DC Power Rack

DCR PSR308-4.0 LV/HV

USER MANUAL

UM_DCR_PSR308_4.0LV_HV_E_R1.1

Notes to this manual

ATTENTION! Read this manual very carefully before installing and commissioning the DC power rack. This manual is a part of the delivered DC power rack. Familiarity with the contents of this manual is required for installing and operating the DC power rack.
The rules for prevention of accidents for the specific country and the universal 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 unit 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 unit 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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The current revision status of this user manual is the following:

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Date: 2009-12-21

Revision	Description of change	Writer	Date
00	Preliminary first edition	RTH	2007-12-14
01	First edition	RTH	2008-03-04
02	Index of figures inserted, minor text modifications, sections “CAN-Bus termination” + “Connection Tables” reworked	RTH	2008-06-16
1.0	Minor text modifications, article code in the section “Technical Specifications” corrected, new revision status numbering (X.X) introduced.	RTH	2009-02-05
1.1	Minor text modifications included.	RTH	2009-12-21

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1A. Safety Instructions

Warning!

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

- Operation and maintenance of electrical devices must be performed by qualified skilled personnel such as electricians in accordance with EN 50110-1 or IEC 60950.
- Install the unit only in areas with limited access to unskilled personnel.
- Before starting work, the unit must be disconnected from mains. Make sure that the unit is earthed.
- 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 DC power rack is a unit for integration in system cabinets with standard 19" frame. A high voltage (HV) and low voltage (LV) version is available. The input is suitable for connection to single- or three-phase mains. The DC power rack can be equipped with a maximum of five rectifiers of type PSR308 and one DC controller unit UPC3S and delivers an output power up to 4000W. After safe mechanical and electrical connection, the unit is ready for operation.
The DC controller UPC3S is easy to configure by PC software and adapts the system to the customer's application and battery parameters.

2.1 Block Diagram

DCR PSR308-4.0 LV/HV

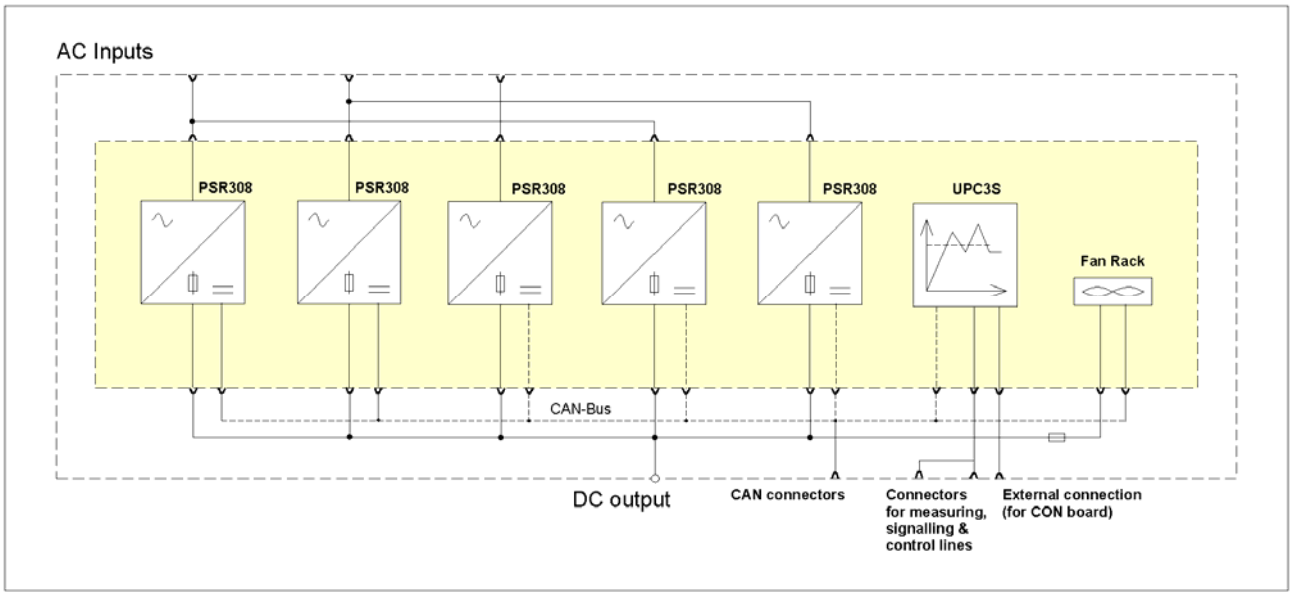

Figure 1) - Block diagram

2.2 Possible Rack Configurations

Up to five PSR308 with output voltages according to the table below plus one DC controller UPC3S (obligatory) can be integrated into one rack.

Designation of the rack	Article code		For rectifier/ output voltage	Necessary type of DC controller UPC3S/Article code
DCR PSR308-4.0 LV	102-308-517.LV02	Input voltage: 100 up to 250V_{AC}	PSR308/24V_{DC}	UPC3S-24V/301-003-497.00
			PSR308/48V_{DC}	UPC3S-48/60V/301-003-597.00
			PSR308/60V_{DC}	
DCR PSR308-4.0 HV	102-308-517.HV02		PSR308/110V_{DC}	UPC3S-110V/301-003-797.00
			PSR308/220V_{DC}	UPC3S-220V/301-003-897.00

Output power @ input voltage > 173V_{AC}

Number of installed Rectifiers	Output power @ input voltage > 173V_{AC}		
	without redundancy	(n + 1)	(n + 2)
1	800W	---	---
2	1600W	800W	---
3	2400W	1600W	800W
4	3200W	2400W	1600W
5	4000W	3200W	2400W

Output power @ input voltage ≤ 173V_{AC}

Number of installed Rectifiers	Output power @ input voltage ≤ 173V_{AC}		
	without redundancy	(n + 1)	(n + 2)
1	600W	---	---
2	1200W	600W	---
3	1800W	1200W	600W
4	2400W	1800W	1200W
5	3000W	2400W	1800W

2.3 Front View

Figure 2) - DC power rack fully equipped with five rectifiers PSR308 and one DC controller UPC3S.

