

# Compact Power Line Shelves

## I<sup>2</sup>C shelf for the CP3500AC65TEZ rectifier

**Model: J2014003L003**



### Description

The J2014003L003 shelf accommodates up to 4 CP3500AC65TE rectifiers in a standard 19" EIA-310-D mounting configuration. The shelf is stackable and parallelable for higher power capacity needs. Parallelability is limited to four shelves when utilizing a single I<sup>2</sup>C bus, configuring the rectifiers with up to 16 different address possibilities. The shelf address is selected by a rotary switch accessible at the rear of the shelf.

### Features

- RoHS Directive 2011/65/EU and amended Directive (EU) 2015/863
- ANSI/UL\* 62368-1 and CAN/CSA† C22.2 No. 62368-1 Recognized, DIN VDE‡ 0868-1/A11:2017 (EN62368-1:2014/A11:2017)
- Mounts into standard 19" EIA-310-D racks
- Isolated output feed may be grounded at either polarity
- +5V standby power isolated from the main output
- Adjustable mounting ears for flush or set back positions.
- Supports hot-swapping of modules
- Accommodates mechanical latching into the slot
- Communicates via PMBus™
- Passes Zone 4 earthquake requirements
- CUR\*† recognized
- CE Mark (pending)§
- Shock & Vibration: Meets IPC 9562 Class II standards

#### FOOTNOTES

\* UL is a registered trademark of Underwriters Laboratories, Inc.

† CSA is a registered trademark of Canadian Standards Association.

‡ VDE is a trademark of Verband Deutscher Elektrotechniker e.V.

§ This product is intended for integration into end-user equipment. All CE marking procedures of end-user equipment should be followed. (The CE mark is placed on selected products.)

\*\* ISO is a registered trademark of the International Organization of Standards

# Technical Specifications

## Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only, functional operation of the device is not implied at these or any other conditions in excess of those given in the operations sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect the device reliability.

Parameter	Symbol	Min	Max	Unit
Input Voltage: Continuous	$V_{IN}$	0	264	$V_{AC}$
Operating Ambient Temperature <sup>1</sup>	$T_A$	-40	65	°C
Storage Temperature	$T_{stg}$	-40	85	°C
I/O Isolation voltage to Frame (100% factory Hi-Pot tested)			2250	$V_{AC}$

## Electrical Specifications

Unless otherwise indicated, specifications apply over all operating input voltage, resistive load, and temperature conditions.

### INPUT

Parameter	Symbol	Min	Typ	Max	Unit
Operational Range	$V_{IN}$	90	110/230	265	$V_{AC}$
Frequency Range	$F_{IN}$	47	50/60	63	Hz
AC Input Current, per module	$I_{IN}$			16	$A_{AC}$

### MAIN OUTPUT

Parameter	Symbol	Min	Typ	Max	Unit
Output Power	$W$	0	-	14,000	$W$
$V_{in} > 200V_{AC}$		0	-	6,000	$W$
$V_{in} \leq 140V_{AC}$					
Max output current	$I_{OUT}$			230	$A_{DC}$
Output voltage default set point	$V_{OUT}$		65		$V_{DC}$
Isolation Output/frame – other circuits	$V$	100			$V_{DC}$

### AUXILIARY OUTPUT

Parameter	Symbol	Min	Typ	Max	Unit
Set point	$V_{OUT}$		5.0		$V_{DC}$
Output current	$I_{OUT}$	0		8	$A_{DC}$
Isolation Output/Frame	$V$	50			$V_{DC}$
Output/Main output	$V$	50			$V_{DC}$
The auxiliary output is accessible to the user via a two position panelmounted connector capable of carrying 9A of current.					

