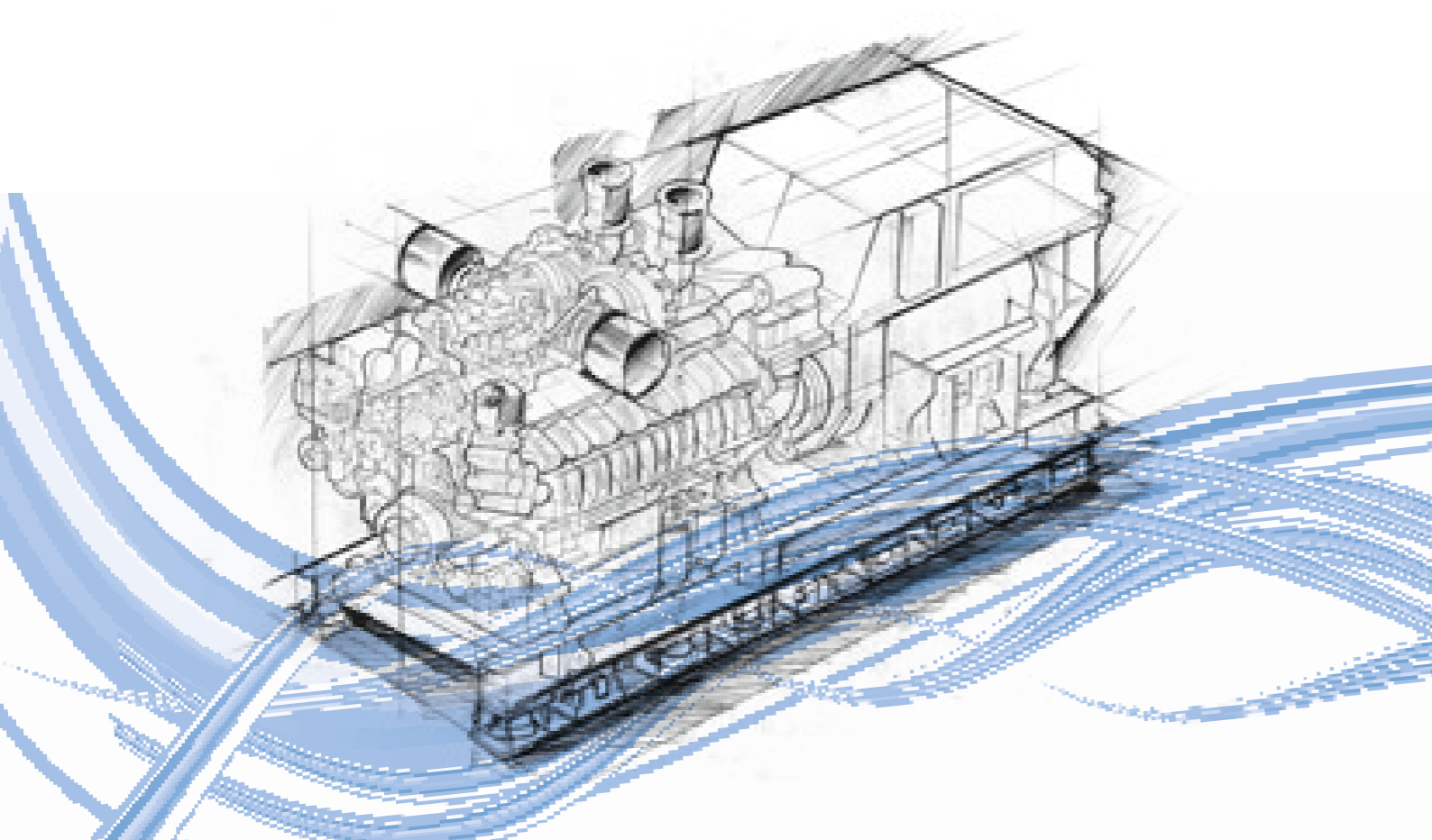


## Systems solutions for marine offshore exploration & production applications

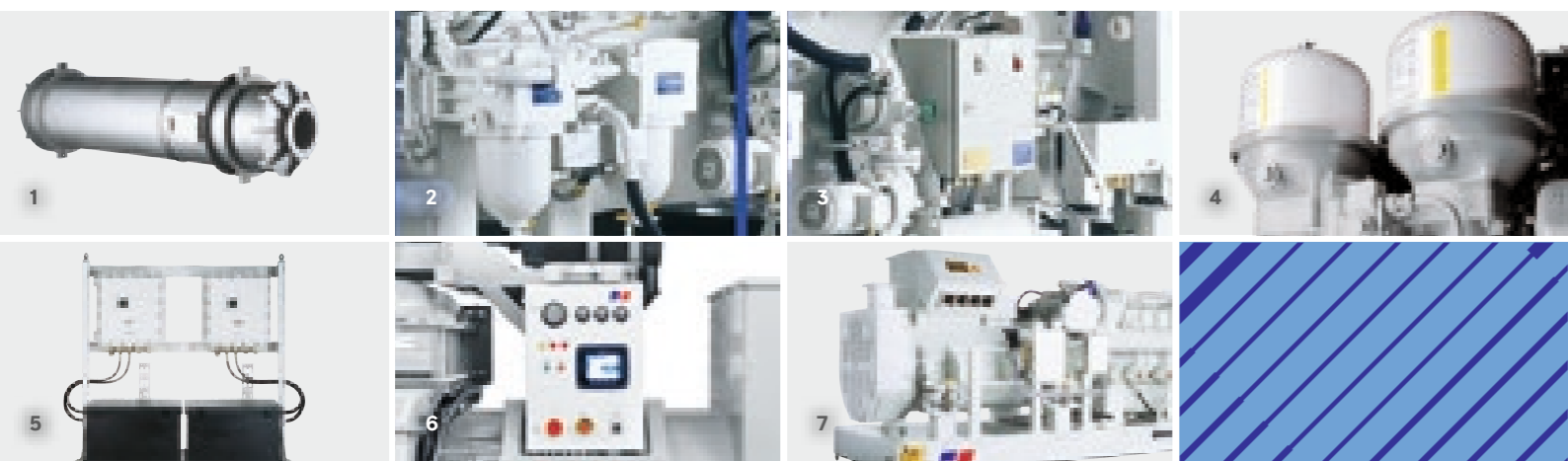
# OFFSHORE GENERATOR SETS

The ideal generator set package comes from a close partnership and vast expertise. We'll work with you to develop a modularized system. We combine decades of oil and gas industry experience with unmatched engineering expertise to form powerful - and complete - solutions. Built to meet the demands of the oil and gas industry, these complete systems deliver high performance, efficiency and reliability in extreme conditions. MTU diesel engines and systems are fully integrated and allow for easy serviceability. Everything is designed to work together, which prolongs preventive maintenance and overhaul intervals.

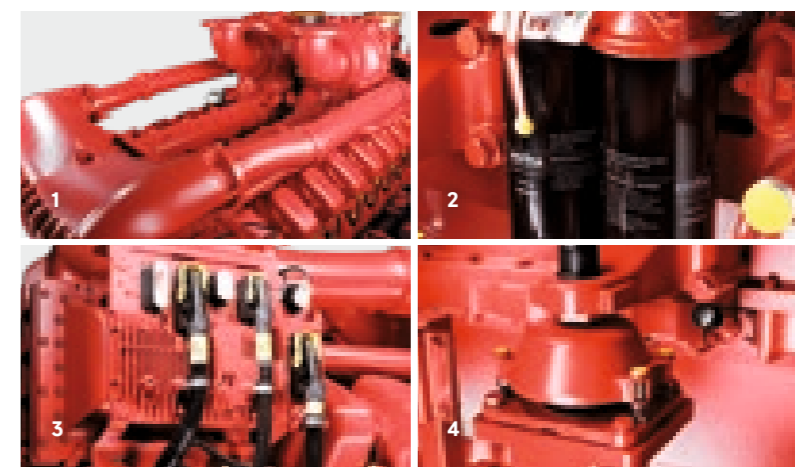
All components, carefully selected from premium manufacturers, are engineered with the latest technology. System assembly takes place on specially equipped production lines. Skilled craftsmanship, continuous monitoring and careful inspections ensure every system meets our high quality standards. And our system solutions can be put to work quickly. Our systems undergo a full factory Acceptance Witness Test with accessories, completed on our own test beds, to allow for fast and cost-effective installation.



