Powerware series

Eaton 9395 UPS

225 - 1100 kVA

Unmatched green power

EATON

Powering Business Worldwide

Introduction and overview

As IT managers, facility managers and CIOs feel increasing pressure to achieve zero downtime, to scale the data center to meet ever-changing requirements and to reduce energy costs, the search for the most reliable and efficient power protection system has become even more critical. With an unprecedented level of power performance, reliability and energy savings, the state-of-the-art Eaton® 9395 UPS from the Powerware® series, has raised the bar in three-phase power protection technology.

The 9395 delivers a wide scope of superior customer-driven benefits unmatched by competitive UPS solutions, including:

Premium power performance and true reliability

- Enhanced power protection due to double-conversion design and lower ITHD
- Reliable operations with Powerware Hot Sync® paralleling technology
- Longer battery runtimes due to higher efficiency and ABM® technology
- Greater reliability through inherent redundancy
- Higher availability through concurrent maintenance

Outstanding savings

- Electrical and cooling savings due to higher efficiency
- Flexible, upgradeable architecture for future expansion needs
- Space and freight savings due to smaller footprint and reduced weight
- Longer life of components due to higher efficiency
- Installation and testing savings thanks to the Easy Capacity test

Unmatched green efficiency

- Less source materials with transformer-free design
- Reduction in energy consumption during manufacturing, testing and use
- Reduced impact on shipping with smaller footprint and lighter weight
- Reduced end-of-life impact due to recycling of materials
- Lower total costs of ownership
- Higher efficiency due to Energy Saver System

Key Applications

- Large data centers
- Server farms
- Telecommunication installations
- Internet service providers
- Transportation systems
- Security operations
- Broadcasting and entertainment
- Process control equipment
- Financial systems
- Credit card operations
- Healthcare
- Industrial systems
- Multiple medical imaging units

Premium power performance and true reliability

Double conversion design for highest power protection

Unlike some other commercially available UPS technologies, the double-conversion design completely isolates output power from input power anomalies and delivers 100% conditioned, perfect sine wave output, regulating both voltage and frequency. Even when presented with the most severe power disturbances, power output remains stable.

Enhanced power performance

Power performance, which is measured by system efficiency, ITHD, input and output power factor is the foundation of the 9395. It is the UPS's robust combination of these three elements that makes it stand out as the premier UPS in its class.

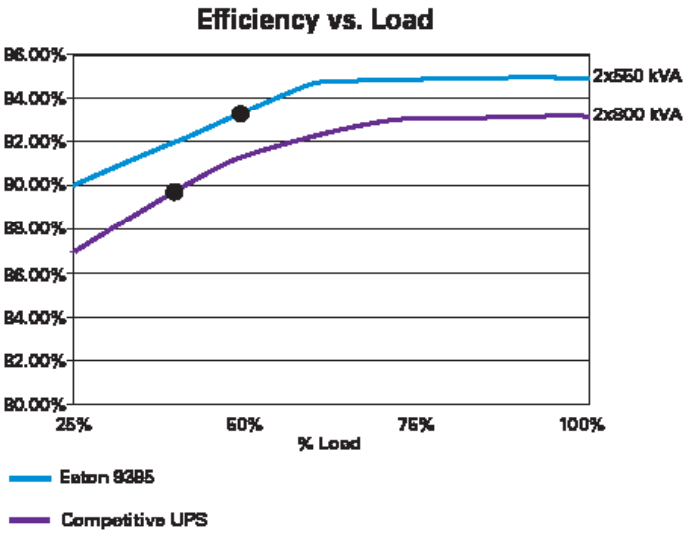
The 9395 delivers an efficiency of up to 94,3% in double conversion mode. Such an enhanced level of power performance in the 9395 is provided by the modern transformer-free technology with small and lightweight filter inductors, high performance IGBTs in both rectifier and inverter, and advanced control algorithm. The graph on the right shows how efficiency generally dips as load level decreases. In general, manufacturers list an optimal efficiency rating at full load. In reality, however, most three-phase UPSs operate in the range of 30 – 50% load. The 9395 can provide exceptional efficiency at half load.