<sup>1</sup>See the derating guidelines published in the rectifier data sheet

# Technical Specifications (continued)

## General Specifications

Parameter	Min	Typ	Max	Units	Notes
Reliability		14,000,000 <sup>2</sup>		Hrs	Full load, 25°C ; MTBF per SR232 Reliability protection forelectronic equipment, issue 2, method I, case III,
Service Life		10		Yrs	Full load, excluding fans
Unpacked Weight				Kgs/Lbs	
Packed Weight		5.53/12.2		Kgs/Lbs	
<b>Safety/Standards Compliance</b>					
Safety Standards	UL62368-1 , CAN/CSA C22.2 No 62368-1 , 62368-1				
Certification Marks	CE mark, UL Recognized (Canada and U.S.)				

## Environmental Specifications

Parameter	Min	Typ	Max	Units	Notes
Ambient Temperature					
Operating	-40 <sup>3</sup>		50 <sup>4</sup>	°C	
Storage	-40		85	°C	
Humidity					
Operating	5		95	%	Relative humidity, non-condensing
Storage	5		95	%	
Shock and Vibration acceleration			6	Grms	NEBS GR-63-CORE, Level 3, 20 -2000Hz, min 30 minutes
Earthquake Rating	4			Zone	NEBS GR-63-CORE, all floors, Seismic Zone 4 Designed and tested to meet NEBS specifications.

## EMC

Parameter	Criteria	Standard	Level	Test
Conducted emissions	AC input	EN55032, FCC Docket 20780 part 15, subpart J EN61000-3-2 Meets Telcordia GR1089-CORE by a 6dB margin	A	0.15 – 30MHz 0 – 2 KHz
Radiated emissions		EN55032 by a 6dB margin	A	30 – 10000MHz
Lightning surge	AC input	EN61000-4-5, Level 4, 1.2/50µs – error free	A	4kV, common mode
		ANSI C62.41 - damage free	A	2kV, differential mode
Fast transients	Input immunity	EN61000-4-4, Level 3	A3	6kV, common & differential
Conducted RF fields	Enclosure immunity	EN61000-4-6, Level 3	B	5/50ns, 2kV (common mode)
Radiated RF fields		EN61000-4-3, Level 3	A	130dBµV, 0.15-80MHz, 80% AM
		ENV 50140	A	10V/m, 80-1000MHz, 80% AM
ESD	AC input & DC output	EN61000-4-2, Level 3	B	6kV contact, 8kV air

<sup>2</sup> Estimated based on comparable calculations of similar shelves

<sup>3</sup> Designed to start and work at an ambient as low as -40°C, but may not meet operational limits until above -5°C

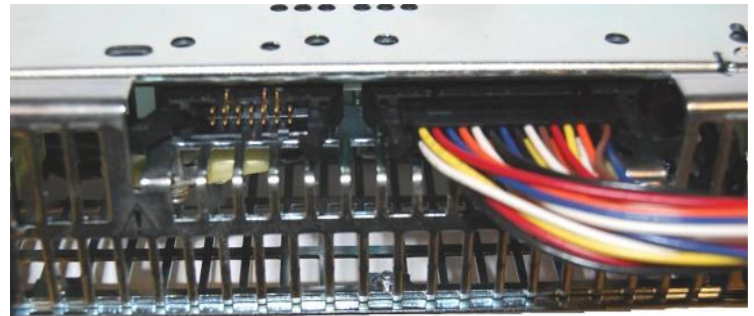
<sup>4</sup> Power Derating with Temperature is 2%/°C above 55°C. Power Derating with Altitude is 2%/305m(1000 ft) above 1524m(5000 ft). Max operational altitude is 3962m(13000 ft). See the safety section for further limitations.