- |   |   |
|---|---|
| <p><b>1 Exhaust system</b></p> <ul style="list-style-type: none"> <li>- Exhaust silencers with spark arrestor</li> <li>- Exhaust gas cooler</li> </ul> <p><b>2 Fuel system</b></p> <ul style="list-style-type: none"> <li>- Fuel pre-filters</li> <li>- Fuel tank (SS, CS)</li> </ul> <p><b>3 Cooling system</b></p> <ul style="list-style-type: none"> <li>- External mounted radiator cooler</li> <li>- Seawater heat exchanger</li> <li>- Pre-heater</li> </ul> <p><b>4 Lube oil system</b></p> <ul style="list-style-type: none"> <li>- Special oil sump designed for higher inclinations</li> <li>- Prelubrication pump</li> <li>- Automatic oil filter</li> </ul> | <p><b>5 Starting system</b></p> <ul style="list-style-type: none"> <li>- High performance electrical starters</li> <li>- Battery skid with breakers</li> <li>- Hydraulic starter</li> <li>- Air starter</li> </ul> <p><b>6 Control panel</b></p> <ul style="list-style-type: none"> <li>- Project specific control panels</li> <li>- PLC types, Siemens, ABB, Allen</li> <li>- Bradley, COMAP</li> </ul> <p><b>7 Alternator</b></p> <ul style="list-style-type: none"> <li>- Project specific design</li> <li>- IP23-IP56</li> <li>- Water, air cooled</li> <li>- LV, MV, HV</li> </ul> |
|---|---|



