RECTIFIER

PSR327

USER MANUAL

Notes to this manual

ATTENTION! Read this manual very carefully before installing and commissioning the specified module. This manual is a part of the delivered module. Familiarity with the contents of this manual is required for installing and operating the specified module.
The rules for prevention of accidents for the specific country and the general safety rules in accordance with IEC 364 must be observed.

The function description in this manual corresponds to the date of publishing.
Technical changes and changes in form and content can be made at any time by the manufacturer without notice. There are no obligations to update the manual continually.

The module is manufactured in accordance with applicable DIN and VDE standards such as VDE 0106 (part 100) and VDE 0100 (part 410). The CE marking on the module confirms compliance with EU standards 2006-95-EG (low voltage) and 2004-108-EG (electromagnetic compatibility) if the installation and operation instructions are followed.

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Changes and errors excepted.

The current revision status of this user manual is the following:

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Date: 2010-11-23

Revision	Description of change	Writer	Date
00	First edition	RTH	2007-11-06
01	Minor text modifications	RTH	2008-01-04
02	Minor text modifications, sections “Commissioning”, “Output power diagram” and “Monitoring” reworked	RTH	2008-04-10
1.3	Minor text modifications, “Index of figures” inserted, new revision status numbering (X.X) introduced.	RTH	2008-11-03
2.0	Section 4.2.1 “Start-up behaviour” inserted; Technical specifications: Adjustable output voltage range changed.	RTH	2009-04-29
3.0	Section 4.5 “Monitoring” reworked.	RTH	2009-05-15
4.0	Minor text modifications, section 4.7 “Default value setting for NiCd batteries” inserted.	RTH	2009-07-07
5.0	Technical specifications: “Internal decoupling circuit” corrected.	RTH	2009-07-24
6.0	Input frequency range updated.	RTH	2010-11-23

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1A. Safety Instructions

Warning!

Because several components of operating electrical modules are charged by dangerous voltage, the improper handling of electrical modules may be the cause of accidents involving electrocution, injury, or material damages.

- Operation and maintenance of electrical modules must be performed by qualified skilled personnel such as electricians in accordance with EN 50110-1 or IEC 60950.
- Install the module only in areas with limited access to unskilled personnel.
- Before starting work, the electrical module must be disconnected from mains. Make sure that the module is earthed.
- Do not touch connector pins as they can be charged with dangerous voltage up to 30 seconds after disconnection.
- Only spare parts approved by the manufacturer must be used.

1B. Electric Waste Disposal

Separate collection is the precondition to ensure specific treatment and recycling of waste electrical and electronic equipment and is necessary to achieve the chosen level of protection of human health and the environment.

In the case of waste disposal of your discarded equipment we recommend to contact a waste management company.

2. General Information

The PSR327 rectifier rectifies sinusoidal AC input voltage to DC output voltage.

The PSR327 is a hot plug-in module with rear side connectors and is designed to be mounted in an assembly set 19" sub rack (see section 3.2). Due to the state-of-the-art circuitry design, the unit has very low losses and therefore very compact dimensions, low weight and high power density.

The PSR327 rectifier can be used in all DC applications with or without battery.
The rectifier is delivered with factory set default values for **lead acid batteries**. If the rectifier is to be used for **NiCd batteries**, the default values must be parameterized accordingly using a CAN dongle and special software.
The nominal output power per unit is 2.7 kW. Up to a maximum of 48 modules can be switched in parallel to increase the system output power or to build redundant power supply systems (n + 1-principle).

3. Type Range/Equipment

PSR327 rectifiers according to the following table are available:

Type Designation	Material Code	Nominal Output Voltage	Nominal Output Current
PSR327/48-56	101-027-158.00	48 VDC	56 ADC
PSR327/60-45	101-027-168.00	60 VDC	45 ADC
PSR327/110-25	101-027-178.00	108 VDC	25 ADC
PSR327/220-12.5	101-027-188.00	216 VDC	12.5 ADC

3.1 Main Data

Nominal input voltage:	230 VAC
Nominal input current:	12.9 AAC
Input frequency range:	16⅔ - 60 Hz (+5 %)
Nominal output power	2.7 kW

For more specific data, see section 8.