1	Four screws M6 to fix the sub rack to the system cabinet	Components of the sub rack
2	Four screws M6 to fix the fan rack to the sub rack and also to fix the sub rack to the cabinet.	
3	The sub rack is equipped with a fan rack, 1U	
4	Two captive screws are used for each module to secure it to the sub rack ()	Components of the modules

2.4 Available Options

Description	Article Code
Cover plate (with handle) to cover unused slots, 1/6 x 19", 3U, colour RAL 7035	881-MEC-BPL.03.14.B
Temperature sensor KTY81-220 T092 with cable of 4m length	302-TMP-KTY.04

2.5 Cooling/ Air Flow Direction

The DC Power rack is forced cooled with a fan rack (1U) located below the rectifiers. The airflow is from bottom to top. The fans are monitored and speed controlled dependent on module temperature. To provide sufficient air flow, a minimum space (see item "A" in figure 3) of 2 HU (approx. 90 mm) is required between the top of the sub rack and the roof of the power supply cabinet as well as an unobstructed supply of air.

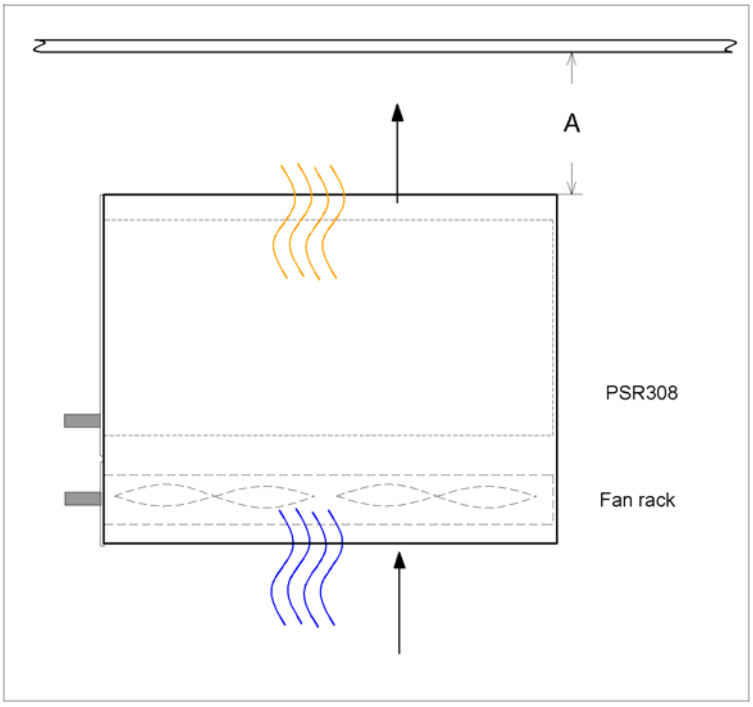

Figure 3) - Rack air flow

2.6 Fan Rack

The fan rack is equipped with two LED indicators which indicate the actual operating status of the fan rack.

The following functions are indicated with the front side LED's:

LED	Colour	Function
	green	Fan rack operating
	red	Fan rack failure

3. Handling

3.1 Storage

Power racks must be stored in a dry, dust free environment with a storage temperature in accordance with the specific technical data (see Section 5).

3.2 Commissioning

Carefully unpack the unit and mount it on your power supply cabinet (8 screws M6).

REMARK: Before assembling the modules, the CAN-Bus termination must be done on the empty rack (see the following sections)