## Technical Specifications (continued)

### Communication Signals: J1 Connector

Pin	Signal	Pin	Signal
1	n.c.	2	n.c.
3	n.c.	4	n.c.
5	MOD_PRES_1	6	MOD_PRES_2
7	MOD_PRES_3	8	MOD_PRES_4
9	PG_1	10	PG_2
11	PG_3	12	PG_4
13	SCL_0	14	n.c.
15	SDA_0	16	n.c.
17	FAULT	18	ALERT_0
19	n.c.	20	Logic_GND
21	Enable	22	Logic_GND
23	Vprog	24	5VA
25	Iso, n.c.	26	Iso, n.c.
27	VO-	28	Interlock
29	VO-	30	Slot_ID

Pin Out

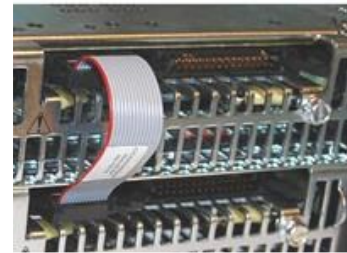


Control Interface cable (part # CC848854034)

### Communication Signals: J2 Connector

Pin	Signal	Pin	Signal
1	SCL_0	2	
3	SDA_0	4	
5	Alert_0	6	5VA
7	Logic_GRD	8	
9	Iso, n.c.	10	Iso, n.c.
11	Ishare	12	n.c.
13	Slot_ID	14	Interlock

Pin Out



Shelf-to-shelf cable connection (part # CC848848952)

**Notes:** (For all other signals refer to the rectifier data sheet)

- Ishare, Interlock and Slot\_ID are referenced to power output  $V_{out(-)}$ . All other signals are referenced to Logic\_GRD.
- For paralleled shelves the  $V_{out(-)}$  busses must be tied together. Modules could get damaged if this connection is not made. The Enable signal from the J1 connector of the First Shelf ( with the Controller ) is not connected to the other shelves. In the following Shelves the Enable Jumper should not be removed. One ( or both ) of the Interlock signals could be used as HW Enable.
- Unit\_ID: The four rectifiers are internally configured into slots 1 - 4. Viewing from the front the leftmost slot is #1.
- Rack\_ID: Selected using the rotary switch on the back of the shelf. The two combinations provide the following addressing;

		Unit_ID			
		1	2	3	4
Rack_ID	1	0000	0001	0010	0011
	2	0100	0101	0110	0111
	3	1000	1001	1010	1011
	4	1100	1101	1110	1111

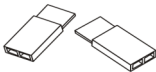
- Address detection: The Slot\_ID pin needs to be shorted to  $V_{o-}$  in order to deliver output power. This connection provides a second interlock feature.
- Pull-up resistors: The shelf does not include the pull-ups resistors between each signal pin; clock, data, Alert# and +5V.

# Technical Specifications (continued)

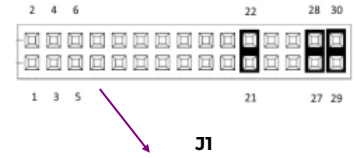
## Operation without I<sup>2</sup>C communications

### J2014003 L003

If no controller is used  
Jumpers on,  
Pin 21/20, Pin 27/28 and Pin  
29/30  
allow the Output of the  
CP3500AC65 to be Enabled.



Shorting Jumper	
Plating	Part Number
0.000076	
0.000030	881545-2
Gold	

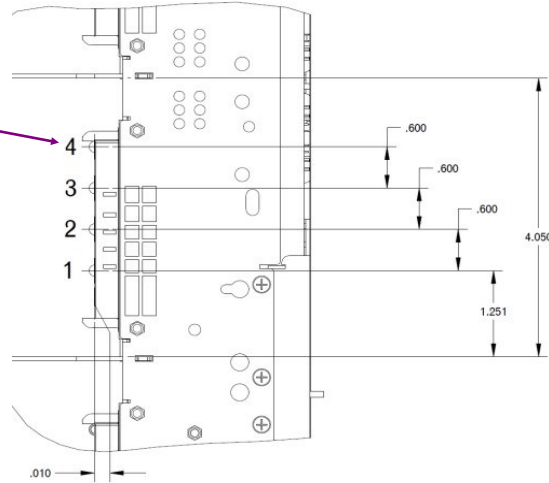


## Shelf Insertion Keying

### J2014003 L003

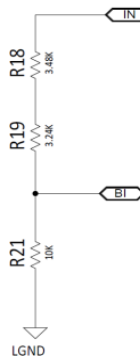
The notch has to be located to accept the key  
in position 4 location in the original design  
concept).

