



Mining

PARTNER IN POWERFUL SOLUTIONS



A Rolls-Royce
solution



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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

Our 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 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.

Partnership with Mercedes-Benz

mtu Series 1000, 1100, 1300, and 1500 engines are based on Mercedes-Benz models customized for off-highway use.



Power for mining

THE POWER TO TAKE YOU FORWARD.

02

Mining has its own laws and challenges. Huge stretches, immense masses, extreme temperatures, unimaginable tasks: Whoever wants to prove themselves in these situations – whether human or machine – must be strong, hard, tough, and persevering. A challenge that only a few master. We are amongst them.

Fully tried-and-tested

Our engines have a long history of proving themselves in mining applications around the globe. Day in and day out, under extreme conditions, in hard continuous operation.

As leaders in quality and tested in practice a thousand times over, our engines first of all feature impressive reliability and availability. Furthermore, low life cycle costs due to efficient operation, low fuel

consumption, long TBO intervals characterize our engines, just as much as environmentally friendly operation.

Ensuring a long, reliable life.

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



Engines for dump trucks < 70 - 130 tn. sh.

EVERYDAY HEROES TACKLE THE TOUGHEST CHALLENGES.

No job is too heavy

Up to 5,500m above sea level, without power reduction. Shimmering heat by day, icy cold at night. Constantly swirling dust, moisture that penetrates everything, steep hillsides on which heavy loads need to be moved. The conditions that dump trucks with our engines brave on a daily basis are beyond doubt the toughest in the world.

In an environment that places the highest demands on technology, vehicles run 24/7 with minimum downtime – continually at full capacity.

Benchmark technology

The combination of a rugged engine enhanced by a proven fuel injection system, refined engine management and a practical

arrangement of the air and exhaust system makes our dump-truck engines a benchmark for these extreme applications. The key benefits are built in: high torque at low engine speeds yields tremendous engine power.

The robust, individually adapted technology of our engines assures the highest availability of these vehicles which play an integral role in working the mine. Furthermore long maintenance intervals, maintenance-friendly designs, and low specific fuel consumption values keep life cycle costs low.

Our comprehensive, worldwide service network is on your side, ensuring the ultimate in reliability, availability and maintenance.

Engines for excavators, loaders and dozers

CARRYING IT ALL AWAY.

Non-stop performance

They move massive amounts of coal or ore containing valuable materials such as gold, copper, silver or platinum. And they transport almost unimaginable amounts of material to the places where it is processed or loaded onto dump trucks. In short: contemporary mining would not be possible without the tremendous power of wheel loaders, dozers and excavators.

The powerful machines driven by our engines work with top reliability – and high productivity. Power packs like our brawny Series 4000 can run at maximum power with practically no breaks. For loaders and dozers this means that they can work continuously at full power, and excavators can achieve the fastest load cycles – even at maximum loads. Despite continuous operation the running costs remain low.

As tough as you are

Our engines are known as some of the lowest-consumption engines in the world. Furthermore, maintenance is so uncomplicated that your vehicles are fully operational again in record time.

Robust, stable, and cost-effective: These are the attributes that make our engines your best choice. In a vehicle fleet that demands as much as it delivers. And in a competitive field as tough as the environment in which the vehicles work.

Support to keep you going

To help ensure maximize performance and uptime, our specialists are ready to provide expert support wherever and whenever you need it.

Engines for dump trucks 150 – 500 tn. sh.

GOING THE DISTANCE WITH THE HEAVYWEIGHTS.

Ready for the challenge

Dump trucks are becoming bigger and faster. Nowadays, they have to transport payloads up to 500 short tons – an extreme challenge for the engines in these "heavy-weights."

But it is a task that our super heavy-duty diesels cope with convincingly every day. Their mountains of power make sure that the vehicles they drive can carry larger loads and handle steeper terrain than the competition. With the end result that they deliver higher productivity.

Technology makes the difference

The fact that our engines remain comparatively "agile" throughout the entire performance map, despite their enormous power, is a tribute to the technological genius of our designers and developers.

The same can be said of their advanced combustion technology: it makes our engines cheaper to operate, cleaner and quieter than most others. Three benefits that make a difference – economically and ecologically.





Engines for underground mining machinery

THE HARSHER THE ENVIRONMENT, THE STRONGER WE ARE.

One of the hardest jobs in the world

Underground mining is a challenge for both man and machines. Massive drilling equipment is driven through rock while vehicles and machinery with heavy loads move around 24/7 at high temperatures in dust and moisture. Our engines are ideal for these situations. The excellent power-to-weight ratio is only one of many factors. Reliability, high availability, and the long service life of the engines are also crucial for effective operation. Maintenance-friendly engine designs keep unproductive downtime to a minimum, long TBO intervals and low fuel consumption keep the life cycle costs low – for maximum effectiveness. Our engines meet the stringent safety criteria of underground mining without restriction.

Power with responsibility

The emissions levels of our engines meet the especially important demands of underground mining. We are leaders in this aspect as well: Modern injection technologies and continually optimized combustion processes make our engines as environmentally friendly as possible. So they comply with EPA Tier 4 final/EU Stage IV emissions regulations.

Worldwide support. Above and below ground.

The performance of your engines and systems is crucial to your success and competitiveness. No matter where you operate – even underground – our specialists are available through our global service network to provide expert support.

Engines for drilling rigs and drilling equipment

BECAUSE ONLY THE STRONGEST PREVAIL.

Reliable groundwork

Drilling is necessary in every mine. Regardless of whether you are searching for natural resources or drilling blast holes, we supply engines that allow your drilling equipment to work reliably at high power.

Machines that are subject to extreme burdens over long periods of operation must be able to provide extraordinary power. Our engines make that possible, reliably and without restrictions. With their power, long service lives and cost-effectiveness, they've set standards against which other high-performance diesels have to be measured.

Strength and sensibility

Electronic engine management ensures that our engines, with all of their strength, are finely tuned to their tasks. It protects the engine, optimizes performance and simplifies diagnostics and maintenance. Strength and sensibility are combined into the ideal combination that asserts itself everywhere – even in the harshest conditions.





Diesel engines

DESIGNED FOR THE FUTURE.
BUILT FOR YOUR SUCCESS.

03

The higher the requirements and tougher the conditions, the more you need for one of our engines. That's because we develop the optimum drive solutions for all individual tasks. The wide range of our mining engines has the right answer for every application – a solution including the highest performance, greatest reliability, safety, environmental friendliness and operating efficiency.

Core technology

ALL ENGINES AT A GLANCE.

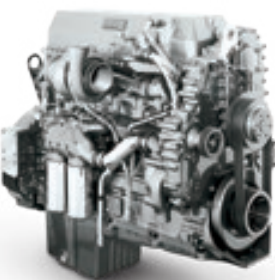
The higher the requirements and the more specific the application, the greater the need for our engines. That's because we develop the optimum drive solutions for all individual tasks. The wide range of engines contains the right answer for every application – a solution including the highest performance and greatest reliability, safety, environmental friendliness, and operating efficiency.



