Power Capacitors Limited

Power Quality Solutions

Uninterrupted Power Quality

RELIABILITY CHALLENGES

IN MISSION CRITICAL PROCESSES

Maintaining high electric power reliability and availability are one of the key considerations in designing modern mission critical business operations. Low reliability and availability lead to significant business risks and compromised profitability.

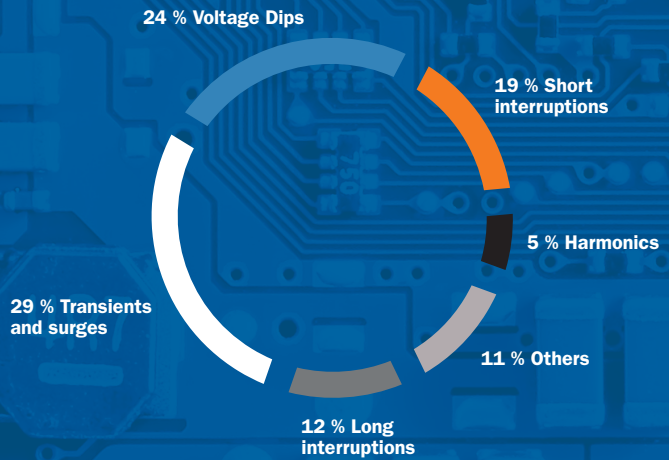
Modern mission critical business processes demand continuous high quality uninterrupted power supply. Even momentary interruptions could damage the sensitive electrical equipment and often result in stoppages of the mission critical business processes. Such interruptions could be inflicted either from supply or load side challenges and lead to lower availability and reliability.

CUSTOMER CHALLENGES

- **Interruptions due to power outages and voltage sags**
- **Production and data losses**
- **Underutilized electrical resources**
- **Damage to sensitive electrical equipment**
- **Rapid aging of electrical resources**

COST OF POOR POWER QUALITY

According to the study done by Manson & Roman Targosz, the total cost of bad power quality in European Union is 150B€ per year. Merus Uninterrupted Power Quality (UPQ) solution can effectively address 59% of these issues.



COMPLETE PROTECTION

WITH A STATE-OF-THE-ART SOLUTION

MERUS UNINTERRUPTED POWER QUALITY

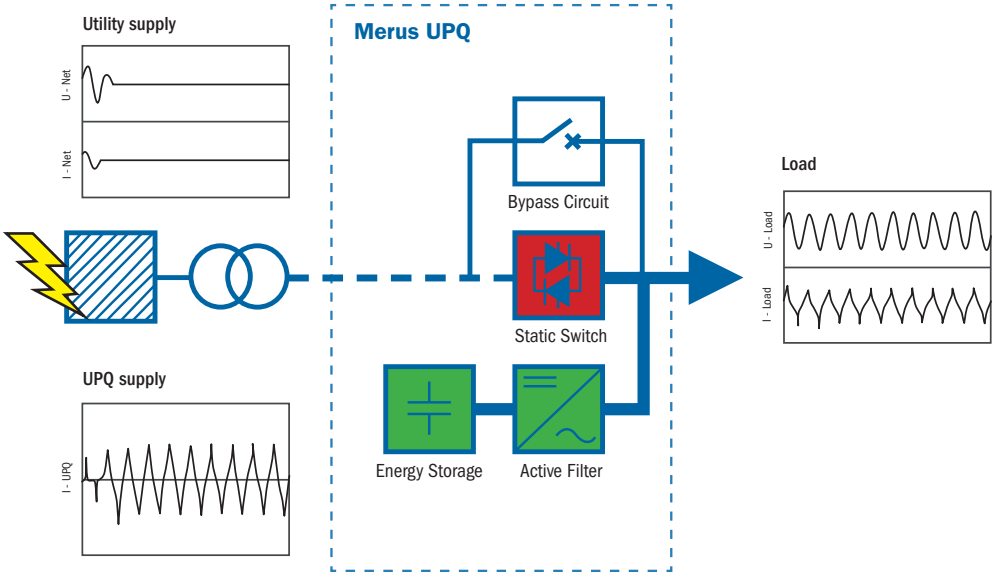
A unique solution that combines the benefits of various power quality systems within one single robust system. Merus UPQ protects your processes against power interruptions, voltage sags- and swells, as well as from losses caused by harmonic currents and voltages. Overall improved power quality ensures smooth profitable business processes.

