

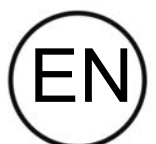
Switching power supply

AC2000 N1
AC3000 N1
DC2000 N1
DC3000 N1

Operating instructions

AEG Power Solutions GmbH, Warstein-Belecke
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**AEG Power Solutions GmbH**

Emil-Siepmann-Strasse 32
59581 Warstein
Germany



+49 2902 763 100

Fax: +49 2902 763 645

E-Mail: service.de@aepps.com

Internet: <http://www.aegps.com>

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1. SAFETY REGULATIONS

This chapter provides guidance on all safety-related issues. All safety measures, safety equipment and residual hazards of the appliance are described. Read this chapter carefully before carrying out any work on the appliance.

1.1 Information symbols

This section explains which symbols are used in the operating instructions.



Icon	Meaning
	Notes are marked with a blue "i". They contain important information on the life phases of the system.
	Environmental regulations are highlighted with a dustbin. Environmental regulations are references to government regulations that must be observed, particularly when disposing of operating materials.

Table 1 - Information symbols in the operating instructions

1.2 Appropriate use

Intended use

Typical applications include use as a mains power supply or as a secure power supply with a battery connected in parallel.

Any other use or modification is not in accordance with the intended use. Persons may be injured or killed if the device is used for purposes other than those for which it is intended.

Unauthorized modifications, manipulations and changes to the system and its safety equipment are not permitted without the manufacturer's approval. Any resulting damage is excluded from liability.

Plant safety

The system is safe to operate if the operating instructions, the operating and system-specific specifications and the regulations of the employers' liability insurance association are observed.

Installation site

The system may only be installed in rooms with restricted access. The ambient conditions must be dry and frost-free.

1.3 Obligations of the operator

The safety of personnel as well as the safety, function and availability of the system depend on compliance with the safety instructions. The safety instructions must always be observed.

Safety of personnel

Select personnel according to qualifications.

Instruct staff to comply with the regulations.

Provide the personal protective equipment as well as user information and instructions to the specialist and transport personnel.

Inform the specialist personnel regularly about all protective measures and document this.

Inform the specialist personnel of the operation and location of the fire extinguishing equipment.

1.4 Safety of the system

Only operate the system in a technically perfect condition in accordance with the electrical technical regulations. If the operating behaviour of the system changes, immediately check for faults.

Keep all safety and warning signs on the system in a complete and easily recognizable condition.

Place fire extinguishing equipment in the immediate vicinity of the system.

Protect the system from external influences such as moisture, swarf and similar.

Keep the system freely accessible.

1.5 Requirements for personnel

Qualification

All work may only be carried out by trained specialist personnel using the tools, devices and test equipment provided and in good working order.

Specialist personnel are qualified electricians who are able to assess the work assigned to them and recognize potential hazards on the basis of their specialist training, knowledge and experience as well as their knowledge of the relevant regulations.

Transportation and storage may only be carried out by transport personnel. Transport personnel are transport specialists who have the necessary qualifications and knowledge.

To protect personnel and the system, it is essential that the safety instructions listed are observed. The specialist and transport personnel must know and observe these safety instructions.

Duties of the specialist personnel

Observe the following safety instructions.

When working in and on electrical installations, fixed rules apply to prevent electrical accidents. These rules are summarized in the five safety rules. Observe the five safety rules:

5 Safety rules

1. Disconnect.
2. Secure against reconnection.
3. Check that all poles are de-energized.
4. Earth, close earth switch, short-circuit.
5. Cover or cordon off neighbouring live parts.

After completing the work, cancel the five safety rules in reverse order.

Read the operating instructions. Memorize the safety regulations.

Observe the regulations:

- BGV A1 (principles of prevention),
- BGV A3 (Electrical installations and equipment),
- BGV A8 (safety and health protection labelling at the workplace).

Report any damage to the system and the electrical equipment to the operator.

Only use spare parts approved by the manufacturer for maintenance and repair work.

Use the personal protective equipment (PPE) as intended.

Check that the PPE is in good condition and report any defects to the operator.

If you have long hair, wear a hairnet and no loose clothing or jewellery.

Refit the protective devices after all work on the system.

1.6 Duties of the transport personnel

Observe the following safety instructions during transportation.