CP3500AC65 rectifiers with a Hardware  
Version up to ( and including ) 1:3 will not fit in  
this Shelf.



## Default Output Voltage of 65V

The below circuit is in the shelf, and sets  $V_{prog}$  to 3.0V, corresponding to an output voltage of 65V.



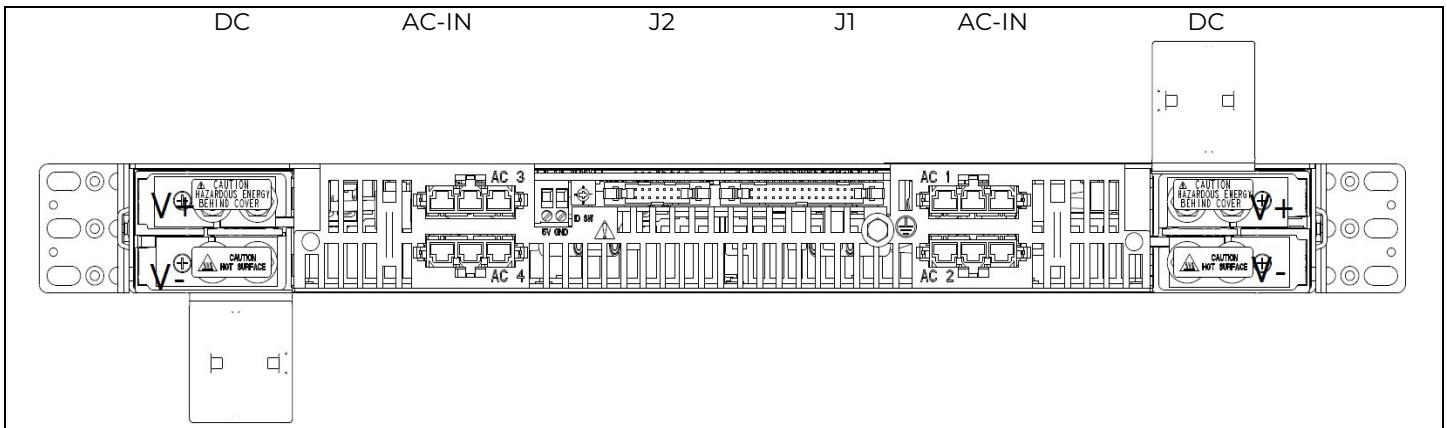
# Technical Specifications (continued)

## Package Outline

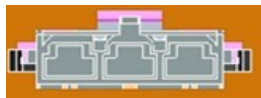


# Technical Specifications (continued)

## Rear of shelf



Shelf with lug terminations

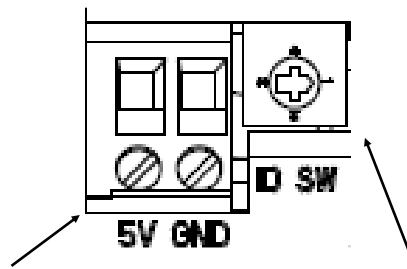


L - Line, G - frame ground,  
N - Neutral

L G N

Polarized input connector pin-out

Part No: Molex 42818-0312



5V termination - Shelf ID switch for I<sup>2</sup>C addressing(1 - 4)



90° Lugs

Torque to 62 in-lb  
(7 Nm)

Output termination - M6 nuts with conical washers are provided Both output buses need to be terminated to carry the output current from the shelf Touch-safe plastic covers the output buses.

Notes:

1. Brackets are located near the input connectors to secure the input cable harness and thus relief strain from the input connector. These brackets are removable.