MAIN BENEFITS OF MERUS UPQ SYSTEM ARE:

- Power Protection operation mode
  - Protecting critical loads from voltage sags and power outages
  - High efficiency (99 %)
  - Superior lifetime and cycle life (15 years)
- Power quality operation mode
  - Mitigation of current and voltage harmonics
  - Total reactive power compensation
  - Mitigation of voltage fluctuations and flicker
- Flexible design
  - Modularity allows wide power range from low to medium voltage levels
  - Support Direct-On-Line (DOL) motor start
  - Redundant design
  - Option to protect common bus power systems by single UPQ
  - Does not limit short circuit current, thus guarantees fuse operation and selectivity

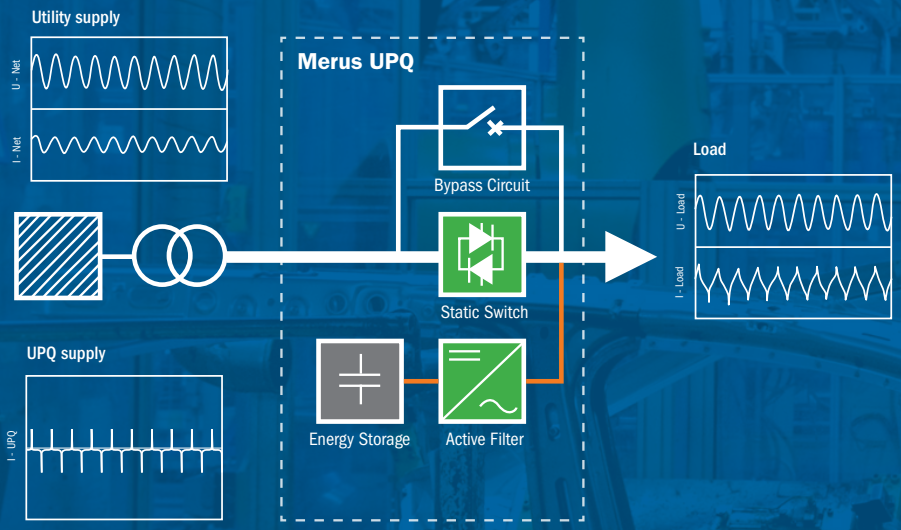
POWER PROTECTION MODE

In the event of power outages or voltage sags, the Merus UPQ activates power protection mode. During this mode, real active power and real reactive power are provided to the loads, ensuring complete immunity to the mission critical processes from utility power interruptions, voltage sags and swells. This guarantees maximum system availability and reliability for mission critical processes.



POWER QUALITY MODE

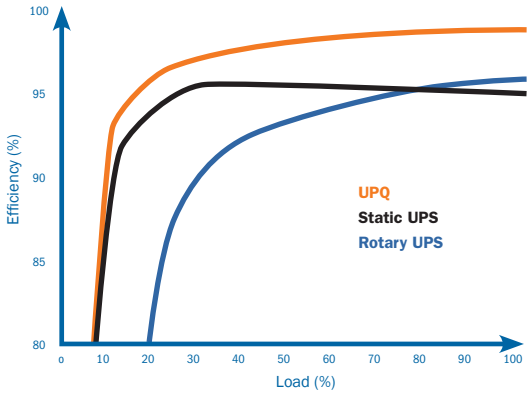
After the fault is cleared, Merus UPQ returns to its normal power quality operation mode, where it actively filters harmonic distortions up to 50th order, mitigates flicker, balances loads, improves power factor and controls voltage.