Figure 4) - View into the empty DC power rack

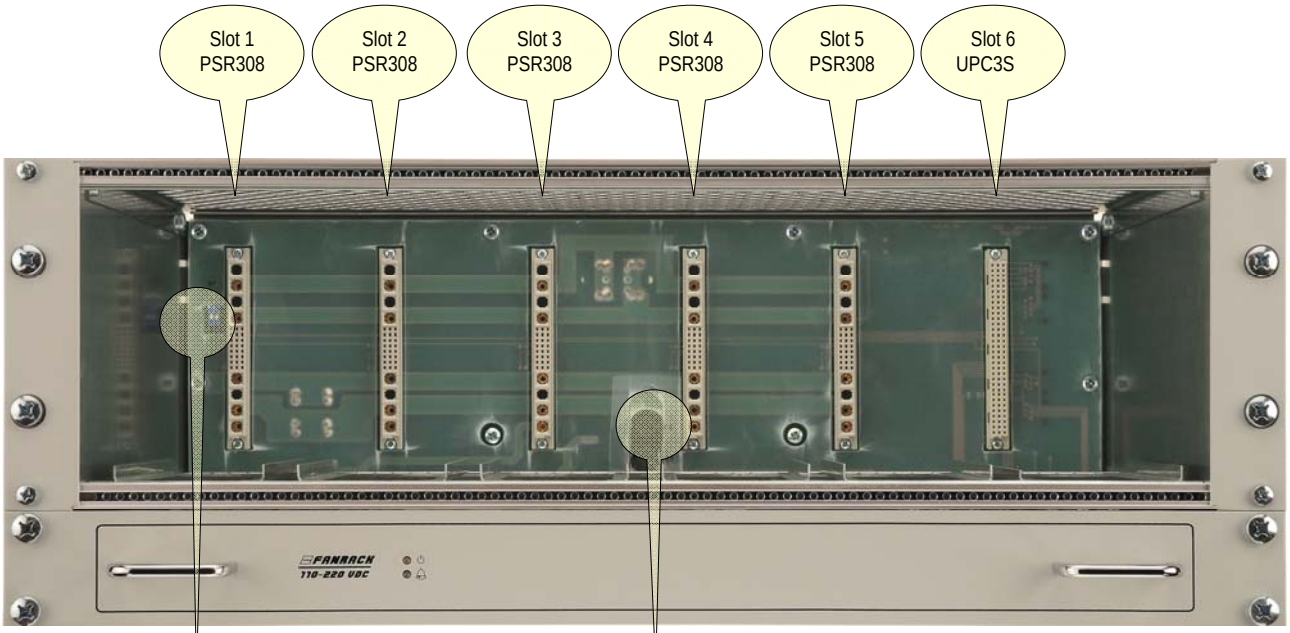

Figure 5) - CAN-Bus termination switches

For details see the section 3.2.2 “CAN-Bus Termination”

Figure 6) - Input fuses for the fan rack

(2 x 3.15A)

3.2.1 Communication Interface

The DCR PSR308 is equipped with a serial data interface in accordance with the Controller Area Network (CAN) specification.
Several power racks and/or modules in a system can be controlled and monitored through the CAN-Bus by a central DC controller unit UPC3.

Two CAN-Bus connectors (X5= CAN1; X6= CAN 2) are located at the rear of the sub rack, see figures 8) and 10).

3.2.2 CAN-Bus Termination

The CAN-Bus must be terminated at both ends. If no other power rack and/or module is connected (CAN 2 not used), the CAN termination resistor must be enabled by setting the CAN termination switch 1, 2 or both (shown in figure 5) to "ON" position.
If CAN 2 is connected too, the CAN termination resistor must be disabled by setting the CAN termination switches 1 **and** 2 to "OFF" position. For switch functions in detail, see the table below.

Table "CAN-Bus termination switch functions"

Switch 1 position	Switch 2 position	CAN-Bus termination resistor:
ON	OFF	Enabled
OFF	ON	Enabled
ON	ON	Enabled
OFF	OFF	Disabled

ATTENTION: Missing terminations or too many terminations within the system can disturb the CAN-Bus communication. No more than two termination resistors should be activated on one bus and these should be located at both ends of the bus.

3.2.3 Fitting of the modules

After you have completed the CAN-Bus termination setting, fit the modules into the slots of the sub rack.

- Fill the rack beginning with the left slot. Slots 1 – 5 are provided for the rectifiers PSR308, slot 6 is provided for the DC controller unit UPC3S.
- Unused PSR slots must be covered with cover plates (see section 2.4 "Available Options").

3.2.4 Low Voltage Rack: Rear View/Electrical Connectors

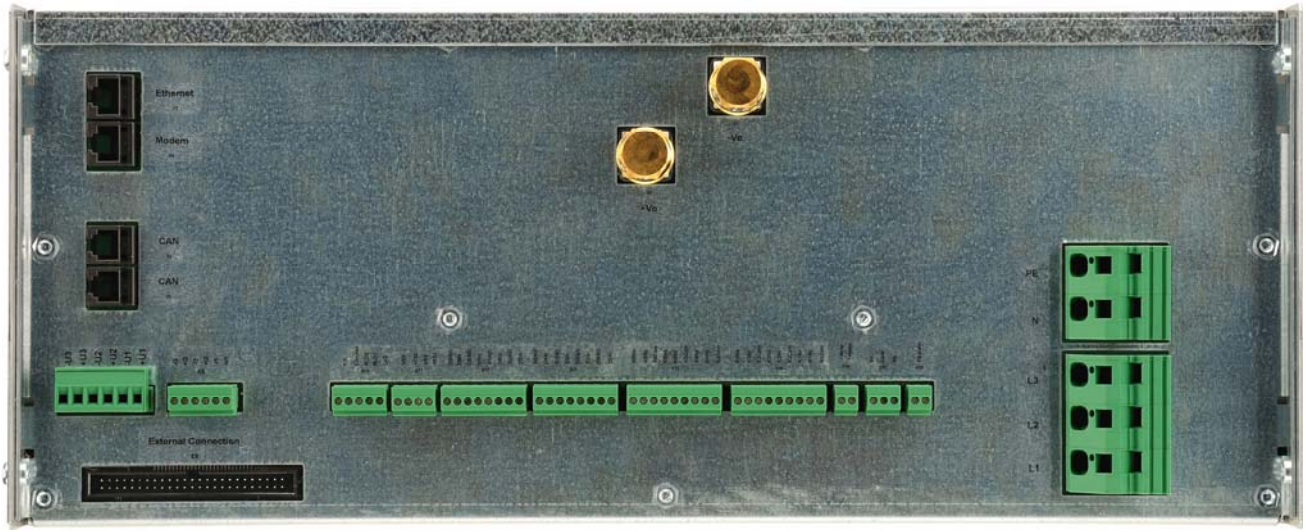

Figure 7) - Rear view of the low voltage (LV) rack

With the stickers affixed on the backplane, the connectors are labelled (X1 ... X18) for a clear identification.

To clarify: The drawing (see figure 8) shows the labelling of the terminal blocks.