Series 460
The proven, evolved engine.
For heavy and medium duty operation.
220 – 375 kW (295 – 503 bhp)



Series 900
Maximum efficiency and availability.
For heavy and medium duty operation.
315 – 390 kW (422 – 523 bhp)



Series 60
Increased rated power. One of the most successful engines ever.
For heavy and medium duty operation.
224 – 496 kW (300 – 665 bhp)

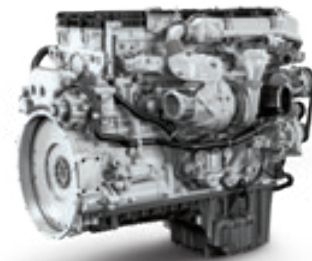


Series 1000*
Uncompromising availability.
For heavy and medium duty operation.
180 – 280 kW (134 – 375 bhp)

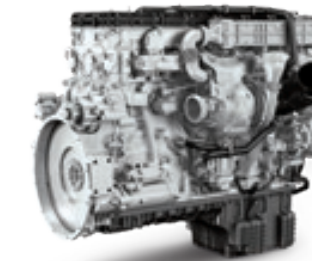
*Manufactured by



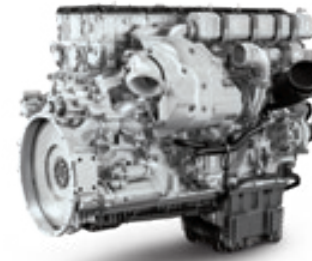
*Customized by



Series 1100*
More efficient than ever. Save up to 3% in fuel in comparison to EU Stage IV/EPA Tier 4 final.
For heavy and medium duty operation.
240 – 340 kW (322 – 456 bhp)



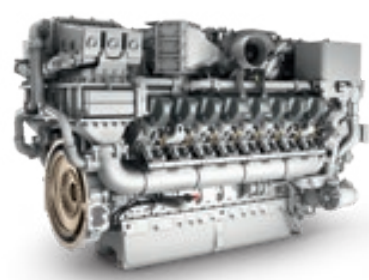
Series 1300*
The toughest ever. With improved peak torque.
For heavy and medium duty operation.
320 – 390 kW (429 – 523 bhp)



Series 1500*
Low life cycle costs. Quick and easy maintenance.
For heavy and medium duty operation.
380 – 480 kW (509 – 644 bhp)



Series 2000
A powerful heart for maximum agility.
For heavy and medium duty operation.
783 – 970 kW (1050 – 1301 bhp)



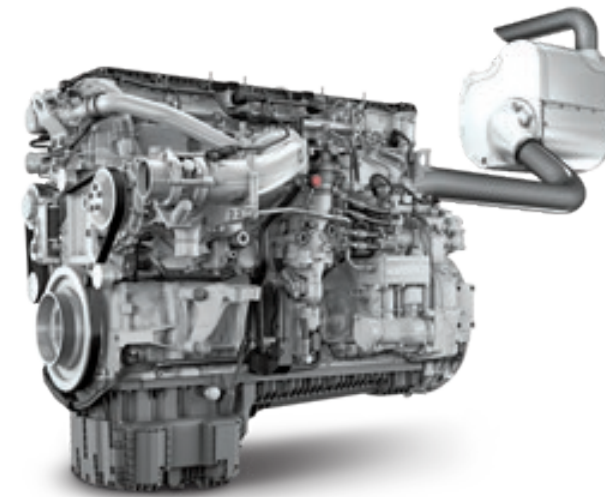
Series 4000
Low life cycle costs.
For heavy duty operation.
1150–3000 kW (1542–4023 bhp)

Emission reduction solutions

SMALL FOOTPRINT. BIG OUTPUT.

Advanced greenhouse gas regulations worldwide for mining applications like EU Stage IV and EPA Tier 4 call for significant reductions in emissions. We have a comprehensive portfolio of highly effective emissions reduction solutions.

By focusing on fuel injection, turbocharging, cooled exhaust gas recirculation, electronic engine controls for optimizing processes and prevention of soot formation, our advanced engine and drive system technologies exceed legislative requirements.

**Aftertreatment solutions below 560 kW****Fuel injection**

Optimized fuel combustion in the cylinder is achieved by combining an electronically controlled common rail fuel injection system with turbochargers.

All-in-one exhaust gas aftertreatment

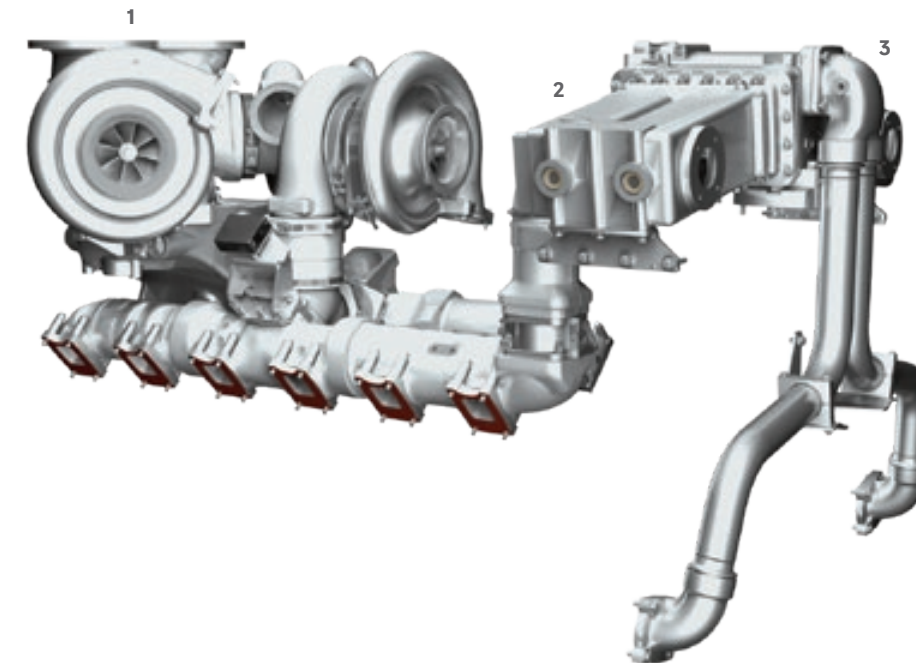
A single box with selective catalytic reduction (SCR), diesel particulate filter (DPF) and integrated dosing unit decreases harmful greenhouse gases and optimizes fuel consumption to meet EU Stage V emission limits.

Internal emissions reductions

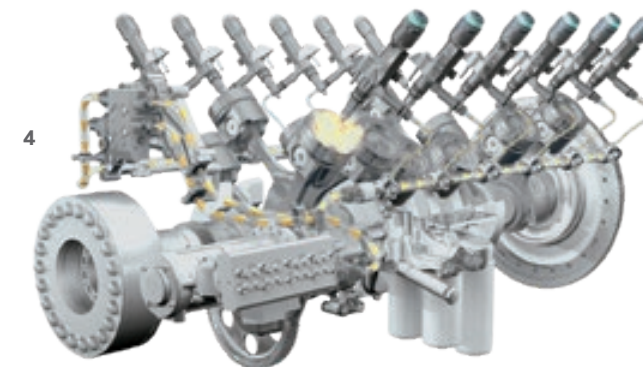
The internal emissions technology alone can significantly reduce nitrogen oxide amounts to improve overall system fuel and urea consumption.

Turbocharging

We offer various turbocharge concepts. Single-stage turbochargers compress the air so that more oxygen flows into the combustion chamber, thereby burning more fuel and increasing engine power output. Two-stage turbochargers ensure low fuel consumption across a wide speed range, exceptionally high torque at low speeds and clean combustion.

**Example: Series 4000 emission reduction**

- Two-stage turbocharging control**
Assures low fuel consumption across a wide speed range, exceptionally high torque at low speeds, and clean combustion
- Exhaust gas recirculation (EGR) coolers**
These coolers lower the combustion temperature and, subsequently, in-engine nitrogen oxide generation
- EGR valve**
This valve regulates recirculated exhaust gas quantities, thereby optimizing the EGR rate for all operating modes
- Common rail fuel injection**
It optimizes the combustion process to lower pollutant levels as well as fuel consumption