Additionally, with the IGBT technology, the 9395 does not require input filters to obtain excellent input ITHD, while most manufacturers must use input filters, which lower their efficiency rating. Due to low input ITHD (below 4,5% at full load) and high input power factor (over 0,99), the 9395 is exceptionally compatible with diverse power sources, especially generators. The 9395 is also extremely mains friendly due to its low harmonic content.

Also on the output side the 9395 can provide its full power capability, as it supports leading power factor loads, which are becoming more prevalent in new and updated data centers. The 9395 UPS handles without derating down to 0.8 leading power factor of modern computer and server loads.

These technological innovations result in dramatic cost savings, given extended battery runtime, longer life of components and cooler operating conditions within the UPS.

The table on the right shows how the 9395 compare to competitive UPS models in terms of efficiency and resulting cost savings.



Savings achieved with Eaton 9395 550kVA

Load rating (VA) =	550 000
Load Power Factor =	0,9
Unit Watts =	495 000
Energy cost per kWh* =	0,09 euro
Competitive product efficiency from graph =	90.5%
9395 UPS efficiency from graph =	94.0%
Loss in Watts with competitive product =	51 961
Loss in Watts with 9395 UPS =	31 595
Extra energy used to operate competitive product =	20 365
Loss in BTU/hr with competitive product =	177 299
Loss in BTU/hr with 9395 UPS =	107 809
Extra BTU/hr used to operate competitive product =	69 490
Daily energy savings using 9395 UPS =	44,97 EUR/day
Yearly energy savings using 9395 UPS =	16 413 EUR/year
Cooling efficiency ratio =	70%
Daily cooling savings using 9395 UPS	31,48 EUR/day
Yearly cooling savings using 9395 UPS =	11 489 EUR/year
Total yearly combined savings per 9395-550 kVA =	**27 902 EUR**
Quantity of Modules =	4
Total yearly savings using 9395-550 kVA =	**111 608 EUR**

* average energy cost per kWh in EMEA (usage charge + taxes)

Powerware Hot Sync technology boosts system reliability

In systems with multiple uninterruptible power modules (UPMs), the 9395 leverages the synchronization, load sharing and selective trip capabilities of Eaton's patented Powerware Hot Sync technology. These capabilities are integral to the ultimate systems availability that is the primary requirement for any parallel UPS configuration.

The Hot Sync system functions automatically without any dependence on centralized, external control.

Powerware Hot Sync utilizes a peer to peer control architecture, as opposed to the ubiquitous master/slave controls found in competitive systems. This unique architecture eliminates the need for a single UPM/UPS to depend on any outside source for its control. The multiple UPMs/UPSs simply monitor their own internal metering, and use simple mathematical computations to remain synchronized, share the load equally, and detect and isolate malfunctions. This architecture does not require extra circuitry or added complex wiring in order to function in parallel. Therefore, it eliminates huge bundles of control wiring, hundreds of electrical connections, removes the need for a failure-prone central control thus eliminating complexity and enhancing reliability.

Ultimate reliability in the implementation of parallel AC power systems guarantees system autonomy and simple instrumentation.

Sync Control

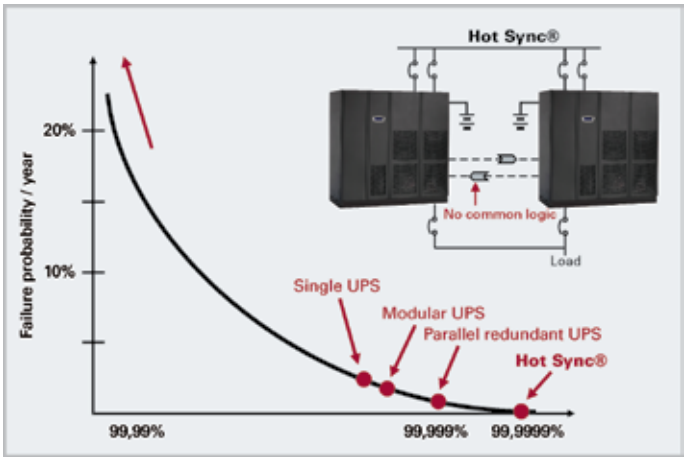
Sync Control ensures that the output of two (or more) separate UPSs (single modules or parallel systems) remain in phase with one another so static transfer switches connected between the separate distribution paths may change state seamlessly when necessary.

