APPLICATION BROCHURE

Railway applications

ABB's UPS solutions for railway infrastructure

- Reliable and safe power protection solutions
- Innovative and proven technology
- Market leading efficiency
- Complete range of power protection products

Powering the railways
Reliable UPSs for railway applications

ABB is a comprehensive solution provider to the railway sector, working with rail customers to tailor standard solutions that meet individual needs.

As a leading global supplier of technology innovations for both train manufacturers and railway operators, comprehensive ABB products, systems and services are being continually developed for both rolling stock and rail infrastructure.

The lifeblood of electric rail is a reliable source of quality electrical power, because even minor disturbances in power supply or quality can create major network disruptions. ABB's power protection solutions are critically important because the electricity they safeguard not only powers the trains, but many other essential rail applications as well.

ABB's comprehensive range of world-class AC and DC power protection and control products ensure maximum availability and return on investment, and reduced lifetime costs. ABB is a power production expert with extensive experience in large international engineering projects, and a thorough understanding that safety, risk management, business continuity and operational excellence are essential ingredients of project success.

ABB's complete support for integrated rail solutions includes UPS, DC systems and batteries; generator sets, distribution, fire detection, control and monitoring; and unmatched rail expertise, ranging from global service solutions to turnkey project delivery.

ABB UPS solutions for rail
Power disruptions in rail networks are not just inconvenient; they are also serious threats to health and safety. ABB's UPS systems are designed to keep rail networks moving safely and promptly, and to provide maximum reliability in a way that is energy-efficient and cost-effective. ABB has delivered rail-specific power protection solutions for many years, and has extensive experience designing, delivering and supporting standard and specific UPS solutions for above-ground and underground rail installations around the world.

Power disturbances come in many different forms. In addition to outages and blackouts, power voltage can sag or swell over short periods – or over longer periods, resulting in brownouts and overvoltages. Electrical noise can appear on lines, or frequency variations, or harmonics in the voltage, but a UPS system reconciles any of these problems by conditioning incoming power to eliminate spikes, swells, sags, noise and harmonics.

ABB's has a wide range of UPS systems that are used in rail networks and metro systems to ensure reliable, stable and continuous power for many different rail applications. ABB UPS systems for rail match all critical load characteristics (single-phase, three-phase) and load power demands, ranging from a few kVA up to six MVA. ABB's flexible power protection solutions provide customers with optimal, individually tailored solutions for specific operational needs and budgets.

Power protection solutions
The modular advantage

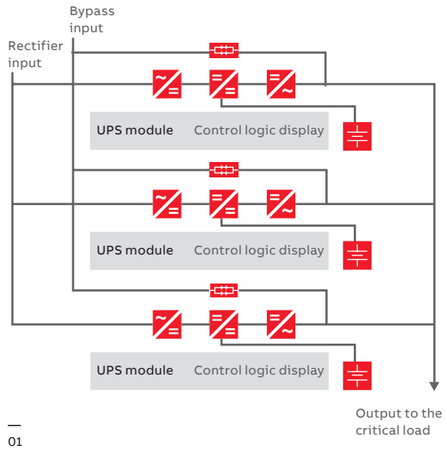
— 01 Modular UPS with no common components (Decentralized Parallel Architecture)

ABB is a pioneer in UPS technology, providing both standalone and modular, decentralized and online-swap UPS systems. Much attention and focus has gone into developing modular UPS systems, which are supported by ABB's decentralized parallel architecture (DPA).

The DPA concept ensures each ABB UPS module contains all the hardware and software needed for full system operation. The modules share no common components – each has its own independent static bypass, rectifier, inverter, logic control, control panel, battery charger and batteries.

All critical components are duplicated and distributed between individual UPS modules, so potential single points of failure are eliminated. In the unlikely event one UPS module fails, the overall system will continue to operate normally, but with one module.

Lower cost of ownership
The modularity and scalability of ABB's UPS technology help to minimize cost of ownership, as do best-in-class designs for energy efficiency. Because they consume less power, high-efficiency UPS modules require less effort to cool and provide a smaller footprint.



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Standardization and modularity keep installation and servicing costs low, simplifying and speeding up the deployment process from planning to installation, commissioning and full use.