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

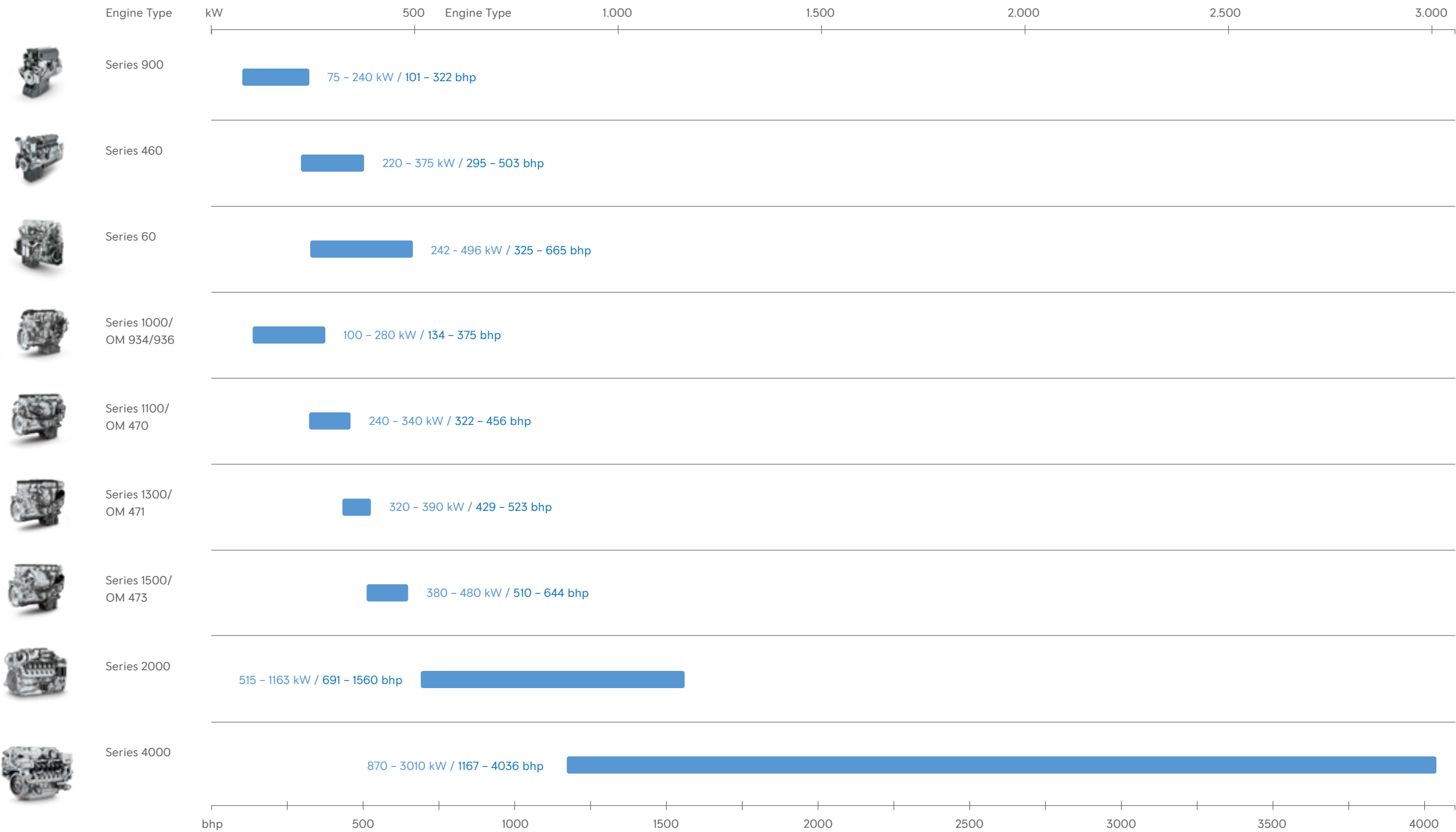
All of our engines above 560 kW (750 bhp) do not require any exhaust aftertreatment. Combining advanced exhaust gas recirculation (EGR) solutions with key technologies, they achieve optimal performance and efficiency while meeting the most stringent emission regulations.

EMISSION FLEX PACKAGE.

Governmental regulations for mining vehicles vary greatly from country to country. Emissions standards in some markets are highly regulated, less so in others. Our Emission Flex Package software lets you quickly and flexibly deactivate engine exhaust gas aftertreatment and selective catalytic reduction (SCR) systems, thereby eliminating the need for time-consuming hardware modifications.

Diesel engines

ALL ENGINES AT A GLANCE.



Our diesel engines portfolio covers the full power range from 75 – 3010 kW (101 – 4036 bhp) – while also fulfilling all emissions requirements. With their uncompromising operational availability, they set the benchmark for mining applications performance. Combining exceptional efficiency with absolute reliability, they greatly contribute to the economic success of mining operations.

Green technology

97.8% REDUCTION IN SOOT EMISSIONS OVER 19 YEARS.

04

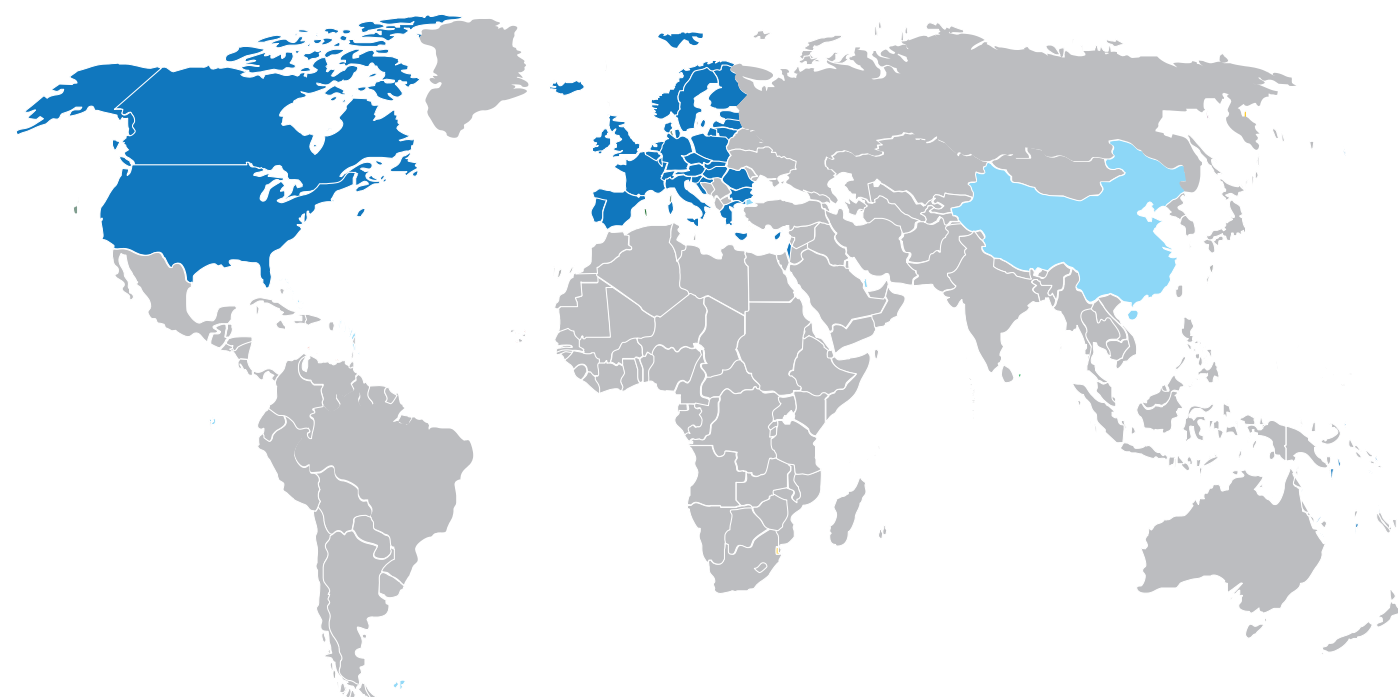
The increasingly stringent emissions limits are fast approaching the ideal “zero emissions” target for diesel engines. The statistics speak for themselves:

Over the course of 19 years, EU emissions stages have been tightened four times, and EPA Tier regulations have been created to govern

industrial engines. EU Stage V calls for a cut of over 94% in nitrogen oxides, even 97.8% in soot particulate emissions over the next 19 years.