Inherent redundancy option for highest availability

Surveys focused on efficiency in data centers reveal that UPSs are often underloaded–frequently at less than 50%. To capitalize on this trend and create even greater reliability, you have the option to configure the multi-module 9395 with inherent redundancy. Anytime the load is below 50% capacity, it is automatically redundant. This option might be the single most important feature that saves customers from dropping their load. Traditional UPS manufacturers cannot deliver this additional availability without adding a more costly second UPS module.

Scalable, redundant architecture for current and future needs

The 9395 combines the reliability and redundancy of a multi-module UPS into an integrated, pre-wired solution. With a unique, flexible design that provides scalability, the UPS can adapt to future changes in load demands and new requirements for higher reliability without requiring the purchase of an additional UPS. For example, the 9395 UPS enables you to add a 275 kVA UPM in the field for N+1 redundancy or capacity (dependent on static switch rating).



Patented Hot Sync technology provides highest availability for load

Key design features of Hot Sync systems

- No system-level single point of failure
- Paralleled UPMs operate completely independently. One module cannot affect or interfere with the others – no domino effect scenario
- No added circuitry is required for parallel operation. Any standard UPS can be used in a parallel system without modification
- This patented and proven technology has been successfully deployed in thousands of systems around the world.

On site upgrade 550 kVA redundant

Concurrent maintenance for higher availability

With 9395 redundant models, Eaton field technicians can completely isolate and service a redundant module while the other module carries the load–without going to bypass for service. The 9395 also features a completely front-accessible design and can be installed against walls or back to back in multi-module configuration. This service-friendly design enhances maximum uptime and availability.

Ease of installation

The 9395 is a completely integrated large system that incorporates multiple power modules and system switchgear on factory pre-wired bases. Cabling busbar enters the 9395 UPS from either the top or bottom of the cabinet to provide easier and more flexible installation. Since everything is pre-wired, cabling busbar costs and installation time are significantly reduced.

Batteries: the heart of every UPS

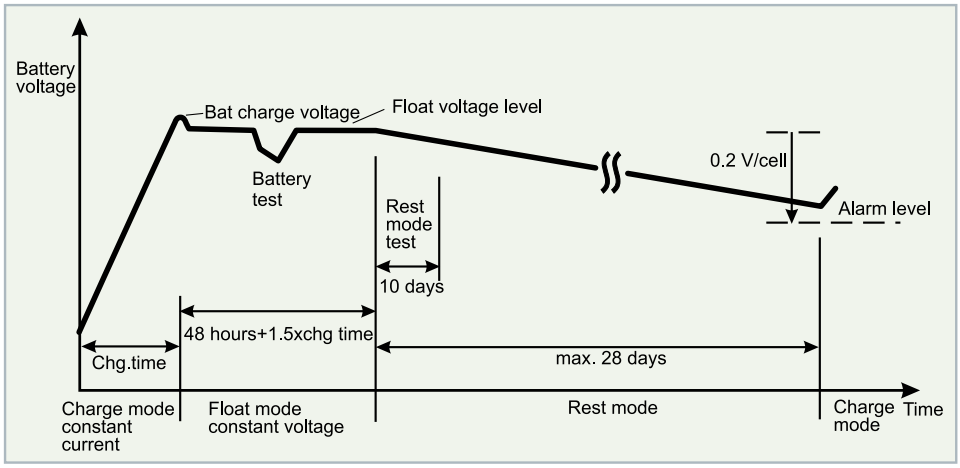
When a utility power outage causes a UPS to switch to battery power, it is imperative that those batteries are healthy, charged and up to the task. Improper battery management is the number one cause of downtime. Many UPS batteries on the market today are constantly trickle-charged – a process that degrades the battery's internal chemical composition over time, reducing potential battery service life by as much as 50%. To address this, the 9395 uses a sensing circuit and an innovative three-stage charging technique ABM technology to significantly extend battery service life and optimize recharge time. In addition, temperature-compensated charging monitors temperature changes, and adjusts the rate of charge to prolong battery life.