- 1 Turbochargers
- 2 Dual fuel filter arrangement
- 3 ADEC
- 4 AVM arrangement

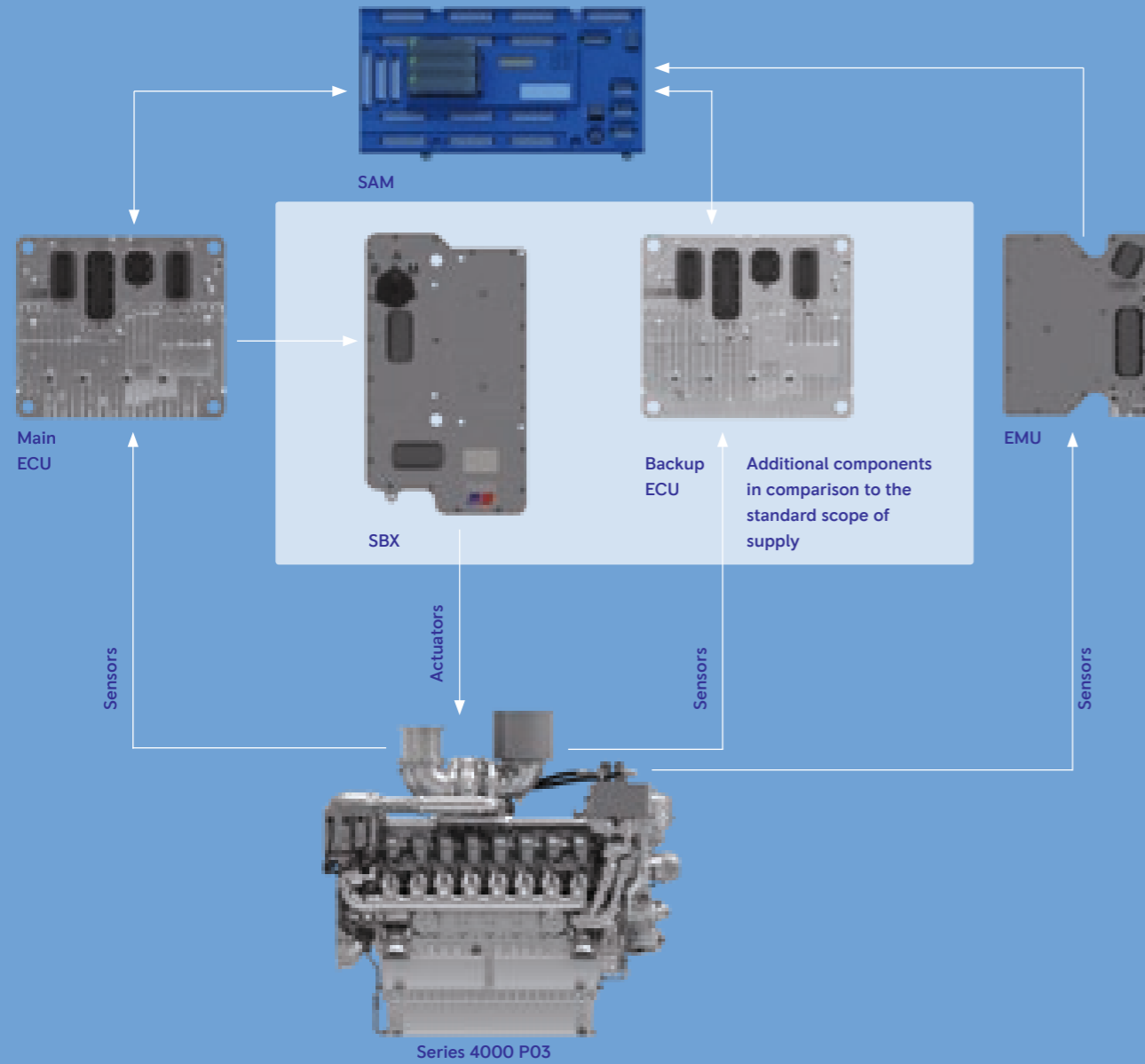


OFFSHORE  
Generator  
SETS

## Redundant Controller for Fire Pump Drive Systems (NFPA 20)

# SAFETY IS GOOD. REDUNDANCY IS BETTER.

# 06



The NFPA-20 (2010) standard requires redundant engine controllers on fire-pump drive systems in order to prevent interruptions in the fire-pump water jet during an emergency. We are the first manufacturer in the world to offer redundant controllers for engines with common rail injection.

In accordance with this standard, the second controller must be installed on the engine and permanently wired. In the event of a fault on the first controller, it must take over the engine control automatically without interrupting the water jet. This measure increases the availability of your fire pumps and consequently the entire system.

The redundant controllers developed by us can be used in direct, hydraulic, and diesel-electric drive systems. To redundantly record all engine data required for controlling, a second sensor set is installed on the engine. The ECU7 engine control unit is used as a main and backup controller. Because the injectors and high-pressure fuel control block are not installed redundantly, triggering of these actuators must be switchable between the two controllers: and so the new SBX1 switch box forms the heart of this system.