3.2 Available Options and Assembly Equipment

Designation	Material Code
DC Power Rack DCR PSR327-8.1 LV (assembly set 19" sub rack 3U incl. backplane for three PSR327/48 V or 60 V rectifiers and one UPC3-48/60 V DC controller), DCC-CB1 connection board included.	102-327-318.LV01
DC Power Rack DCR PSR327-8.1 HV (assembly set 19" sub rack 3U incl. backplane for three PSR327/110 V or 220 V rectifiers and one UPC3-110 V or 220 V DC controller), DCC-CB1 connection board included.	102-327-318.HV01
DC Power Rack DCR PSR327-10.8 LV (assembly set 19" sub rack 3U incl. backplane for four PSR327/48 V or 60 V rectifiers).	102-327-408.LV01
DC Power Rack DCR PSR327-10.8 HV (assembly set 19" sub rack 3U incl. backplane for four PSR327/110 V or 220 V rectifiers).	102-327-408.HV01
Cover plate (with handle) to cover empty PSR slots, 1/4 x 19", 3U; RAL 7035	881-MEC-BPL.03.21.B
Monitoring, control and signalling unit (DC controller) UPC3-48/60 V	301-003-598.02
Monitoring, control and signalling unit (DC controller) UPC3-110 V	301-003-798.02
Monitoring, control and signalling unit (DC controller) UPC3-220 V	301-003-898.02
DCC-CB1; connection board (with MSTB screw terminals) necessary to connect all measuring, control and signalling wires over the backplane of the sub rack to the control unit UPC (spare part).	302-DCC-CB1.00
CAN dongle, incl. PC software; necessary to change the internal default values of the rectifier (e.g. for NiCd application).	880-CAN-DNG.00

Figure 1) DC Power Rack DCR PSR327-8.1 fully equipped with three PSR327 rectifiers and one UPC3 DC controller

Figure 2) DC Power Rack DCR PSR327-10.8 fully equipped with four PSR327 rectifiers

3.3 Front view/Front side LED panel

Figure 3) Front view

The PSR327 rectifier is equipped with the following four LED indicators:

INPUT OK
OUTPUT OK
Vout>
ALARM

For more information about the LED indicators, see section 4.4 please.

Two captive screws are used for each module to secure it to the sub rack (components of the module)

3.4 Rear Side Connection

The rear side male connections (AC input voltage, DC output voltage and signals) are shown in figure 4) and are defined in the table below.

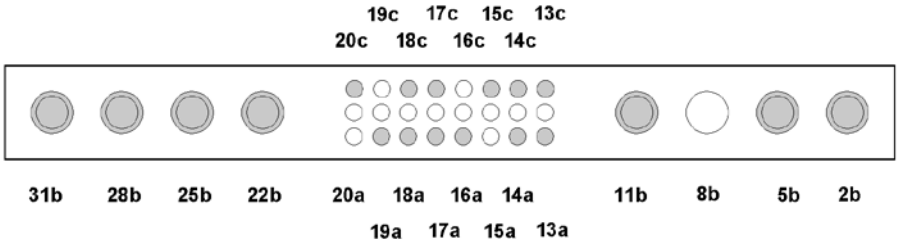

Figure 4) Male connectors (shown from the rear side of the module)

Pin assignment of the rear side connector:

Pin	Function
2b	L1 - Input
5b	N - Input
8b	- - -
11b	PE
13a	CAN - CVSS
13c	(-) output voltage sense link
14a	CAN - H
14c	CAN - L
15a	- - -
15c	CAN - CVCC
16a	AGND
16c	- - -
17a	Hardwarecoding CODE2
17c	Hardwarecoding CODE1
18a	Collective Alarm NC
18c	Collective Alarm COM
19a	Collective Alarm NO
19c	- - -
20a	- - -
20c	(+) output voltage sense link
22b	(-) Output
25b	(-) Output
28b	(+) Output
31b	(+) Output

3.5 Cooling and Air Flow Direction

The unit is cooled with an internal fan. The airflow is from the front to rear side. The fan is monitored and speed-controlled dependent on module temperature. To provide sufficient air flow, a minimum space (see item "A" in figure 5) of 50 mm is required between the unit and the rear cabinet wall as well as an unobstructed supply of air to the front of the module.