Monitor batteries for optimum readiness

Advances in firmware and digital technology enable the 9395 to offer sophisticated battery monitoring and management features that you might expect to find only on expensive add-on systems, including:

- Battery runtime remaining monitor uses system loading and trended battery discharge data plus internal sensing points for voltage and current data to calculate runtime remaining
- Battery circuit test performs a periodic full-load test of the battery string to ensure that there are no open circuits or weak cells that would jeopardize battery performance and system availability

Concurrent maintenance in Eaton 9395 550 kVA



Battery voltage during ABM charging process

Outstanding savings through sustainable design

Unmatched green power performance

The 9395 can operate at up to 94,3% efficiency in double conversion mode and at 99% in Energy Saver System, thus reducing utility costs and extending battery runtimes. Higher system efficiency also results in cooler operating conditions, which reduces facility air conditioning costs, extends the life of UPS components, and increases overall reliability, availability and performance. Through its sustainable design and the derived costs savings, the 9395 contributes to minimize the UPS impact on the environment.

Greatly reduced footprint

Compared to traditional UPS designs, a transformer-free UPS is typically only 50% the weight and occupies just 60% the footprint. In addition, the transformer-free technology permits to achieve high efficiency also at half load.

The 9395 fits a redundant design into the same footprint as a traditional, non-redundant UPS. Unlike some larger and heavier systems, the 9395 fits easily through all doors, can be transported on freight elevators, and there is no need to dismantle it to fit it on elevators or through doorways, which can cause significant delays and increase costs. Therefore, the 9395's smaller footprint not only reduces your total cost of ownership, but also minimizes the impact on shipping.

Substantially improved efficiency with Energy Saver System

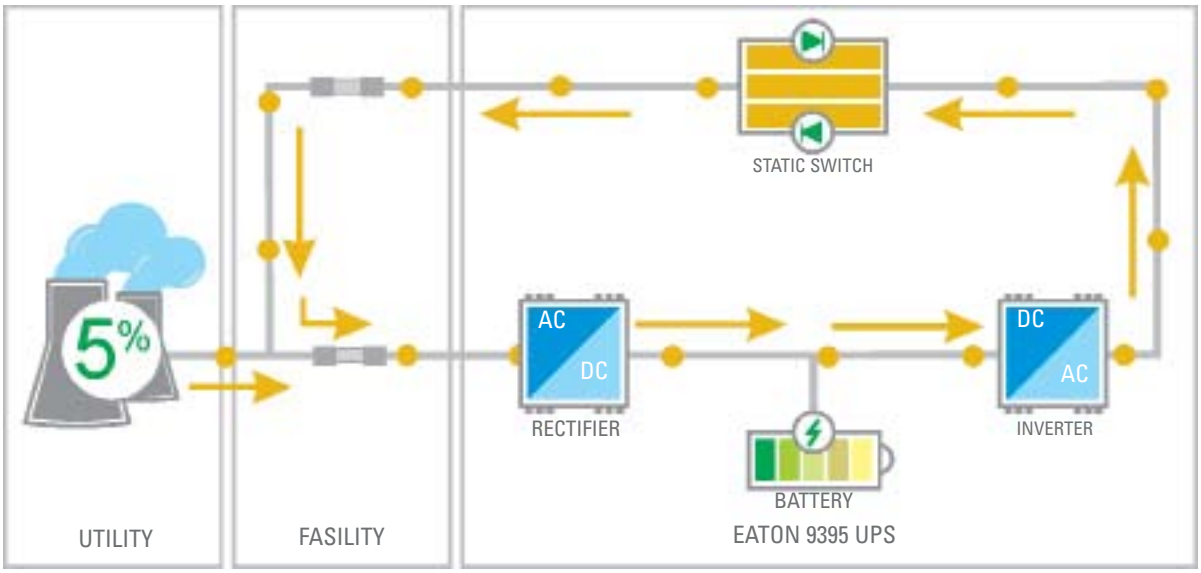
The ESS technology enables UPS efficiency to reach an impressive 99 percent. ESS allows the UPS to switch between three configurable operating modes. In the standard double conversion mode the UPS operates as normal, supplying power through the power converters. In Energy Saver System the power converters are idle and the static bypass switch allows the UPS to supply mains power directly. If mains power is lost or exceeds preset output limits, the DC link that is kept active enables a seamless switchover to double conversion in less than two milliseconds. The third mode is a high-alert mode, in which the UPS switches from Energy Saver System to double conversion for one hour. Power quality is constantly controlled during this time. If a high-alert command is received again, for example due to a thunderstorm, the one-hour timer will be reset.
While in ESS, the UPS is also able to detect whether an output fault has been caused by a source or by a load. A fault at the bypass source results in immediate switchover to the inverter; a fault in the load keeps the UPS in Energy Saver System.