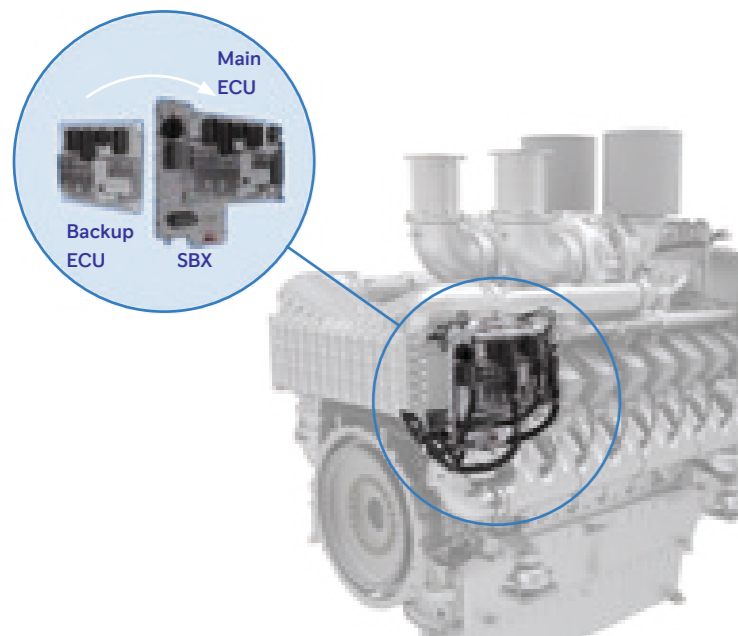
### Switching

The MTU engine controller offers the option of manual switching, whereby the controller active at any given moment is displayed optically (via LED). The switching process is designed to guarantee the greatest possible redundancy of the system. Optimal use is made of the ECU7 plugs for logic switching and for supplying the new unit. This results in extremely simple wiring.

If switching is necessary, drops in speed and excessively high rail pressure must be prevented. Our system guarantees that these demands are met for all types of applications (direct, diesel-electric, or diesel-hydraulic pump drive), all engine cylinder variants (12V, 16V, or 20V), and for every engine base speed (1,500 rpm for 4000 P63 or 1,800 rpm for 4000 P83).

### Benefits:

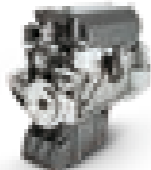
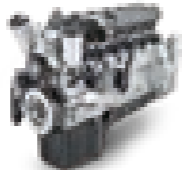
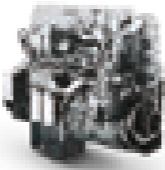

- Achieving the NFPA20 (2010) norm for Series 4000 P-engines
- Specifically designed for common rail injection
- Increased availability thanks to redundancy
- Simple retrofitting due to plug-and-play
- All components are developed to work together seamlessly
- All from one trusted source and in the quality you expect from us


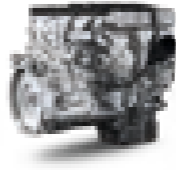
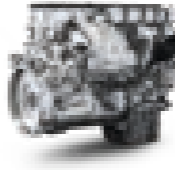
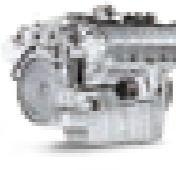
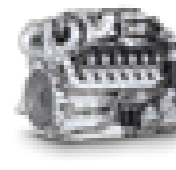
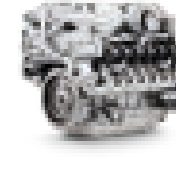


Oil and gas engines for onshore

# SERIES AND EMISSIONS QUALIFICATION.

07

Emissions qualification	Series 900	Series 460	Series 60	Series 1000/ OM 934/936
				
EU Nonroad Stage IIIA Comp (97/68/EC)	■	■	■	
EU Nonroad Stage IIIA (97/68/EC)				
EU Nonroad Stage IIIB Comp (97/68/EC)	■	■		
EU Nonroad Stage IV Comp (97/68/EC)				■
EU Nonroad Stage V (2016/1638) + EPA Nonroad T4				■
China Onroad Stage V (GB17691-2005)		■		
China NRMM Stage III (GB20981-2014)	■	■	■	
MoEF India/ CPCB Stage II				
TA-Luft optimized (Diesel)				
Fuel consumption optimized				
UN ECE R96 Emission Flex Package EFP				■
NEA Singapore for ORDE				
EPA Nonroad T2 Comp (40CFR89)			■	
EPA Nonroad T3 Comp (40CFR89)	■	■	■	
EPA Nonroad T4i Comp (40CFR1039)	■	■		
EPA Nonroad T4 (40CFR1039)				■

Series 1100/OM 470	Series 1300/OM 471	Series 1500/OM 473	Series 1600	Series 2000	Series 4000
					
			■		
■	■	■			
■	■	■			
				■	■
			■		
			■	■	■
■	■	■			
			■		■
			■	■	■
				■	■
■	■	■			■

Oil and gas engines for offshore

# SERIES AND EMISSIONS QUALIFICATION.

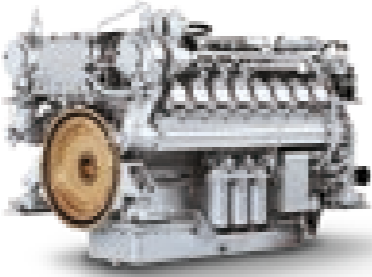
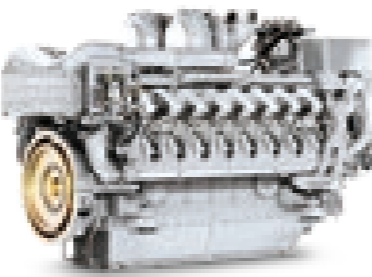
Emissions qualification	Series 2000	Series 4000
 		