High-quality standardized products also significantly reduce intervention times during maintenance, or in the event of failure. Components can be changed quickly and easily, service is simplified and modules can be online-swapped (exchanged) without shutting down the system or compromising power to critical loads.

UPS filter for critical loads
If a disturbance in the power supply network threatens a critical load, the UPS acts as a filter guaranteeing crucial electric equipment receives quality power for a specific backup time via an energy storage system (ESS). The type, size and the dimensions of the ESS depends on the functional requirements of the application the UPS is protecting, which define the minimum time for system autonomy in the event of an interruption of the main power supply.

Today's UPS systems mostly incorporate lead-acid battery technology, and ABB has extensive experience integrating power supply from different types of battery energy storage systems. In addition to matching all critical load characteristics, ABB's comprehensive UPS product portfolio employs a fast IGBT-based double conversion (AC/DC rectifier and DC/AC inverter), which enables highest efficiency across the entire power range, lowest harmonic distortion on both line and load side, and the highest power density available.

ABB UPS protects critical loads
Examples

— 01 ABB UPS systems provide power protection solutions and low-voltage backup power for crucial rail applications, such as substations that provide power for signaling systems, power feeding rail operations control and IT centers, rail depots and administrative centers, and station areas and passenger service centers.

Many rail applications are critical loads that require uninterrupted power of suitable quality and cannot tolerate even the briefest lapse in power flow. Examples include a rail network's emergency and safety systems; infrastructure and services for rail customers; traffic management systems; power substations; automatic train protection systems; and signaling and rail-related equipment for roads, such as level crossings, switches and lights.

ABB's UPS systems instantly protect crucial electrical loads from any type of input power interruption or power quality disturbance.

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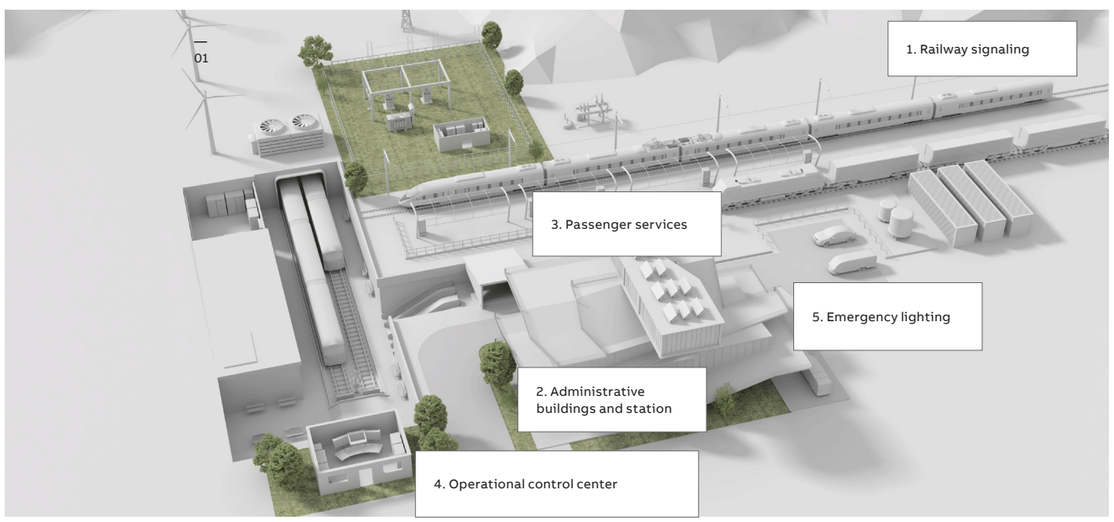

— 01 Schematic 1: Example solution for railway signaling
— 02 Dual-frequency UPS converter

1. UPS solutions for railway signaling
Modular, redundant UPS systems ensure the safe and continuous flow of rail traffic. Optimized investment in control and signaling systems maximizes the use of rail networks, and lowers the cost of new infrastructure and railway lines. UPS systems ensure rail networks deliver efficient, punctual, secure and reliable service, providing uptimes in the range of 99.9999 percent.

The highest uptime capacity is essential because rail infrastructure is exploited 24 hours per day, 365 days a year, and high-speed rail traffic must be able to move in different directions without creating disruptions. This makes reliable signaling systems and accurate transit management key factors in the profitability of a railway system. ABB's UPS systems for rail are designed to reliably protect the rail network's power supplies, often from two redundant sources – the public power network and a private railway power supply.

