

NETSURE™ 9500

400V DC Power System – Up to 600kW



KEY FEATURES

- 600kW total capacity with (5) 120kW Power Modules
- Scalable in 15kW increments; field expandable
- 97% power conversion efficiency with full galvanic isolation
- Global 3 phase nominal AC input
- Fault tolerant design with hot swappable rectifiers and controls limits downtime and reduces MTTR
- Multiple distribution options for local or remote load connections
 - Load distribution panel with (16) breaker positions, 15A to 100A each
 - Bulk distribution panel with single 400A breaker
- Matching battery cabinet available
- UL 60950-1 Listed (US & Canada), CE Marked

Additional Information

- VertivCo.com/400VDC
- [NetSure 9500 Web Page](#)

An efficient and reliable AC to DC power system for critical 400V DC power applications.

Description

The 120kW NetSure™ 9500 DC Power System is designed for applications operating up to 400V DC, such as at 380V DC. The foundation of the system is a patented, proven 15kW eSure™ rectifier, featuring high frequency switching technology in a compact package. Equipped with these rectifiers, this 400V DC power system offers high efficiency over a wide operating range and exceptional NetSure reliability. Full galvanic isolation eliminates the cost and complexity of an external isolation transformer. A flexible and modular design enables deployment in a variety of site configurations and allows for scalable buildouts to avoid stranded capacity.

Main elements of the system are as follows:

- Power Modules (or bays) containing sections for power conversion, controls and distribution which can be expanded to 600kW
- Distribution Modules (or bays) for extended load distribution positions
- Battery Cabinets each containing one string of VRLA batteries

Application

The NetSure 9500 Series offers benefits for a number of end applications, including:

- Telecom – Cable savings due to copper cable reduction compared to -48V DC
- Data Centers – Simple architecture with few power conversions offers high reliability
- Commercial Building Microgrids – Easy integration of renewable energy sources

400V DC can increase overall power efficiency, reduce infrastructure footprint and improve availability compared with modern alternatives.

NetSure 400V DC to -48V DC converter systems can also be used to extend the copper reduction benefits of 400V DC to existing -48V DC networking loads in core telecom applications.



NetSure 9500 400V DC Power System Main Power Module (left) and Expansion Power Modules (middle and right)



NetSure™ 9500 Main Power Module with Integrated Load Distribution Panel



NetSure 9500 Power Module with Integrated Bulk Distribution Panels feeding a Load Distribution Module



Battery Cabinet

System Configuration

120kW Power Modules are the foundation of the NetSure 9500 400V DC power system. A system consists of one Main Power Module and up to four (4) Expansion Power Modules. Each of these bays contains a power and control section and a distribution section. AC power (3-phase, 4 wire) is connected to a terminal board in the power and control section via an internal 250A main breaker and then fed to individual rectifier breakers for each of eight (8) rectifier slots.

Rectifiers are hot swappable, reducing mean time to repair (MTTR) in the event of a failure and allowing for field expansion without system shutdown. Outputs from each of the independent rectifiers are connected to a common bus feeding the distribution section and battery cabinets, as applicable. Power Modules can be located with batteries in a central location, or can be placed in a row with the ICT load.

The power and control section also includes system controls for safe and reliable system operation. All elements of the control system are fault tolerant and can be removed from a running system for repair or upgrade without disrupting the output bus. Redundant components are provided to ensure the highest levels of uptime.

Output Distribution Options

The flexible, modular architecture of the NetSure 9500 can easily be configured to meet the needs of a number of deployment scenarios. Depending on the output distribution topology chosen, the distribution section of the power module can be integrated with either:

- (1) load distribution panel (LDP)
 - (16) breaker positions ranging from 15A to 100A each
- Up to (3) bulk distribution panels (BDP)
 - single 400A output breaker each

Load distribution panels are used to feed powered equipment racks. Bulk distribution panels can be used to feed a busway system or LDPs in additional Distribution Modules. Load breakers can be added or changed in the field as needed.

Each Distribution Bay can contain up to two LDPs, which can be configured for A+B feeds, or connected together to provide more breaker positions.

Energy Storage

A matching battery cabinet is specifically designed for use with the NetSure 9500 Series. Standard VRLA battery options from C&D, EnerSys, and GNB are available.