EPA Nonroad T1 Comp (40CFR89)		■
EPA Nonroad T2 Comp (40CFR89)	■	■
IMO II		■



Photo: Øyvind Hagen / Statoil



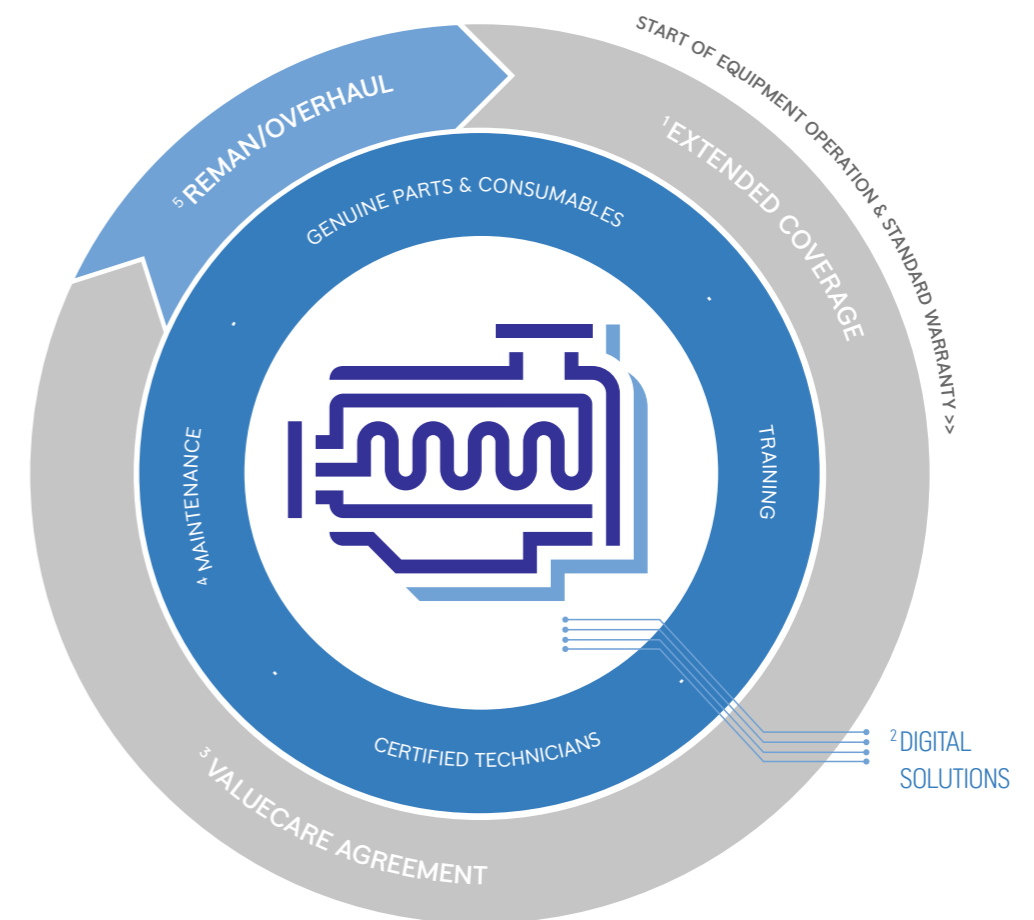


How complete lifecycle solutions help

## ENSURE A LONG, RELIABLE LIFE.

08

As your equipment ages, its needs—and yours—change. Our full portfolio of service solutions wrap around your investment, providing 360 degrees of customized support, for optimal value at every stage of life.



- 1 Avoid the unexpected with added protection beyond the standard warranty.
- 2 Make better decisions faster with digitally-enhanced tools.
- 3 Maximize availability and optimize lifecycle costs with a ValueCare Agreement.
- 4 Improve system performance and extend equipment life with on-demand support.
- 5 Keep a good thing going with factory reman/overhaul solutions.

Why preventive maintenance is essential

# DON'T LET THE UNKNOWN LEAVE YOU UNPREPARED.

With large investments, lifecycle costs can be significant. It's often the unforeseen costs lurking below the surface—things like fuel consumption, unplanned downtime and repairs—that have the greatest potential to impact your business. That's why it pays to invest in our superior power systems and plan ahead with preventive maintenance. There's no better way to optimize fuel economy, maximize uptime and avoid the unexpected.

**Optimize fuel economy.**

Fuel consumption accounts for up to 90 percent of total lifecycle costs depending on the application—by far one of the most significant costs associated with your equipment. Well-maintained MTU engines deliver industry-leading fuel efficiency, helping you keep fuel costs down over the long term.

**Maximize uptime.**

Preventive maintenance services can be planned around your schedule, so your equipment is available when you need it most.

**Avoid the unexpected.**

Planned maintenance helps solve problems before they start, helping you avoid unexpected downtime and resolve problems early before they escalate.