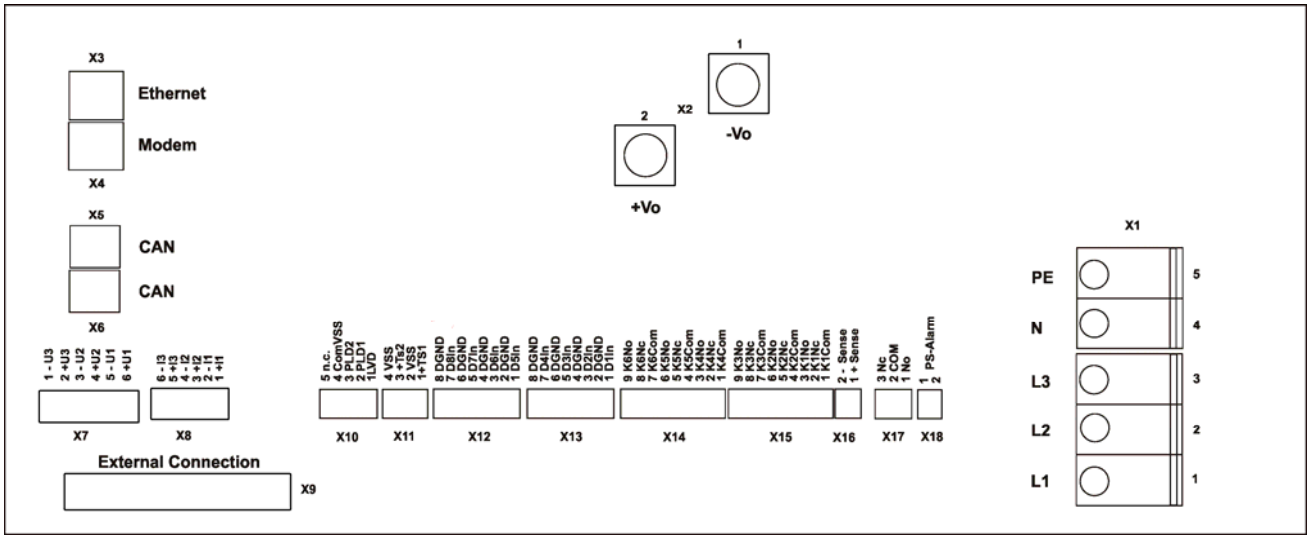

Figure 8) - Rear side connectors of the low voltage (LV) rack

Connect the input and output wires as well as the alarm wires to the rear connectors according to the connection tables on the following pages. All measuring, control and signalling wires of the system can be directly connected to the respective connectors of the power rack.

3.2.4.1 Connection tables LV rack

Assignment of the rear side connectors (**LV** version) according to figure 8).

Connector	Function	Recommended wire cross section @ Vi=	
X1	AC input	230VAC	120VAC
1	L1	2.5 mm²	2.5 mm²
2	L2	2.5 mm²	2.5 mm²
3	L3	2.5 mm²	2.5 mm²
4	N	2.5 mm²	2.5 mm² (#)
5	PE	2.5 mm²	2.5 mm²

(#) If the fully equipped rack is single-phase connected, the wire cross section of N must be 6 mm².

		Recommended wire cross section, calculated for a fully equipped rack (5 rectifiers)		
X2	DC output	24VDC	48VDC	60VDC
1	DC output (minus pole), connection with M10 bolt (brass)	70 mm²	35 mm²	25 mm²
2	DC output (plus pole), connection with M10 bolt (brass)	70 mm²	35 mm²	25 mm²
X3	Ethernet connector (RJ45)	Cord set		
X4	Modem connector (RJ45)	Cord set		
X5	CAN 1 (RJ11, 6-pole)	Cord set		
X6	CAN 2 (RJ11, 6-pole)	Cord set		
X7	Three voltage measurement inputs	Recommended wire cross section		
1	-V3 (tap voltage)	0.75mm²		
2	+V3	0.75mm²		
3	-V2 (system voltage) *	0.75mm²		
4	+V2	0.75mm²		
5	-V1 (battery voltage) *	0.75mm²		
6	+V1	0.75mm²		

* It is necessary to connect the battery voltage or the system voltage, because the battery voltage or the system voltage is to be used for the power supply of the DC controller unit UPC3S.

X8	Three current measuring inputs I1-I3, for shunts 60mV	
1	+I1	0.75mm²
2	-I1	0.75mm²
3	+I2	0.75mm²
4	-I2	0.75mm²
5	+I3	0.75mm²
6	-I3	0.75mm²

Connector	Function	Recommended wire cross section
X9**	External connection (for connection board, optional)	Cord set (ribbon cable, 50-pole)

****Commonly the external connector (X9) is not used because all measuring, control and signalling wires of the system can be directly connected to the respective connectors of the power rack. X9 is alternatively to be used if the connections should be completed over the connection board (optional).

X10	Control outputs for contactors LVD, PLD 1 + 2, optocoupler; max. 60V/20mA	
1	LVD (OC)	0.75mm²
2	PLD1 (OC)	0.75mm²
3	PLD2 (OC)	0.75mm²
4	COMVSS	0.75mm²
5	Not connected	
X11	Two temperature measuring inputs for sensors of type KTY81	
1	+ temperature sensor 1	0.75mm²
2	VSS (ground)	0.75mm²
3	+ temperature sensor 2	0.75mm²
4	VSS (ground)	0.75mm²
X12	Four digital inputs Din5-Din8	
1	Digital input 5	0.75mm²
2	DGND	0.75mm²
3	Digital input 6	0.75mm²
4	DGND	0.75mm²
5	Digital input 7	0.75mm²
6	DGND	0.75mm²
7	Digital input 8	0.75mm²
8	DGND	0.75mm²
X13	Four digital inputs Din1-Din4	
1	Digital input 1	0.75mm²
2	DGND	0.75mm²
3	Digital input 2	0.75mm²
4	DGND	0.75mm²
5	Digital input 3	0.75mm²
6	DGND	0.75mm²
7	Digital input 4	0.75mm²
8	DGND	0.75mm²
X14	Three potential free relay outputs, contact load: max. 60V/max. 500mA	
1	Relay 4 COM	0.75mm²
2	Relay 4 NC	0.75mm²
3	Relay 4 NO	0.75mm²
4	Relay 5 COM	0.75mm²
5	Relay 5 NC	0.75mm²
6	Relay 5 NO	0.75mm²
7	Relay 6 COM	0.75mm²
8	Relay 6 NC	0.75mm²
9	Relay 6 NO	0.75mm²