Each battery cabinet holds (28) 12V battery blocks configured in (1) 336V nominal battery string. A single string can supply approximately 10 minutes of backup time at 120kW load. Refer to the battery backup table below and the system application guide (SAG584001200) for exact backup times. Each cabinet is locally equipped with a disconnect breaker with remote trip capability. This allows for individual maintenance of each string without system disruption and for automatic disconnection at a programmed level during a discharge event.

Customer supplied battery cabinets can also be connected to the NetSure 9500 Power System.

Battery Backup Time

Load (kW)	NUMBER OF BATTERY STRINGS					
	1	2	3	4	5	6
	Minutes Until System Low Voltage Disconnect (LVD)*					
30	69	138	207	276	345	414
45	42	84	126	168	210	252
60	29	58	87	116	145	174
75	21	42	63	84	105	126
90	15	30	45	60	75	90
105	12	24	36	48	60	72
120	9	18	27	36	45	54
240		9	14	18	23	27
360			9	12	15	18
480				9	11	14
600					9	11

*Backup time is based on fully charged batteries and battery manufacturer's published data at 25 °C. C&D UPS12-540MR data shown here; other options available.

High Efficiency Power Conversion

The 15kW high-efficiency eSure™ rectifier (model R400-15000e) converts standard AC supply voltages into stable DC voltage, adjustable up to 400V DC. Each unit in the system operates independently and delivers conditioned, isolated power onto a common distribution bus. The rectifiers function in parallel for seamless redundancy and load sharing within the system. These pure three phase rectifiers provide ideally balanced currents back to the grid with low harmonic content.

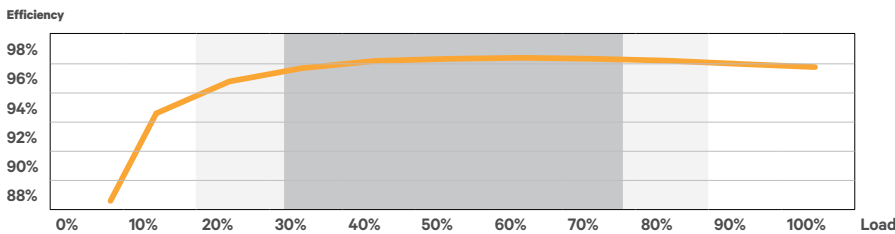
The eSure rectifiers are designed with the latest patented switchmode technology, using DSP (Digital Signaling Processor) functionality for efficient operation.

Rectifiers are designed to be hot-swapped into operational systems by trained personnel. This allows rectifiers to be added for expansion or removed and replaced for maintenance, with no interruption to the critical load.



eSure™ 15kW High-Efficiency Rectifier

eSure R400-15000e Efficiency Curve



Controls

The ACU+ controller in the Main Power Module provides primary power system control, alarm management, data acquisition, and advanced battery and energy management. Low voltage disconnect (LVD) functionality is provided to remotely trip battery circuit breakers and protect batteries against over-discharge. If equipped with optional temperature probe(s), the controller can support battery charge temperature compensation. Temperature probe(s) may also be designated to monitor ambient air temperature. The NetSure™ 9500 ships pre-configured from the factory.

The controller has a local LCD display, keypad and Ethernet port for remote connectivity through TCP/IP or SNMP. Access to an internal web interface for remote system management is provided. The control section also contains the ground fault monitoring hardware and algorithms.

The NetSure 9500 has several maintainability and redundancy features built into the controls section. The modular ACU+ controller is hot-swappable, allowing for field replacement or upgrade and the entire controls section can be removed from an operating system for replacement or repair without disturbing the output bus. Additionally, redundant power supplies are provided to ensure maximum uptime of this sub-system.



NetSure™ ACU+ Controller

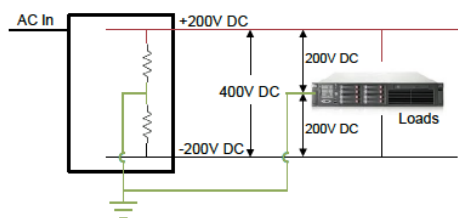
System Grounding Configuration

The NetSure 9500 Series includes high resistance mid-point ground (HRMG) as a built-in safety feature. This concept, which corresponds to the IT earthing topology in IEC 61557, not only increases personnel safety but also assures continuity of supply under ground fault conditions.