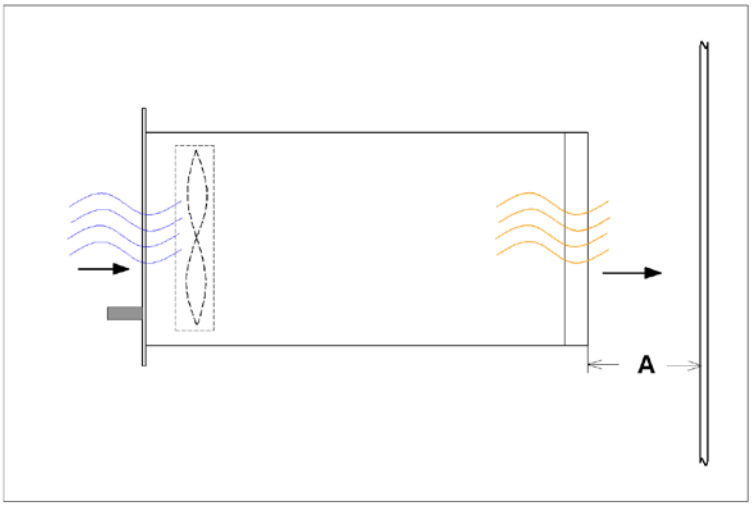

Figure 5) Module air flow

3.6 Communication Interface

The PSR327 rectifier is equipped with a serial data interface in accordance with the Controller Area Network (CAN) specification. The CAN-Bus connection is integrated in the rear side connector.

Several modules in a system or parallel connection can be controlled and monitored through the CAN-Bus by a central UPC DC controller unit.

The following parameters of a specific rectifier unit can be controlled or monitored:

- Output voltage
- Output current
- Device temperature
- Device status

Furthermore, the rectifier unit receives all threshold values through the CAN-Bus from the DC controller unit.

4. Handling

4.1 Storage

Modules must be stored in a dry, dust free environment with a storage temperature in accordance with the specific technical data (see section 8).

4.2 Commissioning

Note: Before commissioning the module, make sure that the input voltage corresponds to the input voltage range of the unit as specified on the type plate and that the output voltage of paralleled units matches.

1. Carefully unpack the unit
2. Fill the rack beginning with the left slot.
3. Put the unit into an empty slot.
4. Carefully slide in the unit until the module connector touched the backplane connector.
5. Increase the force until the unit fits in completely. Avoid using too much force. If the unit does not fit in, begin again at step 3.
6. Secure the module using the two captive screws (M3x12) provided with the module.
7. Switch ON the module by external MCB.

Note: The PSR327 is serially equipped with an internal output side decoupling diode. This ensures hot plug-**in** capability for the module and enables the operator to **add** modules under operating conditions.

Note: Before a module is to be **removed**, it must be **switched off** by the external input fuse!

Caution: After switching off the module the internal capacitors are still fully charged. Do not touch connector pins as they can still be charged with dangerous voltage after disconnection.

4.2.1 Start-up behaviour

When the PSR327 is switched on (without CAN-Bus connection) first it provides a start-up voltage according to the table below. The start-up voltage is held for 60 seconds, than the output voltage steps up to the internal default value.

PSR327	48 V version	60 V version	110 V version	220 V version
Start-up voltage (VDC)	45.0	55.5	97.5	192.0
Default value Vo (VDC)	54.5	68.1	122.6	245.2

If a DC controller unit (UPC) is integrated into the system, it is powered with the start-up voltage after the rectifier has been switched on. The output voltage immediately steps up to the value given from the UPC unit via CAN-Bus.