## Technical Specifications (continued)

### Ordering Information

Part Number	Description	Ordering Codes	Usage
<b>Shelves</b>			
J2014003L003	Single output, lug output terminations, no communication pull-ups, 65Voutput	1600264425A	
<b>Blank Slot Fillers</b>			
	Central Office White	CC848822263	All
	Raven Black	CC848781534	All
	Graphite	CC848825233	All
<b>Extensions and mounting brackets</b>			
	CP 19 inch mounting bracket kit (includes two brackets and mounting hardware)	CC109145760	
	1U high extension bracket kit for 23" cabinets (includes two brackets and mounting hardware)	CC848844803	All
	2U high extension bracket kit for 23" cabinets (includes two brackets and mounting hardware)	848683009	All
<b>Cables sets</b>			
	Individual J1 controller wire set– 6 ft. One end mates into J1, other end not terminated.	CC848854034	All
	Inter-shelf cable set for interconnecting J2 signals between shelves	CC848848952	All
	Output cable set: 2 AWG DC Lug termination– 10 ft ( 1 RED and 1 BLACK cable)	848748987	All
	m6 screw with conical washer	901377010	All

### Signal connector part numbers ( AMP – as specified or equivalent)

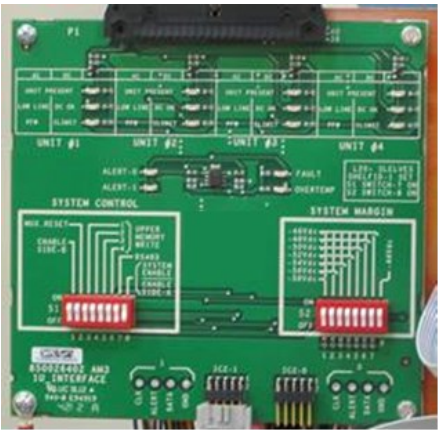

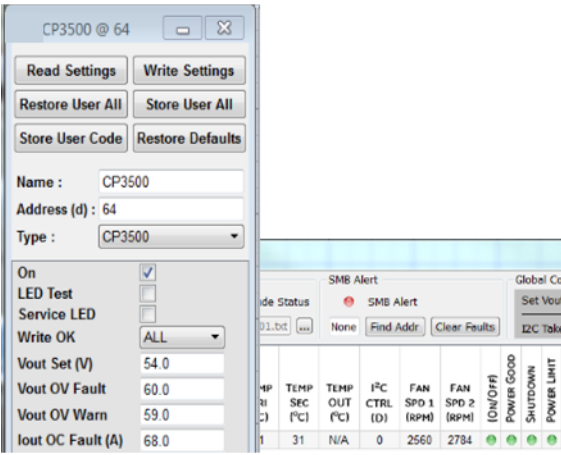
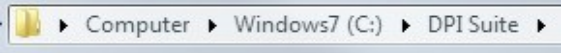
Connector	Positions	On shelf	Ribbon cable	Individual wires	Crimping tool
J1	30	5102159-7	1658621-7 header	102387-7 header	
		102320-1 latch	1-499252-2 retainer	6-87756-8 pin <sup>5</sup>	91517-1
J2	14	5102159-2	1658621-2 header	102387-2 header	
		102320-1 latch	499252-9 retainer	6-87756-8 pin	91517-1