LOWEST OPERATIONAL COST

WITH SHUNT CONNECTION

Compared to conventional power protection technologies, Merus UPQ solution gives you lowest operational costs. Lifetime operational costs are defined by UPQ power quality operation mode, as utility power connection is mostly available. In this operation mode the UPQ is shunt connected with the load giving higher efficiency. Therefore it offers lowest operational costs compared to any other power protection device like conventional UPS or rotary UPS which are connected in series.



UPQ SUPERIOR EFFICIENCY CAN BE SEEN DIRECTLY IN YOUR ELECTRICITY BILL

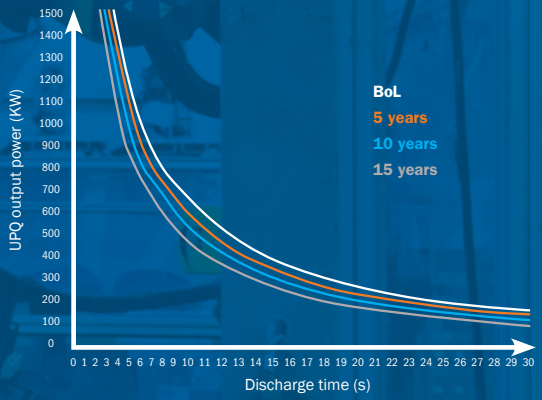
In an example case, where the need is 1500kW maximum power protection with 80% average loading and the cost of electricity is 0,10€ per kWh, UPQ saves 37 480€ per annum.

LONGEST LIFETIME WITH ULTRA CAPACITORS (UC)

Ultra capacitors (UC) are utilized as a default energy storage in UPQ due to their superior power density, cycle life and life time. As a default, UPQ ultra capacitor energy storage offers full charge cycle life of 10 years with more than 500 000 operations at an average ambient temperature of +25C.

When the ultra capacitor energy storage reaches the end of designed life cycle, specified nominal energy may no longer be reached at full, but the device does not become obsolete.

The ultra capacitor cycle life and life time are defined by depth of discharges, voltage stress and ambient temperature. By request it is possible to design an energy storage solution which can meet a cycle life of more than 1 000 000 operations at average ambient temperature of +25C within 15 years.

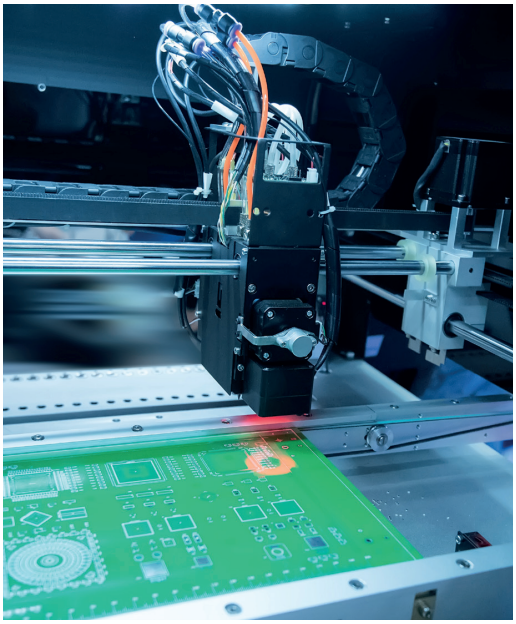


SMOOTH BUSINESS PROCESSES

WITH REAL TIME RESPONSE

Merus UPQ is built on modern power electronics technology, ensuring extremely fast and effective response to power outages, voltage sags and a number of other power quality disturbances. Such dynamic real time response ensures uninterrupted power for business processes.

During power quality mode, it filters harmonic distortions and improves power factor in less than 1 millisecond. In an event of a power outage or a voltage sag, switching to power protection mode takes place in less than 1.8ms. Such dynamic performance ensures maximum up-time and system availability for crucial business processes.



COMPREHENSIVE PROTECTION WITH A SINGLE ROBUST SOLUTION

Conventional solutions in the market offer incomplete protection, which is often limited to either supply side or load side challenges.