**Work with one source.**

We keep maintenance simple, safe and efficient. Our factory-approved methods and expert technicians ensure everything is done correctly according to proprietary preventive maintenance schedules, optimizing the availability of your equipment, reducing lifecycle costs and helping you avoid unforeseen problems.

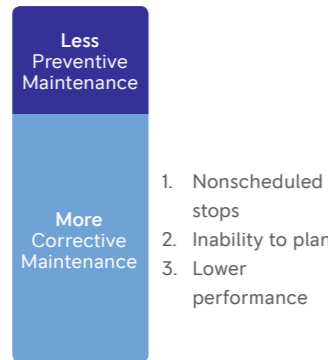
## The Importance of Preventive Maintenance

When preventive maintenance is a high priority.

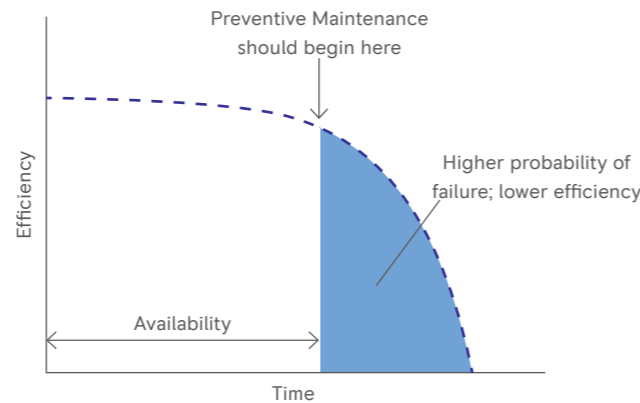


1. Scheduled stops
2. Improved performance
3. Better control over operation

When preventive maintenance is a low priority.



1. Nonscheduled stops
2. Inability to plan
3. Lower performance



We focus on preventive maintenance to reduce the downtime and added costs of corrective maintenance.

Delaying maintenance increases unexpected failures and decreases performance and fuel economy.





## Factory-certified technicians

# RELY ON OUR EXPERTISE.

To give your equipment a long and productive life, choose a partner you can trust. Only factory-certified technicians know how to get the job done right using proven service methods, factory-specified maintenance schedules and genuine OEM parts.

From preventive maintenance to complete overhaul, we are your true lifecycle partner. Whatever level of support you need, our global network of factory-trained professionals knows all about your equipment and is ready to help you maximize performance and minimize lifecycle costs.

### **Never compromise.**

MTU engines and systems are built to last with legendary high standards. When it's time for service, don't settle for anything less. Protect the life of your equipment with professional certified service technicians and genuine OEM parts and consumables—the only options that live up to our standards for craftsmanship, quality and performance. To get the most from your equipment, there are no shortcuts. For maximum reliability, performance and uptime, choose a name you can trust.

### **If you need us a little:**

On-Demand Support—including professional inspections and preventive maintenance recommendations from us—we help you to identify and address problems early, save on repairs or unexpected downtime, and optimize your equipment's performance and longevity. Inspections include visual assessment, test run and leak check, on-site oil and coolant analysis, diagnostic evaluation and reporting.

### **If you need us a lot:**

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.




ValueCare Agreements

# FOCUS ON YOUR OPERATIONS. LEAVE THE REST TO US.

You've got a tough job. With us as your partner, you'll you get the power, performance and peace of mind to get it done right. Our digitally connected power systems, wrapped in 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**

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.

		
<p><b>Bronze</b></p> <p>Ensure parts availability and price stability</p>	<p><b>Silver</b></p> <p>Eliminate unexpected maintenance costs</p>	<p><b>Gold</b></p> <p>Maximize operational uptime</p>
<ul style="list-style-type: none"> <li>- Digital connectivity (Go! Connect) and platform access (Go! Manage)</li> <li>- Automated delivery of parts (preventive) at a predefined rate based on operating hours</li> <li>- Preventive maintenance labor options to fit your business needs</li> <li>- Dedicated support for technical issues</li> <li>- Quarterly reporting of completed and upcoming maintenance and costs</li> <li>- Annual on-site engine health check by our technician</li> </ul>	<ul style="list-style-type: none"> <li>- Proactive maintenance planning, troubleshooting and remote engine health monitoring</li> <li>- Fixed pricing per operating hour for maintenance and repairs</li> <li>- Key corrective maintenance components always in-stock at our main warehouses</li> <li>- 24/7 standby service with remote technical support</li> <li>- Quarterly reports, including reliability analysis (mean time between failure)</li> </ul> <p><i>Silver also includes all benefits of Bronze level</i></p>	<ul style="list-style-type: none"> <li>- Operational uptime commitment to meet or exceed your availability targets</li> <li>- Regular supervision by local service partner (e.g. monitoring of parts stock, improvements)</li> <li>- 24/7 emergency assistance with on-site support</li> <li>- Monthly reports, including availability and average repair times</li> <li>- Asset health monitoring</li> <li>- Annual performance meetings and trend analysis with us to address technical updates, engine fleet data, operational optimization and more</li> </ul> <p><i>Gold also includes all benefits of Silver &amp; Bronze levels</i></p>



ValueCare Agreements help you:

-  Increase operational uptime
-  Guarantee parts availability and service quality
-  Predict equipment-related costs
-  Optimize maintenance planning
-  Connect to us, 24/7

Proof from the field:

"Delivering a best-in-class travel experience requires an uncompromising commitment to quality. And that's exactly what we get from you—reliable power systems with complete lifecycle support."