<sup>5</sup> For 22 – 26ga wires



# Technical Specifications (continued)

## Accessories

Item	Description	Part number
	<p>1u_CP3500_shelf_interface board. This debug tool can be used to evaluate the performance of a set of rectifiers inserted into this shelf. The board provides terminations to two independent Isolated Adaptors that can be connected to either of the two i<sup>2</sup>c lines. Additionally, connection points are provided for interfacing to the four signals of each i<sup>2</sup>c line for monitoring the signals.</p> <p>The input interface is a standard IEC 320 C20 type socket. Outputs are connected via standard 0.25 fast-ons.</p>	150045498
	<p>Interface cable between the 30 pin J1 signal connector of the shelf and the 40 pin mating connector of the interface board above.</p>	CC848848960
	<p>Isolated Interface Adapter Kit – interface between a USB port and the I<sup>2</sup>C connector on the rectifier interface board. Includes a cable set to the PC and to the 1u_CP3500_interface board above.</p>	150036482
<p>Software:</p> 	<p>The site below downloads the OmniOn Digital Power Insight™ software tools, including the pro_GUI. When the download is complete, icons for the various utilities will appear on the desktop. Click on pro_GUI.exe to start the program after the download is complete.</p> <p><a href="https://electrification.us.abb.com/publibrary/family/embedded-power/software">https://electrification.us.abb.com/publibrary/family/embedded-power/software</a></p> <p>Graphical User Interface Manual; The GUI download created a directory In that</p>  <p>directory start the DPI_manual.pdf file.</p>	Free download

The OmniOn Digital Power Insight™ software tool exercises the various commands and functions available via the PMBus™ interface of the power supply.

Another useful feature of the GUI is the automated polling feature that records all time stamped state changes automatically. The power system can be monitored for an extended period of time and if any operational state changed it will be recorded for further analysis

## Technical Specifications (continued)

### Safety

#### Product Labeling

Follow all warnings and instructions marked on the product. Some of the safety symbols used with the CP3500 rectifier and this shelf may include the following. They may also be accompanied by instructions:

#### Mounting and Installation

- This product shall be installed in compliance with mounting requirements for the ultimate application.
- This product must be installed, serviced, and operated only by skilled and qualified personnel who have the necessary knowledge and practical experience with electrical equipment and who understand the hazards that can arise when working on this type of equipment. This product is intended for use in a Restricted Access Location.
- This equipment is to be used in controlled environments (an area where the humidity is maintained at levels that cannot cause condensation on the equipment, the contaminating dust is controlled, and the steady-state ambient temperature is within the range specified).
- This equipment has been evaluated for use in a continuous ambient temperature of of:
  - a. 50°C at full load with sharing the load across the two DC output feeds with 2%/°C de-rating from 50°C to 75°C at low range and 2.3%/°C de-rating from 50°C to 75°C at high range.
  - b. 44°C at full load with a single DC output feed setup with 1.6%/°C de-rating from 44°C to 75°C for low range and 1.8%/°C de-rating from 50°C to 75°C for high range.
- The CE mark if provided on the product is applied to show conformance to the requirements outlined in the European Union's Low Voltage Directive {2006/95/EC} and EMC Directive {2004/108/EC}.
- The internal AC-DC rectifier connectors have been evaluated for hot swapping. The four main AC input feed Mate-N-Lok connectors at the rear of the shelf have not been evaluated for hot swapping.
- A separate protective Earthing terminal is provided at the rear of the shelf
  - the building installation shall provide a means for connection to protective earth; and
  - the equipment is to be connected to that means; and
  - a SERVICE PERSON shall check whether or not the socket-outlet from which the equipment is to be powered provides a connection to the building protective earth. If not, the SERVICE PERSON shall arrange for the installation of a PROTECTIVE EARTHING CONDUCTOR from the separate protective Earthing terminal to the protective earth wire in the building.

#### Output Connections

- All field wiring should comply with the U.S. National Electrical Code (NEC) and/or applicable local codes/standards.
- Routing of the DC output cables should guarantee that cables are not in contact with sources of heat and surfaces that may damage the cable insulation.
- The DC output is not provided with a fuse or circuit breaker suitable for branch circuit protection. Therefore, the power shelf should be mounted in the same rack or cabinet as the equipment being powered. Use interconnecting power cables suitable for the application and sized to carry the rated output current. The interconnecting cables should be capable of carrying the overload current and short circuit current without damage or risk of fire.
- The output for the system is SELV and has available power greater than 240VA.
- Insulation on output field-wired conductors should be rated no less than 90°C. Wiring internal to enclosed equipment cabinets should be rated at 105°C (minimum). The provided DC output cords (red and black wires) are rated for 105°C.
- Before opening the insulating cover to gain access to load and ground connections, ensure all power supplies are disconnected from the AC MAINS.

