



NC Product Guide

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REVISION 2.1



Exceeding Expectations for your Protection

This document represents the capabilities of only the most basic NC Systems. Please contact us for questions regarding NC accessories or configurations not shown in this document.

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NC Inverter Electrical Specs

INPUT POWER (12KW System)

MODEL VOLTAGE	MINIMUM (TYPICAL)	SYSTEM (TYPICAL)	MAXIMUM (TYPICAL)	MAXIMUM CURRENT
48V	40V	53V	60V	350A

INPUT POWER (PER EACH POWER MODULE)

MODEL VOLTAGE	MINIMUM (TYPICAL)	SYSTEM (TYPICAL)	MAXIMUM (TYPICAL)	TYPICAL EFFICIENCY @ FULL POWER	PEAK EFFICIENCY @ 1/2 POWER
48V	40V	53V	60V	> 88%	> 91%

OUTPUT POWER (12KW System)

CONTINUOUS POWER	SURGE POWER (3 seconds)	OUTPUT VOLTAGE	OUTPUT CURRENT	WEIGHT LBS. (With Monitoring Module)
12000W	24000W	120V +/-2%	100 A	69

OUTPUT POWER (PER EACH POWER MODULE)

CONTINUOUS POWER	SURGE POWER (3 seconds)	NO LOAD POWER	OUTPUT VOLTAGE	OUTPUT CURRENT	WEIGHT LBS.
2000W	4000W	15W	120V +/-2%	16.7 A	9

ENVIRONMENTAL

Temperature:	-25°C to +40°C full power, derated -25% per 10°C above 40°C.
Humidity:	5 to 95% non-condensing
Altitude:	-60m to 3,962m (-197ft. To 13,000ft.) Altitudes >13,000ft. thermally derate from 40°C to 30°C.
Cooling:	Thermostatically controlled variable speed forced air.
Warranty:	Full year parts and labor.

PROTECTION CIRCUITRY

Over Voltage:	Shutoff at maximum input voltage, per input table.
Under Voltage:	Shutoff at minimum input voltage, per input table.
Thermal:	Shuts off due to over temperature condition.
Output Short:	Unit shuts off: electronically limited. Manual reset required.

GENERAL

CONDITIONS	MINIMUM	TYPICAL	MAXIMUM
WAVEFORM	-	SINUSOIDAL	-
LINE REGULATION	-	.1%	2%
LOAD REGULATION	-	1%	2%
DISTORTION	-	1.5%	2%
FREQUENCY	-.1%	60Hz	+.1%

NC Components Overview

The NEBS level 3 certified NC Series telecommunication inverter systems are engineered to address the high reliability and safety demands of the telecommunication industry. NC Series inverter systems are a modular design which allows each system to be tailored for specific needs. This is done by selecting different combinations of modules to create a NC inverter system.

- Power Module Cage Assembly

The cage assembly can be designed to accept DC input of either positive or negative. It will house from 1 to 6 inverter power modules resulting in a system output of up to 12,000 Watts. It will also house an optional monitoring module (recommended). The left most power module is the system's master module. The next power module to the right is the system's redundant (backup) master module. For redundant operation the system **MUST** include a monitoring module. The monitoring module is required to initiate a transfer of control to the backup master module.

- Power Modules

The power module is the backbone of the NC inverter system and is the majority of the modules in most systems. Each module is capable of producing 2000 Watts of continuous output power. Each module can perform all of the functions to operate as a system's master module. The module will only perform the system master function when placed in the power module cage assembly location identified in the previous section. Each power module is equipped with an LCD display that can show power module status information as well as system status information.

NC Components Overview - Continued

- Monitoring Module

The monitoring module provides a visual representation of different alarms created by the system. Each monitoring module has an ON/OFF switch for the system. If a monitoring module is not used the remote switch must be used to turn the system on and off. A monitoring module is required to detect a master power module failure and switch to the secondary master power module if it is available. There are a few different options available to monitor the NC inverter system.

1. Alarm Card:

With the alarm card, system monitoring is basic and is seen manually through power module LCD displays. Pre set alarms (Alarm 1/Minor & Alarm 2/Major) are provided via dry form C relay contacts on the inverter systems backplane. Use of the other connections on the back plane may result in damage to the module or system.

2. Monitor Card:

With the monitor card, system data is more detailed and can be seen either manually through power module LCD displays or through Ethernet connection which allows for remote monitoring of system data. Each phase's information can be reported via the Ethernet connection. The data can be sent to a PC to be viewed and logged or reported via SNMPv2 or an optional secure SNMPv3. Programmable alarms (Alarm 1/Minor & Alarm 2/Major) are provided via dry form C relay contacts on the inverter systems backplane. Product Status is used to program alarms. Use of the other connections on the back plane may result in damage to the module or system.

Features - Power Module

DC Voltage Inputs:

48VDC inputs are available. It is recommended to have a maximum ripple voltage of less than 5% with the peaks not going above V_{max} and below V_{min} .

AC Voltage Outputs:

120VAC outputs are available (+/- 6%) at 60Hz, (+/- 0.1%).

Load Sharing:

By control system design, the power modules will automatically load share current with other power modules. The load sharing occurs immediately when a module is either added or removed from a power module cage assembly. If a module fails for any reason, the remaining modules will immediately redistribute the load among themselves.

Cooling:

A microprocessor controlled variable speed fan is located on the face plate of the power module. The fan will operate when the module senses an appropriate combination of temperature and power. Fan speed is monitored, and reported to the inverter system monitoring module. Fan speed can be displayed on the power module's LCD display.

Over Temperature Protection:

Each power module will go into thermal shutdown when its internal temperature exceeds the maximum set point. Approximately 5C prior to thermal shutdown, a warning alarm will be sent to the inverter system monitoring module, and will also be displayed on the power module's LCD display. The power module will provide its full rated output up to the temperature listed in the specification sheet. Ambient temperatures in excess of the maximum specification will likely result in thermal shutdown unless the load is reduced appropriately (see detailed specifications for derating). When the power module shuts down, the alarm condition will persist and the cooling fans will continue to run. The power module will automatically restart when it has sufficiently cooled.

Overload/Short Circuit Protection:

If the load attempts to draw current in excess of this value, the output waveform will be "clipped" so that this limit is never exceeded.

The power module has a continuous output of 2000 Watts. In addition, the power module is also able to provide a 3 second surge of up to 4000 Watts (depending on the battery voltage and internal temperature). This surge current is available to supply the inrush current demanded by electronic or motor loads. If the surge persists for longer than 3 seconds, the waveform will be "clipped" in an attempt to reduce the output to under 2000 Watts. If "clipping" the waveform is ineffective in reducing the output below 2000 Watts (as would be the situation for an overload/short circuit condition), the power module will shut down after a period of about 7 seconds. Once shut down, it requires cycling the inverter system's ON/OFF switch to reset from this condition. The cause of the overload/short circuit condition must be removed prior to cycling the ON/OFF switch, otherwise, the inverter system will shut down again after the 7 second delay.



Features - Alarm Card

- The alarm card can be added to 19" and 23" power module cage assemblies.
- The alarm card is powered by the inverter or utility.
- Each alarm card is specific to one input voltage.
- AC & DC alarms only (Non-Programable)
- No data reporting through Ethernet.
- Data can be monitored via power module LCD display.

Faceplate Displays:

INVERTER SWITCH: Up is "ON" and Down is "OFF"

PHASE TEST BUTTONS: Test the following functions for each phase:

- AC ALARMS
- AC LED STATUS
- MASTER TOGGLE

PHASE STATUS LED: Will be green when AC power is in specs

DC STATUS LED: Will be green when the DC power is in specs

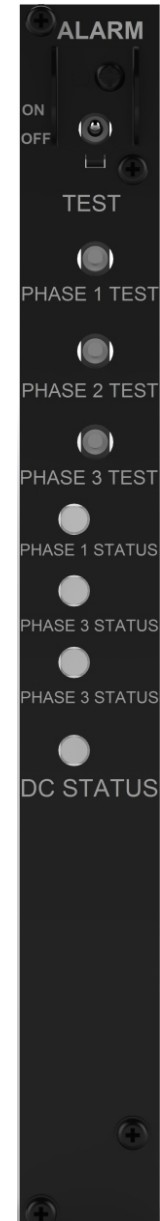
CONTACT CLOSURES (REMOTE ALARMS): The alarm module contains "form-C" contact closures to monitor inverter status remotely. These remote alarms include: Alarm 1/Minor, and Alarm 2/Major.

ALARM 1/MINOR:

Relay is energized in case of any AC Under Voltage/Over Voltage.

ALARM 2/MAJOR:

Relay is energized in case of any DC Under Voltage/Over Voltage.



Features - Monitor Card

It is now possible to monitor all of your remote power stations from a single location. You can have up to the minute verification that all of your remote power systems are 100% operational. For example, the remote power system can report that it is currently running at 90% of its rated capacity.

Operation

Normal operation of the monitor card is similar to the alarm card previously described in this document. The biggest difference is the remote monitoring of the system data.

Remote Monitoring

Ethernet connection allows for remote monitoring of system data. Each phase's information can be reported via an Ethernet connection. The data can be sent to a PC to be viewed and logged or reported via SNMPv2 or an optional secure SNMPv3. Programmable (Alarm 1/Minor & Alarm 2/Major) are provided via dry form C relay contacts. Use of the other alarm ports on the back plane may result in damage to the module or system.

Faceplate Displays:

INVERTER SWITCH:

Up is "ON" and down is "OFF"

PHASE STATUS LED:

Will be green when AC power is in specs

COMM STATUS:

Will be green when monitor card is communicating to another device

IP RESET:

When pushed it will Reboot the communication port

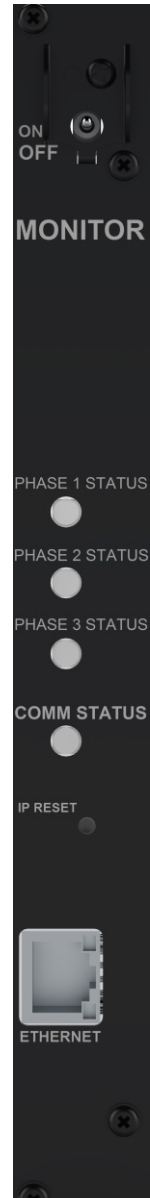
Ethernet Port:

Allows connection to the inverter system via Ethernet cable

CONTACT CLOSURES (REMOTE ALARMS): The alarm module contains "form-C" contact closures to monitor inverter status remotely. These remote alarms include (Alarm 1/Minor & Alarm 2/Major).

ALARM 1/MINOR & ALARM 2/MAJOR

- Alarms programable through Product Status
- Alarm options will vary by system.



NC 19" Inverter Series

2KW - 28KW N+1

Single Phase

NC 19" Single Phase 8KW N+1 Alarm Card

Specifications

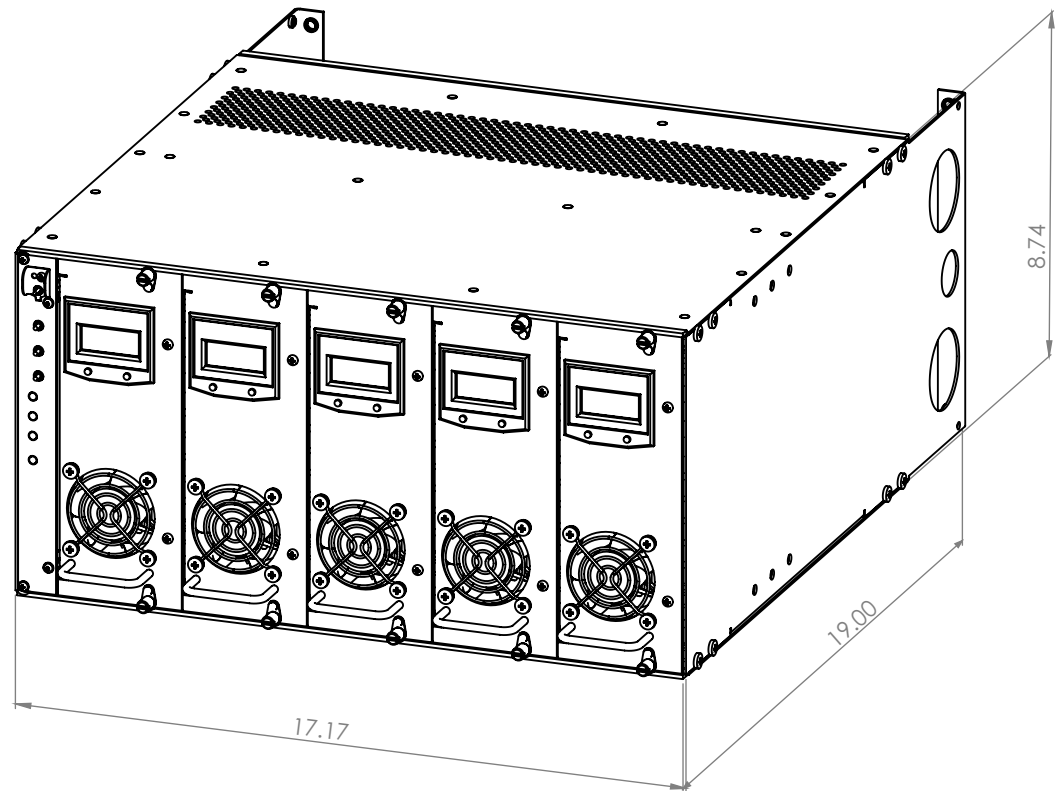
Power Output: 2KW to 10KW

Output Voltage: 120VAC

DC Input: 48VDC

Included Parts:

- 19" NC Cage (1)
- Alarm Card (1)
- Up to (5) 2KW Power Modules



NC 19" Single Phase 8KW N+1 Monitor Card

Specifications

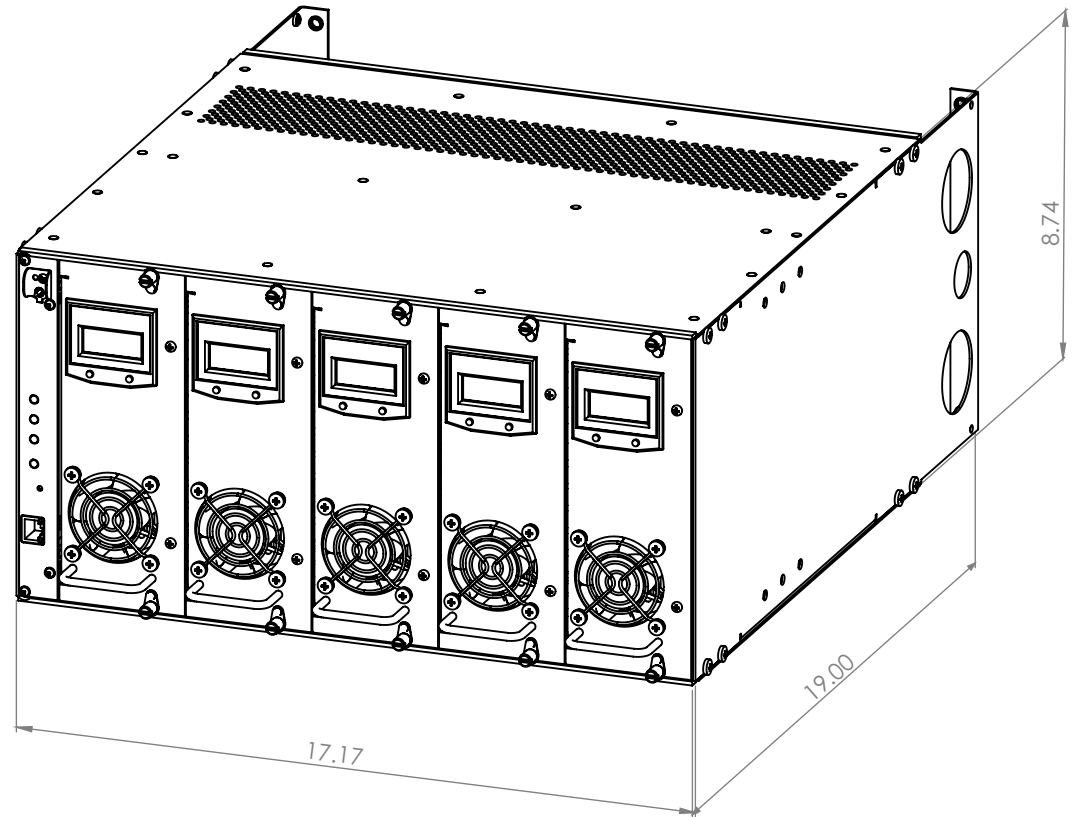
Power Output: 2KW to 10KW

Output Voltage: 120VAC

DC Input: 48VDC

Included Parts:

- 19" NC Cage (1)
- Monitor Card (1)
- Up to (5) 2KW Power Modules



NC 19" Single Phase 18KW N+1 Alarm Card

Specifications

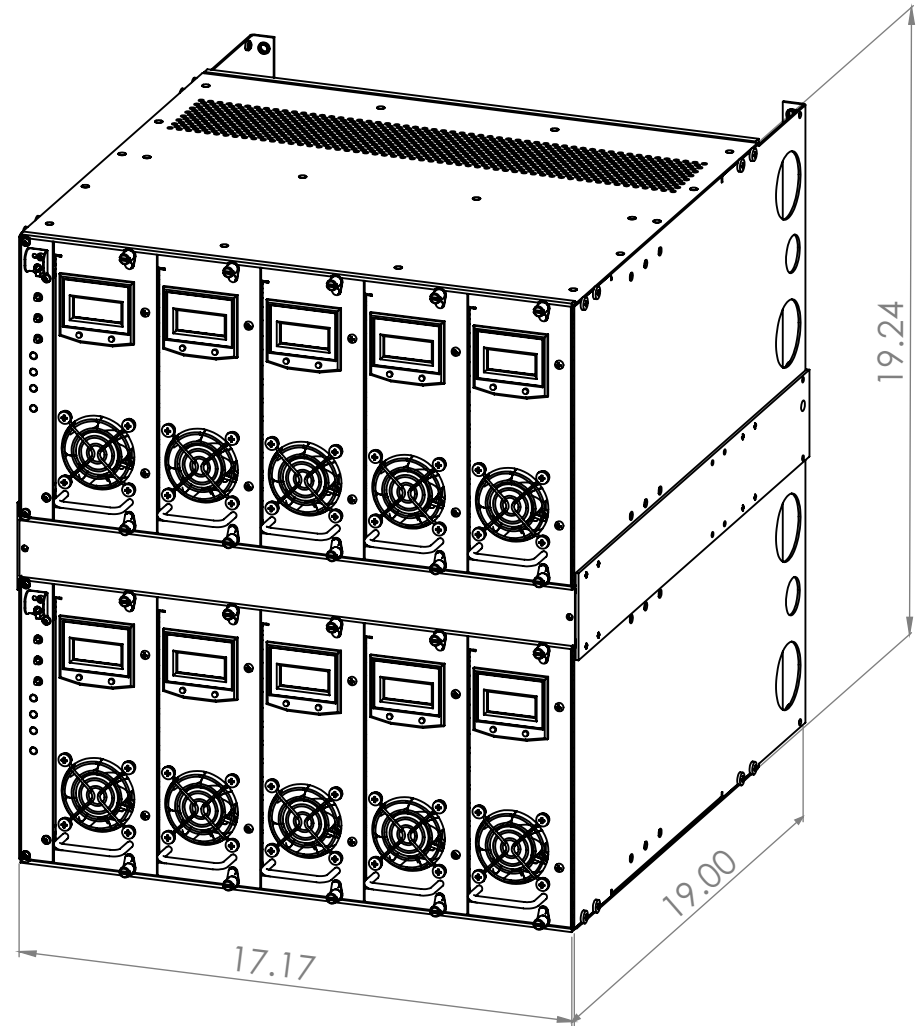
Power Output: 2KW to 20KW

Output Voltage: 120VAC

DC Input: 48VDC

Included Parts:

- 19" NC Cage (2)
- Alarm Card (2)
- Up to (10) 2KW Power Modules
- Stacking Kit (1)



NC 19" Single Phase 18KW N+1 Monitor Card

Specifications

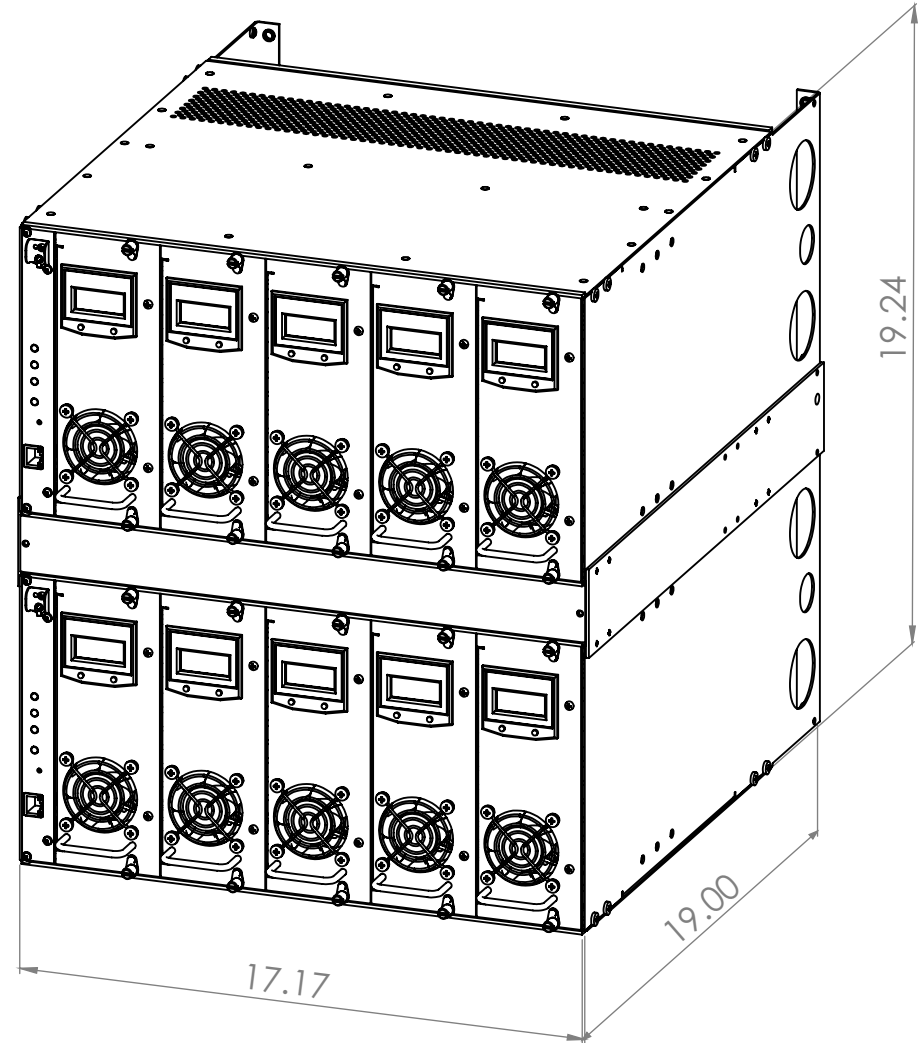
Power Output: 2KW to 20KW

Output Voltage: 120VAC

DC Input: 48VDC

Included Parts:

- 19" NC Cage (2)
- Monitor Card (2)
- Up to (10) 2KW Power Modules
- Stacking Kit (1)



NC 19" Single Phase 28KW N+1 Alarm Card

Specifications

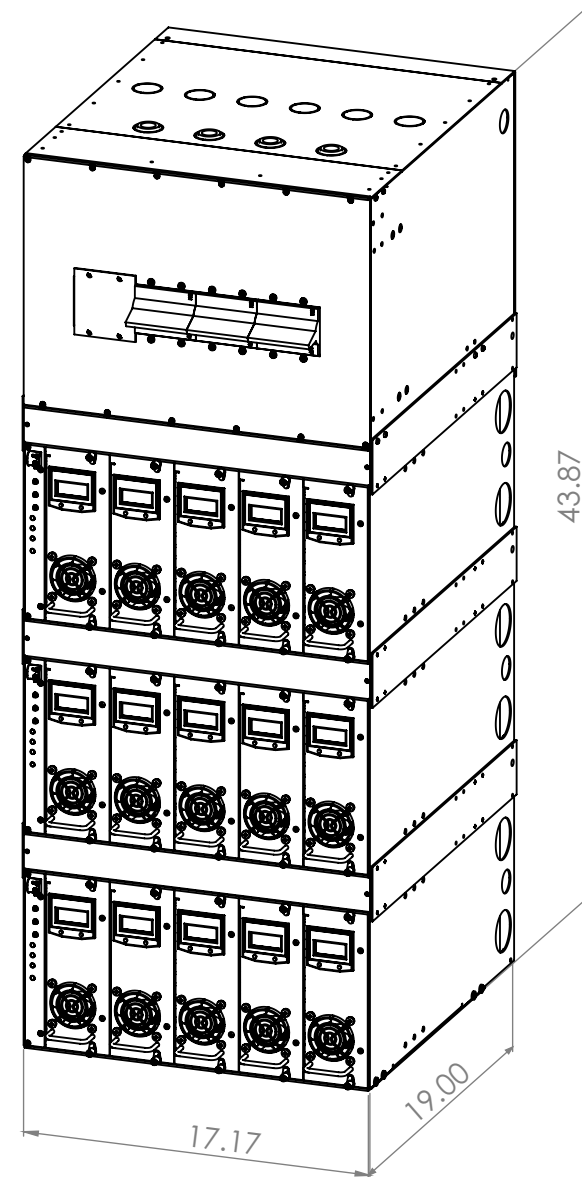
Power Output: 2KW to 30KW

Output Voltage: 120VAC

DC Input: 48VDC

Included Parts:

- 19" NC Cage (3)
- Alarm Card (3)
- Up to (15) 2KW Power Modules
- Stacking Kit (3)
- 19" NC Customer Interface Cage (1)
 - DC Circuit Breakers (3)



NC 19" Single Phase 28KW N+1 Monitor Card

Specifications

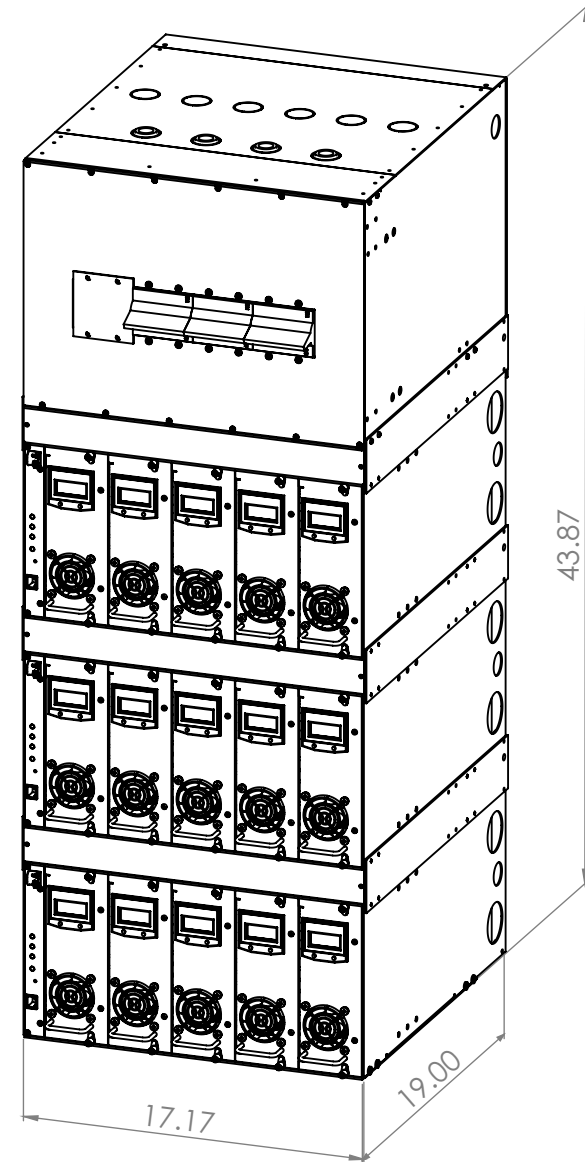
Power Output: 2KW to 30KW

Output Voltage: 120VAC

DC Input: 48VDC

Included Parts:

- 19" NC Cage (3)
- Monitor Card (3)
- Up to (15) 2KW Power Modules
- Stacking Kit (3)
- 19" NC Customer Interface Cage (1)
 - DC Circuit Breakers (2)



NC 23" Inverter Series

2KW - 34KW N+1

Single Phase

NC 23" Single Phase 10KW N+1 Alarm Card

Specifications

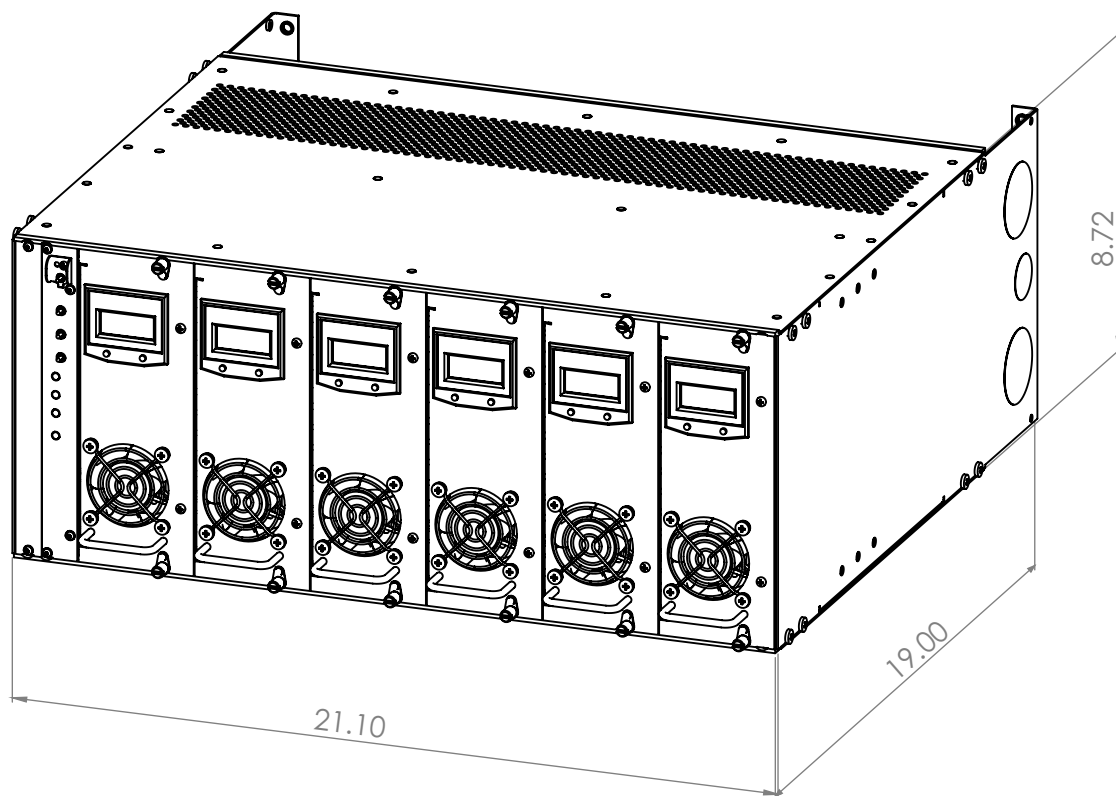
Power Output: 2KW to 12KW

Output Voltage: 120VAC

DC Input: 48VDC

Included Parts:

- 23" NC Cage (1)
- Alarm Card (1)
- Up to (6) 2KW Power Modules



NC 23" Single Phase 10KW N+1 Monitor Card

Specifications

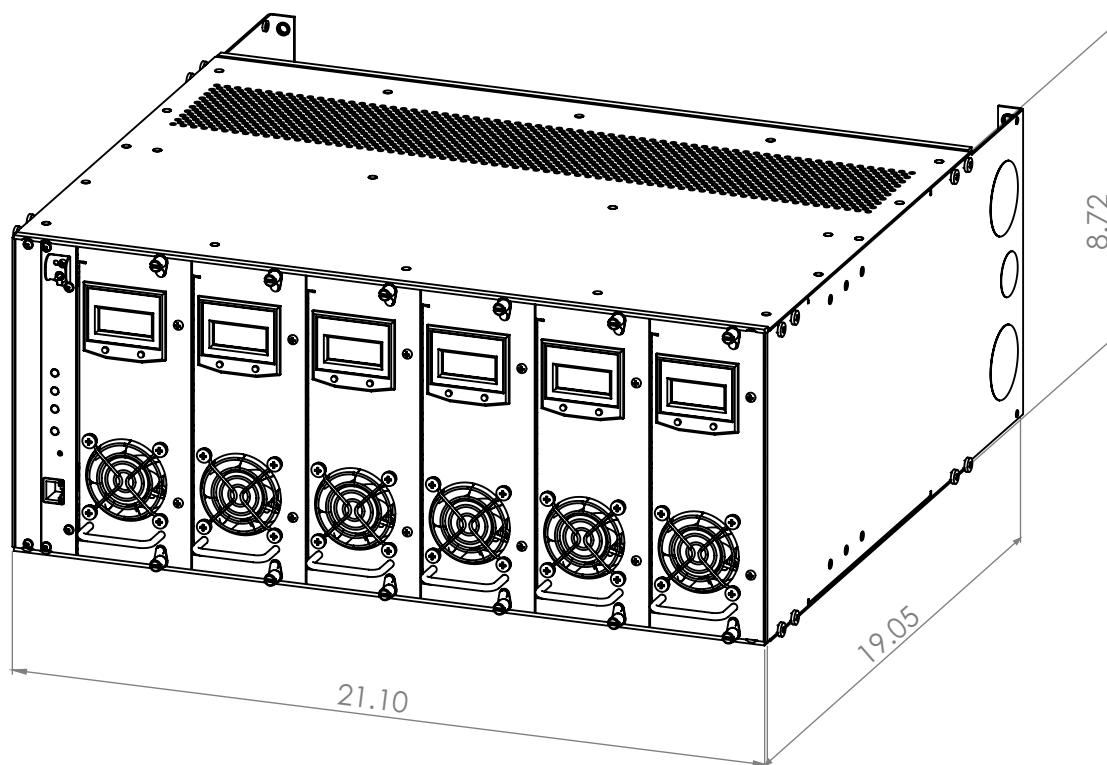
Power Output: 2KW to 12KW

Output Voltage: 120VAC

DC Input: 48VDC

Included Parts:

- 23" NC Cage (1)
- Monitor Card (1)
- Up to (6) 2KW Power Modules



NC 23" Single Phase 22KW N+1 Alarm Card

Specifications

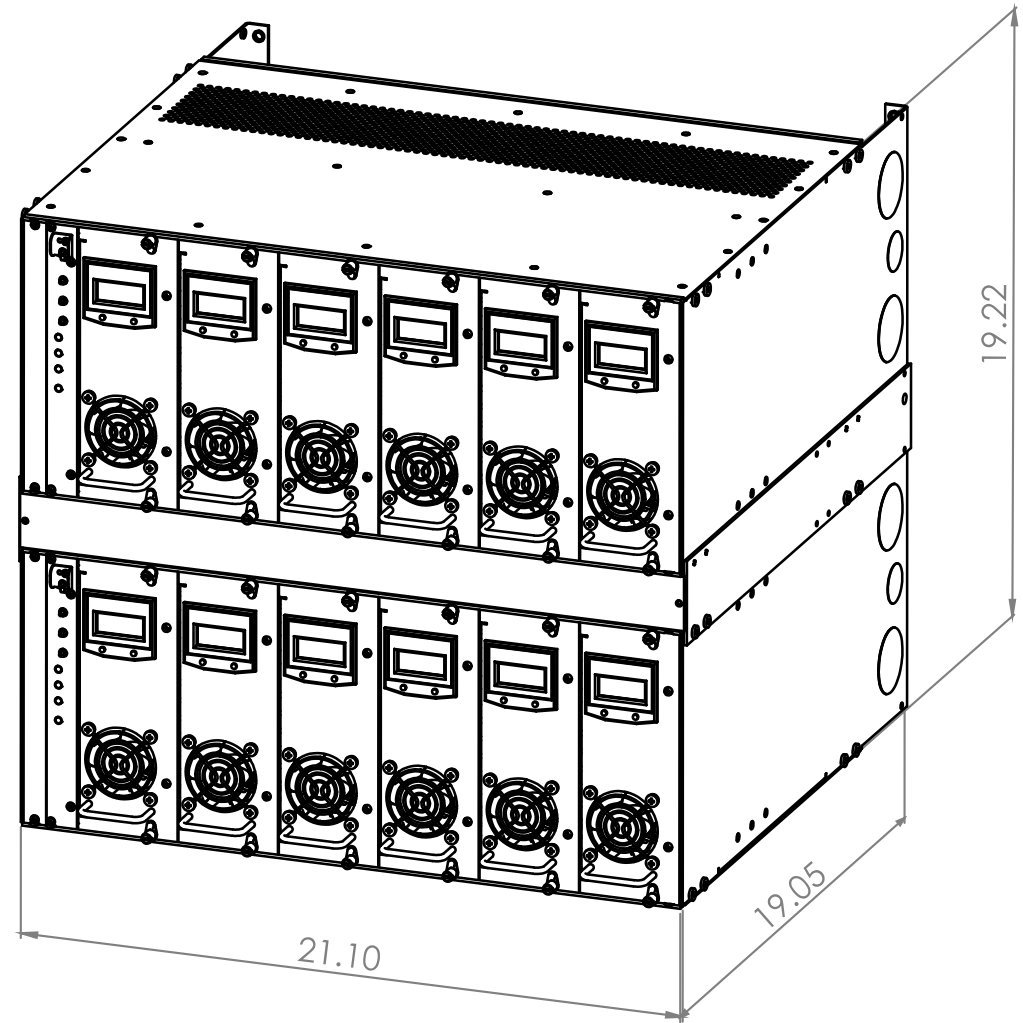
Power Output: 2KW to 24KW

Output Voltage: 120VAC

DC Input: 48VDC

Included Parts:

- 23" NC Cage (2)
- Alarm Card (2)
- Up to (12) 2KW Power Modules
- Stacking Kit (1)