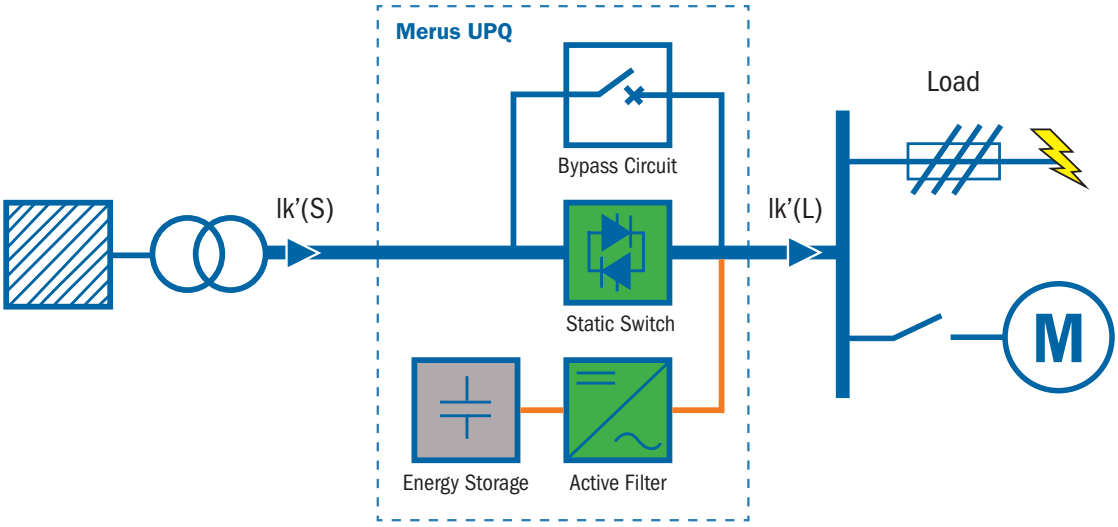
Merus UPQ is a comprehensive and effective protection package from both, supply as well as load side disturbances. It brings complete benefits of several solutions e.g. UPS, Power Conditioning and Active Harmonic Filtering Solutions in a single robust solution.

SUPPORTING DOL MOTOR START

AND GUARANTEED PROTECTIVE FUSE OPERATION

Unlike conventional power protection systems, Merus UPQ does not limit short circuit current. Therefore Ik' (S) fed by utility, equals to Ik' (L) at load bus. This unique feature allows direct on-line (DOL) motor starting, improved by UPQ real time reactive power compensation.

Since short circuit current is not limited, the protective fuse operation is guaranteed in the same way as in in conventional power distribution system.

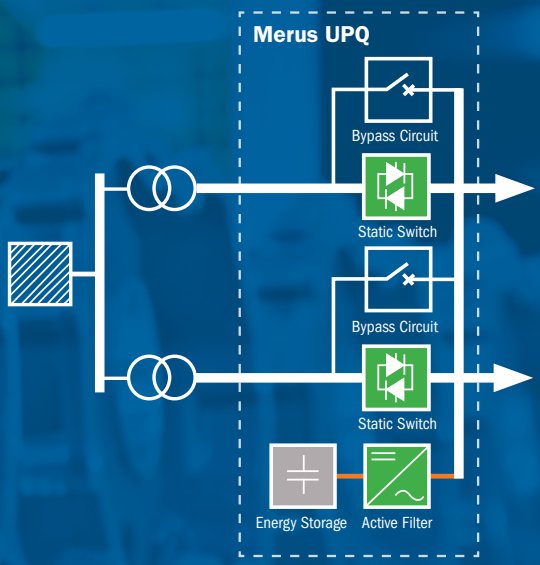


TOTAL CUSTOMIZATION WITH MODULAR DESIGN

Full scalability is achieved through modularity in both power electronic units as well as in selection of energy storage capacity and media.