**Andy Clarke**  
Head of Commercial Engineering,  
Great Western Railway

"Our Maintenance and Repair Contract (MARC) with MTU (Asia) since 2010 has contributed significantly to more efficient and reliable ferries allowing us to achieve a high operational state of readiness and availability. All thanks to your competent and skilled engineering workforce"

**Sebastian Koh**  
General Manager,  
Bintan Resort Ferries

## Digital Solutions

# THE FUTURE IS DIGITAL.

For over 100 years, we've been known for technological innovation and leadership—driving efficiency and reliability to new heights. Today, we're applying that same spirit of innovation to digitalization. Fueled by your system's data—and supplemented with our exclusive expertise, smart analytics and extensive database—digital solutions magnify the power of your investment.

From proactive failure prevention and intelligent troubleshooting to instant failure support and smart maintenance planning, digital solutions unlock the full potential of your our MTU system.

### **Go! Act**

#### 1. Service in your pocket

Designed to support on-site operators, Go! Act:

- Receives push notification of failure codes from connected assets
- Provides crew members with vital information about failure codes
- Supports event reporting with convenient photo capture functionality
- Enables direct communication with fleet managers or our Customer Assistance Center

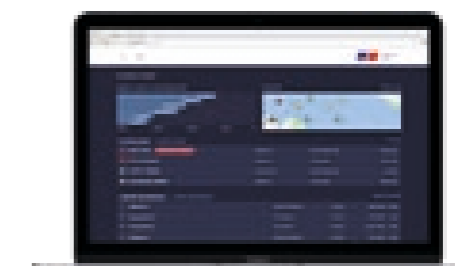


### **Go! Manage**

#### 2. Monitor your fleet

Built for fleet managers, Go! Manage:

- Provides a live overview of fleet, asset and engine conditions
- Displays active and closed alarms
- Enables interaction and communication with on-site staff via Go! Act
- Shows maintenance schedule, with completed tasks clearly marked
- Supports remote troubleshooting via multigraph



Remanufactured Products

# EXCHANGE AND SAVE.

Factory remanufactured products deliver the same high standards of performance, service life and quality as new products, along with identical warranty coverage—at a fraction of the cost. And with design and model-related updates, they also feature similar technological advancements. Developed by R&D engineers, the remanufacturing process saves you time and money, while benefiting the environment through the reuse of materials. To help you work efficiently, a wide range of remanufactured parts, engines and systems are available worldwide.

**Reduce lifecycle costs.**

As you evaluate your long-term power needs, you must consider a variety of factors. Factory remanufactured products are a smart solution, helping you reduce the total lifecycle cost of your equipment.

- Acquisition costs: Remanufacturing saves energy, resources and other costs associated with producing new products. These savings are passed on to you.
- Operating costs: Factory remanufactured products are fully remanufactured according to strict factory standards, resulting in reduced fuel and oil consumption compared to other used products.
- Maintenance costs: Model-related updates made during the remanufacturing process lengthen equipment life, while customizing maintenance to the engine’s specific load profile further extends equipment life and lowers maintenance costs.
- Warranty exposure: Factory remanufactured products are backed with the same warranty coverage as new products.

**Save time.**

Factory remanufactured products put your equipment back to work faster than an overhaul, which reduces downtime, service time and indirect costs such as storage. Rather than wait for your original equipment to be repaired or overhauled, you are supplied with a remanufactured unit. You then receive a credit in exchange for your original core, depending on its technical condition. With our no-hassle core acceptance policy, we provide the total costs to replace your product upfront—preventing unplanned costs. It’s that simple.