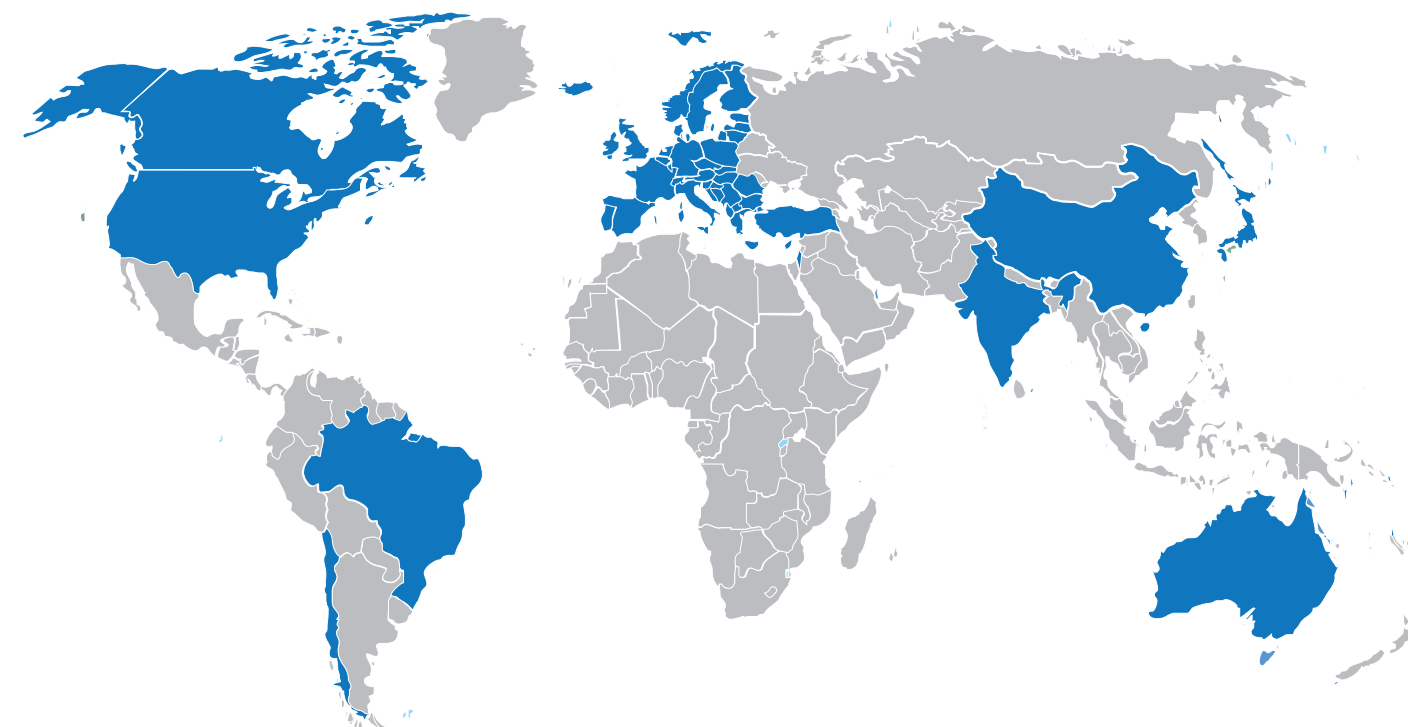
Our **mtu** solutions can help you fulfill all your emissions standards needs.

>560kW Situation 2021





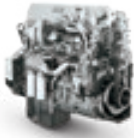

- Emissions legislation with a high technology approach
- Emissions legislation with a medium nationwide and high technology approach in emission hot spots
- Emission legislations with a medium technology approach
- No emissions legislation standard technology approach






>560kW A forecast to 2031



Overview of engines

SERIES AND EMISSIONS COMPLIANCE.

Emission qualifications	Series 900	Series 460	Series 60	Series 1000/ OM 934/936
				
EU Nonroad Stage IV Comp (97/68/EC)				■
EU Nonroad Stage V (2016/1638) + EPA Nonroad T4				■
China NRMM Stage III (GB20981-2014)	■	■	■	
China NRMM Stage V (GB17691-2005)		■		
MSHA approved	■		■	■
CANMET approved				
Fuel consumption optimized				
UN ECE R96 Emission Flex Package EFP				■
EPA Nonroad T1 Comp (40CFR89)				
EPA Nonroad T2 Comp (40CFR89)			■	
EPA Nonroad T3 Comp (40CFR89)	■	■	■	
EPA Nonroad T4 (40CFR1039)				■

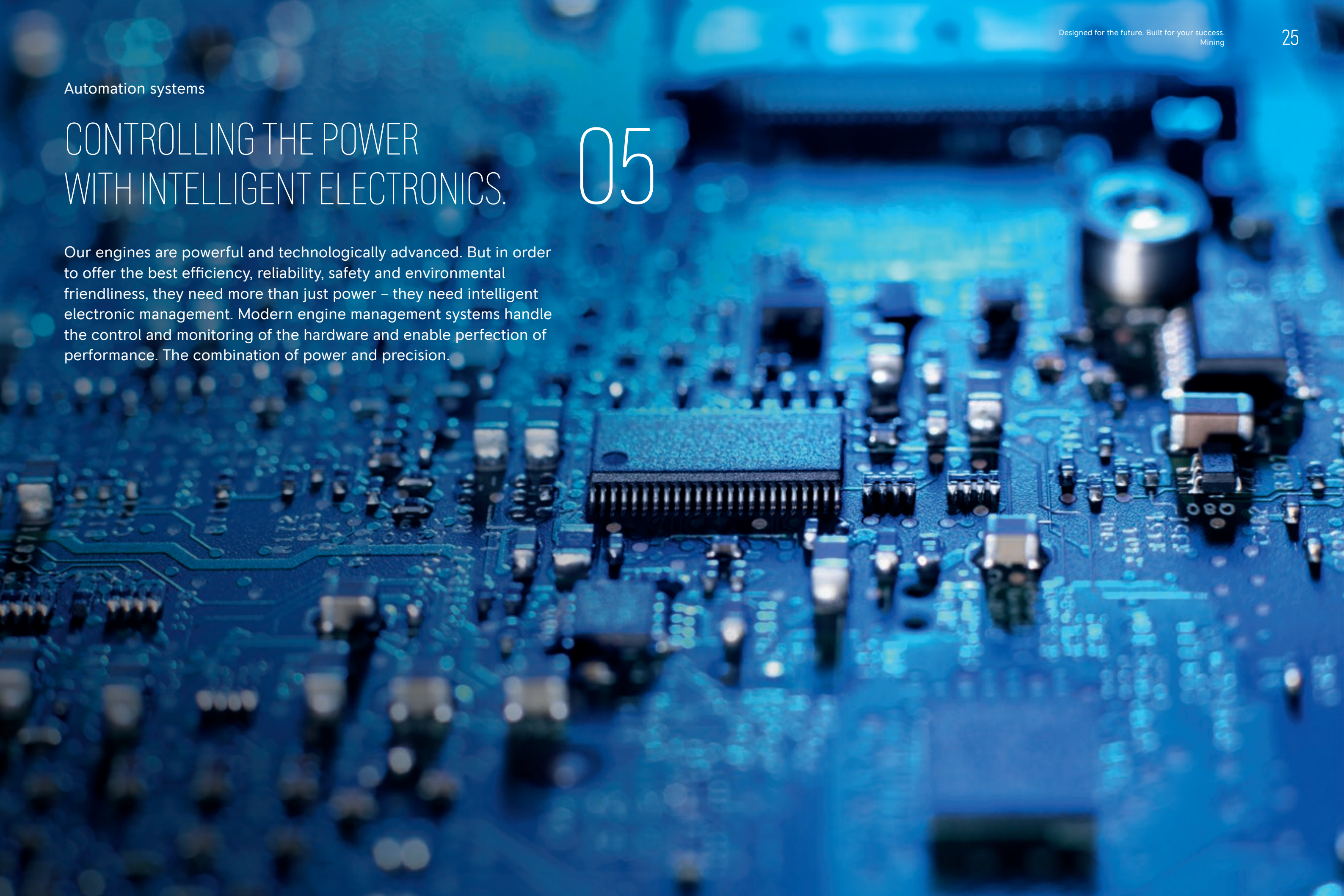
Series 1100/ OM 470	Series 1300/ OM 471	Series 1500/ OM 473	Series 2000	Series 4000
				
■	■	■	■	
■	■	■		
			■	■
■				
■	■			
				■
			■	■
■	■	■		■

Automation systems

CONTROLLING THE POWER WITH INTELLIGENT ELECTRONICS.

05

Our engines are powerful and technologically advanced. But in order to offer the best efficiency, reliability, safety and environmental friendliness, they need more than just power – they need intelligent electronic management. Modern engine management systems handle the control and monitoring of the hardware and enable perfection of performance. The combination of power and precision.