Read the operating instructions. Memorize the safety regulations.

Observe the regulations:

- BGV D8 (winches, lifting and pulling devices)
- BGV D27 (Industrial trucks)

Use the personal protective equipment (PPE) as intended.

Check that the PPE is in good condition and report any defects to the operator.

Report any transport damage to the system to the operator.

1.7 Type plate

You will find information on the type plate:

- Series (head)
- Type
- Input/Output
- Type of current
- Nominal frequency
- Nominal voltage
- Rated current
- Year of construction
- CNF no.
- Serial no. (device number)
- CE mark

Example of a nameplate:



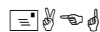
Illustration 1: Example nameplate.

2. IDENTIFICATION

2.1 Product brand and type designation

Type designation:	Part number:	Input voltage:	Output voltage:	Output current:
AC2000 N1 E230 G24/65 BWrg-Cü	10005614	230 V AC	24 V DC	65 A
DC2000 N1 G220 G26/65 Wrg-Cü	10005613	220 V DC	26 V DC	65 A
AC3000 N1 E230 G24/100 BWrg-Cü	10005616	230 V AC	24 V DC	100 A
DC3000 N1 G220 G26/100 Wrg-Cü	10005615	220 V DC	26 V DC	100 A

2.2 Name and address of the manufacturer, supplier, distributor



Power Solutions GmbH
Emil-Siepmann-Strasse 32
59581 Warstein
Germany



+49 2902 763 100

Fax: +49 2902 763 645

E-Mail: service.aegps@aeqps.com

Internet: <http://www.aeqps.com>

2.3 Declaration of conformity with the product standards

CE certified in accordance with Directive 2014/35/EU (LVD) and 2014/30/EU (EMC)

3. PRODUCT DESCRIPTION

3.1 General functions and area of application, intended use

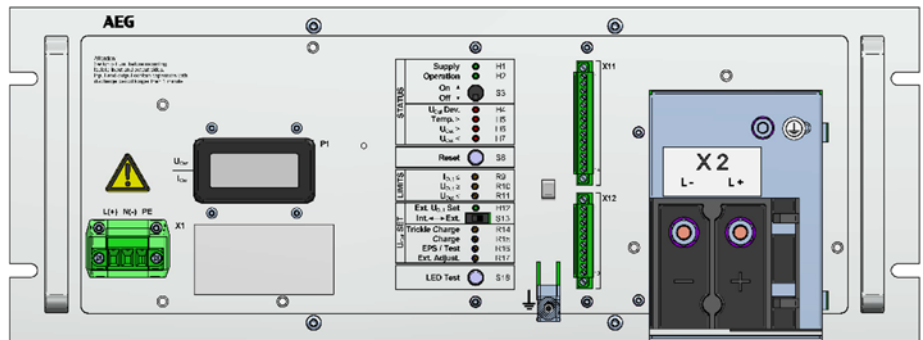


Illustration 2: Front view with terminal cover removed.

The AC2000 N1 / DC2000 N1 / AC3000 N1 / DC3000 N1 switched-mode power supplies (SNT) provide a highly reliable DC voltage at the output, which is suitable for direct or battery-buffered supply of critical loads.

Thanks to the fanless design, a high level of reliability is achieved with low maintenance requirements. Despite the absence of fans, the SNTs are very compact with 19" 4 height units (HE) and up to 3.2 kW output power, thanks to the use of state-of-the-art silicon carbide MOSFETs.

The analog circuit technology - i.e. the absence of freely programmable components and digital interfaces to the outside - contributes to a further increase in reliability and availability. This device therefore also scores highly in terms of future cybersecurity challenges.

Several devices can be connected in parallel to increase system reliability and performance. Thanks to the IU characteristic curve with constant current limitation and simple switching between several setpoints, the device is also suitable for charging batteries directly.

Another feature is the double short-circuit current to reliably trigger fuses in the event of a short circuit. The DC series is equipped with this option as standard, for the AC series it is available on request.