A unique feature of ABB UPS systems is the interchangeability of modules, which radically reduces spare part count and simplifies servicing. A defective UPS module can be online-swapped (removed or inserted) in 20 minutes, without risk to the critical load.

This directly addresses continuous uptime requirements, significantly reduces MTTR (mean time to repair), reduces inventory levels of specialist spare parts, and simplifies system upgrades. The approach also pays off in terms of serviceability and availability – online swapping means there is no downtime and service personnel do not need special skills to replace or install modules.

Spares can be held on-site or at a nearby service center, improving availability and reducing cost as service engineers spend less time on-site, the risk of power loss is minimized and inventory levels of specialist spare parts are reduced.

ETCS (European Train Control System) is a signaling, control and train protection system set up to replace incompatible safety systems in European railways, especially on high-speed lines. ETCS power supplies are typically backed up by a diesel electric generator, which has a significant impact on the installation cost of the entire system, and, because it takes up considerable space, on system power density.

ABB's solution not only aims to remove the backup diesel electric generator (and associated greenhouse emissions and noise), but to also increase the level of redundancy by adding a battery pack.

Where an independent second mains network is available, it can also be used in the backup power scheme. An ABB dual-frequency UPS converter makes it possible to harness the power networks of different frequencies, so the load can utilize either, or both, as appropriate. If a fault develops in one, the dual-frequency UPS feeds the critical load through the other. In the event of a fault in both independent networks, a third energy storage option – the UPS battery pack – would provide power needed, for example, by a control system like ETCS, ensuring zero downtime for the entire system.

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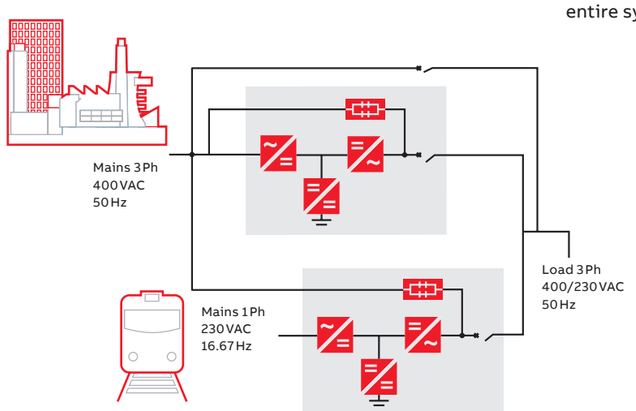

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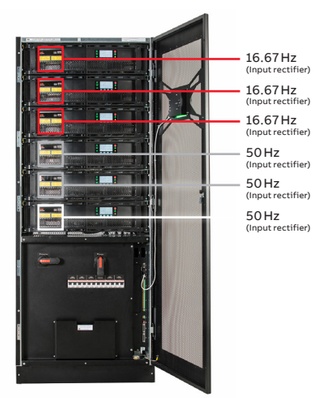

ABB UPS protects critical loads
Examples

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01 Schematic 2: Clean backup power for sensitive electronic devices

2. UPS solutions for administrative buildings and stations
ABB's UPS solutions are ideal for protecting critical applications such as building management systems (BMS). Large facilities such as railway stations and office areas are often provided with a BMS to control and monitor the building's mechanical and electrical systems such as ventilation, lighting, fire alarms and security. The BMS is designed to create and maintain a safe, productive and comfortable environment, thus increasing operational efficiency, decreasing the energy consumption and ensuring the safety of personnel and equipment. ABB's UPS offers clean backup power for sensitive electronic devices (controllers, I/O devices and user interfaces) designed to monitor and control the infrastructure, thus avoiding loss of data or damage to equipment.