An application to well demonstrate UPQ's modularity is a common bus power system which is fed by parallel running redundant transformers. Such system can be protected by UPQ system equipped with dual static switch system.

Freedom of customization from choosing different UPQ power module, static switch and energy storage capacity, gives engineering consultants and plant owner opportunity to optimize the investment cost according to the desired protection time, cost of lost production and environmental considerations.

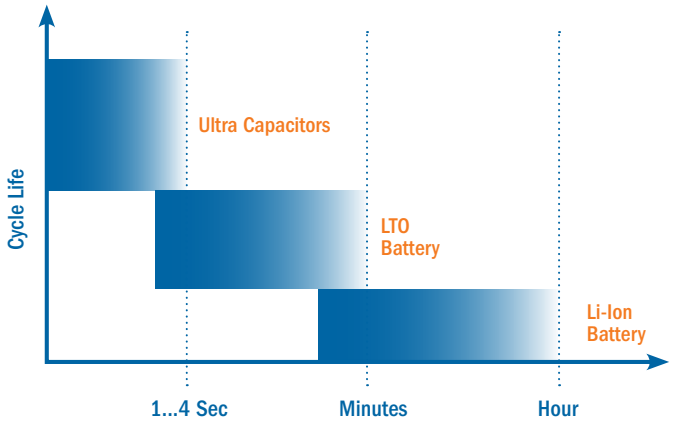


POWER PROTECTION

FOR EXTENDED PERIOD OF TIME

Merus UPQ comes by default with Ultra Capacitors (UC) which provides excellent protection for short-term interruptions. However, Merus UPQ solution can be tailored for applications requiring power protection for extended periods of time.

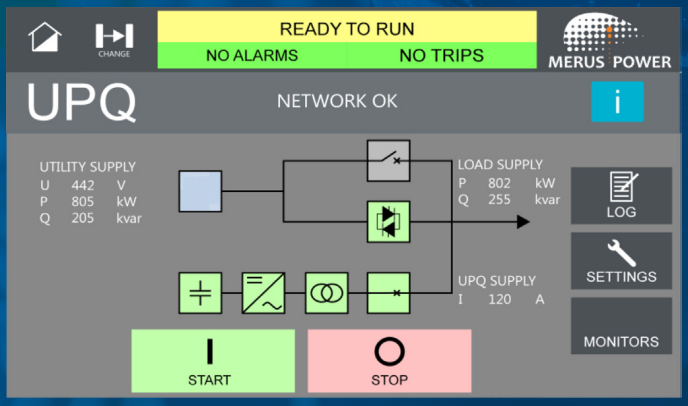
UPQ Solution can be designed for applications requiring power back up of minutes with the use of Lithium-Titanate (LTO) Batteries as energy storage media. However, if the power protection is needed for even longer period of time, Lithium-Ion (Li-Ion) batteries will be an ideal energy storage media.



MODERN MONITORING AND REPORTING FUNCTIONALITY

Sophisticated touch screen panel provides advanced monitoring options, both on-site and off-site. Remote monitoring is possible through Ethernet, which keeps you updated through the reporting functionality.

Modern monitoring and reporting functions feed the user with relevant information and has the option to be integrated to other SCADA systems via smart communication features.



