



mtu Kinetic PowerPack

DISCOVER THE POWER
OF KINETIC ENERGY.



A Rolls-Royce
solution

A NEW PERSPECTIVE ON DYNAMIC UPS.

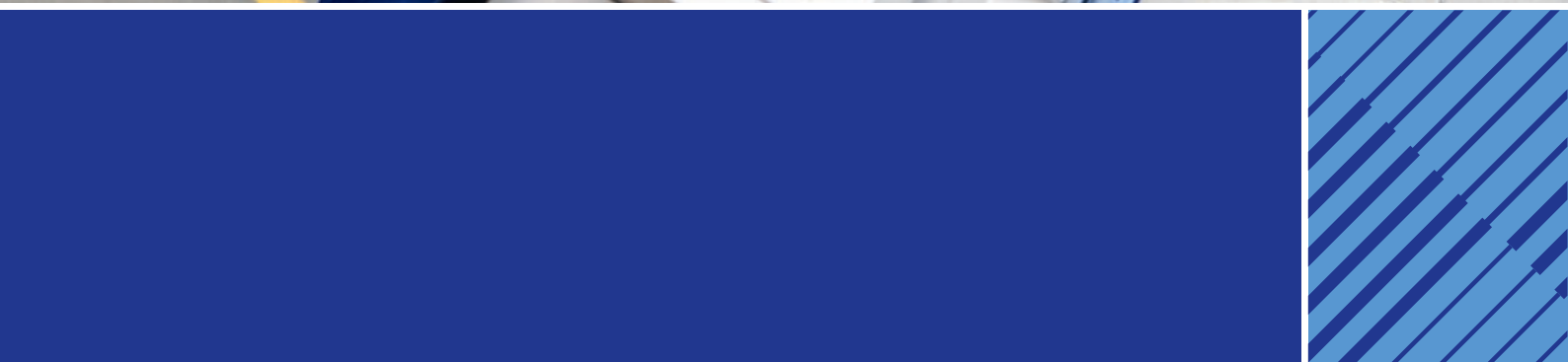
The **mtu** Kinetic PowerPack perfectly answers all your specific needs regarding power, footprint, and sustainability. The dynamic UPS technology is based on kinetic energy and consists of a diesel engine coupled to a kinetic energy accu via an electromagnetic clutch. **mtu** Kinetic PowerPacks ensure reliable and environmentally friendly uninterruptible electrical power and power conditioning.

We believe in the power of dynamic UPS. Without the need for batteries, the system offers the highest power density (kW/m²) in the industry with a high system efficiency in conditioning mode, low total cost of ownership, small footprint, scalable solutions, and a compact design.

We challenge the market to see another, better way of power protection through dedicated, personal service and more resilient, sustainable and cost-effective UPS solutions designed with our customers' needs in mind.

Whether your installation is on top of a skyscraper or in the world's most isolated desert, with our local 24/7 service network, you can rest assured that your power supply runs smoothly at all times.

We are a global partner securing 'infinite' power for businesses and industries across the globe. From the Rockies to Santiago de Chile, Singapore to Frankfurt, Hong Kong to South Africa,



POWERING A DYNAMIC WORLD.

Our **mtu** Kinetic PowerPacks provide dynamic uninterruptible power supply through kinetic energy and are engineered to withstand the most demanding power supply challenges. We support critical applications around the globe. Here we give an insight into how our technology is being utilised worldwide.

Data centers

Data centers are a keystone to the modern world. We understand the industry’s strategic importance and its fundamental role in our daily lives, economy and social interaction. Our collaborative, long-term approach ensures we work closely with our clients to understand their immediate and longer-term requirements, developing solutions that can grow organically with their businesses.

Our technicians and engineers are passionate about what they do, drawing on their inherent and collective experience. Our skilled professionals are experts in all matters relating to electrical systems and Uptime Institute Tier topologies. **mtu** is a preferred partner at many Tier-accredited data centers around the world.



Critical process manufacturing

An unstable power supply can lead to situations from which it may be difficult to recover. Think about interrupted production runs, wastage, process restart costs, equipment damage, missed deadlines and data loss all leading to financial ripples. Preparation is the only way to mitigate the risk including having the right UPS technology and partner in place.