**Maintain factory standards.**

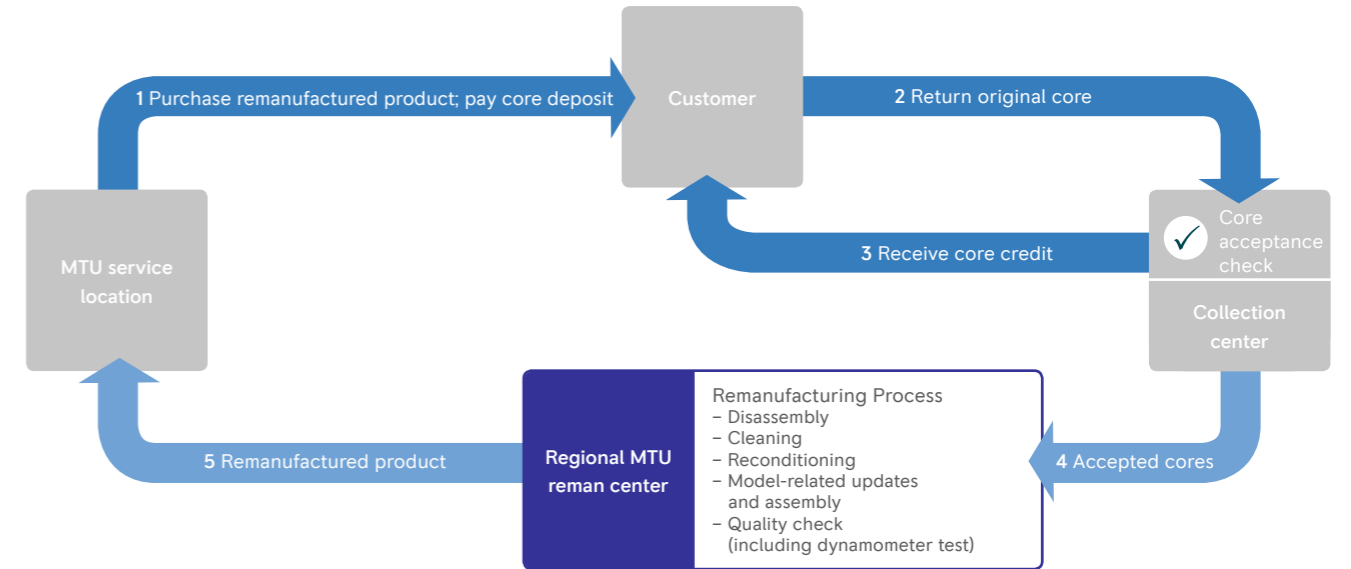
All products are remanufactured to strict our standards by our certified technicians at our regional reman centers. Only we can remanufacture our parts, engines or systems to our original factory specifications. Whether it’s fuel injectors, crankshafts, cylinder heads or complete systems, every product undergoes a detailed remanufacturing process developed by R&D engineers.

In the factory remanufacturing process, used products and assemblies are fully disassembled, cleaned and inspected, then reassembled with all genuine, new wear parts from us. Replacement parts are issued for components that are worn, damaged or outdated. Design and model-related updates are incorporated, making factory remanufactured products comparable to new products. All remanufactured engines and systems are rigorously dynamometer tested according to the same procedures used for new products in our assembly plants.

**Protect the environment.**

Since remanufacturing is an efficient use of resources and energy, factory remanufactured products benefit the environment as well. By remanufacturing end-of-life products rather than discarding them, the need for raw materials and energy to produce new parts is minimized, significantly reducing waste and CO2 emissions. Often, the process can be repeated multiple times, greatly extending the lifespan of these nonrenewable products.

Exchange process



Used products and assemblies are fully disassembled, cleaned and inspected during the remanufacturing process.



After the remanufacturing process, products are fully restored to updated specifications according to certified, standard processes from the original manufacturer.



Service Network

## LOCAL SUPPORT. WORLDWIDE.

09

The most important part of your power system isn't a part at all—it's your local service team. With more than 1,200 service locations worldwide—backed by regional Parts Logistics Centers in Europe, Asia and America—you can count on responsive support by expert technicians, wherever work takes you. To find your local service partner, visit [www.mtu-solutions.com](http://www.mtu-solutions.com).

**Always on call, 24/7**

Whether it's connecting you with a local service partner or assigning an urgent problem to a dedicated team of our experts, we're ready to assist you—wherever you are, whatever you need.

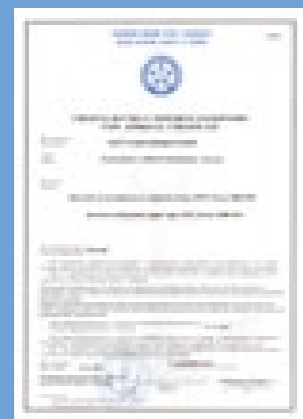
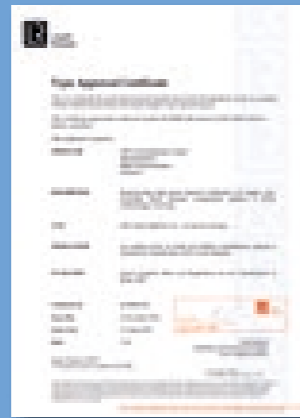
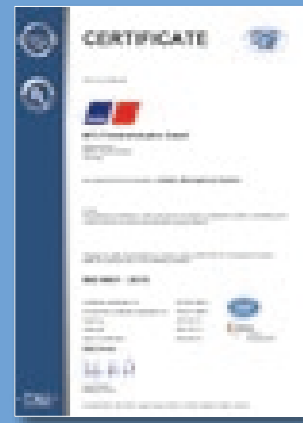
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Certified quality

# FULFILLING DEMANDING REQUIREMENTS.

# 10

For decades, we held high standards for engineering excellence, ensuring the quality of our products at every stage of their development. Through hard work and dedication, we earned many certifications of quality.

We meet international requirements of ISO 9001:2008 and 14001:2009. Our engines and gensets are certified by all major classification societies such as Achilles, FPAL, BS OHSAS 18001:2007, ABS, DNV, LRS, GL, BV, CCS and RS.

Nevertheless, there is a lot more to quality than obtaining a certificate or meeting an inspection specification. For us, the true mark of quality is reflected in customer satisfaction, confidence and loyalty. Our customers have high expectations for quality. This inspires us to set high standards for ourselves. This has enabled us to keep innovating, improving and succeeding. With reliable engines and systems trusted by customers all over the world, we will continue to power the oil and gas industry well into the future.