Engine management systems for *mtu* Series 4000

WE MANAGE EVERYTHING
FOR YOU.

All of our engines are equipped with intelligent electronic controls to ensure performance and efficient operation under all operating conditions. Innovative, high-end technologies control, regulate and monitor the engine to lower emissions and optimize safety.

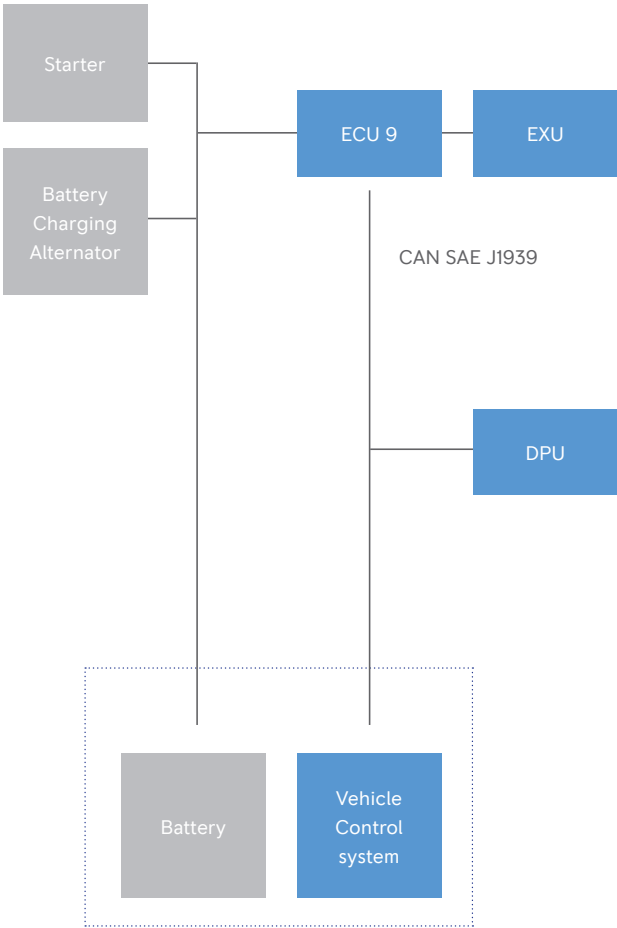
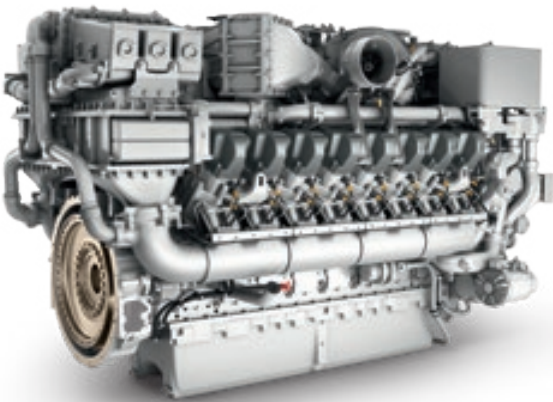
The engine management system ECS for *mtu* Series 4000 Tier IV engines comprises the engine control unit ECU 9 and the engine controller extension unit EXU.

These interconnected devices are installed directly on the engine and connected to the sensors, injectors and other actuators with wiring harnesses.

We also offer a DPU (data logger) in combination with our Digital Solutions Service that enables you to keep track of operating hours, system alarms and maintenance schedules. As a result, you can plan service intervals more effectively. For more details, see our “Digital Mining Solutions” on page 36.

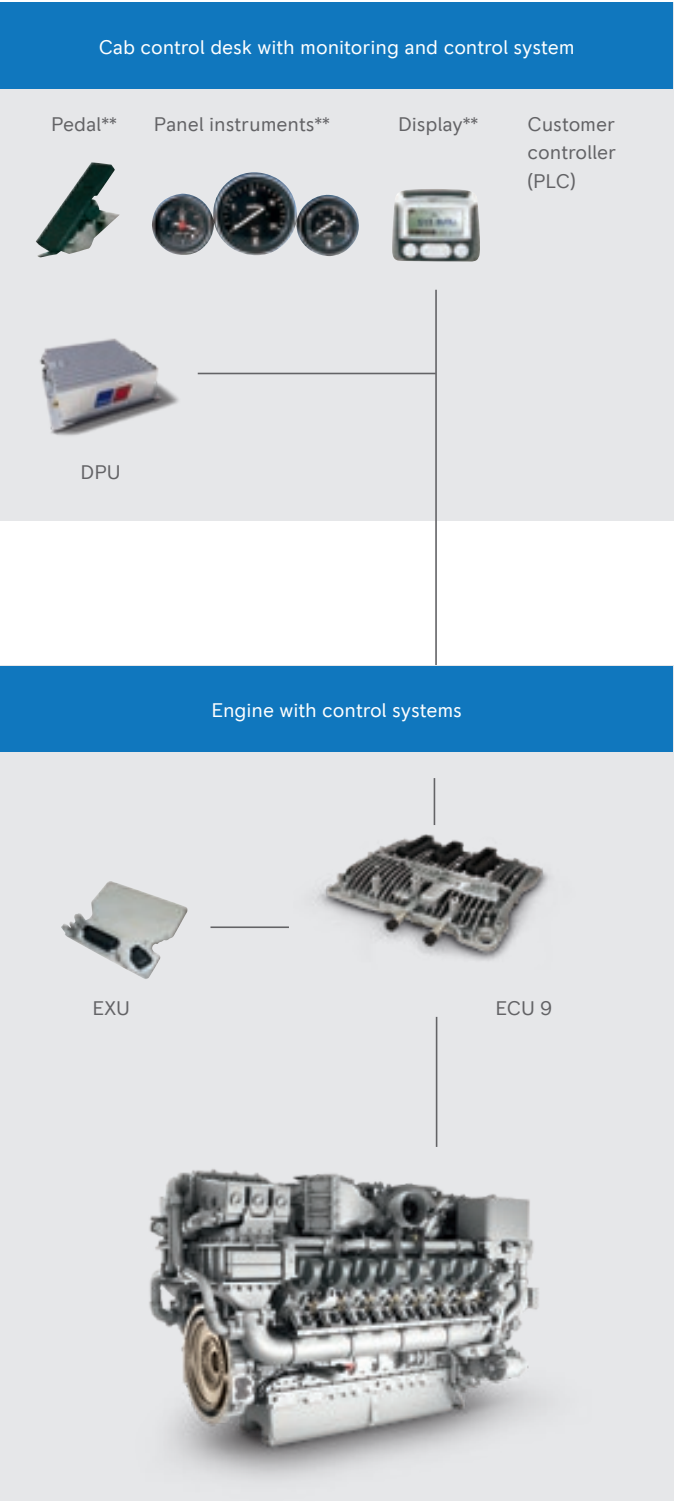
The engine management system optimally adapts the diesel engine to various complex operating conditions. It also detects in advance operating conditions that can lead to damage.

- Your benefits:**
- Engine protection and safety thanks to:
 - Critical operating condition reporting
 - Temporary reduction in power
 - Automatic shutdown
 - Automatic starting procedure, including pre-lubrication
 - Self-diagnosis and regulation for the system
 - Standard interfaces for external system connections, such as CAN SAE J1939
 - Easy integration with the vehicle
 - Flexible adjustment to the vehicle or vehicle components and project-specific needs
 - Interface for engine diagnosis
 - High availability and fail-safe operation
 - High power efficiency
 - Low fuel consumption
 - Minimal exhaust emissions that fully meet all legal requirements



ECU 9 = Engine controller
EXU = Engine controller extension unit

** Optional



Repowering solutions

MORE PROFIT. MORE POWER.
MORE PRODUCTIVITY.

06

A proven solution

We stand alone as the premier engine supplier to many of the world's most productive mine operations. Engineered and built specifically for mining, the Series 4000 is widely regarded as the industry's ideal engine for high-horsepower applications, due to its superior durability, fuel economy and low total cost of ownership. Over 800 mining vehicles have already been repowered with Series 4000, and repowering solutions are also available for Series 2000.