Many leading pharmaceuticals, petro-chemical, semi-conductor, electronics, mining and processing, printing and media, plastics and textiles, life sciences and biomedical companies across the globe rely on **mtu** Kinetic PowerPacks. We protect any industry with critical processes from downtime resulting from an unstable power supply.



Infrastructure

We rely on vital services every day – transportation, power, water and sewage, communications, education and governance. Government and defense must function without interruption. Universities carrying out cutting-edge research need to be protected from fluctuating power or power loss to ensure irreplaceable data and research safety.

Broadcasters may have a duty to governments to ensure they can transmit during times of crisis in the interest of public safety. They require robust electrical networks and resilient critical power support systems to ensure the cameras keep rolling. **mtu** Kinetic PowerPacks provide critical, behind-the-scenes support to all these functions ensuring they run as smoothly and efficiently as possible.



Healthcare

In the healthcare sector, an uninterruptible power supply can be a matter of life and death. Just imagine the impact of a power outage or malfunctioning electrical systems that prevent operating rooms and incubators from working - something you don't even want to contemplate. Therefore, we see it as our driving force to keep your surgical facilities, care units, diagnostic devices, monitors and information systems powered. Whether in acute or long-term care, we will help your healthcare facility focus on patients, giving them the best possible treatment and care they need.

Keeping your power supply in perfect health, **mtu** Kinetic PowerPacks offer a wide range of advantages.



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OUR KINETIC TECHNOLOGY.

Our business is keeping your business up and running. That is why our dynamic UPS systems provide power quality and secure your critical power supply. We continually evolve and develop the **mtu** Kinetic PowerPack range.

What is Dynamic UPS?

Dynamic UPS systems can instantaneously provide power, using stored kinetic energy to drive their synchronous machines. They provide an “infinite” back-up power supply using diesel engines.

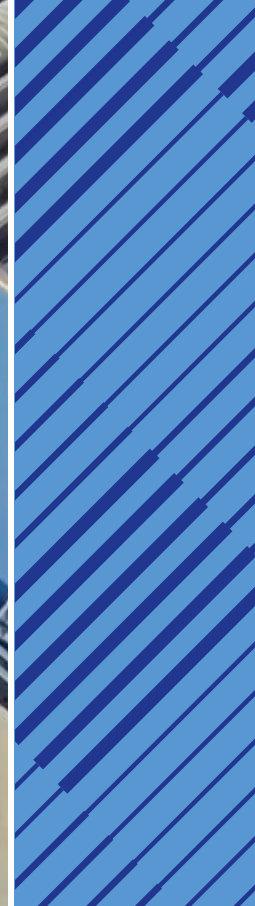
This is a different approach to static UPS systems which provide the output voltage via power electronic devices with batteries providing the reserve energy.

In addition a dynamic UPS acts as a power conditioner. The synchronous machine combined with the choke coil acts as a conditioner to filter spikes or transient interferences and to regulate the loads voltage within tolerance.

The system also eliminates micro-cuts, reduces harmonics distortion, improves power factor and allows clearing of short-circuits on downstream feeders or starting a larger motor DOL (Direct On Line).

At your service, wherever your journey takes you

Our teams are with you all the way; from design, installation, commissioning through to 24/7 service and maintenance programs. We support over 2,000,000 kVA of critical power applications around the world with dedicated regional and HQ based teams. Teams that know each customer, take time to understand their business, needs and expectations; that know each site and solution - with us you are never just a number.



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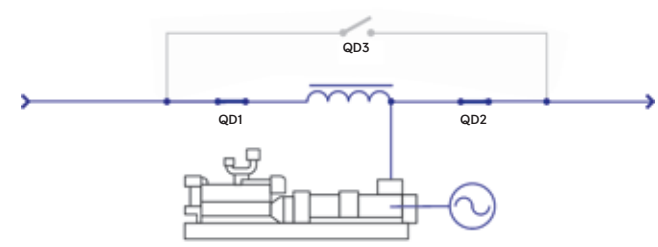


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HOW DOES DYNAMIC UPS WORK?

In Conditioning Mode, while utility power is present, the **mtu** Kinetic PowerPack stabilizes the voltage within pre-set tolerances. It provides power factor correction and protects the load from mains harmonics.