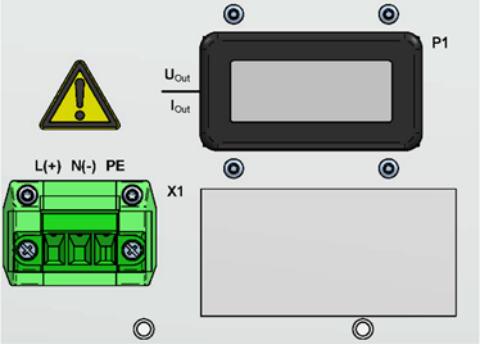
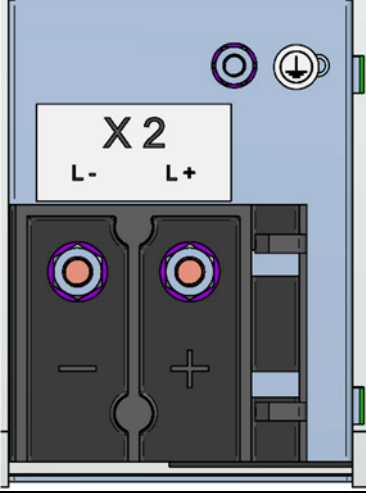
External monitoring or external control is possible with the signals fed out at the remote signal connections. The external control unit PSC100 N1 is optionally available for this purpose. A system-side connection to control rooms or PLC controls is also possible. The strict separation between control and monitoring functions should be emphasized here.

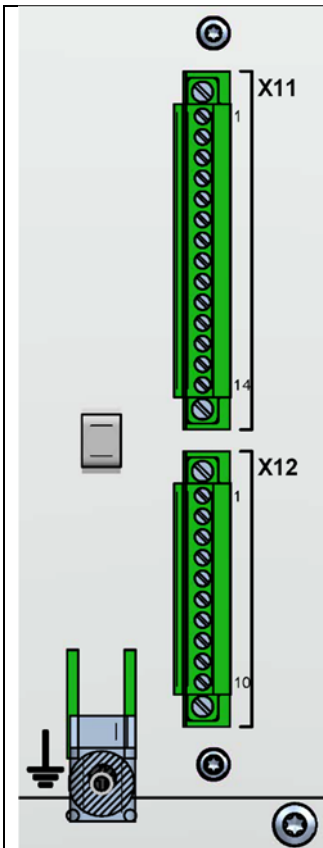
Thanks to its good dynamic control characteristics for input voltage changes and load jumps, this switched-mode power supply is superior to line-commutated thyristor rectifiers for mains transients, frequency jumps and dynamic loads.

The device is supplied as a ready-to-connect unit. The connections are accessible from the front for easy maintenance. The operating and display elements are built into the front of the device.

For further technical data, please refer to chapter 4.

3.2 Overview of the front panel elements

	<p>Pluggable terminal X1 Mains input plug. The polarity in brackets applies to devices in the DC series. (→ Section 5 for installation instructions)</p> <p>LCD P1 Display of the current actual values of voltage and current.</p>
	<p>Connection bolt X2 DC output U_{Out}.</p> <p>Additional earthing connection point To be used if the protective conductor connection via X1 is not sufficient. (→ Section 5 for installation instructions)</p>



Remote signal connector X11



















1	Ground external setpoint specification	
2	+	External voltage setpoint specification (→ section 6.3.3)
3	-	
4	+	External current setpoint specification (→ section 6.3.3)
5	-	
6	+7.5 V internal reference voltage (→ section 6.3.3)	
7	External on/off (jumper = device on), Delivery state with bridge	
8		
9	+	External sensing line
10	-	
11	Do not prove	
12	Collective fault relay NC contact (12-13 = fault)	
13	Collective fault relay changeover contact	
14	Collective fault relay NO contact (13-14 = normal operation)	

Remote signal connector X12

1	Voltage setpoint switching 1 (jumper = selected)	
2		
3	Voltage setpoint switching 2 (Bridge = Selected)	
4		
5	Actual value output as 0-10 V (bridge = 0-10 V)	
6		
7	+	Actual value output Voltage
8	-	
9	+	Actual value output current
10	-	

Shield clamp

Use with shielded control cables.
(→ section 5.5.3)

STATUS	Supply		H1
	Operation		H2
	On		S3
	Off		
	U_{Out} Dev.		H4
	Temp. >		H5
	U_{Out} >		H6
U_{Out} <		H7	
Reset			S8
LIMITS	$I_{Out} \leq$		R9
	$U_{Out} \geq$		R10
	$U_{Out} \leq$		R11
U_{Out} SET	Ext. U_{Out} Set		H12
	Int. ← → Ext.		S13
	Trickle Charge		R14
	Charge		R15
	EPS / Test		R16
	Ext. Adjust.		R17
LED Test			S18

LED H1 (Supply)
Display: Mains voltage supply within the tolerance range.