Series 4000 engines provide up to 6% better fuel economy and up to 3% higher uptime than the engines they have replaced. Series 2000 engines provide up to 25% better fuel economy than the engines they have replaced.

Many equipment operators have saved enough in fuel, maintenance and repair costs to return their repower investment before the first overhaul. Installation detail and cost saving projections are available from our authorized distributor.

Pre-engineered repower kits are available for the most popular mining equipment models. The efficiency of our repowering process results in typical equipment outage of one week or less.

Much more than a new engine

We produce system designs and provide fully customized solutions for every possible requirement and any application.

The heart of the system is always the engine as the main component of a mining-vehicle powertrain. It is supplemented by a wide range of auxiliary equipment that can be adapted to suit the basic engine in every detail, and is naturally manufactured to the same high quality standards.

The auxiliary systems include:

- Electronic engine management: for safety, reliability, versatility and data recording
- Transmission/generator: the complete solution – from a single source
- Baseframe: for secure and permanent attachment/support of system components
- Acoustic enclosure/exhaust silencers: for consistently low noise emissions
- Cooling system: modern systems with intelligent management
- Mountings: for maximum safety and comfort

To keep the system easy to manage despite its technological complexity, the number of interfaces between the engine and peripheral systems is deliberately limited. The entire powertrain module can be installed and commissioned quickly using Plug&Play connections. This is an advantage for repowering projects and particularly when replacing engines. Availability and economy are substantially improved, and downtime minimized.

Powerful benefits

- Higher reliability: more uptime thanks to improved engine reliability and ease of maintenance due to the simplicity of our engine configurations
- Higher availability: robust engine is time proven in mining
- Enhance operator productivity: lower engine noise level reduces operator fatigue
- Lowest total cost of ownership:
 - Best fuel efficiency in the industry
 - Increased time between overhaul (TBO) & highly consistent overhaul intervals
 - Multiple rebuilds of original engine core throughout the engine life
 - Lower operating costs
- Emission and application specific engines:
 - High altitude specification engines
 - Emission-compliant
 - Fuel consumption optimized

We can help manage your projects right from the initial planning. We provide helpful, expert advice from the concept phase to in-life use. This way, you benefit from our experience very early on and develop a drive-power design that is just right for your specific equipment and application.

Time is money

Due to intelligent engineering and efficient processes we repower you quickly. The duration for the complete engine replacement up to final testing will be approximately one week only.

Complete power system solutions for mining

ENERGY FOR YOUR MINING SITE.

07

As resources become scarcer, mining companies are increasingly being forced to operate far off the beaten track. Mines in remote locations are faced with very high energy costs, as fuel transportation is often more expensive than the fuel itself. Hybrid power microgrids can reduce fuel costs in remote mining locations by up to 40%.

Although most mines have huge potential for using renewable energies, the benefits are severely limited, as gensets still need to run continuously – and at lower efficiency – in order to provide spinning reserve.



Microgrids

SAVE MONEY WITH RELIABLE,
AND SUSTAINABLE SOLUTIONS

Microgrids are decentralized energy systems consisting of a combination of renewable power generation, power storage and conventional power generation in order to meet a given demand. A microgrid may be off-grid or on-grid, with a centralized controller is in place to optimize the way the system operates.

Mine site infrastructure

Electricity costs represent an important share of a mine's life cycle, depending on the type of mine. High electricity consumption is usually needed for mine site infrastructure, e.g. mining accommodation, crushing and milling processes, conveying or pumping and transport. However, more important than the cost of generating electricity is the reliability of supply, because if any of the processes are interrupted by a power failure, the whole mine operation may come to a halt.

Battery energy storage systems

mtu battery energy storage systems are a great complement to systems using renewable energies that cannot be ramped up and down at will. They provide grid stability, voltage and frequency control, instantaneous power, plus the ability to de-couple peaks in generation from peaks in demand. Operation and maintenance costs are low.

Microgrid controller

The **mtu** microgrid controller seamlessly integrates generation, storage and demand. It optimizes the production and use of energy to meet a user's requirements, whether their priority is cost, carbon footprint or availability.

Gas and diesel generators

mtu gas and diesel generator sets provide power on demand – and do so reliably and quickly. Their load flexibility adapts output quickly to the customer's needs. They also provide emergency backup and help cope with load peaks. Our gas gensets are also suitable for combined heat and power applications (CHP).

On-grid / off-grid

A microgrid can run while connected to a public power grid (on-grid) and can be used to safeguard stability of supply and optimize both cost and the operator's environmental footprint. Fully independent (off-grid) microgrids can be used to power remote communities and industries or to provide energy independence from the grid.

Renewable energy sources (RES)

Solar power, wind power and other renewables that are not always dispatchable offer key benefits – zero carbon emissions, low operating costs and low fuel expenses – but there are some drawbacks as they are dependent on weather and time-of-day, can suffer output fluctuations, and often require major capital investment. A smart microgrid uses storage and/or complementary generation technologies to optimize the use of renewables.



How to reduce energy costs by up to 53% – along with the environmental footprint?

Learn more by scanning the code.

Diesel generator sets

READY FOR EVERY
CHALLENGE.

Often located in remote, off-grid locations, mining operations can have a great range of different energy requirements. Our diesel generator set solutions adapt perfectly to your needs: standby power or continuous, mobile or stationary, individual generators or complete power systems.

Our diesel-powered generator sets can be designed flexibly depending on the application and location. They are suitable for both emergency power supplies and permanent power systems, and can be installed as either mobile or stationary units. The performance range runs from 30 to 4,000 kVA. No matter which design you choose, our generator sets meet the highest demands in terms of quality, performance and fuel efficiency.

Depending on your requirements, we can offer generator sets or complete power system solutions. And because our generator sets meet all current industrial codes and standards, they can also be

integrated into other systems without any hassle. Installation, operation and monitoring are simple. Thanks to the excellent load-impact behavior of the generator sets, the required energy is made available promptly. Fuel consumption is exceptionally low and vibrations and emissions are also minimized, making our generator sets ideal for the most demanding environments and challenging installations. One salient feature of our power system solutions is their improved maintenance intervals and long equipment life. And our commitment to world-class service and support helps optimize the lifetime value of your equipment.



Series 1600 DS
The **mtu** 1600 DS genset brings together power, efficient technology and reliability.

Power range:
50 HZ: 460-730 kVA
60 HZ: 400-600 kWe



Series 4000 DS
The **mtu** 4000 DS generator set performs at the highest level, with a robust design and optimum fuel consumption.

Power range:
50 HZ: 1600-4000 kVA
60 HZ: 1550-3250 kWe

Battery energy storage systems

mtu ENERGYPACK – THE
FLEXIBLE STORAGE SOLUTION.

When it comes to microgrid solutions in mining facilities, the new **mtu** EnergyPack is a key component for improving reliability and profitability. It stores electricity from any source – diesel or gas-powered gensets, wind turbines or solar panels – and delivers it just when it's needed. Designed as a scalable, all-in-one solution, the **mtu** EnergyPack is able to provide grid support services and can form an autonomous microgrid, enabling customers to operate independently during grid outages.

The system can be built into existing power grids, making it easy to expand capacity. A highly mobile, fully integrated plug-and-play design ensures fast, easy installation, reducing setup times and costs. As a result, power is available more quickly and at lower cost.

By bringing power on-stream immediately, the **mtu** EnergyPack provides essential fast response capability for better power quality, black starts, frequency response and backup applications.



Scan the QR code
for more information about
the **mtu** EnergyPack.



Digital Solutions supporting your business

DELIVERING ACTIONABLE INSIGHTS THROUGH DIGITAL SOLUTIONS

08

We offer you the best possible equipment service by incorporating digitalization in a holistic service approach. This helps improve our service and helps you operate your equipment more effectively.