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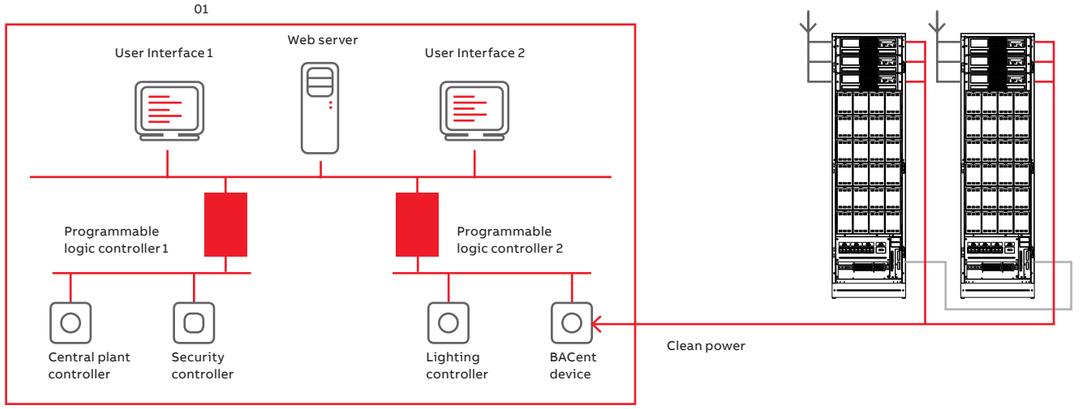

3. UPS solutions for passenger services
Modern public passenger travel is not possible without the extensive use of IT technologies. At the interface
to the passenger, applications on static systems and also, increasingly, on mobile devices play an essential role. Beginning with the passenger's desired journey, they include timetable information, ticket purchase, passenger care and smooth connections when services are disrupted.

Today, public passenger services are being more attractive, with up-to-date individualized information available to travelers throughout their journey. The combination of satellite location with other localization technologies inside buildings and vehicles is essential for the development of integrated location-based services. All of these passenger applications must be secured by UPS systems.

ABB UPS protects critical loads
Examples

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01 Schematic 3: Example of a DPA 500 installation protecting the load of an operational control center. The system flexibility allows upgrading or downgrading power capacity according to the customers' needs. Modules can be removed or inserted without risk to the critical load and without the need to power down or transfer to raw mains supply.
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02 Schematic 4: CPPS

4. UPS solutions for operational control centers
Control centers are major power users. As any railway company is often highly reliant on the operation of a control center, it is critical that operations and traffic controlling is available at all times and that the data is stored in a reliable and energy-efficient way. ABB's uninterruptible power supply (UPS) systems ensure this. A reliable UPS will guarantee a flow of continuous, clean power to the data center no matter what happens on the power supply side. No control center operates without an effective UPS. ABB provides a range of modular and standalone UPS solutions. All these UPS solutions are recognized as being at the forefront of power protection innovation and technology and are class-leading in terms of system reliability efficiency, availability, scalability and flexibility.

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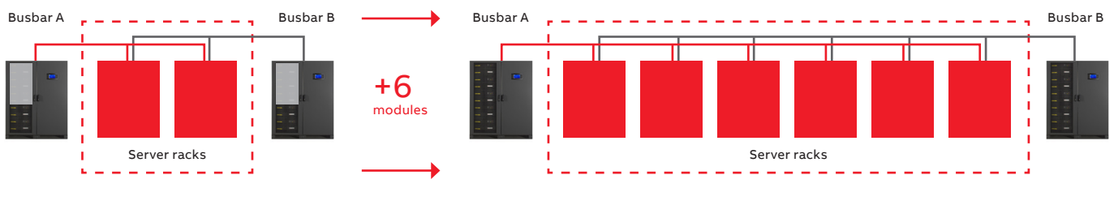

5. UPS solutions for emergency lighting
Emergency lighting requirements and related building codes are vital in public transportation structures to facilitate occupant egress during a building fire or other emergency situation. The emergency lighting UPS from ABB is designed in compliance with standard EN 50171 and is therefore the ideal solution for installation in buildings subject to fire safety regulations and in particular for the power supply of emergency lighting systems. This is not all however, the emergency lighting UPS is also suitable for supplying power to other emergency systems such as automatic fire extinguishing systems, alarm systems and emergency detection systems, smoke extraction equipment and carbon monoxide detection devices as well as dedicated security systems in sensitive areas.