Easy Capacity Test for reduced testing time and costs

The 9395 has the unique ability to test its entire power train under full load stress without the requirement of an external load thanks to Easy Capacity Test. With no load connected, the 9395 is able to test all of its power handling components, including the rectifier, inverter, contactors, fuses, power busses, cabling, batteries, bypass (static switch), magnetics and filter capacitors.

Furthermore, the 9395 has the ability to test the upstream bypass input breaker (BIB), the rectifier input breaker (RIB) and all of the electrical cables between them. The net result of this innovative load test is that there are no load banks to rent, no temporary load connections to make, no wasted energy, thus saving you time and money during startup and commissioning tests.

Eaton field technicians are trained to use this load testing capability during a startup service to ensure optimum calibration, maximum efficiency and inherent redundancy.



Easy Capacity Test Power Flow

Unmatched green efficiency

An Eaton Green Solution

The Eaton 9395 UPS dramatically improves energy efficiency and sustainability, while offering a much smaller footprint than legacy system.

- **Less energy during use**

  Operating at 94,3% efficiency in double conversion mode and 99% in ESS, the 9395 requires less power, which in turn creates cooler operating conditions, reducing air conditioning requirements and extending the life of UPS components and batteries.

- **Less energy during manufacturing**

  The new design requires 50-80% less energy in manufacturing due to less energy required for testing and to the smaller configuration.

- **Smaller footprint**

  50%-70% weight reduction is realized due to the much smaller footprint, thus minimizing impact of shipping and reducing freight costs.

- **Less source materials**

  Source materials such as steel and copper are much less than in legacy systems. This reduction is possible due to the transformer-free technology.

- **Reduced end-of-life impact**

  The Eaton UPS business model supports recycling. 90% of the materials can be recycled, further decreasing end-of-life impact.

Due to these outstanding green performance, the Eaton 9395 has earned the "An Eaton Green Solution™" label used by Eaton to identify products that offer proven exceptional environmental benefits to the customers.

Eaton 9395 exemplifies Eaton's way of doing business right, helping our customers utilize electrical power more efficiently while paying attention to sustainable values.

At Eaton, we apply ISO 14001 Environmental Management System, on site and R&D certification to all of our facilities. The implementation of ISO 14001 has resulted in dramatic reductions of energy and water consumption at the plant. Also the amount of mixed waste has been cut by 80% since 2002.

Eaton is proud to endorse the RoHS (Restriction on Hazardous Substances) and the WEEE directive (Waste Electrical and Electronic Equipment Directive) through the development of non-hazardous products and sound disposal of harmful electrical materials in support of a safer environment.

A significant part of 9395 components complies with RoHS initiative, such as:

- Mechanics
- Cable harnesses
- Electromechanical components
- Printed circuit components (except solder alloy)

Strategies have been deployed to guarantee proper collection and disposal of materials falling within WEEE restriction.

Product specific end-of-life instructions included in the manuals provide information for environmentally friendly disposal of batteries, electrical and electronic components.

™

An Eaton Green Solution

Extensive configurability

Eaton offers power management software solutions for continuous real time monitoring and performance analysis of UPS and other power equipment.

PowerVision

PowerVision is performance monitoring and trend analysis software for critical UPSs and multiple UPSs in a network. It stores information about the operation of the UPS device in its relational database where it can be retrieved for display and analysis. PowerVision's alert and notification behaviour is highly configurable, which makes it a great tool for system administrators. Integrated shutdown controller module can host hundreds of shutdown clients and it can also be used in case of paralleled UPSs.