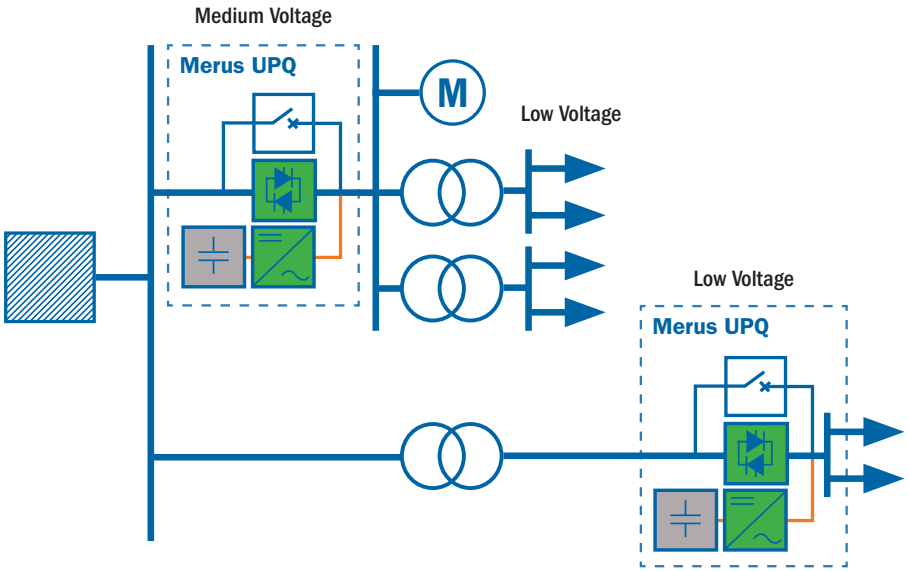
Problem Identification → Root-Cause Analysis → Solution Design

END TO END TURNKEY SOLUTIONS

FLEXIBLE CONNECTIVITY OPTION

Entire facility protection with flexibility of connecting Merus UPQ at any voltage level: Merus UPQ provides superior connectivity options, unlike any other solution. It could be easily connected at any voltage level up to 38.5kV.

Such flexibility allows designing of an economically viable power protection solution, utilizing the most cost optimized energy storage media for entire production processes. This excellent feature keeps production downtime to the minimum in your facility.



TURNKEY SOLUTION WITH RELIABLE AFTER-SALES SUPPORT

Merus power solutions team has a vast experience and sound technical capabilities to provide you with a turnkey solution. Our solutions team takes over the turnkey projects from problem recognition phase. The scope of delivery can also include commissioning and training of the client's personnel.

Mission critical processes require dependable after-sales support mechanism. Our after-sales support team strives to provide fastest response to the client's needs in order to keep the critical processes running uninterruptedly.

Installation ▶ Commissioning ▶ Training

SEAMLESS OPERATION

WITH UNINTERRUPTED POWER

SEMICONDUCTOR INDUSTRY:

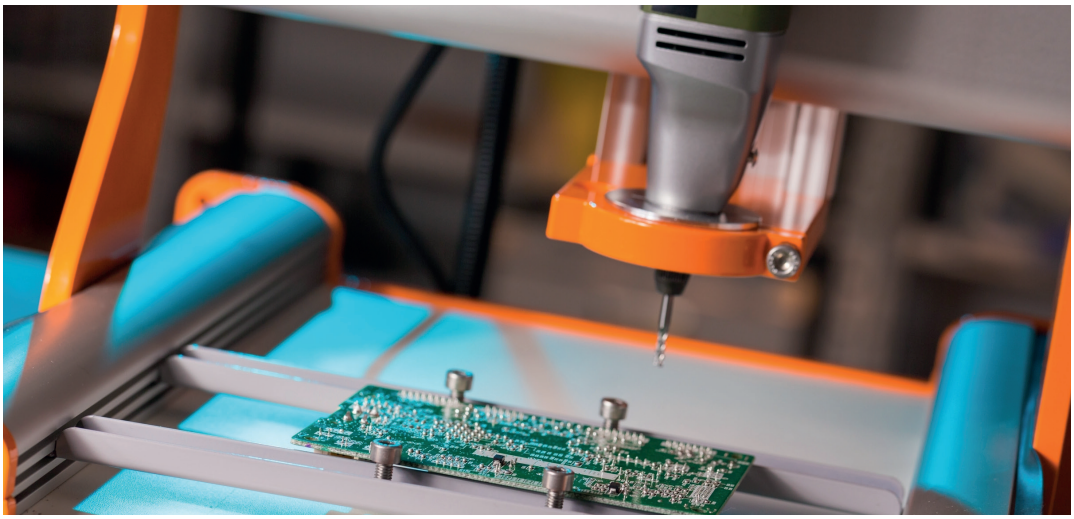
Semiconductor- and other process critical industries are very sensitive to voltage sags, power outages or other power quality issues.