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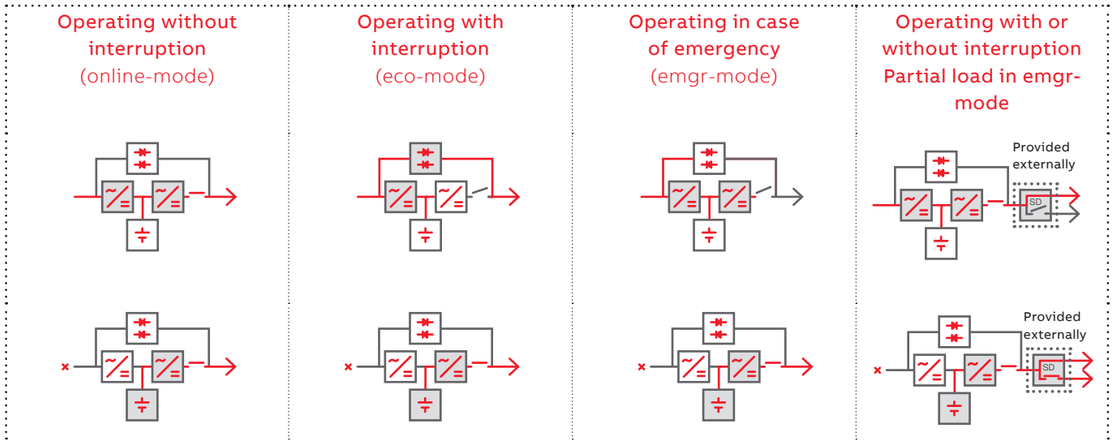

Low-voltage power protection for rail

At the core of our business is a technically advanced product portfolio of high-quality and reliable three-phase and single-phase transformerless uninterruptible power supplies.

All our UPSs provide online double conversion topology and are designed for continuous power protection of critical equipment against all power problems: power failure, power sag, power surge, undervoltage, overvoltage, switching transient, line noise, frequency variation and harmonic distortion.

UPS systems make rail networks safer by protecting the power that feeds train signaling operations, level crossings and switches at rail junctions, and supply train control systems and sensors. Either standard UPS products or special engineered solutions such as dual frequency UPS systems can be adopted to meet these application requirements.

UPS power protection enhances rail network traffic control to ensure high reliability and the maximum use of trackway slots, guaranteeing continuous, reliable rail traffic management. UPS systems also protect the emergency and safety systems in train stations, by rail tracks and on board trains, which continually monitor operating conditions in the surrounding environment.

Systems providing fire protection, radio communications, video surveillance and emergency lighting are just some of the safety-relevant, critical low-voltage loads that require uninterrupted power supply. ABB's standard products are tailor-made for such applications, providing the highest availability and reliability, and a low cost of installation, maintenance and service.

ABB's power protection systems also support passenger services, such as information panels, ticketing systems, lift systems, lights and auxiliary services for rail personnel.

Industry specific certifications for railway applications are available:

The PowerLine DPA and the DPA 250 S4 are also certified according to the European standard EN 50121 ("Railway applications. Electromagnetic compatibility") and International standard IEC 62236 for fixed power supply installations and apparatus. The modular UPSs designed for use in industrial and commercial applications have passed stringent electromagnetic test ensuring minimal disturbance to other equipment surrounding the railway environment.