## Technical Specifications (continued)

### AC Input Connections

- This shelf is configured with primary internal wiring and Molex connectors, rated for internal factory wiring only. The Molex connector is not UL Recognized for direct connection to the AC mains. The internal wiring is not UL recognized to be directly accessible by a user. Consideration should be taken on the end product's Listing to comply with NEC requirement for AC mains installations.
- The subject equipment was evaluated for use with a maximum 30A branch circuit per feed. Consideration shall be taken in the end-product evaluation in the sizing of conductors per Annex NAE s.c. 3.3.4. If used on a branch circuit greater than this, additional testing may be necessary.
- An accessible AC disconnect/protection device to remove AC power from the equipment in the event of an emergency must be provided.
- The equipment is powered by multiple AC inputs (one per rectifier). Disconnect all AC sources of power before servicing.
- These units are to be used with TN-S power systems only.

### Safety Symbols and Guidelines

Read and understand all instructions before attempting any installation of this product. When installing, operating, or maintaining the J85480S1 Power System, basic safety precautions should always be followed to reduce the risk of fire, electric shock, and injury to persons. Such precautions include the following:

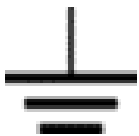


This symbol identifies the need to refer to the equipment instructions for important information.



This symbol identifies the presence of hazardous AC or DC voltages or hazardous energy levels. In the context of this product

- The DC output cables contain electrical energy levels capable of causing heating and arcing if shorted to metal objects. Make connections with the power disconnected.
- Hazardous AC voltage and DC electrical energy is contained within the enclosure of the power shelf. No user or field serviceable parts inside.



This symbol is used to identify safety earth ground connection points within the equipment.

### German Safety Guidelines

#### Installationsanleitung

- Alle Ausgänge des Gerätes erfüllen die Anforderungen für SELV nach IEC/EN62368-1.
- Die Ausgänge des Gerätes liegen über den Limits für Energiegefahr nach IEC/EN62368-1 (>240 VA). Das Gerät ist zum Einbau in ein Montage-Rack bestimmt. Siehe Einbaubestimmungen in der Montageanleitung, um eine Gefährdung des Benutzers während der Installation zu vermeiden.

## Technical Specifications (continued)

### ACHTUNG:

#### **Hoher Ableitstrom Vor Anschluss an den Versorgungsstromkreis unbedingt Erdungsverbinding herstellen**

- Das Produkt ist zum Gebrauch in einer Umgebungstemperatur von max. 55°C bestimmt.
- Die Gerätestecker des Produktes sind dazu bestimmt, eine sichere Erdung des Gerätes herzustellen.
- Das Produkt ist zum Gebrauch in einer Umgebung mit Verschmutzungsgrad 2 nach IEC/EN62368-1 bestimmt.
- Die Netzteile des Gerätes können während des Betriebes einzeln ausgetauscht werden (Hot Swapping).
- Das Gerät wurde zusammen mit den Anschlussleitungen (ohne Anschlussstecker) geprüft. Die Installation eines Steckers des jeweiligen Landes, sollte nur durch geschultes Service Personal durchgeführt werden. Als alternative könnte eine Vorinstallation des Steckers bereits bei der Herstellung erfolgt sein.

## Contact Us

For more information, call us at

1-877-546-3243 (US)

1-972-244-9288 (Int'l)

## Change History (excludes grammar & clarifications)

Revision	Date	Description of the change
2.3	12/10/2021	Updated as per template and upgraded RoHS standard
2.4	12/18/2023	Updated as per OmniOn template

**OmniOn Power Inc.**

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