In semiconductor industries, manufacturing a finished product can take up to 3 months which is why interruptions can ruin a batch and cause serious damage to the production process.

Merus UPQ protects sensitive equipment from a wide range of power quality challenges and ensures a smooth, continuous production processes without any interruptions.

OTHER APPLICATIONS

- **Chemical industry**
- **Pharmaceutical Industry**
- **Food & beverages**
- **Glass Industry**
- **Other mission critical processes**



AUTOMOTIVE INDUSTRY:

Automotive industries are extremely sensitive to power quality challenges as they are highly automated. A power quality disruption in the middle of the critical production process can easily ruin the model in the making, resulting in a lost unit.

Not only are power interruptions costly in terms of lost production, but also in their impact on supplier's reputation and customer confidence. Merus UPQ is a reliable solution which keeps your critical process running round the clock, reliably.

TECHNICAL SPECIFICATIONS

	UPQ A-Series		UPQ M-Series	
Nominal voltage U_N	200...400 V	200...400 V	220 – 725 V	220 – 725 V
Power system	3 -Phase + Neutral (4-Wire)			
Nominal system frequency f_N	50 / 60 Hz			
Efficiency	>99% (typical at power protection stand by mode)			
Power protection mode				
Load maximum power P_N	50 kW	624 kW	750 kW	3000 kW
Load protection Time t	3 Sec	3 Sec	3 Sec	3 Sec
Load protection Time t	Other protection time capacities are available on request			
Energy storage media	Ultra Capacitors (Other energy storage meida available on request)			
Load power factor	0,7 pu			
Transition Time t	< 1.8 ms (no voltage interuption due energy storage)			
Power quality mode - Active Filter				
Continues reactive power Q_N	13 kvar	156 kvar	188 kvar	750 kvar
Operating modes	All harmonics / All harmonics but not fundamental / Selective harmonics			
DOL Motor Starting	Enabled and supported			
Response time	<< 0.1 ms / 1 cycle (selective mode)		<< 1 ms / 1 cycle (selective mode)	
Harmonic performance	up to 50th harmonic		up to 31st harmonic	
Human-Machine-interface (HMI)				
Human-Machine-interface (HMI)	7" easy to use touch screen interface			
HMI languages	8 languages including English-German-Spanish-Chinese-Russian. Others on request.			
Monitoring	On-site and remote monitoring possibilities			
Reporting	Reports data of power quality events from last 30 days			
Communication	Ethernet / RS485, ModBus TCP/IP			
Operating environment				
Ambient temperature	0...40°C, without de-rating			
Recommended operating temperature	15...40°C for Ultra capacitor			
Humidity	Maximum 95% RH; non-condensing			
Protection degree	IP21 for indoor installation, IP54 as option			
Cooling	AF			
Mechanical				
Cabinet color	RAL7035			
Dimensions (Width x Depth x Height)	2400x600x1800 mm	5800x600x1800 mm	2850x2100x2290 mm	5815x2100x2290 mm
Weight	970 kg	2800 kg	6750 kg	13 200 kg
Standards	Safety standard: EN 50178, EMC standards: EN 61000-6-2 and EN 61000-6-4			

WINNING BUSINESS WITH POWER QUALITY

Merus Power offers world-leading clean technology to improve power quality, energy efficiency and environmental performance. Our dynamic compensation solutions- active harmonic filters, UPQs, energy storage systems, STATCOMs and SVCs – solve your power quality problems in no time. You will enjoy a swift payback on your investment: our solutions save energy, increase productivity and lifetime of the facility.

We also offer a service portfolio which spans the whole product lifecycle from power quality surveys to after-sales services. We provide our clients with world-class products, reliable Finnish technology, dependable and flexible service and true co-operation.

Merus Power is a member of Cleantech Finland.

MERUS POWER

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