LED H2 (Operation)
Display: Power output.

Switch S3 (On/Off)
Switch the device on/off.

LED H4 (U_{Out} Dev.)
Display: Deviation between setpoint and actual value, indicator for current limitation.

LED H5 (Temp. >)
Warning: Overtemperature.

LED H6 (U_{Out} >)
Fault: DC output overvoltage.

LED H7 (U_{Out} <)
Fault: DC output undervoltage.

Button S8 (Reset)
Resets the device and the monitoring.
(→ section 6.2.8)

Potentiometer R9 (I_{Out})
Setting DC output current limitation.

Potentiometer R10 ($U_{Out} \geq$)
Setting overvoltage monitoring DC output.
(→ section 6.2.5)

Potentiometer R11 ($U_{Out} \leq$)
Setting undervoltage monitoring DC output.
(→ section 6.2.5)

LED H12 (Ext. U_{Out} Set)
Display: External voltage setpoint setting active.

Switch S13 (Int./Ext.)
Internal/external voltage setpoint value changeover.
(→ section 6.3.3)

Potentiometers R14-R17 (U_{Out} Set)
Setting/adjusting the voltage setpoints.
(→ section 6.3.4)

Push-button S18 (LED test)
Test of all LEDs.

Note: The LEDs in the illustration show the European colour scheme (Asian colour scheme is available on request → section 6.5).

4 TECHNICAL DATA

4.1 General technical data

Inrush current.....	≤ Current consumption input current	
Required mains fuse gL	16 A	
Input fuse	Internal HRC fuse	
Characteristic curve	IU characteristic curve according to DIN 41772	
Emitted interference.....	according to EN 61000-6-3	
- Conducted interference	according to EN 61204-3 for residential, commercial and light-industrial environments	
- Radiation	according to EN 61204-3 for residential, commercial and light-industrial environments	
Interference immunity	according to EN 61000-6-2 for industrial environments	
- Enclosure.....	ESD test acc. to EN 61000-4-2: 6 kV contact 8 kV air discharge HF field acc. to EN 61000-4-3: 10 V/m (80 MHz - 1 GHz)	
- Power cables	Burst test acc. to EN 61000-4-4: 2 kV Surge test acc. to EN 61000-4-5: 2 kV conductor against ground 1 kV conductor against conductor	
- Control cables.....	Burst test acc. to EN 61000-4-4: 2 kV Surge test acc. to EN 61000-4-5: 2 kV conductor against ground	
Functional extra-low voltage	with safe isolation according to IEC 60364-4-41	
Isolation (1 sec.)	Input – Output:	2,83 kV DC
	Input – Case:	2,83 kV DC
	Output – Case:	0,71 kV DC
	Remote signalling – Output:	1,75 kV DC
Dynamic behaviour	≤ ± 5 % with sudden load changes between 10 %-90 %-10 % rated output current (settling time $t \leq 1$ ms)	
Short-circuit behaviour	permanent short-circuit proof, limited short-circuit current (→ type overview section 4.2)	

Monitoring Basic settings

.....	Description of the monitoring: (→ section 6) - Mains undervoltage with switch-off, self-acknowledging - Mains overvoltage with switch-off, self-acknowledging - Overtemperature (→ Type overview, section 4.2) - DC undervoltage (→ Type overview section 4.2) - DC overvoltage (→ Type overview section 4.2)
Displays	- Mains input and operation, displayed by LEDs - Internal/external U setpoint, displayed by LED - U_{Out} and I_{Out} , displayed via LCD digital display - Overvoltage and undervoltage output monitoring, displayed by LEDs - Overtemperature monitoring, displayed by LED - Deviation monitoring between actual value and setpoint, displayed by LED
External functions -	Collective fault signal via potential-free relay contact - ON/OFF via external potential-free contact - External sensing line output voltage U_{Out} , output current I_{Out} - External setpoint specification 0 to 4 V for U_{Out} , with LED display - External setpoint specification 0 to 4 V for I_{Out} (available on request, internal device setting) - Selectable setpoint specification from four different preset setpoints (trickle charging, heavy charging, NEA, manual charging)
Parallel operation, Number	unlimited, load sharing approx. 10 % of the nominal system current
Type	19" full insert
Installation position	Horizontal
Distance between devices	3 U (134 mm), air baffle required between the devices
Protection class	IP 20
Protection class	Protection class 1
Cooling.....	Air self-cooling
Sound pressure level.....	≤ 30 dB(A) (at a distance of 1 m) according to EN ISO 3744