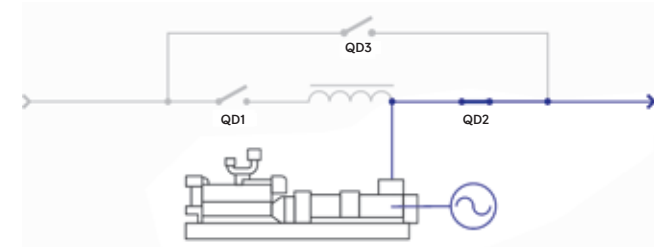
In Independent Mode, on utility power failure or voltage disturbance, the stored kinetic energy is retrieved and transferred to the synchronous machine, acting as a generator. This proceeds without interruption, a zero-second transfer to the critical loads.



Conditioning Mode
mtu Kinetic PowerPack protects the load

Shortly after a utility failure, the engine starts and is coupled to the synchronous machine by closing the electromagnetic clutch. The engine then provides the energy for the synchronous generator for an unlimited time.

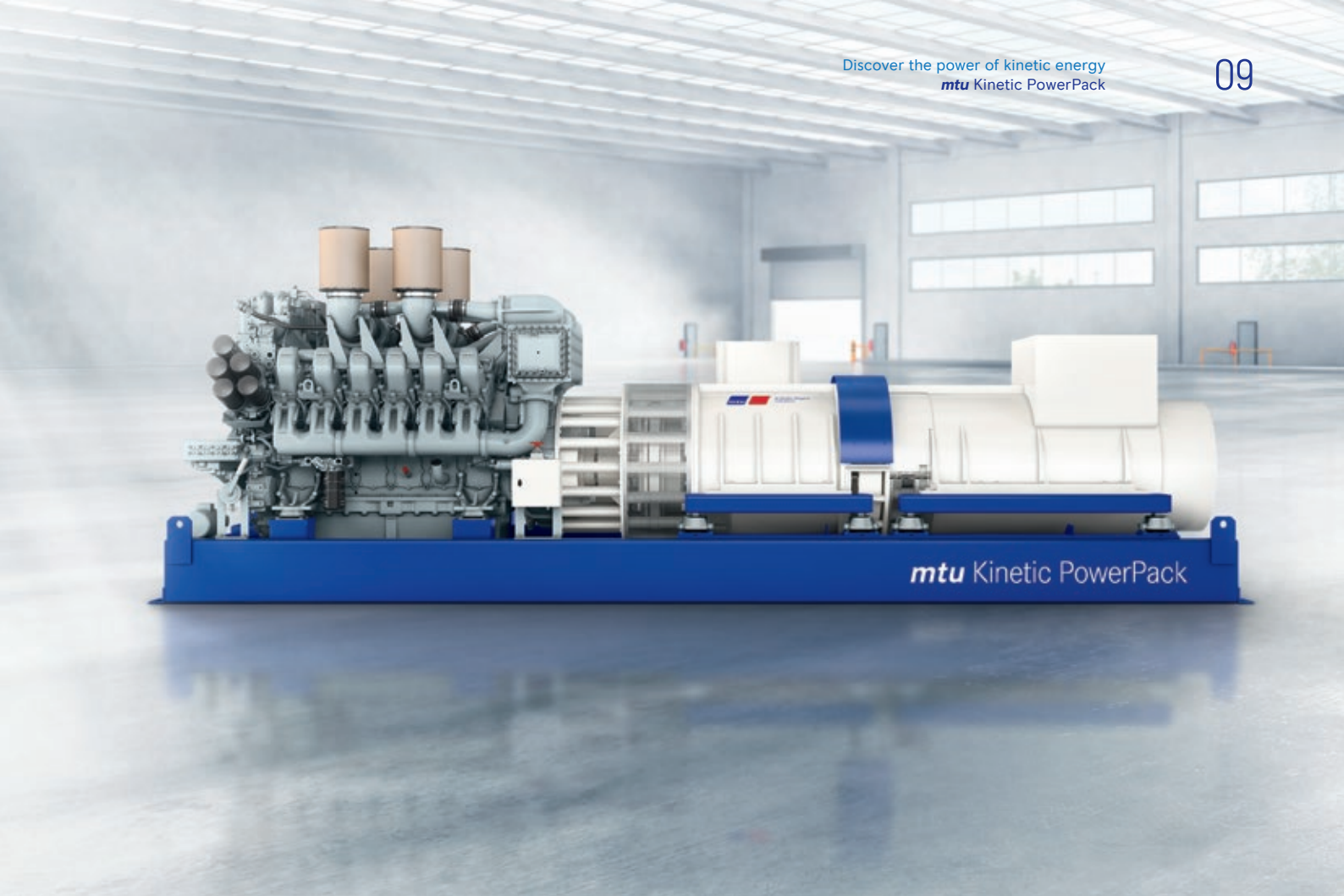
The kinetic energy stored in the accu can be used to start the engine mechanically if a start battery fails, thereby ensuring engine start and the secondary power source.