If a DC controller unit (UPC) is integrated into the system (e.g. powered by the battery and due to this operating yet) the rectifier directly provides the output voltage given from the UPC unit via CAN-Bus.

4.3 Charge Characteristic/Output Power Diagram

The charge characteristic of the PSR327 is a power limited IV characteristic curve in accordance with DIN 41772/DIN 41773.
For modules in parallel operation mode a load sharing of about ±10 % is attained due to a sloping output voltage line (-1 % at 100 % Inom).
The module is continuous short circuit proof.

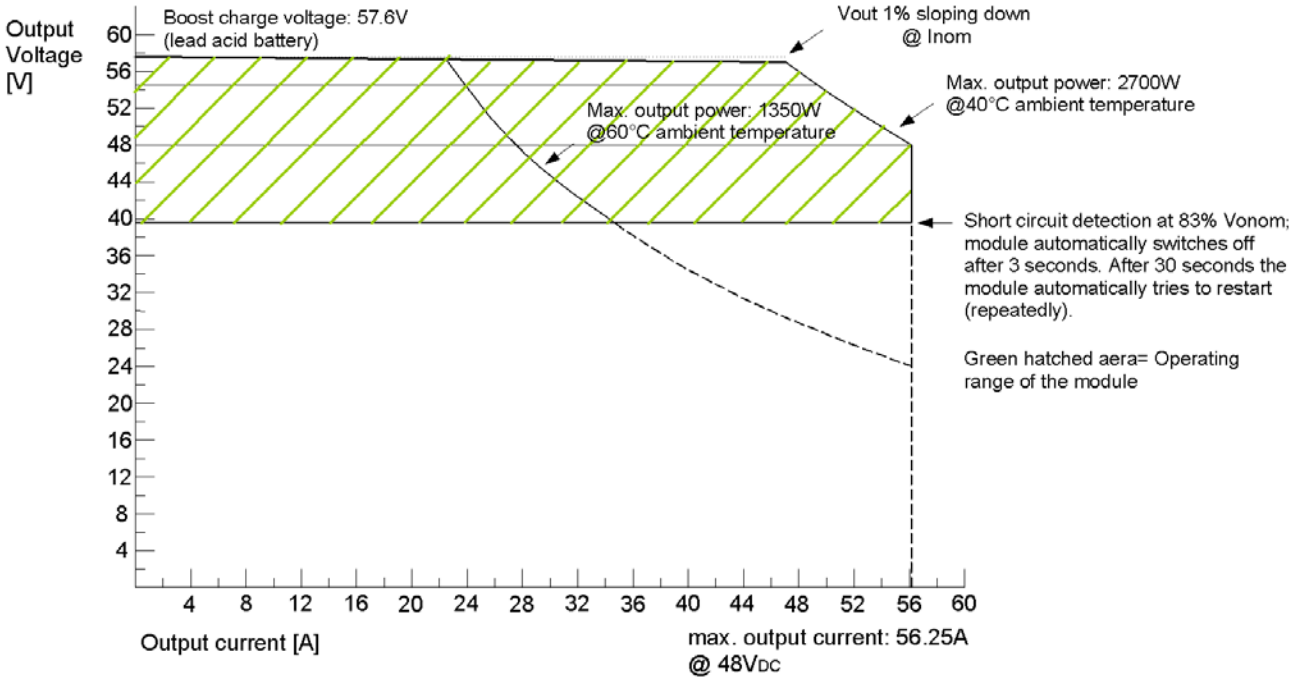

Figure 6) Output power diagram (example PSR327/48-56)

Calculation of the output current (Io) at different output voltage values using the **PSR327/48-65** being the example:

The PSR327 rectifier provides an output power of Vonom x Ionom= Ponom (**48 V x 56.25 A= 2700 W**).