Our product offering for railway applications







GENERAL DATA	PowerValue 11 RT G2	PowerScale	DPA UPScale ST	DPA 250 S4	SG Series	PowerWave 33	PowerLine DPA
UPS frame rated power	1 / 2 / 3 / 6 / 10 kVA	10 / 15 / 20 / 25 / 30 / 40 / 50 kVA	40 / 60 / 80 / 120 / 200 kW	300 kW	10-500 kVA	60 / 80 / 100 / 120 / 160 / 200 / 250 / 300 / 400 / 500 kW	20 -120 kVA (3ph); 20 - 80 kVA (1ph)
UPS module rated power	-	-	10 / 20 kW	50 kW	-	-	20 - 40 kVA
UPS output rated PF	0.9 (1-3 kVA) 1.0 (6-10 kVA)	0.9	1.0	1.0	0.9	1.0	1.0
Max. no of parallel frames	Up to 3 UPSs (6-10 kVA)	Up to 20 UPSs	Up to 4 UPSs	Up to 5 UPSs	Up to 6 UPSs	Up to 10 UPSs	2 (Redundancy)
Max no of parallel modules across system	-	-	20 modules	30 modules	-	-	6
Max. system power	30 kW	1000 kVA	400 kW	1500 kW	3000 kVA	5000 kW	120 kVA
Wiring	1-ph + N + PE	3ph + N + PE	3ph + N + PE	3ph + N + PE	3ph + N +PE	3ph + N + PE	3ph + N+ PE (3ph); 1ph + N + PE (1ph)
UPS type	**Standalone tower**	**Standalone tower**	**Modular (DPA)**	**Modular (DPA)**	**Standalone tower**	**Standalone tower**	**Modular (DPA)**
Topology	Online double conversion	Online double conversion	Online double conversion	Online double conversion	Online double conversion	Online double conversion	Online double conversion
INPUT							
Nominal input voltage	220/230/240 VAC (1-3 kVA) 208/220/230/240 VAC (6-10 kVA)	220 / 380, 230 / 400, 240 / 415 VAC	220 / 380, 230 / 400, 240 / 415 VAC	220 / 380, 230 / 400, 240 / 415 VAC	380/400/415 VAC	220 / 380, 230 / 400, 240 / 415 VAC	400/230 VAC, others on request
Voltage range	100-300 VAC (1-3 kVA) 100-276 VAC (6-10 kVA)	161/280 - 264/460 VAC	150/260 - 264/460 VAC	161/280 - 264/460 VAC	340-460 VAC	138/240 - 264/460 VAC	For loads < 100% (–15%, +10%), < 80% (–20%, +10%), < 60% (–25%, +10%)
Frequency range	45-55 Hz for 50 Hz systems 54-66 Hz for 60 Hz systems 40-70 Hz with load <60% (6-10 kVA)	35 - 70 Hz	35 - 70 Hz	35 - 70 Hz	45-66 Hz	35 - 70 Hz	35-70 Hz
Current THD at 100% load	5% (1-3 kVA) < 3% (6-10 kVA)	≤ 3%	< 3%	< 3%	< 2%	≤ 4%	< 4%
Power factor at 100% load	≥0.99 (1-3 kVA) ≥0.995 (6-10 kVA)	≥ 0.99	≥ 0.99	≥ 0.99	0.99	≥ 0.99	0.99
OUTPUT							
Rated output voltage (load dependent)	220/230/240 VAC (1-3 kVA) 208/220/230/240 VAC (6-10 kVA)	220 / 380, 230 / 400, 240 / 415 VAC	220 / 380, 230 / 400, 240 / 415 VAC	220 / 380, 230 / 400, 240 / 415 VAC	3x 380/400/415 VAC	220 / 380, 230 / 400, 240 / 415 VAC	400/230 VAC (3ph); 230 VAC (1ph)
Voltage THD (with linear load)	< 2% (1-3 kVA) < 1% (6-10 kVA)	< 2%	< 1.5%	< 2%	< 1.5%	< 2%	< 2%
Rated frequency	50 or 60 Hz (selectable)	50 or 60 Hz (selectable)	50 or 60 Hz (selectable)	50 or 60 Hz (selectable)	50 or 60 Hz (selectable)	50 or 60 Hz (selectable)	50 or 60 Hz (selectable)
EFFICIENCY							
Line-interactive	-	-	-	-	-	-	-
Double conversion	Up to 91% (1-3 kVA) Up to 95% (6-10 kVA)	Up to 95.5%	Up to 96%	Up to 97.6% module efficiency, up to 97.4% system efficiency	up to 94.6%	Up to 96%	Up to 96%
Eco-mode	Up to 98%	98%	98%	99%	up to 98.7% (eBoost)	99%	98.5%
ENVIRONMENT							
User interface	Touchscreen LCD (Up), LCD (Pro) LCD	LCD + mimic diagram	Module level LCD + mimic diagram, system graphical display	Module level LCD + mimic diagram, system graphical display	System Graphical Diyplay LCD	Graphical touch screen (optional on 160 - 200 kW), LCD + mimic diagram (on 60 - 200 kW only)	System graphical display (HMI) + LCD panel UPS Module
Communication ports	USB, RS232	USB (optional), RS-232, SNMP slot, potential-free contacts (optional)	USB, RS-232, SNMP slot, potential-free contacts	USB, RS-232, SNMP slot, potential-free contacts	RS232, SNMP (Modbus IP, RS232, RS485 & BacNet IP)	USB, RS-232, SNMP slot, potential-free contacts	SNMP; ModBus; potential free contacts
Control / monitoring	Monitoring and shutdown software available				Monitoring and shutdown software available as option		

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