Independent Mode
mtu Kinetic PowerPack provides energy as secondary power source, without interruption

Sequence upon mainsfail:

- QD1 opens
- The kinetic energy transferred from the outer rotor maintains the frequency at 50Hz or 60Hz within +/- 1%
- The engine starts and accelerates up to 1500 rpm (50Hz) or 1800 rpm (60Hz)
- The electromagnetic clutch closes
- The load is progressively transferred from the kinetic energy accu to the diesel engine



Transfer from conditioning mode to independent mode

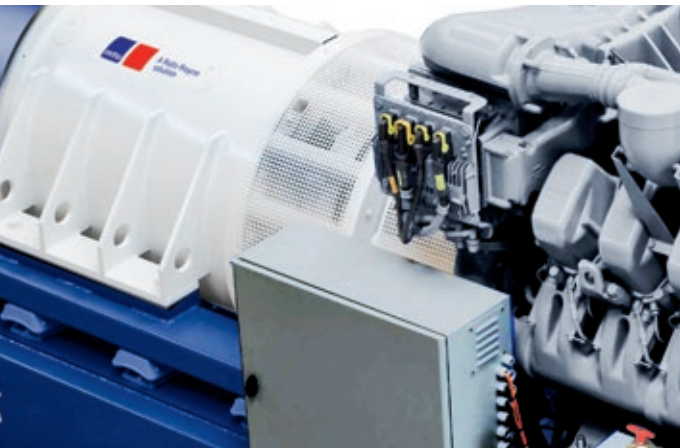
When the transfer from conditioning mode to independent mode occurs, the frequency is maintained within narrow tolerances, the accu's speed decreases, and then the diesel engine starts to provide power to the load.

Redundant start

In the event of a diesel engine start-up failure, the electromechanical clutch will close shortly after opening QD1, and the kinetic energy of the accu will start the diesel engine. It gives the system a redundant possibility, a second guarantee to start the engine.

Mains return back to conditioning mode

- The **mtu** Kinetic PowerPack, synchronizes with the mains supply.
- The outer rotor is re-accelerated to its rated speed.
- When the rated kinetic energy is stored, QD1 closes.
- The electromagnetic clutch opens.
- The diesel engine runs at idle speed for cooling and then stops eventually.
- The system secures the critical load against an unlimited number of repeated mains failures.





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KEY ADVANTAGES.

Reliability

The lowest component count and low operational speed provide a superior design with the highest reliability and MTBF.

Efficiency

The most efficient system on the market up to 97%.

Brushless

Over 30 years of proven brushless design reduces downtime and avoids carbon dust inside the electrical machines.

Monobloc

All machines are directly coupled by the high-precision flanging of the main components (engine, accu, alternator), making the **mtu** Kinetic PowerPack extremely robust. No required critical laser alignment/inspections in the factory or at the site.

Durability

The kinetic energy is stored in the outer rotor, which is called the drum, which rotates only at a relative speed of 1200 rpm (60Hz) or 1500 rpm (50Hz) compared to the inner rotor, guaranteeing lower operating temperatures, higher efficiencies, and ten years bearing life.

KINSTART

The electromagnetic clutch provides KINSTART, a redundant starting process that does not rely on batteries or motor starters.

Power factor improvement

The input power factor remains close to unity.

Dynamic filter

Filters harmonics distortion and voltage spikes.

Voltage regulation

Excellent voltage stabilization even in brownouts and over-voltages.

Small footprint

The **mtu** Kinetic PowerPack can save up to 50% of floor space over static UPS designs.

Lower construction cost

mtu Kinetic PowerPacks do not need the same HVAC system as battery rooms and can be located outside in enclosures.