PowerVision's shutdown logic is based on user definable script, which gives almost unlimited flexibility in deciding when to initiate operating system shutdown. The Software Suite CD offers a 30-day trial license of PowerVision Network Edition. After evaluation period it is possible to obtain a key code to unlock the software and continue using it without reinstallation.

Web card

Eaton 9395 UPS comes equipped with a ConnectUPS Web/SNMP card. This tool is a complete UPS monitoring, control and shutdown solution in a networked IT environment. In case of alert the Web/SNMP card can notify users and administrators through e-mail. In case of a prolonged power failure the protected computer systems can be shut down in a graceful manner with NetWatch and LanSafe software. The unique three-port switching hub on the X-Slot model provides additional network connections.

The ConnectUPS-X Web/SNMP Card allows you to connect your 9395 directly to the Ethernet network and the Internet. This unique solution allows you to conveniently monitor and manage your UPS with a standard Web browser.

Customised solutions

The 9395 is Eaton´s answer to meet customers needs looking for tailor-made solutions for their mega data centers that require high power performance, maximum availability and costs savings. In order to satisfy customers' needs and to meet the sophisticated requirements set by demanding installations, environment and load applications, the LSG (Large System Group) organization is put in place in EMEA region.

Eaton is experienced in delivering solutions for the most demanding applications. As an example, marine UPS have special dependability requirements due to harsh environmental conditions and to the critical nature of the protected equipment. Eaton has supplied marine UPS to hundreds of vessels over the years.

Eaton offers 9395 based customized systems for different markets, including:

- Marine / off-shore
- Oil & Gas
- Rail & Track / underground / traffic / tunnel / mines
- Aviation
- Industrial applications
- Defense / military
- Emergency lighting

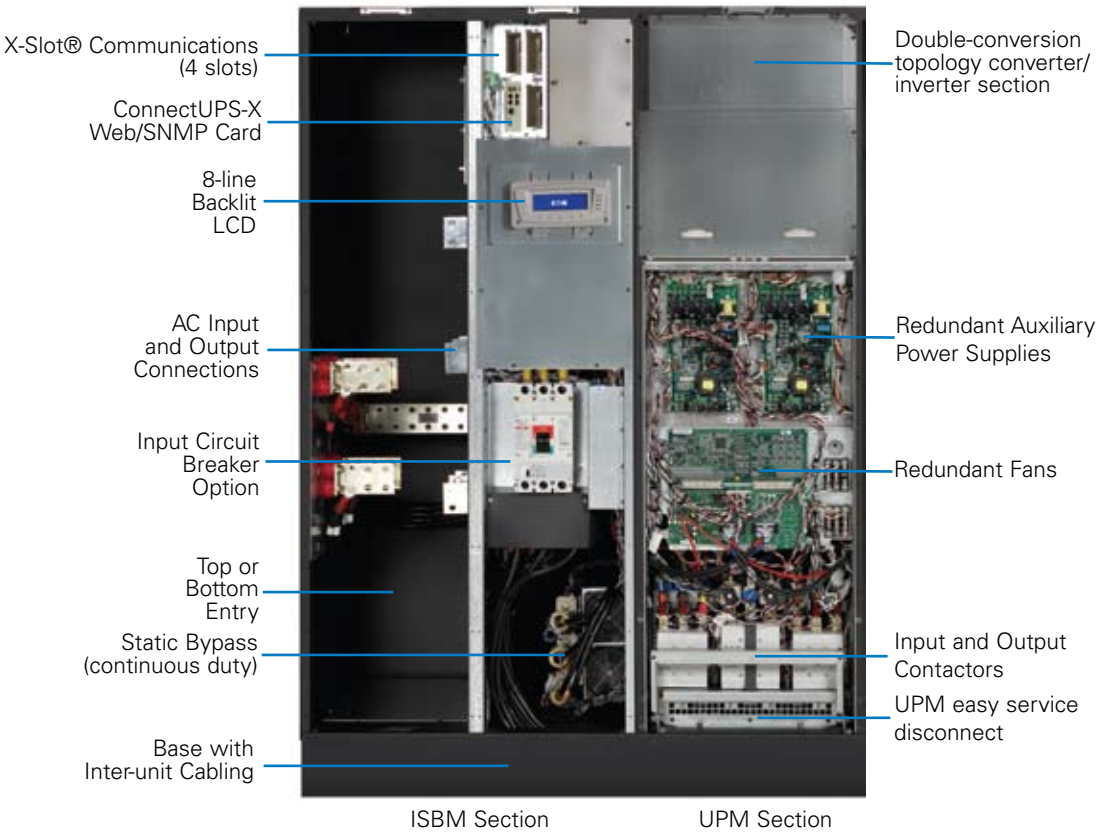
Expertise and reliability through Eaton service