As shown with the output power diagram (see figure 6), the nominal output current (56.25 A) is available at the nominal output voltage (48.0 V).
At other output voltage values (e.g. float or boost charge voltage), the output current is corresponding to the following formula: Io= Ponom : Vo

Example 1):
Float charge voltage for lead acid batteries (24 cells) = 54.5 V; **Io**= 2700 W : 54.5 V= **49.5 A**

Example 2):
Boost charge voltage for lead acid batteries (24 cells) = 57.6 V; **Io**= 2700 W : 57.6 V= **46.9 A**

4.4 LED Indications

Functions of front panel LED indicators

LED	Colour	Function
	green	INPUT OK - Mains input voltage okay (criteria: 195 V_{AC} ≤Vn ≤265 V_{AC})
	green	OUTPUT OK - Vout ok (criteria: Vout ≥97 % of adjusted value)*
	red	Vout > (criteria: Vout ≥ than adjusted operating threshold)*
	red	ALARM - Collective alarm**: Vin incorrect, Vout incorrect, module overtemperature, fan failure and short circuit

*For factory set output voltage threshold values, see section 4.6

**The module is equipped with an isolated signalling contact (normally open contact).
The maximum load is 60 V_{DC}/500 mA. The contact is time-delayed and reacts after approx. 10 sec.

4.5 Internal Monitoring

Monitored values	Criteria	Function
AC input voltage	I.) Mains input voltage 164 V≤ Vn≤ 195V	Linearly decreases output power.
	II.) Mains input voltage <164 V	Module automatically switches off.
	III.) Mains input voltage >184 V	Module switches on.
	IV.) Mains input voltage >275 V	Module switches off (self-locking). It must be manually restarted.
DC output voltage	Output voltage higher than the adjusted operating threshold*	Module automatically switches off (self locking). The unit must be manually restarted.
Module temperature	Heat sink temperature ≥80 °C	Module automatically switches off. It automatically switches on when the heat sink cools down to ≤70 °C.
Cooling fan	Cooling fan malfunction	Module automatically switches off. After 30 sec. the module automatically tries three times to restart. If this fails, the module switches off and must be manually restarted.
Short circuit	Module automatically detects short circuit operation by the output voltage value. (criteria: Vout ≤83 % of Vnom)	Module automatically switches off after 3 seconds. After 30 seconds the module automatically tries to restart repeatedly.

*For factory set output voltage threshold values, see section 4.6

4.6 Threshold & Default Values

The following table shows the factory set threshold/default values which are internally stored in the PSR327 unit (for **lead acid batteries**):

Default values	48 V version	60 V version	110 V version	220 V version
Output voltage Vo (VDC)	54.5	68.1	122.6	245.2
Over voltage V> (VDC)	60.0	75.0	135.0	270.0
Current limiting Iconst (ADC)	56.0	45.0	25.0	12.5

Note: The threshold/default values can only be changed in combination with a UPC DC controller unit.

If an UPC DC controller unit is controlling the power supply unit through the CAN-Bus, the charge voltage is completely controlled by the UPC based on its configuration values and momentary charge state (for example temperature compensation, boost charge, or battery test). That means that the values sent from the UPC over CAN-Bus have top priority. During CAN-Bus communication the internally stored values of the rectifier are invalid.
But when the CAN-Bus connection is inactive for more than five seconds (e. g. due to trouble), the PSR327 automatically switches back to the internally stored default values. In this case it is ensured that the battery is charged in the float charge mode.

4.7 Default value setting for NiCd batteries

If the rectifier is to be used to charge **NiCd batteries** the default/threshold values must be set according to the individual battery type using a CAN dongle and PC software (see section 3.2 “Available Options and Assembly Equipment”). A specific manual is available on request. For the adjusting range of the output voltage please see section 8 “Technical Specifications”.