X15	Three potential free relay outputs, contact load: max. 60V/max. 500mA	
1	Relay 1 COM	0.75mm²
2	Relay 1 NC	0.75mm²
3	Relay 1 NO	0.75mm²
4	Relay 2 COM	0.75mm²
5	Relay 2 NC	0.75mm²
6	Relay 2 NO	0.75mm²
7	Relay 3 COM	0.75mm²
8	Relay 3 NC	0.75mm²
9	Relay 3 NO	0.75mm²
X16	Sensor input for voltage drop compensation	
1	+ sense	0.75mm²
2	- sense	0.75mm²
X17	Alarm (Fan rack) *	
1	Alarm NO	0.75mm²
2	Alarm COM[1]	0.75mm²
3	Alarm NC	0.75mm²
	[1] COM and NO are closed during failure.	
X18	Rectifier fault**	
1	Relay output (COM, NC)	0.75mm²
2	Relay output (COM, NC)	0.75mm²

* Contact load max. 60V_{DC}/max. 1A; 30V_{DC}/max. 5A; 240V_{AC}/max. 5A

**Contact load max. 60V_{DC}/max. 500mA

3.2.5 High Voltage Rack: Rear View/Electrical Connectors

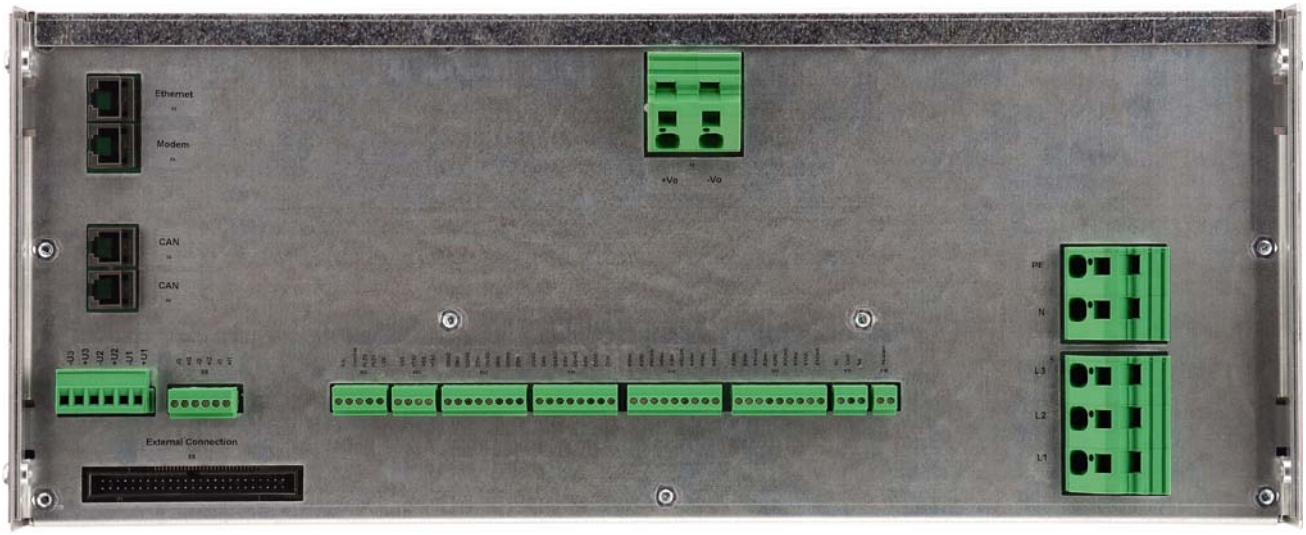

Figure 9) - Rear view of the high voltage (HV) rack

With the stickers affixed on the backplane, the connectors are labelled (X1 ... X17) for a clear identification.

To clarify: The drawing (see figure 10) shows the labelling of the terminal blocks.