Eaton provides an extended network of technical support to cover EMEA power protection needs. Eaton offers a number of distinct service packages to match different types of maintenance needs and budgets. Whichever package you choose, you can rest assured it delivers power security and reliability to keep your core business running.

Core components

Eaton 9395 825 kVA N+1 or 1100 kVA capacity

A closer look inside the Eaton 9395



Eaton 9395 275 kVA

Technical specifications

UPS output power rating (0,9 p.f.)

kVA	225	275	450	550	675	825	1100
kW	202	247	405	495	606	742	990

General

Efficiency in double conversion mode (full load)	>94,3%
Efficiency in double conversion mode (half load)	93,3%
Efficiency in Energy Saver System (ESS)	up to 99%
Distributed parallelling with Hot Sync technology	5
Internal N+1 redundance capable	from 225 to 825 kVA
Field upgradeable	yes
Inverter/rectifier topology	transformer-free IGBT with PWM
Audible noise	<76 dB; <81 dB (825 and 1100 kVA)
Altitude (max)	1000 m without derating (max 2000 m)

Input

Input wiring	3 ph + N + PE
Nominal voltage rating (configurable)	220/380, 230/400, 240/415 V 50/60 Hz
Input voltage range	+10% / -15%
Input frequency range	45-65 Hz
Input power factor	0,99
Input ITHD	less than 4,5%
Soft start capability	Yes
Internal backfeed protection	Yes

Output

Output wiring	3 ph + N + PE
Nominal voltage rating (configurable)	220/380, 230/400, 240/415 V 50/60 Hz
Output UTHD	<3% (100% linear load); <5% (standard non linear load)
Output power factor	0,9 (e.g. 247 kW at 275 kVA)
Permitted load power factor	0,7 lagging - 0,8 leading
Overload on inverter	10 min 100-110%; 30 sec 110-125%; 10 sec 125-150%; 300 ms >150%
Overload when bypass available	Continuous <115%, 20 ms 1000% Note! Bypass fuses may limit the overload capability

Battery

Type	VRLA, AGM, Gel, Wet Cell			
Charging method	ABM technology or Float			
Temperature compensation	Optional			
Battery nominal voltage (lead-acid)	480 V (40 x 12 V, 240 cells)			
Charging current / Model	275	550	825	1100
Default A	38	76	114	152
Max* A	83	166	249	332

*Limited by maximum UPS input current rating

Dimensions and weights

225 kVA, 275 kVA	1350 x 880 x 1880 mm (wxdxh)	830 kg
225 kVA redundant, 275 kVA redundant	1890 x 880 x 1880 mm	1430 kg
450, 500, 550 kVA	1890 x 880 x 1880 mm	1430 kg
450, 550 kVA redundant	2520 x 880 x 1880 mm	2030 kg
Field upgrade module, 225 or 275 kVA	740 x 880 x 1880 mm	600 kg
675, 825 kVA	3710 x 880 x 1880 mm	2520 kg
675, 825 kVA + 1 redundant	4450 x 880 x 1880 mm	3120 kg
1100 kVA	4450 x 880 x 1880 mm	3120 kg

Accessories

	External battery cabinets with long-life batteries, X-Slot connectivity (Web/SNMP, ModBus/Jbus, Relay, Hot Sync, ViewUPS-X remote display), integrated manual bypass for 225-550 kVA

Communications

X-Slot	4 communication bays
Serial ports	1 available
Relay inputs/outputs	5/1 programmable

Compliance with standards

Safety (CB certified)	IEC 62040-1, IEC 60950-1
EMC	IEC 62040-2
Performance	IEC 62040-3

In the interests of continuous product improvement all specifications are subject to change without notice.

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