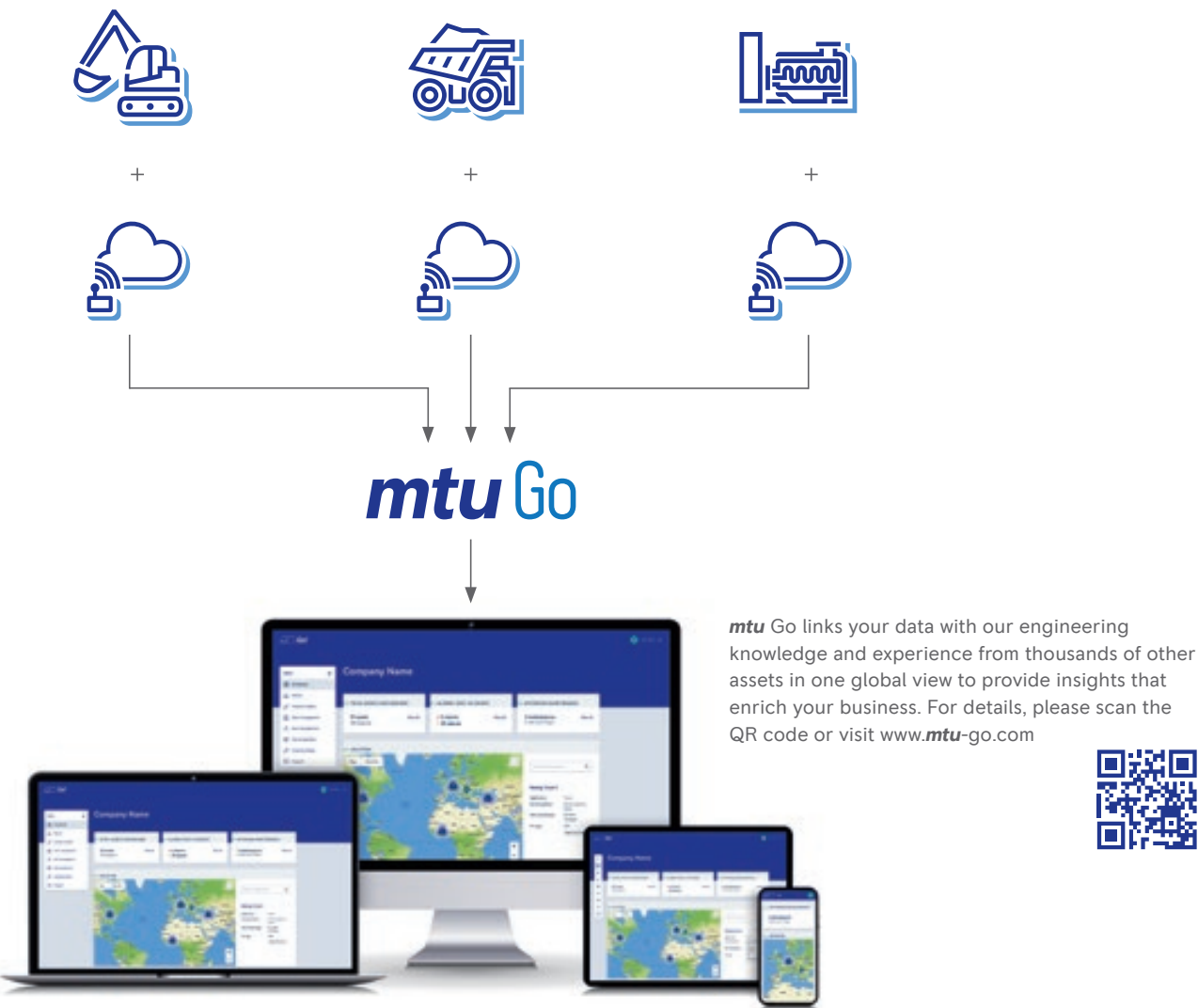
Our digital platform **mtu** Go offers you the opportunity to analyze system data quickly, determine important action steps, and plan them optimally, either independently or together with our service department. Ensure that your business runs smoothly with **mtu** Go digital service solutions.



Digital mining solutions

HOW DIGITAL SOLUTIONS OPTIMIZE YOUR MINING BUSINESS.

Mining has great demands on engines and drive systems. Ensuring the equipment is constantly available for optimum use, means making the right maintenance decisions. Our digital solutions enable you to keep track of operating hours, system alarms and maintenance schedules so you can plan service intervals more effectively.



mtu Go

Delivering actionable insights through digital solutions



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 collecting 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
 - Different device and software options ensure optimal connectivity
 - Data privacy and security to the highest industry standards



Monitor your fleet
Visualization of data for a quick and accurate overview of your fleet
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. Open APIs allow you to interface directly to your existing dashboards or systems.

- 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



Manage your fleet
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. In future, the analysis can be enriched with additional external data sets, such as environmental influences or time schedules. Cross-linking data will create new opportunities for optimizing business processes.

- Learn from your data (under development)**
- Algorithms for proactive early detection of deviations
 - Troubleshooting based on large amounts of data with artificial intelligence
 - Comparison with data outside own fleet leads for faster knowledge transfer and optimum service tool for initial analyses

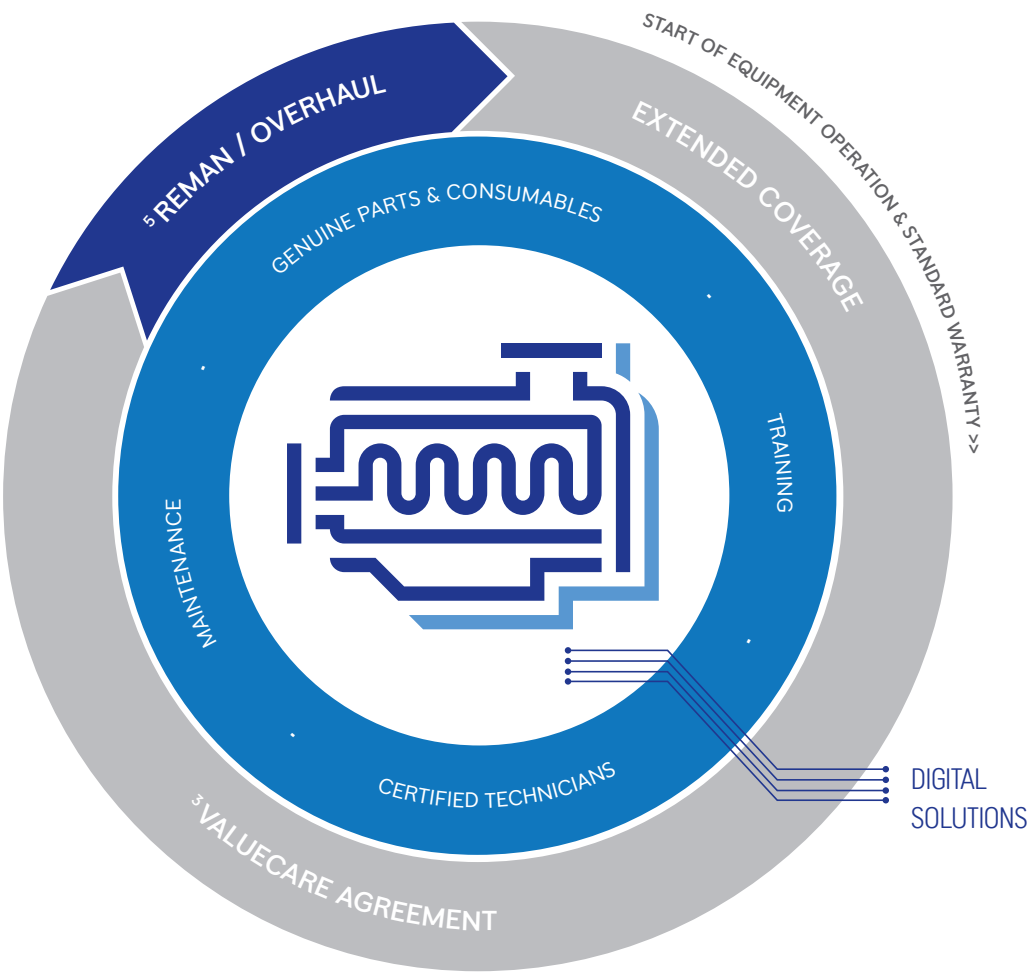


ValueCare Agreement

ENSURE A LONG,
RELIABLE LIFE.

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As your equipment ages, its needs—and yours—change. ValueCare wraps 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 our reman/overhaul solutions.