In normal operation, permanent high resistance between both the positive and negative busses and ground (earth),

limits available current that could accidentally flow through an individual or equipment from line to ground to a level consistent with today's -48V DC systems and lower than most AC installations. An independent, online ground fault detection (GFD) system, also referred to as the insulation monitoring device (IMD), is included to alert users to unintended insulation breakdowns anywhere in the distribution system.

High Resistance Mid-Point Ground Schematic



Note: Further information on this configuration can be found in ETSI EN 301 605 "Earthing and bonding of 400 VDC data and telecom equipment," and the NetSure 9500 User Manual.

Technical Specifications

SYSTEM AC OUTPUT

Range	260 VAC to 530 VAC Nominal: 380 VAC to 480 VAC; 3 phase, 4 wire
Line Frequency	45 Hz to 65 Hz
Input Breaker / AIC Rating	250 A / 65,000 A
Input Current, Maximum	192 A @ 380 VAC, 184 A @ 400 VAC, 152 A @ 480 VAC per 120 kW power module/bay

SYSTEM DC OUTPUT

Adjustable Voltage Range	290 VDC to 400 VDC
Default Voltage	378 VDC
Output Power, Maximum	120 kW per power module @ Vout > 336 VDC
Output Current	317 A per 120 kW power module @ Vout = 378 VDC
Voltage Regulation	0.5% for full operating range
Grounding Configuration	High resistance mid-point ground (HRMG) with ground fault detection / insulation monitoring device
Efficiency, Peak	97%

ENVIRONMENTAL

Temperature Range, Operating	-5 °C to +35 °C
Cooling Method	Front to back forced air
Humidity, Relative	0% to 95% non condensing

POWER MODULE/BAY MECHANICAL SPECIFICATIONS

Rectifier Form Factor	Hot pluggable module
Rectifier Weight	10 kg (22 lb.)
Dimensions (H x W x D)	42 RU: 2000 mm x 600 mm x 1100 mm (79" x 24" x 43.3")
Power & Control Section	21 RU
Distribution Section	21 RU
Cabling Details	Top or bottom cabling; front and rear access

DISTRIBUTION MODULE/BAY MECHANICAL SPECIFICATIONS

Dimensions (H x W x D)	42 RU: 2000 mm x 600 mm x 1100 mm (79" x 24" x 43.3")
Distribution Panel Options	Bulk Distribution Panel - (1) 400 A breaker (6 U) Load Distribution Panel - (16) 15 A to 100 A breaker positions (21 U)
Cabling Details	Top or bottom cabling; front and rear access

BATTERY CABINET

Dimensions (H x W x D)	2000 mm x 914 mm x 750 mm (79" x 36" x 29.5")
Battery Type	High rate discharge lead acid (VRLA), flame retardant (V0) case
Temperature Range, Operating	20 °C to 25 °C (recommended)
Battery Capacity	540 Watt/cell (15 min. rate)
String Details	28 x 12 V blocks; 336 VDC nominal, 378 VDC float
Battery Options	C&D USP12-540MR, EnerSys 12HX540 and GNB S12V550NGF

SAFETY AND STANDARDS COMPLIANCE

Electrical	UL60950-1; cUL60950-1; CE Marking
EMC	EN 300 386, Class A; FCC Part 15, Class A
Environmental	REACH; RoHS; IP20 rated (cabinet)

Ordering Information

PART NUMBER	DESCRIPTION
584001200	NetSure 9500 400V DC power system

OVERVIEW



NetSure™ 9500 Main Power Bay with Integrated Load Distribution Panel

Power Module/Bay

1. Distribution Section (Load Distribution Panel Shown)
2. Control Section Including Redundant Power Supplies and ACU+ Controller
3. eSure™ Rectifiers, 15 kW Each
4. Main AC Input Breaker
5. Supplemental Rectifier Breakers
6. Battery Termination Points
7. Output Breaker Termination Points
8. AC Input Termination Point
9. Surge Protection Device, Class II