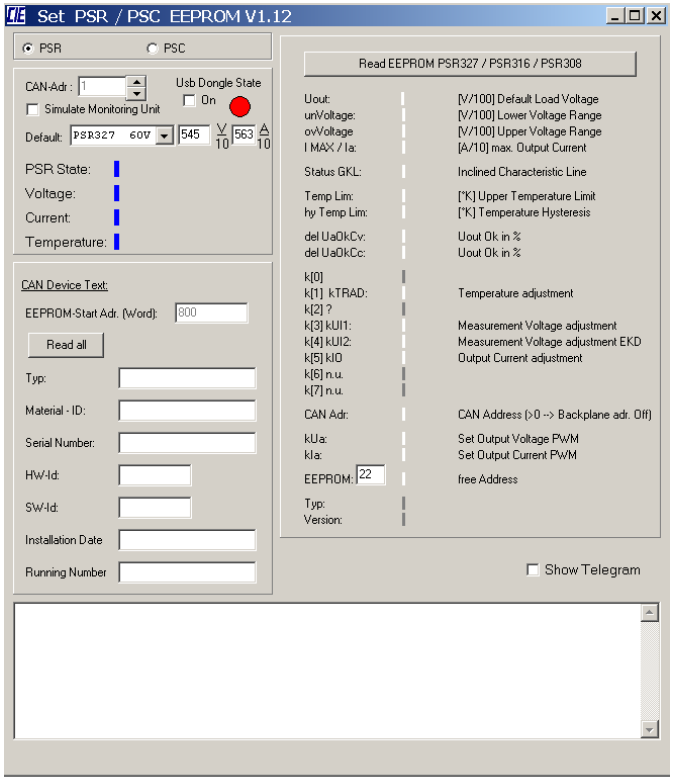

Figure 7) Screenshot “PC software for CAN-Dongle”

5. External Functions

If the rectifier works together with a UPC DC controller unit, the following external functions can be used:

- Compensation of output voltage
- Temperature compensation of charge voltage
- Discharge test
- Boost charge mode

For more information about these functions, read the UPC user manual.

6. Maintenance

In general, the module is maintenance-free. Exclusively the fan is a component consisting of moving parts. By way of precaution a yearly inspection with following checks is recommended:

- Mechanical/visual inspection
- Removal of dust and dirt, especially on radiator surfaces
- Check for internal dust or humidity

It is recommended to exchange the fan every five years.

Attention! Dust combined with moisture or water may influence or destroy the internal electronic circuits.
Dust inside the unit can be blown out with dry compressed air.
The interval between the checks depends on ambient conditions of the installed module.

7. Troubleshooting

Symptom	Possible reason	Corrective action
No output voltage	Is mains voltage present?	Check →
	Mains switched to “ON” position?	Check
	PSR327 module plugged in securely?	Check
	Incorrect polarity or short circuit at the output?	Check
	LED V> on?	1.) Switch the module off and on. 2.) Check the settings for V> (see section 4.6).
Deviation of the output voltage	Is the unit operating in current limiting mode due to overload?	Reduce the load
	Is the output voltage setting Vout at the DC controller incorrect?	Adjust output voltage to nominal values (see section 4.6)
	If an external sensor lead is used for the output voltage, is the connection faultless?	Check

If the unit still does not work even though all checks have been done, contact your sales agent or the service department of ELTEK DEUTSCHLAND GmbH.

8. Technical Specifications

Type designation	PSR327/48-56	PSR327/60-45	PSR327/110-25	PSR327/220-12.5
Material code	101-027-158.00	101-027-168.00	101-027-178.00	101-027-188.00
AC input:				
Nominal input voltage	230 V_{AC} ±20 %	←	←	←
Nominal input current	12.9 A_{AC}	←	←	←
Input frequency range	16⅔ - 60 Hz (+5 %)	←	←	←
Power factor	>0.99 @ P >50 %			
Total harmonic distortion	<5 %	←	←	←
Efficiency	≥91 %	←	←	←
Internal input fusing	16 A (6.3 x 32 mm)	←	←	←
DC output:				
Nominal output voltage	48 V_{DC}	60 V_{DC}	108 V_{DC}	216 V_{DC}
Nominal output current	56 A_{DC} @ 48 V	45 A_{DC} @ 60 V	25 A_{DC} @ 108 V	12.5 A_{DC} @216 V
Nominal output power	2700 W	←	←	←
Charge characteristic line	IV characteristic according to DIN41772/DIN41773; power limited			
Adjustable output voltage range	42 - 62 V_{DC}	52.5 - 78 V_{DC}	87 - 150 V_{DC}	170 - 295 V_{DC}
Default value of the charging voltage (factory set, 2.27 V/cell; lead acid battery*)	54.5 V_{DC}	68.1 V_{DC}	122.6 V_{DC}	245.2 V_{DC}
Output over voltage Vo> (factory set, 2.5 V/cell; lead acid battery*)	60 V_{DC}	75 V_{DC}	135 V_{DC}	270 V_{DC}
Output under voltage Vo< (factory set, 1.7 V/cell; lead acid battery*)	40.8 V_{DC}	51 V_{DC}	91.8 V_{DC}	183.6 V_{DC}
*Default/threshold values for charging of **NiCd batteries** are settable using a CAN dongle and PC software.				
Voltage ripple / psophometric acc. to CCITT-A	≤20 mVpp/ ≤ 1.8 mV	≤20 mVpp/ ≤2.0 mV	≤100 mVpp/ n/a	≤200 mVpp/ n/a
Dynamic accuracy of the charge voltage	<3 % Vnom at load changes between 10 % - 90 % - 10 % Inom; transient time ≤1.5 ms			
Short circuit protection	Continuous short circuit proof; 1 x Inom			