Environmental conditions

Operation	IEC 60721 Part 3-3 Class 3K22 / 3Z1 / 3B2 / 3C2 / 3S6 / 3M11 Condensation not permitted. Ambient temperature Dependent on type (→ section 4.2 Type overview and section 4.3 Derating).
Transportation.....	IEC 60721 Part 3-2 Class 2K12 / 2B2 / 2C2 / 2S5 / 2M4 Protected in suitable packaging. -25 °C to 70 °C
Storage	IEC 60721 Part 3-1 Class 1K21 / 1B2 / 1C2 / 1S12 / 1M11 Condensation not permitted. -25 °C to 55 °C
Installation altitude	up to 1000 m above sea level, above that power reduction
Degree of soiling.....	2
Mechanical strength and vibration resistance	EN 60068-2-6
Front panel.....	Anodized aluminium
Chassis	galvanized sheet steel
Mounting in the cabinet.....	4x M6 screws (not included in the scope of delivery)
MTBF according to	MIL-HDBK-217 223,178 h at 25 °C

Connection technology (* = included in the scope of delivery)

Mains connection X1.....	Plug-in terminal, screw-fastened* up to 4 mm ² (plastic-insulated wire end ferrule) max. 0.6 Nm
DC output X2 (U _{Out}).....	Connection threaded bolt M8 with nuts* max. 6 Nm
Protective conductor	Connection threaded bolt M6 with nut* max. 4.4 Nm
Signal interface X11.....	Plug-in and screw-on terminal block*, 14-pole up to 0.5 mm ² (plastic-insulated wire end ferrule) up to 1.5 mm ² (bare wire end ferrule)
Signal interface X12.....	Plug-in and screw-on terminal block*, 10-pole up to 0.5 mm ² (plastic-insulated wire end ferrule) up to 1.5 mm ² (bare wire end ferrule)

Collective fault relay.....	Potential-free with safe isolation to the DC output, contact load capacity: max. 250 V AC / 8 A (resistive) max. 60 V DC / 0.6 A DC max. 24 V DC / 4 A DC Version as gold-plated signal contact
Ext. analog setpoint specification.....	<u>No</u> potential separation to DC output X2,
Ext. sensing line.....	<u>No</u> electrical isolation to DC output X2, Cables must be twisted or shielded
Ext. on/off.....	Floating to DC output X2, connected to potential of remote signalling
Ext. characteristic switching.....	Potential-free to DC output X2, connected to potential of remote signalling
Analog actual value output	Scaling to - actual voltage value: 35 V = 20 mA or 10 V - Actual current value: 100 A = 20 mA or 10 V Accuracy: - Actual voltage value: $\pm 2\%$ of nominal voltage (for the setting range) - Actual current value : $\pm 2\%$ of nominal current (for 10 - 100 % nominal current) Type of output: 0 - 20 mA 0 - 10 V (optionally via switchable 500 Ω load) Remote supply <u>not</u> permitted! Potential-free to DC output X2, Connected to potential of remote signalling
LCD display	Accuracy $\pm 2\%$ in relation to the nominal value
RoHS	Compliant with exception acc. to Art. 5 and 6

Note: Nominal values (rated voltage/rated current) depend on the type and are listed in the following type overview.