TECHNICAL CHARACTERISTICS.

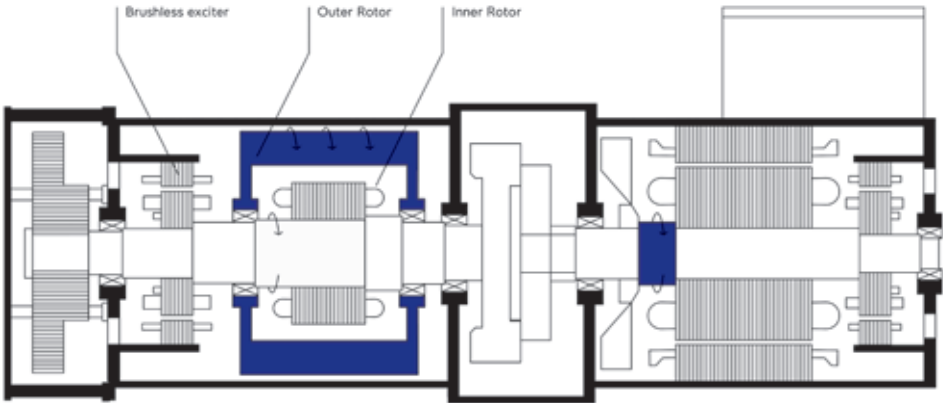
The **mtu** Kinetic PowerPack systems range from 400kVA up to 3000kVA, operating at low and medium voltage. All are suited for both 50 and 60 Hertz. The **mtu** Kinetic PowerPack can serve as a single unit or part of a multi-unit system to support larger loads. The **mtu** Kinetic PowerPack can be installed in an existing building (typically a genset room) or delivered in factory-built enclosures designed following local standards.

| General dimensions and weights | | | | | |
|--------------------------------|--------|-----------------|----------------|-----------------|---------------------|
| kW | kVA*** | Length m/ft* | Width m/ft* | Height m/ft* | Weight kg /lb* |
| 400 | 500 | 5,3/17** | 1,7/5,6** | 2,12/7,0** | 10.250/ 22.500** |
| 800 | 1000 | 6,1/20 | 1,9/6.2 | 1,91/6,3 | 17.270/ 37.900 |
| 1000 | 1250 | 6,75/22 | 1,95/6,4 | 2,39/7,8 | 22.650/ 48.830 |
| 1200 | 1500 | 6,75/22 | 1,95/6,4 | 2,39/7,8 | 22.650/ 48.830 |
| 1360 | 1700 | 7,1/23 | 1,9/6,2 | 2,23/6,3 | 22.700/ 49.940 |
| 1600 | 2000 | 7,42/24 | 1,9/6,2 | 2,47/8,1 | 24.400/ 53.680 |
| 2000 | 2500 | 9,65/31 | 1,9/6,2 | 2,59/8,5 | 35.300/ 77.660 |
| 2400 | 3000 | 9,95/33 | 1,87/6.4 | 2,59/8,5 | 36.500/ 80.300 |

Standard power outputs rated at sea level
* Typical sizes - size may vary according to engine used, ancillaries added, etc. Without radiator
** With radiator
*** Other power ratings are available

System specifications

| Rated voltage | 380, 400, 440 and 480 Volts Medium Voltage Up to 36kV |
|---|--|
| Frequency | 50 Hz or 60 Hz |
| Input specifications | |
| Standard input voltage tolerances | ± 10% |
| Standard input frequency tolerance | ± 1Hz |
| Input power factor under nominal conditions | 0,98 |
| Output specifications | |
| Output voltage steady state conditions | ± 1% |
| Output voltage during dynamic conditions, < 1 second: | ± 5% |
| Output frequency steady state conditions | ± 0,5% |
| Output frequency during dynamic conditions, < 1 second: | ± 1Hz |
| (With maximum 50% load step) | |
| Design output power factor | 0.8 |
| Max. Current during down-stream short circuit | 20 x In |
| Harmonic distortion factor on linear load | ≤ 3% |
| Overload capacity in normal operation | 10% for one hour in every 12 hrs |
| Voltage system symmetry | 2% |
| Radio interference level | K |
| Ambient conditions | |
| Maximum ambient temperature | 50°C (122F) |
| Humidity | 90% non condensing |



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KINETIC POWERPACK ANATOMY.