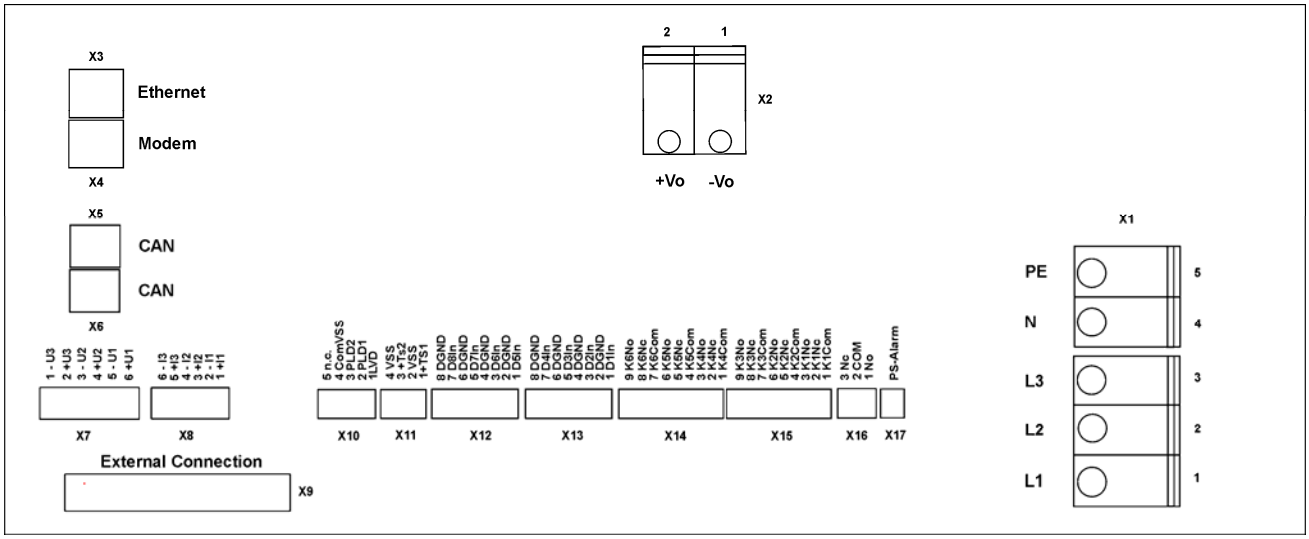

Figure 10) - Rear side connectors of the high voltage (HV) rack

Connect the input and output wires as well as the alarm wires to the rear connectors according to the connection tables on the following pages. All measuring, control and signalling wires of the system can be directly connected to the respective connectors of the power rack.

3.2.5.1 Connection tables HV rack

Assignment of the rear side connectors (**HV** version) according to figure 10).

Connector	Function	Recommended wire cross Section @ Vi=	
X1	AC input	230VAC	120VAC
1	L1	2.5 mm²	2.5 mm²
2	L2	2.5 mm²	2.5 mm²
3	L3	2.5 mm²	2.5 mm²
4	N	2.5 mm²	2.5 mm² (#)
5	PE	2.5 mm²	2.5 mm²

(#) If the fully equipped rack is single-phase connected, the wire cross section of N must be 6 mm².

		Recommended wire cross section, calculated for a fully equipped rack (5 rectifiers)	
X2	DC output	110VDC	220VDC
1	DC output (minus pole), terminal contact "Combicon"	10mm²	2.5mm²
2	DC output (plus pole), terminal contact "Combicon"	10mm²	2.5mm²
X3	Ethernet connector (RJ45)	Cord set	
X4	Modem connector (RJ45)	Cord set	
X5	CAN 1 (RJ11, 6-pole)	Cord set	
X6	CAN 2 (RJ11, 6-pole)	Cord set	
X7	Three voltage measurement inputs	Recommended wire cross section	
1	-V3 (tap voltage)	0.75mm²	
2	+V3	0.75mm²	
3	-V2 (system voltage) *	0.75mm²	
4	+V2	0.75mm²	
5	-V1 (battery voltage) *	0.75mm²	
6	+V1	0.75mm²	

* It is necessary to connect the battery voltage or the system voltage, because the battery voltage or the system voltage is to be used for the power supply of the DC controller unit UPC3S.

X8	Three current measuring inputs I1-I3, for shunts 60mV	
1	+I1	0.75mm²
2	-I1	0.75mm²
3	+I2	0.75mm²
4	-I2	0.75mm²
5	+I3	0.75mm²
6	-I3	0.75mm²

Connector	Function	Recommended wire cross section
X9**	External connection (for connection board, optional)	Cord set (ribbon cable, 50 pole)

****Commonly the external connector (X9) is not used because all measuring, control and signalling wires of the system can be directly connected to the respective connectors of the power rack. X9 is alternatively to be used if the connections should be completed over the connection board (optional).

X10	Control outputs for contactors LVD, PLD 1 + 2, optocoupler; max. 60V/20mA	
1	LVD (OC)	0.75mm²
2	PLD1 (OC)	0.75mm²
3	PLD2 (OC)	0.75mm²
4	COMVSS	0.75mm²
5	Not connected	
X11	Two temperature measuring inputs for sensors of type KTY81	
1	+ temperature sensor 1	0.75mm²
2	VSS (ground)	0.75mm²
3	+ temperature sensor 2	0.75mm²
4	VSS (ground)	0.75mm²
X12	Four digital inputs Din5-Din8	
1	Digital input 5	0.75mm²
2	DGND	0.75mm²
3	Digital input 6	0.75mm²
4	DGND	0.75mm²
5	Digital input 7	0.75mm²
6	DGND	0.75mm²
7	Digital input 8	0.75mm²
8	DGND	0.75mm²
X13	Four digital inputs Din1-Din4	
1	Digital input 1	0.75mm²
2	DGND	0.75mm²
3	Digital input 2	0.75mm²
4	DGND	0.75mm²
5	Digital input 3	0.75mm²
6	DGND	0.75mm²
7	Digital input 4	0.75mm²
8	DGND	0.75mm²
X14	Three potential free relay outputs, contact load: max. 60V/max. 500mA	
1	Relay 4 COM	0.75mm²
2	Relay 4 NC	0.75mm²
3	Relay 4 NO	0.75mm²
4	Relay 5 COM	0.75mm²
5	Relay 5 NC	0.75mm²
6	Relay 5 NO	0.75mm²
7	Relay 6 COM	0.75mm²
8	Relay 6 NC	0.75mm²
9	Relay 6 NO	0.75mm²