NC 23" Single Phase 22KW N+1 Monitor Card

Specifications

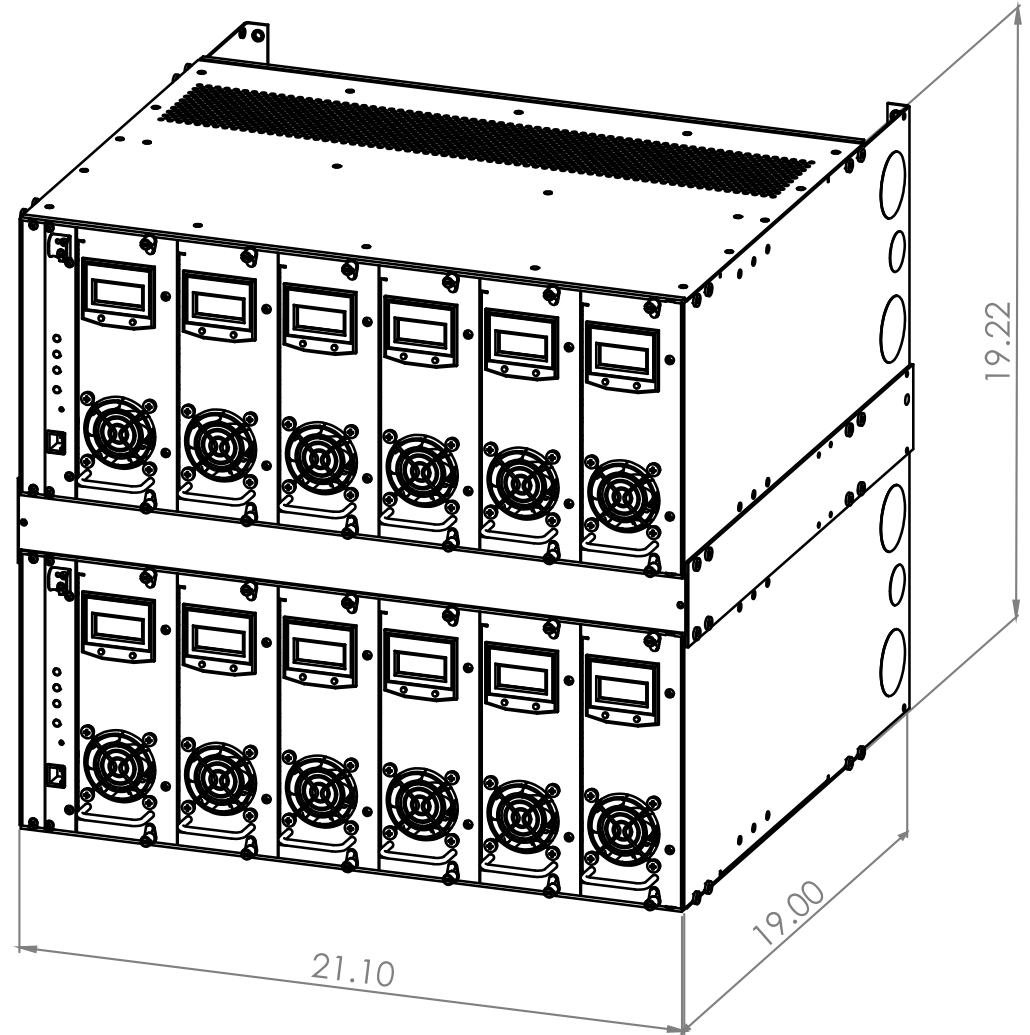
Power Output: 2KW to 24KW

Output Voltage: 120VAC

DC Input: 48VDC

Included Parts:

- 23" NC Cage (2)
- Monitor Card (2)
- Up to (12) 2KW Power Modules
- Stacking Kit (1)



NC 23" Single Phase 34KW N+1 Alarm Card

Specifications

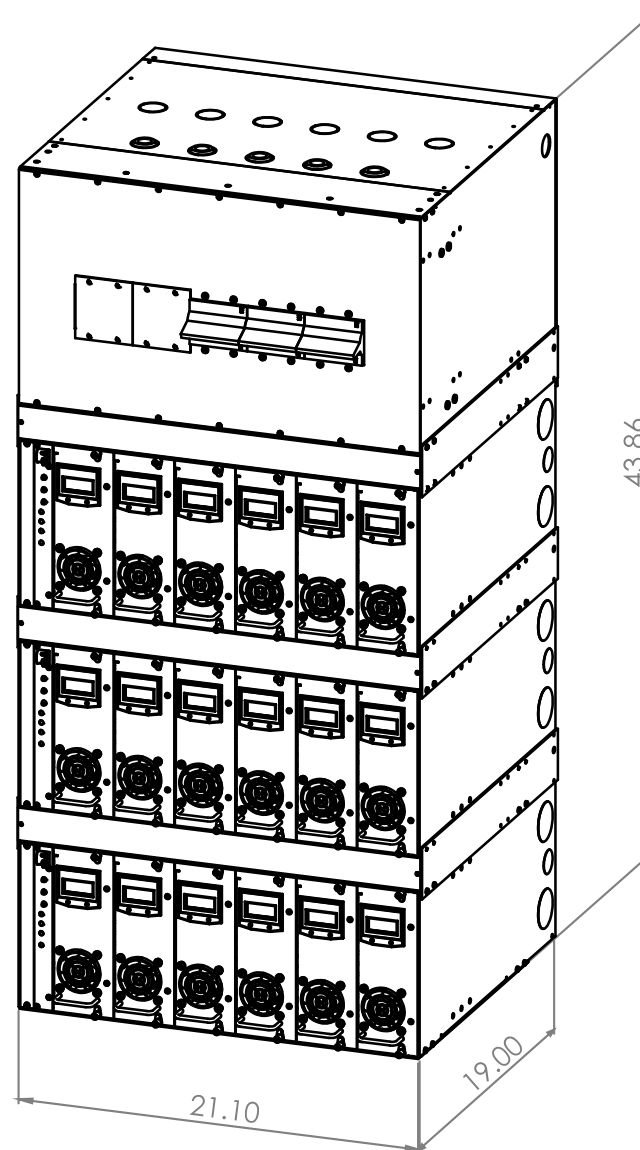
Power Output: 2KW to 36KW

Output Voltage: 120VAC

DC Input: 48VDC

Included Parts:

- 23" NC Cage (3)
- Alarm Card (3)
- Up to (18) 2KW Power Modules
- Stacking Kit (3)
- 23" NC Customer Interface Cage (1)
 - DC Circuit Breakers (3)



NC 23" Single Phase 34KW N+1 Monitor Card

Specifications

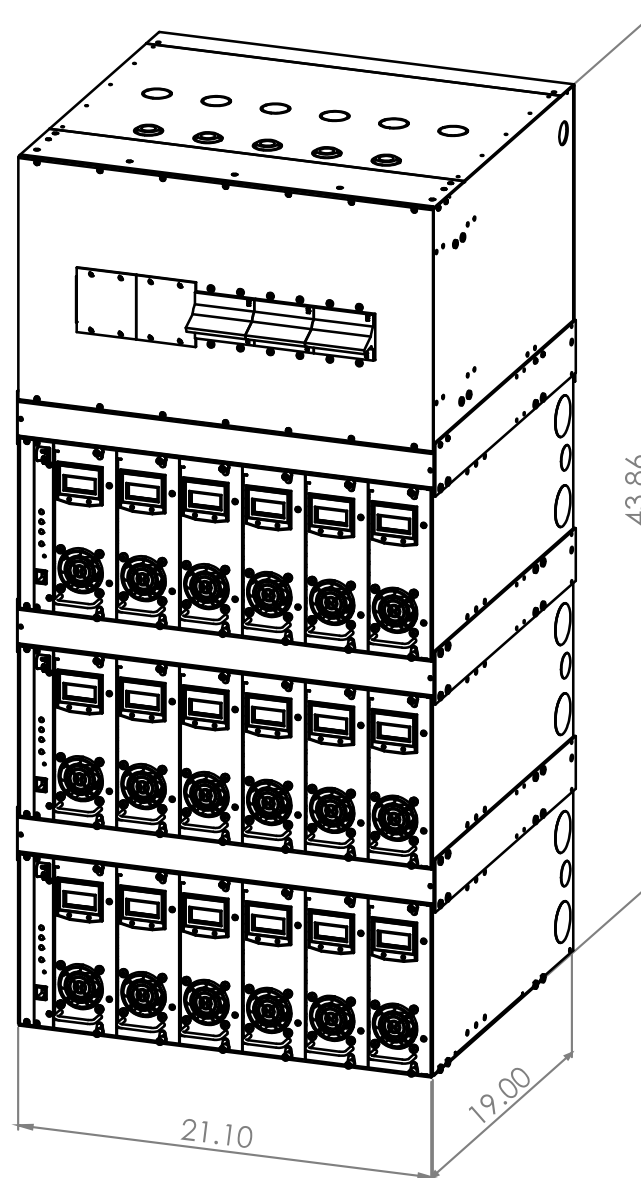
Power Output: 2KW to 36KW

Output Voltage: 120VAC

DC Input: 48VDC

Included Parts:

- 23" NC Cage (3)
- Monitor Card (3)
- Up to (18) 2KW Power Modules
- Stacking Kit (3)
- 23" NC Customer Interface Cage (1)
 - DC Circuit Breakers (3)



NC 19" Inverter Series

4KW - 16KW N+1

Bi-Phase

NC 19" Bi-Phase 4KW N+1 Alarm Card

Specifications

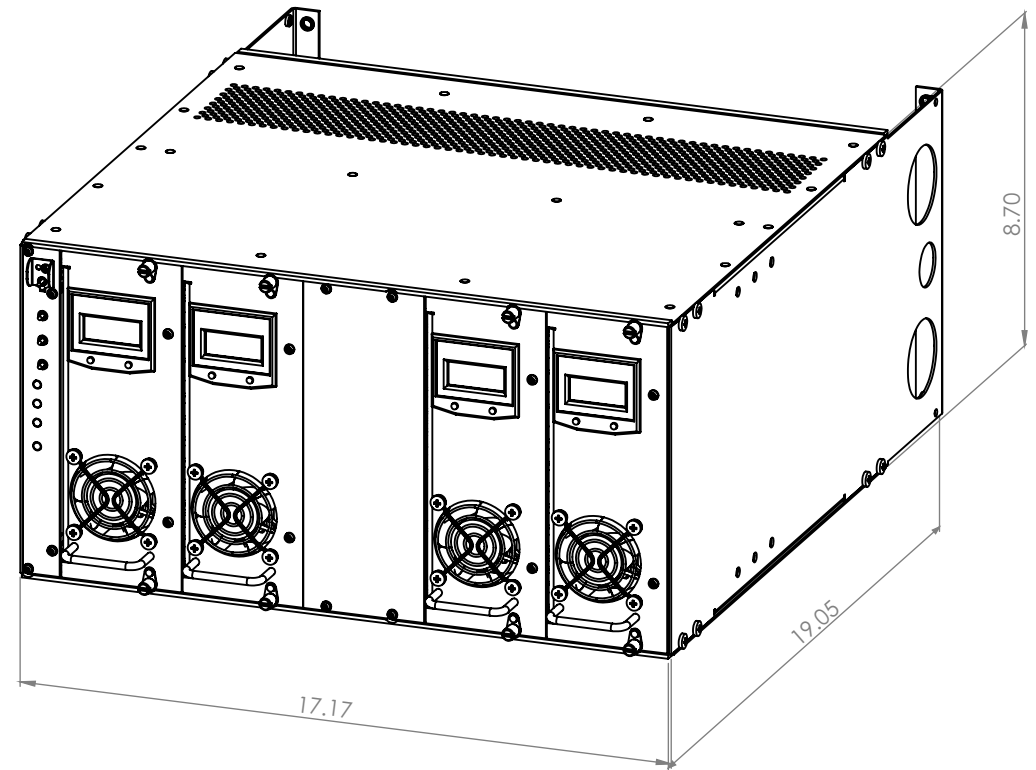
Power Output: 4KW to 8KW

Output Voltage: 120VAC L-N / 240VAC L-L

DC Input: 48VDC

Included Parts:

- 19" NC Cage (1)
- Alarm Card (1)
- Up to (2) 2KW Power Modules per Phase



NC 19" Bi-Phase 4KW N+1 Monitor Card

Specifications

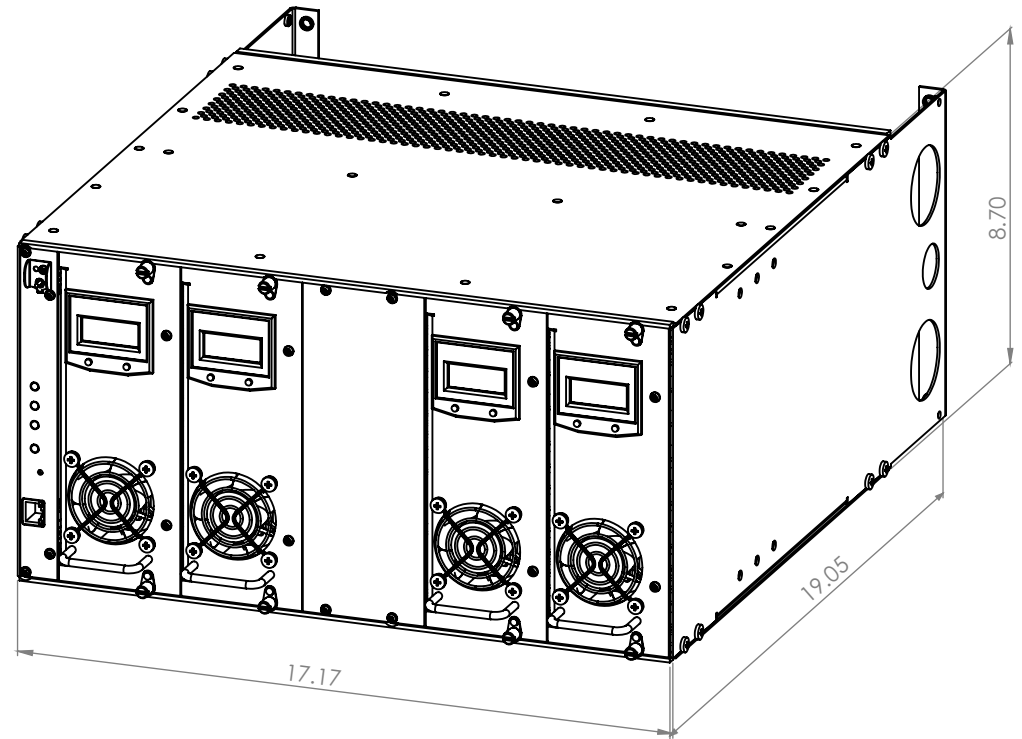
Power Output: 4KW to 8KW

Output Voltage: 120VAC L-N / 240VAC

DC Input: 48VDC

Included Parts:

- 19" NC Cage (1)
- Monitor Card (1)
- Up to (2) 2KW Power Modules per Phase



NC 19" Bi-Phase 16KW N+1 Alarm Card

Specifications

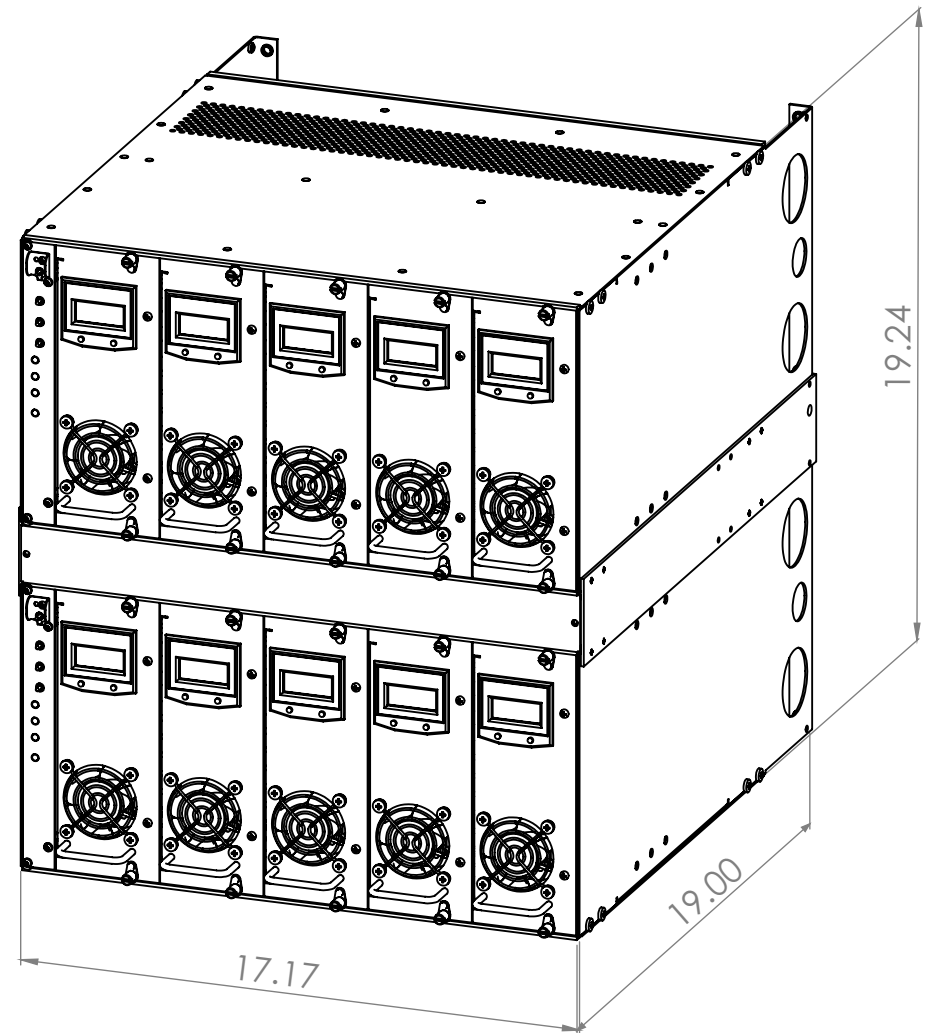
Power Output: 4KW to 20KW

Output Voltage: 120VAC L-N / 240VAC L-L

DC Input: 48VDC

Included Parts:

- 19" NC Cage (2)
- Alarm Card (2)
- Up to (5) 2KW Power Modules per Phase
- Stacking Kit (1)



NC 19" Bi-Phase 16KW N+1 Monitor Card

Specifications

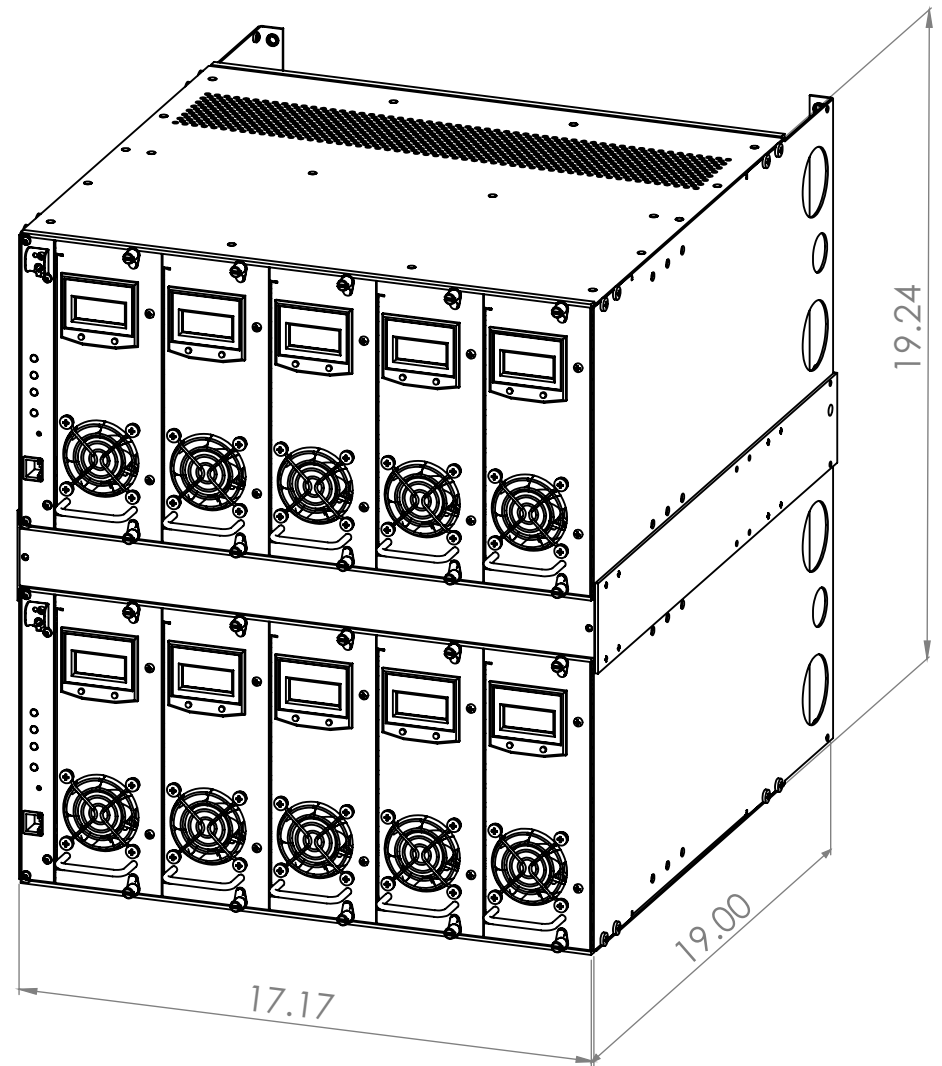
Power Output: 4KW to 20KW

Output Voltage: 120VAC L-N / 240VAC L-L

DC Input: 48VDC

Included Parts:

- 19" NC Cage (2)
- Monitor Card (2)
- Up to (5) 2KW Power Modules per Phase
- Stacking Kit (1)



NC 23" Inverter Series

4KW - 32KW N+1

Bi-Phase

NC 23" Bi-Phase 8KW N+1 Alarm Card

Specifications

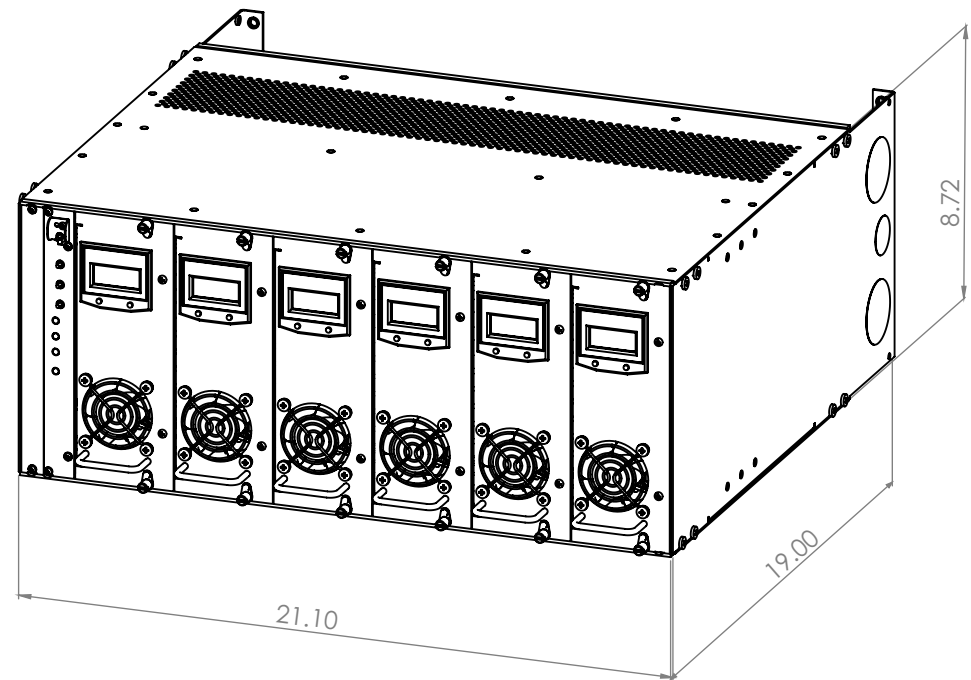
Power Output: 4KW to 12KW

Output Voltage: 120VAC L-N / 240VAC L-L

DC Input: 48VDC

Included Parts:

- 23" NC Cage (1)
- Alarm Card (1)
- Up to (3) 2KW Power Modules per Phase



LC 23" Bi-Phase 8KW N+1 Monitor Card

Specifications

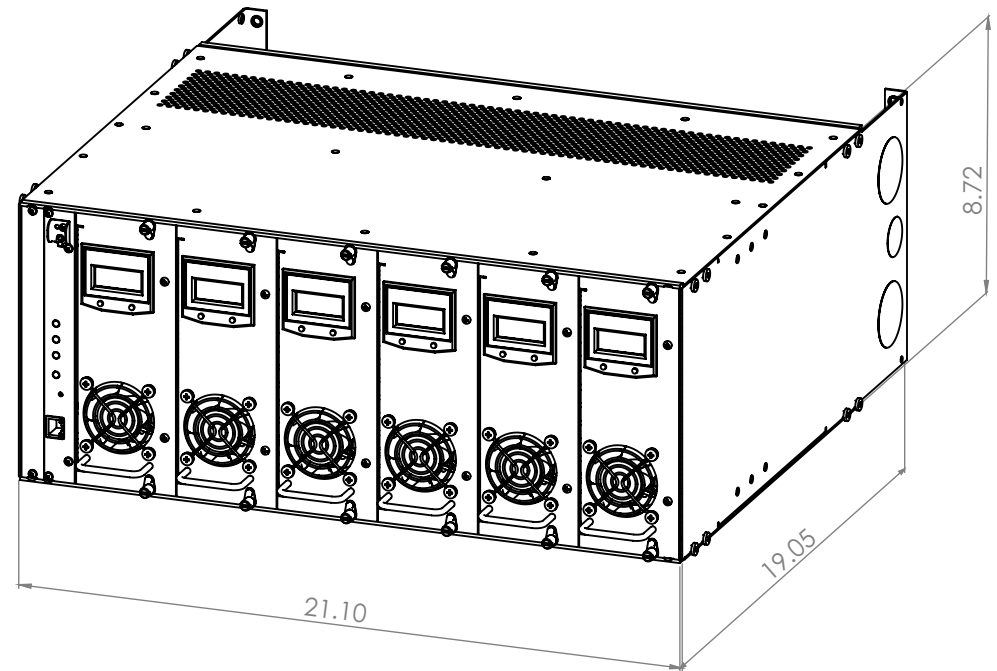
Power Output: 4KW to 12KW

Output Voltage: 120VAC L-N / 240VAC L-L

DC Input: 48VDC

Included Parts:

- 23" NC Cage (1)
- Monitor Card (1)
- Up to (3) 2KW Power Modules per Phase



NC 23" Bi-Phase 20KW N+1 Alarm Card

Specifications

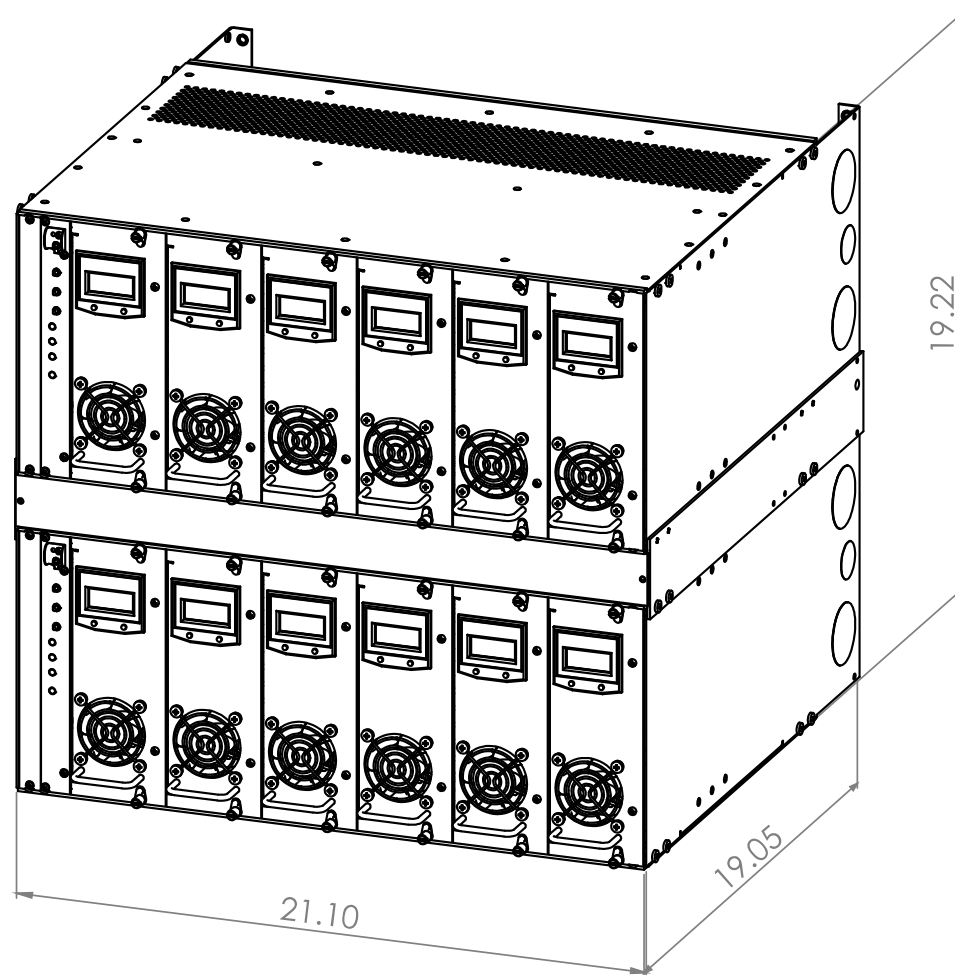
Power Output: 8KW to 24KW

Output Voltage: 120VAC L-N / 240VAC L-L

DC Input: 48VDC

Included Parts:

- 23" NC Cage (2)
- Alarm Card (2)
- Up to (6) 2KW Power Modules per Phase
- Stacking Kit (1)



NC 23" Bi-Phase 20KW N+1 Monitor Card

Specifications

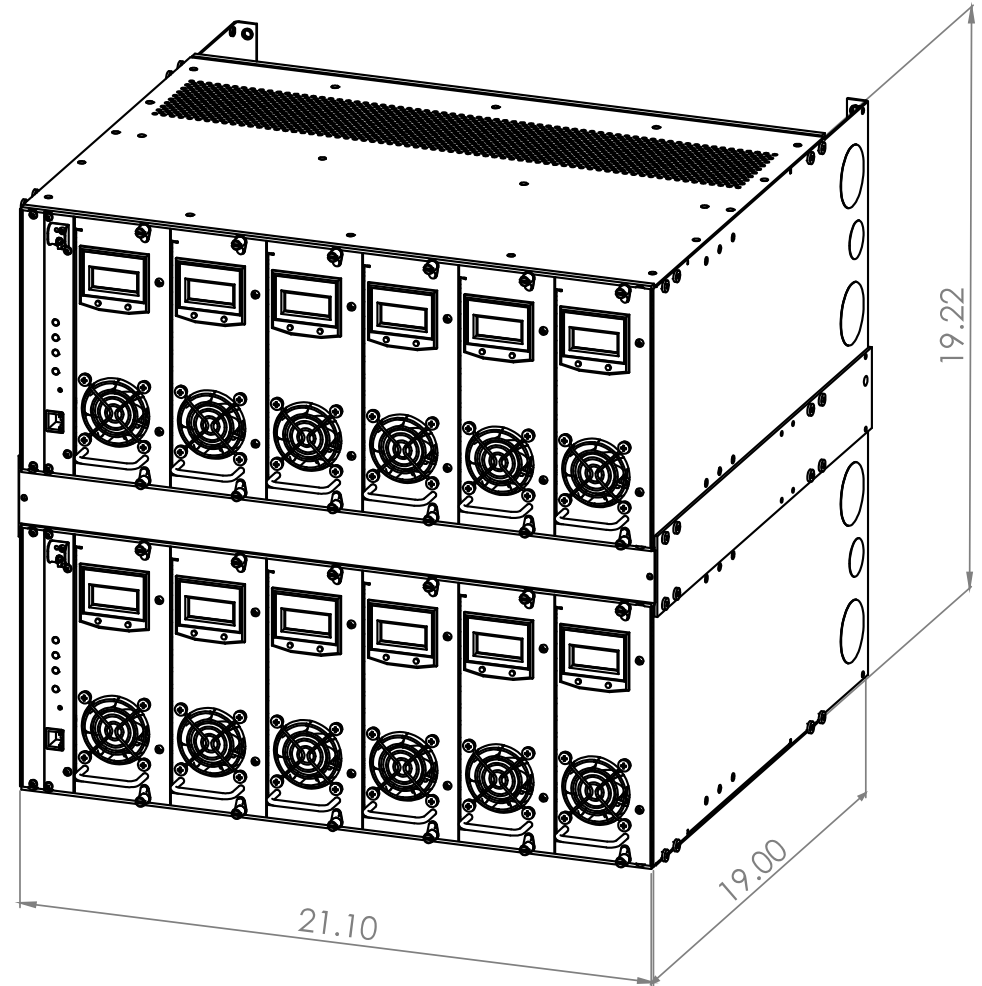
Power Output: 8KW to 24KW

Output Voltage: 120VAC L-N / 240VAC L-L

DC Input: 48VDC

Included Parts:

- 23" NC Cage (2)
- Monitor Card (2)
- Up to (6) 2KW Power Modules per Phase
- Stacking Kit (1)



NC 23" Bi-Phase 32KW N+1 Alarm Card

Specifications

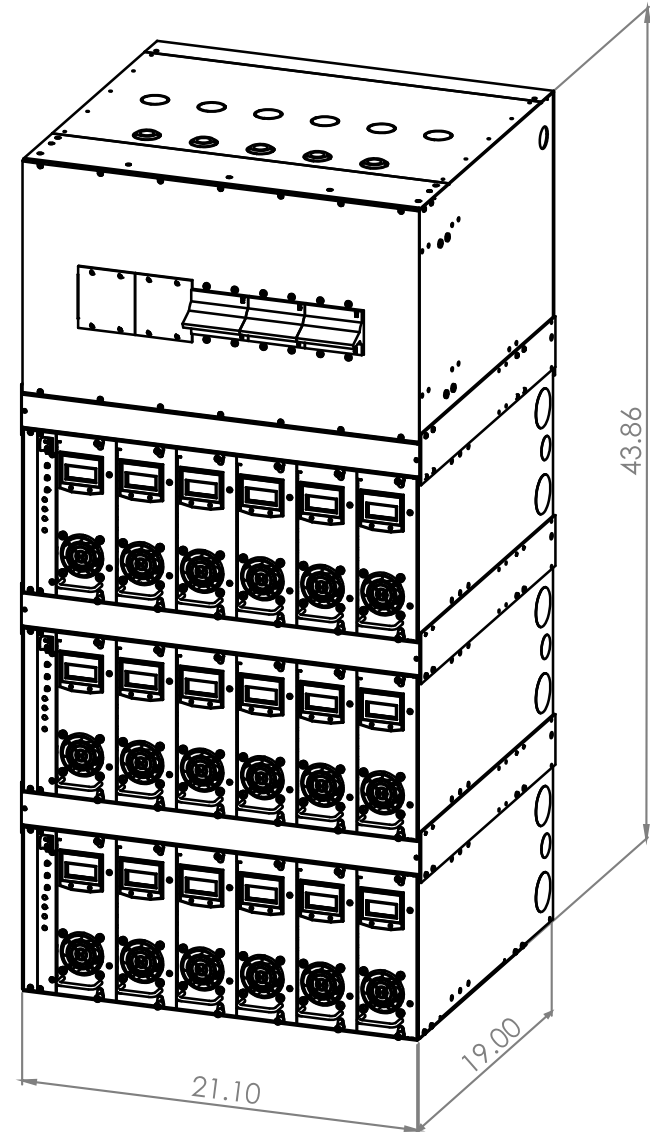
Power Output: 12KW to 36KW

Output Voltage: 120VAC L-N / 240VAC L-L

DC Input: 48VDC

Included Parts:

- 23" NC Cage (3)
- Alarm Card (3)
- Up to (9) 2KW Power Modules per Phase
- Stacking Kit (3)
- 23" NC Customer Interface Cage (1)
 - DC Circuit Breakers (3)



NC 23" Bi-Phase 32KW N+1 Monitor Card

Specifications

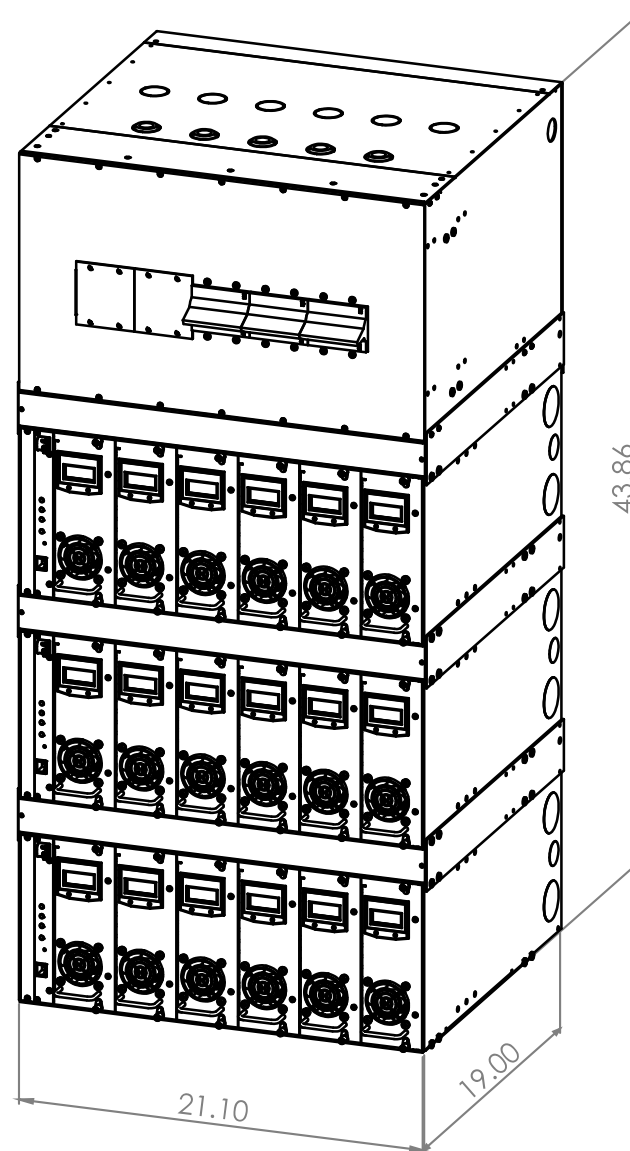
Power Output: 12KW to 36KW

Output Voltage: 120VAC L-N / 240VAC L-L

DC Input: 48VDC

Included Parts:

- 23" NC Cage (3)
- Monitor Card (3)
- Up to (9) 2KW Power Modules per Phase
- Stacking Kit (3)
- 23" NC Customer Interface Cage (1)
 - DC Circuit Breakers (3)



NC 19" Inverter Series

6KW - 24KW N+1

Three-Phase

NC 19" Three-Phase 6KW Alarm Card

Specifications

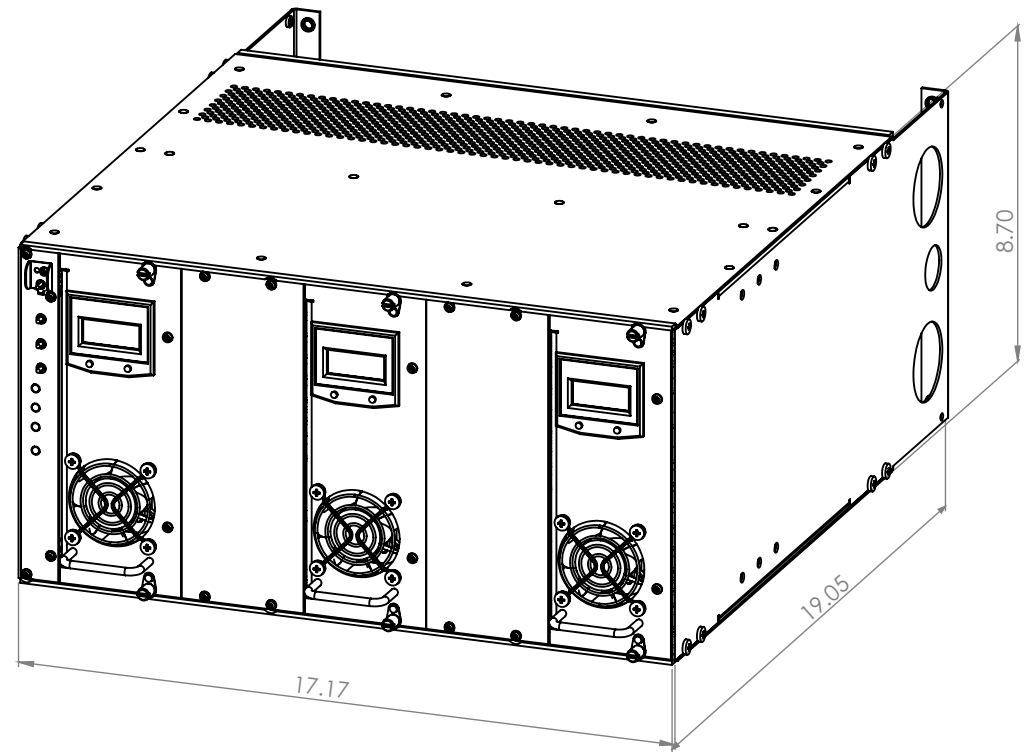
Power Output: 6KW

Output Voltage: 120VAC L-N / 208VAC L-L

DC Input: 48VDC

Included Parts:

- 19" NC Cage (1)
- Alarm Card (1)
- Up to (1) 2KW Power Modules per Phase



NC 19" Three-Phase 6KW Monitor Card

Specifications

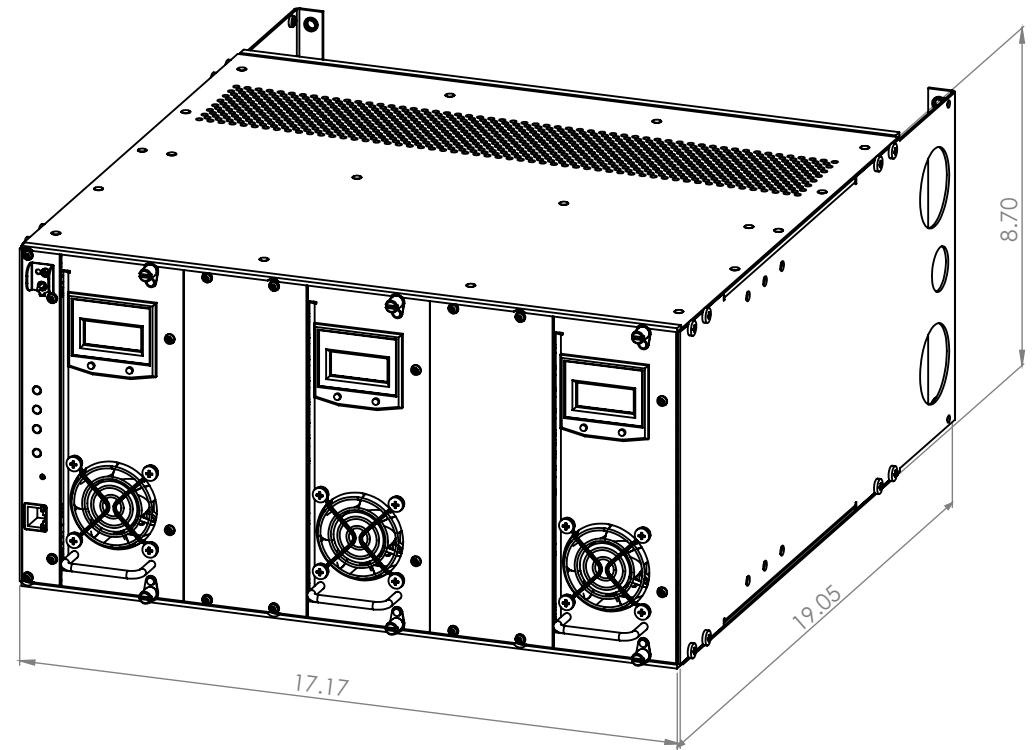
Power Output: 6KW

Output Voltage: 120VAC L-N / 208VAC L-L

DC Input: 48VDC

Included Parts:

- 19" NC Cage (1)
- Monitor Card (1)
- Up to (1) 2KW Power Modules per Phase



NC 19" Three-Phase 24KW N+1 Alarm Card

Specifications

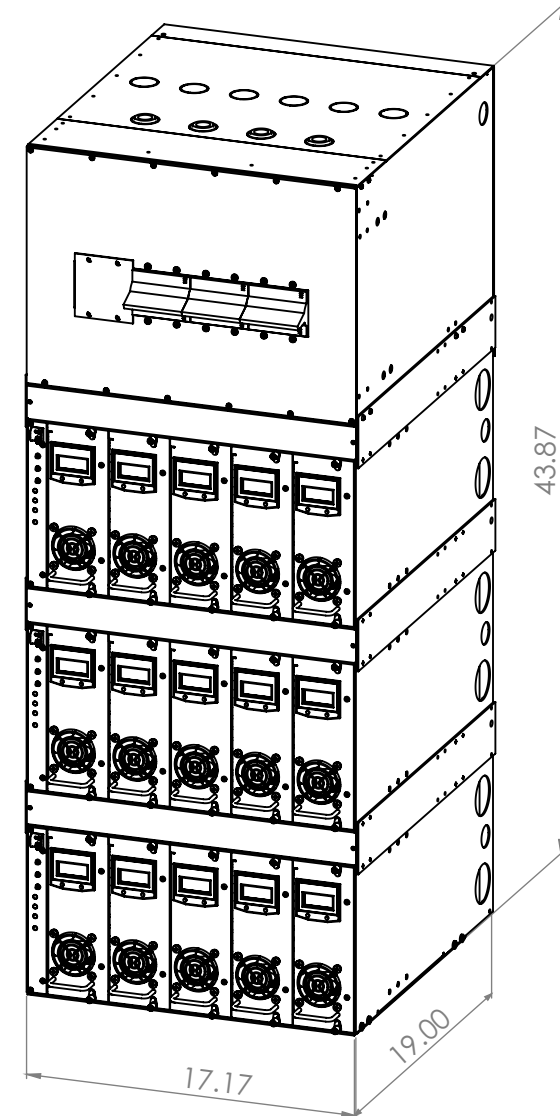
Power Output: 6KW to 30KW

Output Voltage: 120VAC L-N / 208VAC L-L

DC Input: 48VDC

Included Parts:

- 19" NC Cage (3)
- Alarm Card (3)
- Up to (5) 2KW Power Modules per Phase
- Stacking Kit (3)
- 19" NC Customer Interface Cage (1)
 - DC Circuit Breakers (3)
- 19" NC Relay Rack Recommended



NC 19" Three-Phase 24KW N+1 Monitor Card

Specifications

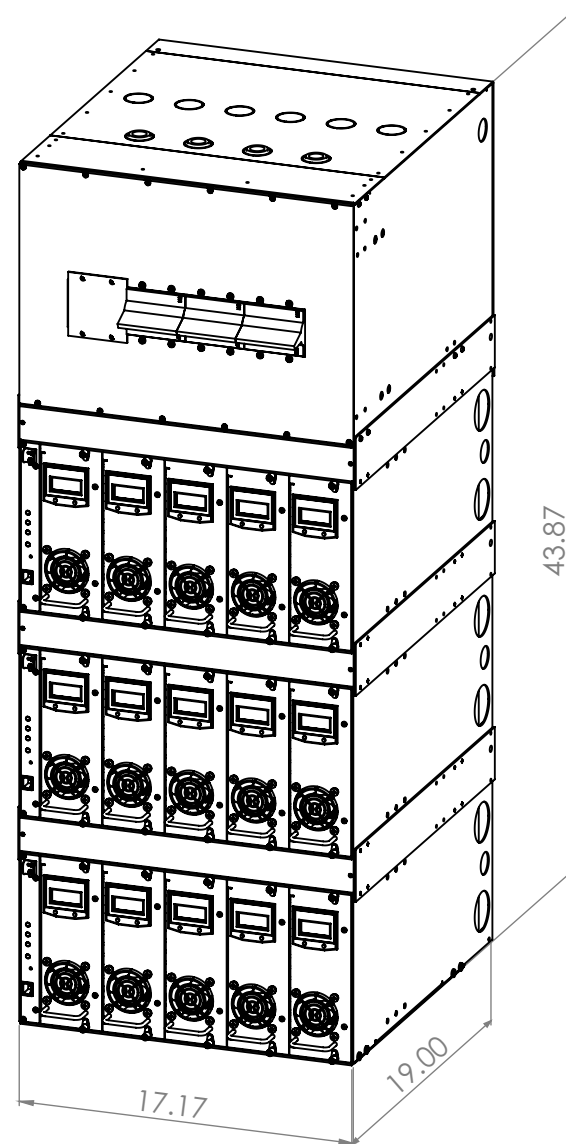
Power Output: 6KW to 30KW

Output Voltage: 120VAC L-N / 208VAC L-L

DC Input: 48VDC

Included Parts:

- 19" NC Cage (3)
- Monitor Card (3)
- Up to (5) 2KW Power Modules per Phase
- Stacking Kit (3)
- 19" NC Customer Interface Cage (1)
 - DC Circuit Breakers (3)
- 19" NC Relay Rack Recommended



LC 23" Inverter Series

6KW - 30KW N+1

Three-Phase

NC 23" Three-Phase 6KW N+1 Alarm Card

Specifications

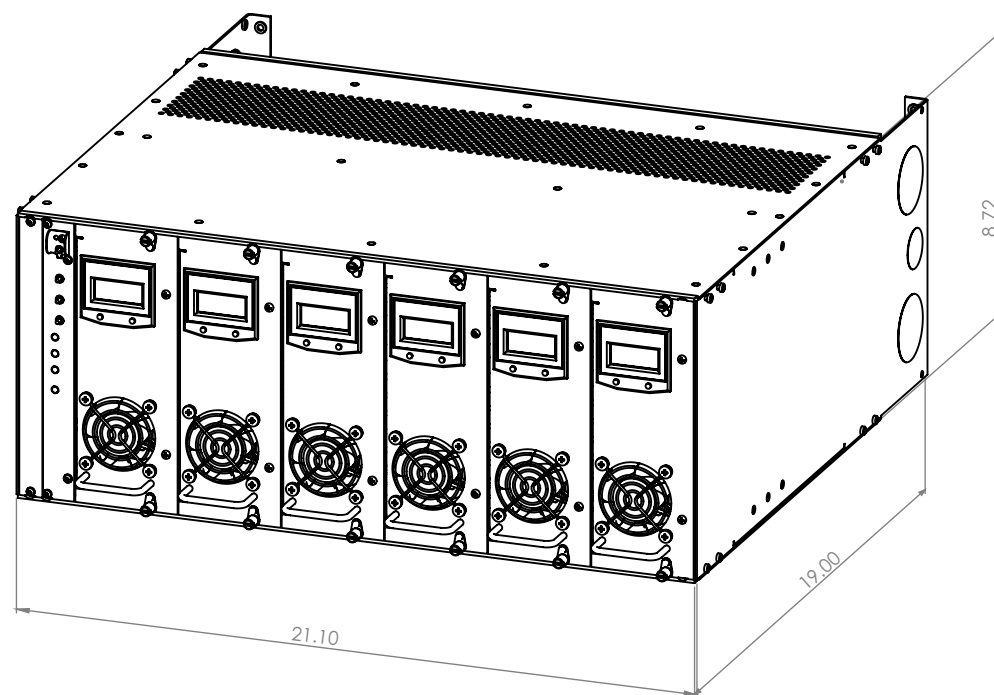
Power Output: 6KW to 12KW

Output Voltage: 120VAC L-N / 208VAC L-L

DC Input: 48VDC

Included Parts:

- 23" NC Cage (1)
- Alarm Card (1)
- Up to (2) 2KW Power Modules per Phase



NC 23" Three-Phase 6KW N+1 Monitor Card

Specifications

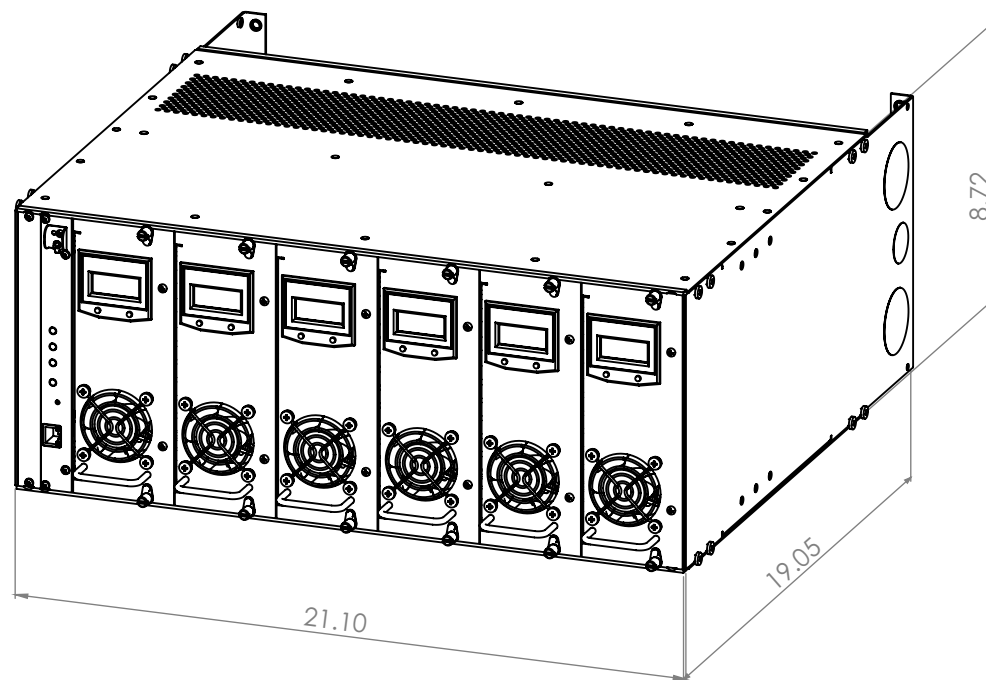
Power Output: 6KW to 12KW

Output Voltage: 120VAC L-N / 208VAC L-L

DC Input: 48VDC

Included Parts:

- 23" NC Cage (1)
- Monitor Card (1)
- Up to (2) 2KW Power Modules per Phase



NC 23" Three-Phase 18KW N+1 Alarm Card

Specifications

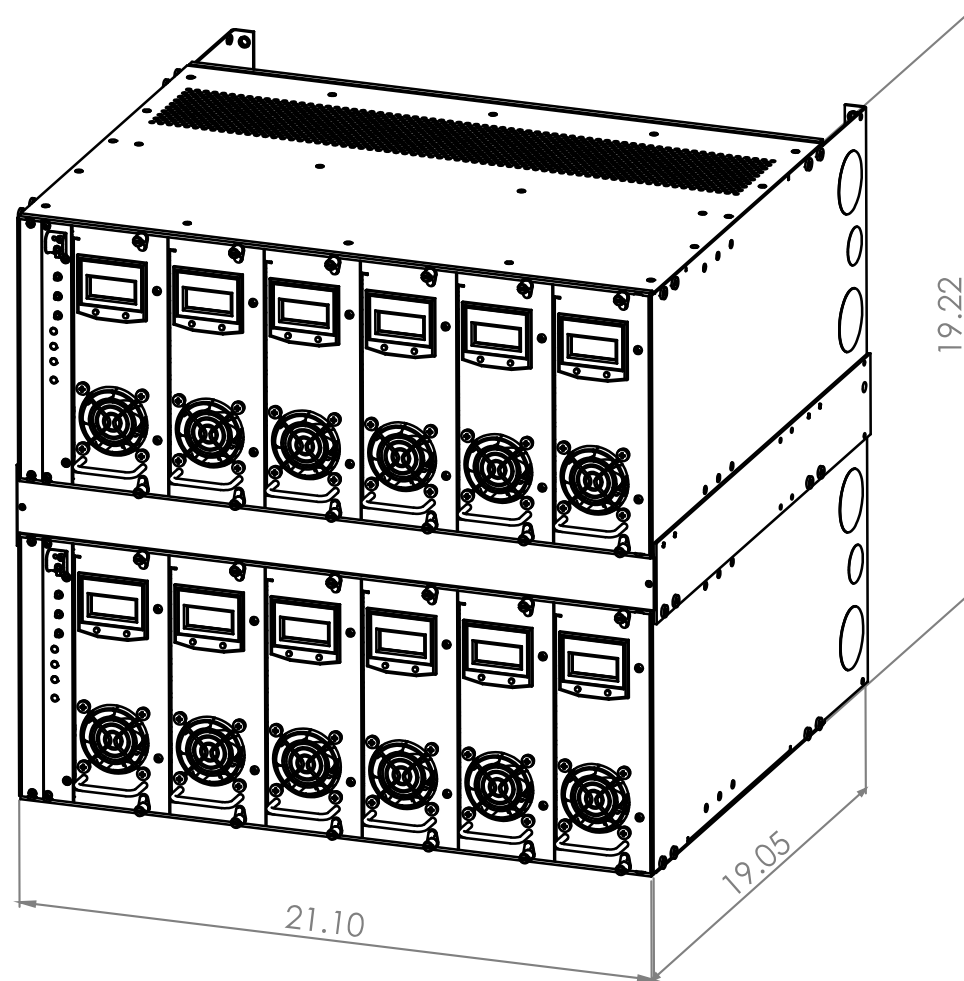
Power Output: 6KW to 24KW

Output Voltage: 120VAC L-N / 208VAC L-L

DC Input: 48VDC

Included Parts:

- 23" NC Cage (2)
- Alarm Card (2)
- Up to (4) 2KW Power Modules per Phase
- Stacking Kit (1)



NC 23" Three-Phase 18KW N+1 Monitor Card

Specifications

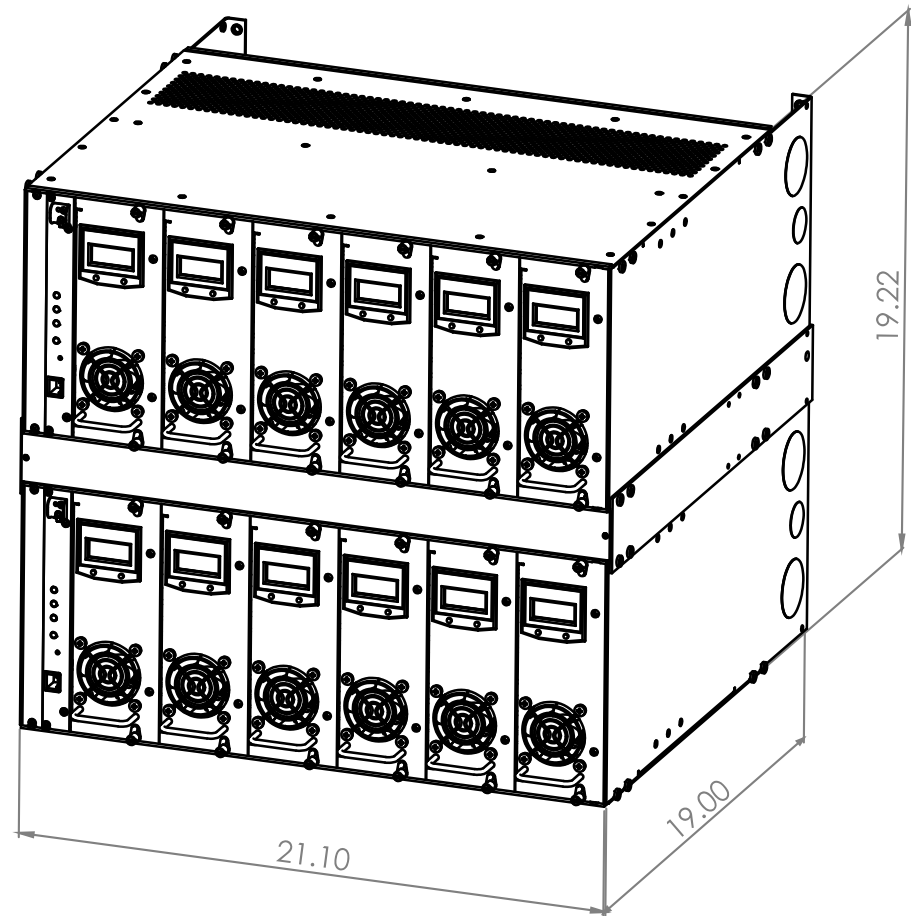
Power Output: 6KW to 24KW

Output Voltage: 120VAC L-N / 208VAC L-L

DC Input: 48VDC

Included Parts:

- 23" NC Cage (2)
- Monitor Card (2)
- Up to (4) 2KW Power Modules per Phase
- Stacking Kit (1)



NC 23" Three-Phase 30KW N+1 Alarm Card

Specifications

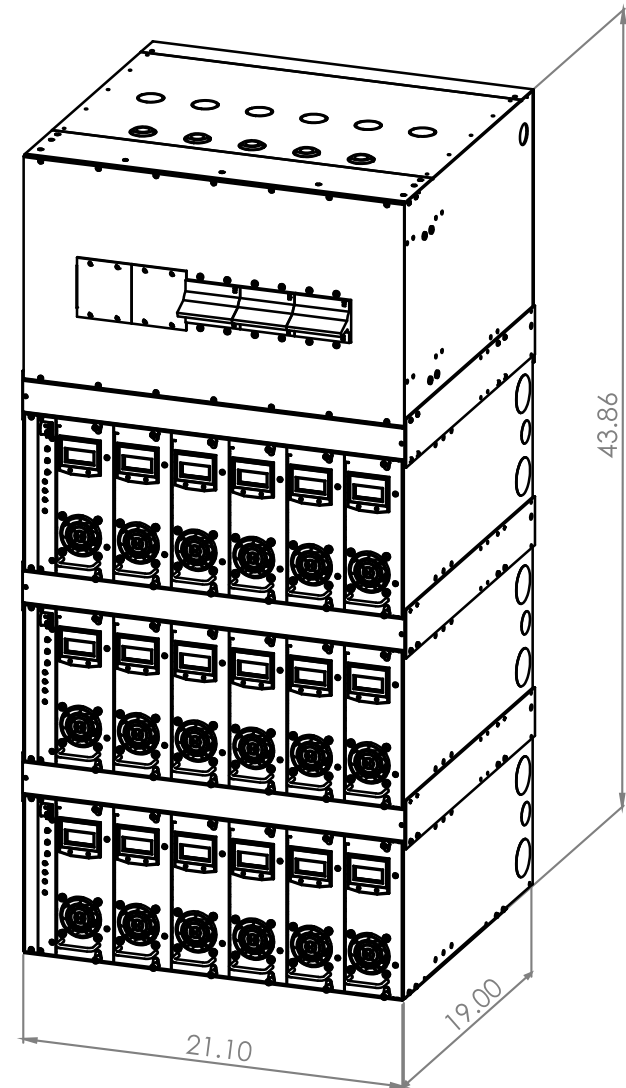
Power Output: 6KW to 36KW

Output Voltage: 120VAC L-N / 208VAC L-L

DC Input: 48VDC up to 108VDC

Included Parts:

- 23" NC Cage (3)
- Alarm Card (3)
- Up to (6) 2KW Power Modules per Phase
- Stacking Kit (3)
- 23" NC Customer Interface Cage (1)
 - DC Circuit Breakers (3)
- 23" NC Relay Rack Recommended



NC 23" Three-Phase 30KW N+1 Monitor Card

Specifications

Power Output: 6KW to 36KW

Output Voltage: 120VAC L-N / 208VAC L-L

DC Input: 48VDC

Included Parts:

- 23" NC Cage (3)
- Monitor Card (3)
- Up to (6) 2KW Power Modules per Phase
- Stacking Kit (3)
- 23" NC Customer Interface Cage (1)
 - DC Circuit Breakers (3)
- 23" NC Relay Rack Recommended