Type designation	PSR327/48-56	PSR327/60-45	PSR327/110-25	PSR327/220-12.5
Parallel operation	Yes (max. 48 units with UPC DC controller unit); current sharing ≤10 % Inom; sloping output voltage line (-1 % at 100 % Inom)			
Internal decoupling at the output	Yes; active, low-loss decoupling circuit in the negative output line	←	Yes, in the positive output line	←
Internal output fuse	80 A	80 A	30 A	20 A
Standard Features:				
LED signalling	Input OK (green), Vo OK (green), Vo> (red), Alarm (red)			
Main processor	16Bit Fujitsu	←	←	←
Isolated signalling contact	"Collective alarm"; relay COM/NO/NC, maximum contact load: 60V_{DC}/500mA			
Communications interface	CAN-Bus, proprietary protocol			
Environmental:				
Ambient temperature	Operation: -20 °C to +55 °C, storage: -40 °C to +85 °C			
Climatic conditions	according to IEC 721-3-3 class 3K3/3Z1/3B1/3C2/3S2/3M2			
Max. installation altitude	≤ 1500 m			
Audible noise	<45 dB (A)	←	←	←
Mechanical:				
Type of construction	¼ x 19", 3U	←	←	←
Cooling	Fan cooling (temperature-controlled, r.p.m.-monitored)			
Connector	AC input, DC output and signals: DIN41612-M-connector			
Dimensions (W/H/D)	106.3/133/326.5 mm			
Minimum installation depth	438 mm (in combination with an assembly set 19" sub rack)			
Weight	approx. 3.9 kg	←	←	←
Type of enclosure / Protection class	IP20 (front panel) / 1			
Colour	Front panel: RAL 7035, neutral, black print RAL 9005			
Compliances:				
CE conformity	yes	←	←	←
Compliance to safety standards	EN60950-1; VDE0100 T410; VDE0110; EN50178; EN60146			
Compliance to EMC standards	EN55022/24 (ITE), class "A"; EN61000-4 T2-5			

8.1 Dimensional Drawings

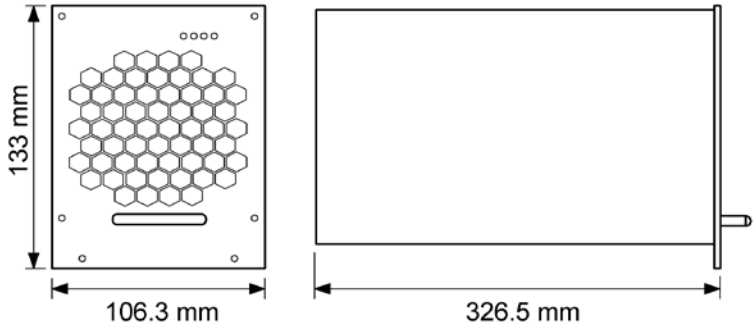

Figure 8) Module dimensions

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