Connector	Function	Recommended wire cross section
X15	Three potential free relay outputs, contact load: max. 60V/max. 500mA	
1	Relay 1 COM	0.75mm²
2	Relay 1 NC	0.75mm²
3	Relay 1 NO	0.75mm²
4	Relay 2 COM	0.75mm²
5	Relay 2 NC	0.75mm²
6	Relay 2 NO	0.75mm²
7	Relay 3 COM	0.75mm²
8	Relay 3 NC	0.75mm²
9	Relay 3 NO	0.75mm²
X16	Alarm (Fan rack)*	
1	Alarm NO	0.75mm²
2	Alarm COM[1]	0.75mm²
3	Alarm NC	0.75mm²
	[1] COM and NO are closed during failure.	
X17	Rectifier fault**	
1	Relay output (COM, NC)	0.75mm²
2	Relay output (COM, NC)	0.75mm²

* Contact load max. 60V_{DC}/max. 1A; 30V_{DC}/max. 5A; 240V_{AC}/max. 5A

**Contact load max. 60V_{DC}/max. 500mA

3.2.6 Schematic Diagram (Example of use)

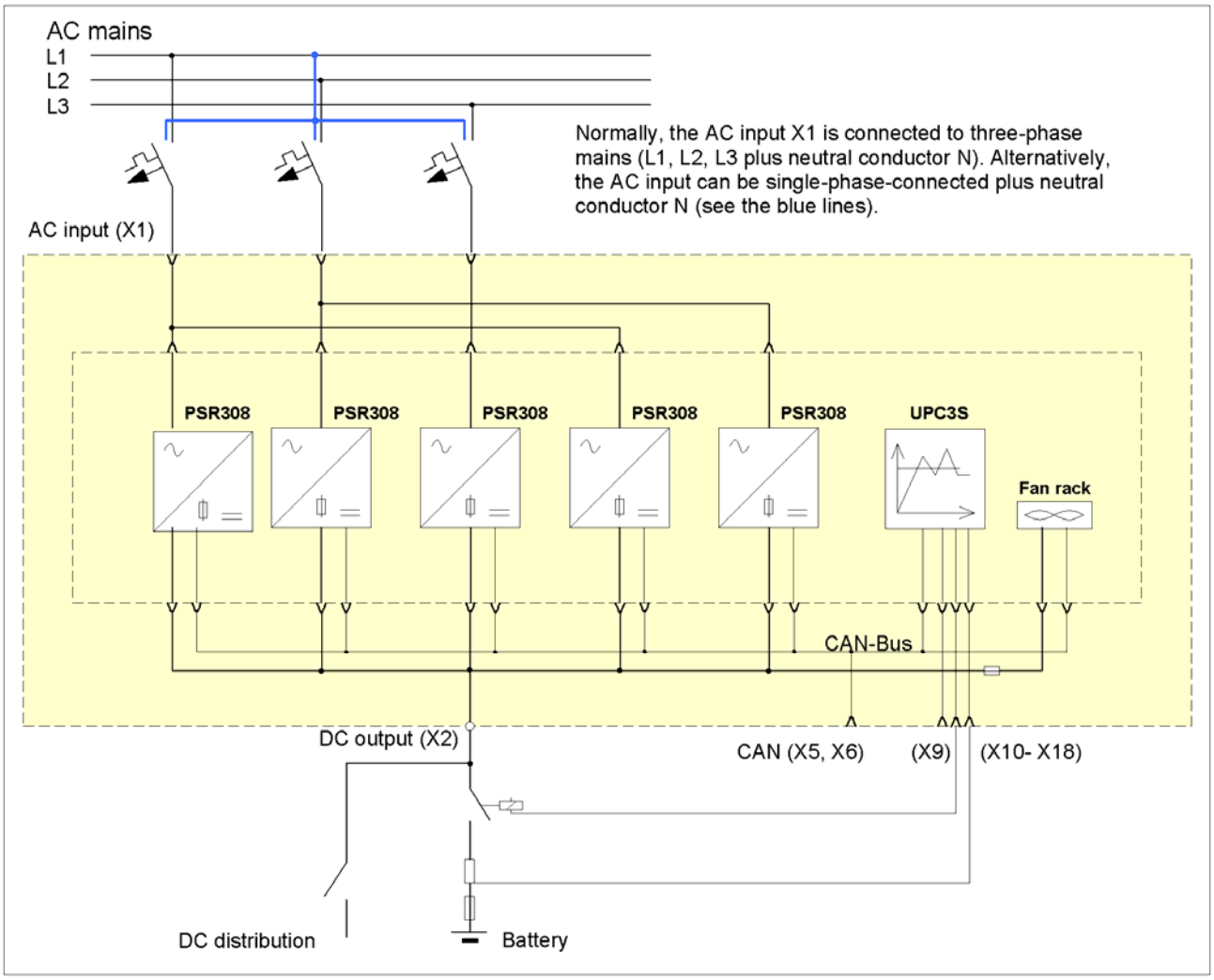

Figure 11) - Schematic diagram

REMARK: We recommend an individual fuse for each input.

Recommended input fuses: 16A MCB, characteristic “B”

4. Maintenance

In general, the system is maintenance-free.
A yearly inspection with following checks is recommended:

- Correct fan operation
- Mechanical inspection
- Removal of dust and dirt
- Check for internal dust or humidity

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 system.

For the exchange of defective fans in the fan rack, an additional instruction manual is available on request.