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. REMAN products are a smart solution, helping you reduce the total lifecycle cost of your equipment.

Save time.

REMAN products put your equipment back to work faster than an overhaul, which reduces downtime, service time and indirect costs such as storage.

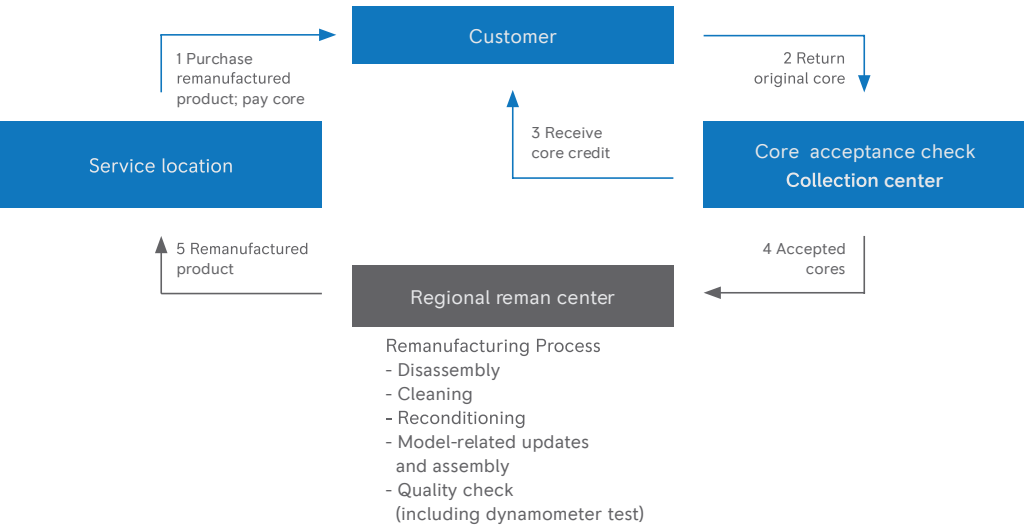
Our maintain standards.

All products are remanufactured to our strict standards by certified technicians at our regional reman centers which remanufacture our parts, engines or systems to their original factory specifications.

Protect the environment.

Our REMAN engines help to use resources more efficiently and save energy as well.

Exchange process



Preventive maintenance

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 a superior power system 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% of total lifecycle costs depending on the application – by far one of the most significant costs associated with your equipment. Well-maintained 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.

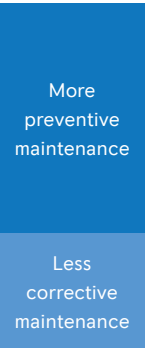
Planned maintenance helps solve problems before they start, helping you avoid unexpected downtime and resolve problems early before they escalate.

Work with one source.

We keep maintenance simple, safe and efficient. Our factoryapproved 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.

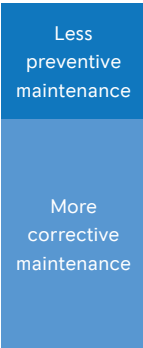
The Importance of preventive maintenance

When preventive maintenance is a high priority.

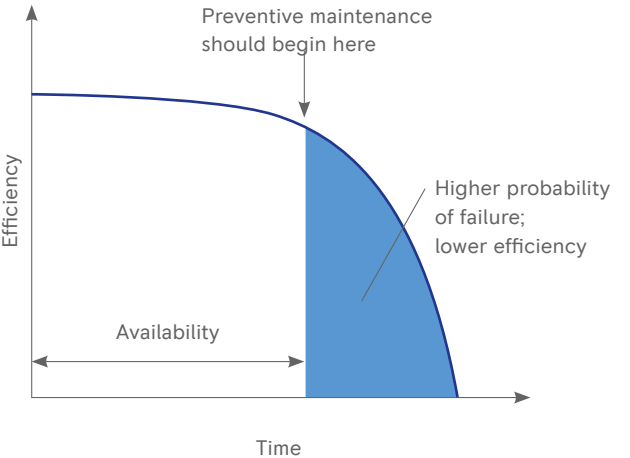


- 1. Scheduled stops
- 2. Improved performance
- 3. Better control over operation

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.

Certified support

RELY ON OUR EXPERTISE.

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

From preventive maintenance to complete rebuild, 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 prepare a customized plan to help you maximize performance and minimize lifecycle costs.

Never compromise.

Our engines and systems are built to last with legendary high standards. When it's time for service, don't settle for anything less. 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 helps you 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 for mining applications make it easy to keep your business running smoothly and reduce total cost of ownership (TCO) by maximizing uptime, optimizing lifecycle costs and helping you avoid equipment related business disruptions through preventive maintenance.



Long-term service agreements

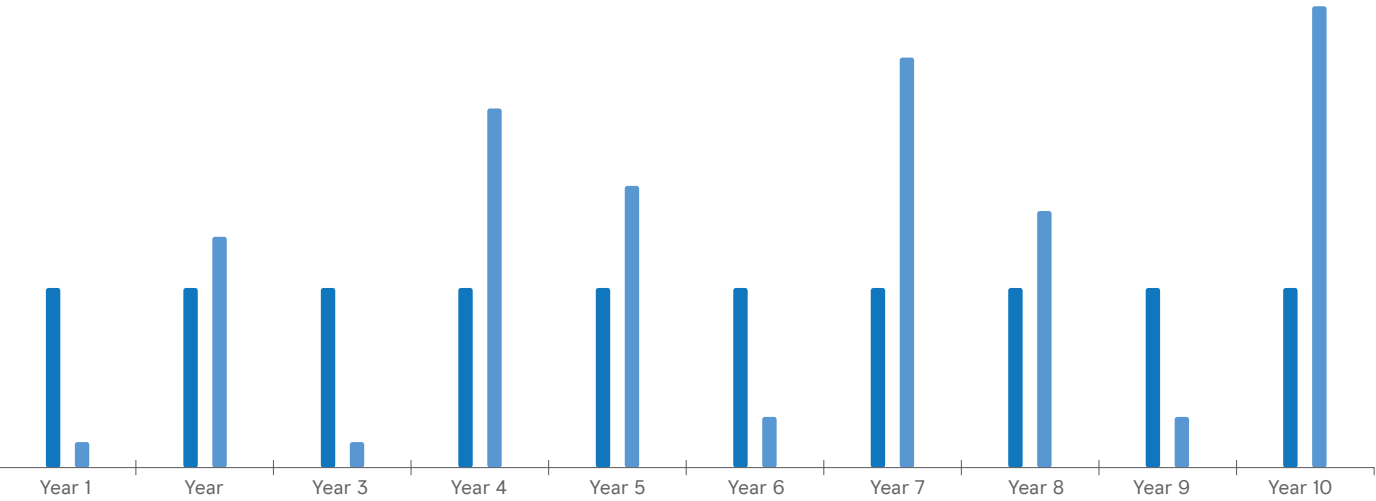
PLAN AHEAD.

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

Optimize availability.

Long-term Service Agreements make it easy to plan the cost of maintenance and maximize availability throughout the lifecycle of your equipment. The details, terms and periods of each agreement are precisely tailored to match your individual needs, with maintenance performed by our certified technicians using only genuine new or remanufactured parts.

Example: Scheduled Maintenance Costs



Financial Investment
Annual costs are more predictable and consistent with Long-term Service Agreements.

■ Long-term Service Agreement*
■ Preventive Maintenance
* Excludes corrective services

Extended coverage

EXTEND THE VALUE OF YOUR INVESTMENT.

Our mining engines – backed by extended coverage – provide invaluable peace of mind beyond the standard warranty. With extended coverage, you can be assured that the costs of unplanned repairs are covered, with service performed by our certified technicians – upholding resale value and ensuring long-term confidence in your investment.

Cover the unexpected.

Extended coverage protects you from the cost of unexpected repairs beyond your standard warranty, with professional service from our certified technicians and coverage tailored to your needs. Packages can also be extended up to five years and are fully transferable, enhancing resale value. Coverage includes all materials and labor for troubleshooting, fault clearance, and corrective services to engines and on-engine electronics (excluding gearbox, alternators or similar components). To ensure maximum quality, all repairs are conducted using only genuine parts.





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