A state-of-the-art manufacturing facility in Belgium builds our **mtu** Kinetic PowerPack products: single units with ratings between 400 kVA/320 kW to 3000 kVA/2400 kW offered at 50 Hz and 60 Hz frequencies. Multiple units can be combined to provide higher installed rating and the expected level of redundancy.

ELECTROMAGNETIC CLUTCH

The prime starter system consists of standard engine starting motors. The clutch is maintenance-free and guarantees the diesel engine to start at all times, thanks to the redundant start feature.

CONTROL SYSTEM

KS Vision HMI control system; class-leading electrical and mechanical monitoring including load level, mains failures, input and output voltage, frequencies and power factor; data logging feature recording all historic events.

POWER PANEL

A power panel comprising input, output and automatic bypass circuit breakers.

SYNCHRONOUS MACHINE

Four-pole synchronous machines from world-renowned manufacturers designed not to exceed Class F temperature rises; right-sized for your application and to absorb load harmonics.

mtu DIESEL ENGINE

Complying with the latest emissions standards; preheated, pre-lubricated, quick start and not running during conditioning mode.

KINETIC ENERGY MODULE

Patented accu provides stored kinetic energy to ride through mains interruptions; designed for a 10-year bearing life.

VIBRATION ISOLATION

Thanks to the solid base frame with isolators between frame and equipment and direct floor installation, vibrations are reduced >97%.



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BENEFITS OF KINETIC ENERGY.

Our **mtu** Kinetic PowerPack provides dynamic uninterruptible power supply through kinetic energy and is engineered to withstand the most demanding power supply challenges.

**Lower TCO**

At medium and higher power ratings, **mtu** Kinetic PowerPacks are the most cost-effective, reducing consumable electricity cost and maintenance.

**Smaller footprint**

Its component count and monobloc structure give the **mtu** Kinetic PowerPacks a compact design, reducing its footprint to 40% of an equivalently rated static UPS system – making it the smallest in the market. This decreases building construction costs and increases space for production and revenue generating purposes.

**Units up to 3000kVA**

The current-carrying capability of electronic components does not limit **mtu** Kinetic PowerPacks. Their per unit ratings are considerably more significant, leading to a much lower component count on higher power installations. As all designers know, a lower component count leads to a higher level of reliability and resilience.

**Medium Voltage Systems**

mtu Kinetic PowerPacks are the perfect solution for medium voltage critical loads or when more considerable distribution distances need to be covered. In both cases, the installation cost will decrease on low voltage cabling as the quantity required will be smaller.

**Optimal sustainability**

Static UPS systems require heavy batteries and generate chemical waste. Due to the kinetic energy storage unit's energy that is immediately available to generate power until the **mtu** diesel engine is activated, batteries belong to the past when using **mtu** Kinetic PowerPacks.



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HOW WE WILL MAKE THE DIFFERENCE.

From project start to finish, we stand by our customers' sides to ensure that nothing is left to coincidence. We are responsible for the solutions we offer and the deliveries we make. A single customer contact will be assigned to your account and will be at your service at all times.

We listen to your needs

In an industry where power outage is not an option, where reliable power control is mission critical, understanding the needs of our customers and their reality is not only important, it's a necessity. We will work with you to define the needs and refine your requirements to provide you the best dynamic UPS solution.

Geographical coverage

Whether your installation is on top of a skyscraper or in the world's most isolated desert, we will be your trusted power back-up partner across the globe. With our local 24/7 service network, you can rest assured that your power supply runs smoothly at all times.

Personal service

You will always have our team to support you. From project management through to the service technician.

Turnkey solutions

mtu Kinetic PowerPacks offer turnkey installation in most parts of the world, either utilizing our standard value-option range or solutions customized to your specific requirements. Whichever direction you choose, you can be assured of quality and value. All third party equipment that we provide carries the same warranty as our core product.

Rental units

Our service team can deliver a modular **mtu** Kinetic PowerPack to your door - ready to plug in and play (available in Europe).

After sales service

Additional lifecycle management programs on all **mtu**-installed equipment include a preventive maintenance program, predictive inspections, upgrades, and on-site health and safety inspections.



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