5. Technical Specifications

Type designation	**DCR PSR308-4.0 LV**	**DCR PSR308-4.0 HV**
Article code	**102-308-517.LV02**	**102-308-517.HV02**
Main Data:		
Devices	Designed for the use of 1 up to max. 5 rectifiers of series PSR308 (Vo= 24; 48; 60V_{DC}) and 1 DC controller UPC3S (24; 48/60V version)	Designed for the use of 1 up to max. 5 rectifiers of series PSR308 (Vo= 110; 220V_{DC}) and 1 DC controller UPC3S (110; 220V version)
Input voltage	100 up to 250V_{AC}	←
Internal input fuses	There are no internal fuses, we recommend an individual fuse for each input (16A MCB, characteristic “B”)	
Nominal output voltage	24, 48, 60V_{DC} (single-output), depends on the used rectifiers	108, 216V_{DC} (single-output), depends on the used rectifiers
Max. output current (rack fully equipped with 5 rectifiers)	150A_{DC} @24V_{DC} / 83.5A_{DC} @48V_{DC} / 67.5A_{DC} @60V_{DC}	37.5A_{DC} @108V_{DC} / 18.5A_{DC} @216V_{DC}
Output power	From 800 to a maximum of 4000W @ Vi >173V_{AC} (From 600 to a maximum of 3000W @ Vi ≤173V_{AC})	
Electric connectors:		
AC input	3-phase input (L1, L2, L3), N, PE; alternatively connectable to single-phase	
DC output	1 x output (screw terminal, M10)	1 x output (terminal contact)

Type designation	DCR PSR308-4.0 LV	DCR PSR308-4.0 HV
Signalling contacts	Rectifier fault: 1 x potential free relay output COM, NC; contact load max. 60V_{DC}/max. 500mA Fan alarm: 1 x relay output COM, NC, NO; contact load max. 60V_{DC}/max. 1A; 30V_{DC}/max. 5A; 240V_{AC}/max. 5A	
Communication interfaces	2 x isolated CAN-Bus connectors (RJ11, 6-pole), 1 x Ethernet (RJ45), 1 x Modem (RJ45)	
Voltage measurement inputs	3 x (V1, V2, V3); battery voltage, system voltage, tap voltage of the battery	
Sensor input	1 x for voltage drop compensation	Not available
Temperature sensor inputs	2 x for sensors KTY81	←
Current measurement inputs	3 x (I1, I2, I3), for shunts 60mV	←
Control outputs	Optocoupler outputs for contactors LVD, PLD 1 + 2; max. 60V/20mA	
Relay outputs	6 x potential free, contact load max. 60V_{DC}/max. 500mA	
Digital inputs	8 x (Din 1-Din 8)	←
External connection	1 x 50-pole terminal block for the connection of all measuring, control and signalling lines of the system via the connection board (optional) to the control unit UPC3S	
Environmental:		
Max. installation altitude	≤1500 m	←
Ambient temperature	operation: -20°C...+55°C; storage: -40°C...+85°C	
Audible noise	≤ 45dB(A) at 1m distance	←
Mechanical:		
Type of construction	Sub rack, 19”, 4U	←
Cooling	Forced cooled with integrated fan rack, temperature-regulated and monitored	
Surfaces	powder coating RAL 7035 (front only), constructive parts: anodized metal	
W/H/D	483/178/318mm (19”, 4U))	
Min. installation depth	368mm plus 25.5mm length of the module handle	
Weight	approx. 4.8 kg (excluding PSR and UPC3S modules)	

Applicable standards:

Mechanical construction	acc. to VDE 0160 edition 5.88 chapter 7.2.2
Protection class	IP20 ←
Climatic conditions	acc. to IEC 721-3-3 class 3K3/3Z1/3B1/3C2/3S2/3M2
RFI suppression / immunity	CE-label, (EN50081-1, EN55011/55022 class „B“, EN50082-2, EN61000-4 part 2/3/4/5)
Compliance to safety standards	acc. to EN60950-1, VDE0100 T410, VDE0110, EN60146

5.1 Dimensional Drawings:

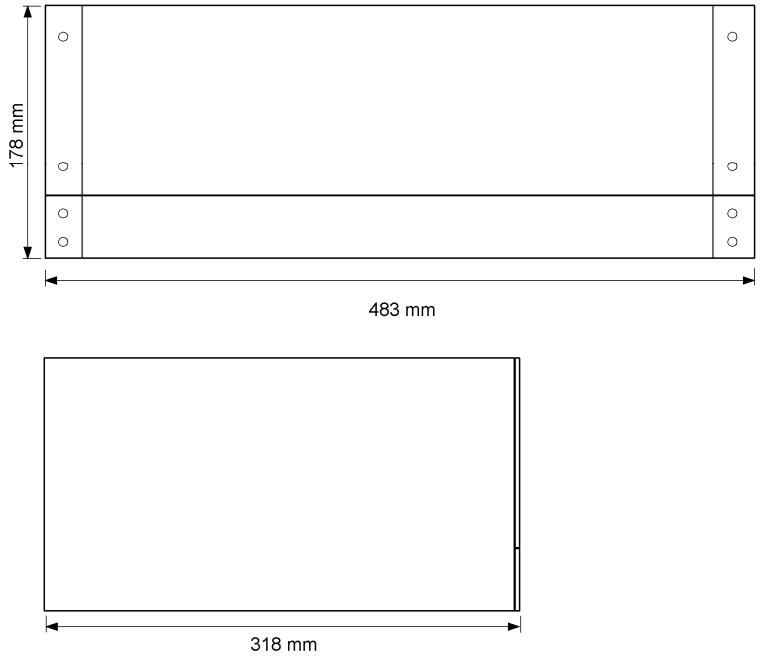

Figure 12) - Rack dimensions

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