4.2 Type overview: Technical data

Type	AC2000 N1 E230 G24/65 BWrg-Cü	AC3000 N1 E230 G24/100 BWrg-Cü	DC2000 N1 G220 G26/65 Wrg-Cü	DC3000 N1 G220 G26/100 Wrg-Cü
Part number	10005614	10005616	10005613	10005615
Nominal input voltage	230 V AC \pm 15 %		220 V DC + 35 % / - 15 %	
Frequency	47 to 63 Hz		DC	
Current consumption in nominal operation	8,1 A	12,4 A	8,1 A	12,5 A
Earth leakage current	t.b.d.		< 3,5 mA	
Output voltage Set value	(for 12 cells)		(Reduction for diode test in characteristic curve EPS)	
Trickle charging (2.23 V/cell):	26,8 V \pm 1 %		26,0 V \pm 1 %	
Charging (2.4 V/cell):	28,8 V \pm 1 %		26,0 V \pm 1 %	
EPS (2.1 V/cell):	25,2 V \pm 1 %		24,4 V \pm 1 %	
Ext. Adjust:	31,3 V \pm 1 %		26,0 V \pm 1 %	
Adjustment range:	17 to 35 V		17 to 35 V	
Output current Set value	65 A \pm 2 %	100 A \pm 2 %	65 A \pm 2 %	100 A \pm 2 %
Adjustment range (take derating into account) ¹	10 to 65 A	10 to 100 A	10 to 65 A	10 to 100 A
Short-circuit current	1-fold (permanently short-circuit proof) <i>On request: 2-fold for \geq 1 sec</i>		2-fold for \geq 1 sec, then 1-fold (permanently short-circuit-proof)	
Voltage ripple and noise (peak-to-peak)	< 0,5 %			
Battery type	11-13 Pb cells		---	
Power factor	\geq 0,99		---	
THDi at nominal load	< 9%	< 7 %	---	
Efficiency	typ. 94 %			
Monitoring:				
Mains undervoltage	On: \geq 190 V AC / Off: \leq 180 V AC \pm 5 % ²		On: \geq 175 V DC / Off: \leq 165 V DC \pm 5 %	
Mains overvoltage	On: \leq 265 V AC / Off: \geq 275 V AC \pm 5 % ²		On: \leq 300 V DC / Off: \geq 320 V DC \pm 5 %	
Mains transients	Surge & Burst \rightarrow see section 4.1		Surge & Burst \rightarrow see section 4.1 In addition: 1.6 times the rated input voltage (3 s)	

Type	AC2000 N1 E230 G24/65 BWrg-Cü	AC3000 N1 E230 G24/100 BWrg-Cü	DC2000 N1 G220 G26/65 Wrg-Cü	DC3000 N1 G220 G26/100 Wrg-Cü
DC undervoltage response value Adjustment range	$\leq 24 \text{ V DC} \pm 2 \%$ 18 to 30 V DC Self-resetting warning without switch-off (response delayed $t \leq 2 \text{ s}$)		$\leq 22.8 \text{ V DC} \pm 2 \%$ 18 to 30 V DC Switch-off with latching (response delayed $t \leq 2 \text{ s}$)	
DC overvoltage response value Adjustment range	$\geq 32.0 \text{ V DC} \pm 2 \%$ 18 to 35 V DC Switch-off with latching (response delay $t \leq 30 \text{ ms}$)		$\geq 29 \text{ V DC} \pm 2 \%$ 18 to 35 V DC	
Overtemperature warning	Warning via LED and collective fault relay			
Overtemperature shutdown	Self-resetting switch-off		Shutdown with self-holding	Self-resetting switch-off
Mechanics and environment				
Dimensions (mm) (W x H x D) ³	483 x 177 x 206 mm (19" x 4 U)			
Weight	11 kg			
Ambient temperature during operation, at the air inlet of the appliance ⁴	0 - 55 °C	0 - 45 °C	0 - 55 °C	0 - 45 °C

Subject to change without notice.

¹ Derating for AC3000 N1 and DC3000 N1: From 32 V / 100 A to 35 V / 91.5 A (3.2 kW)
(→ section 4.3.1)

² with sinusoidal mains voltage

³ Depth from rear edge of front panel (without handles, plugs and controls)

⁴ Condensation not permitted, take derating into account (→ section 4.3.2)

4.3 Derating

The derating must be maintained under all circumstances by designing the system accordingly in order to obtain the optimum service life from the appliance.

4.3.1 Output voltage/current derating

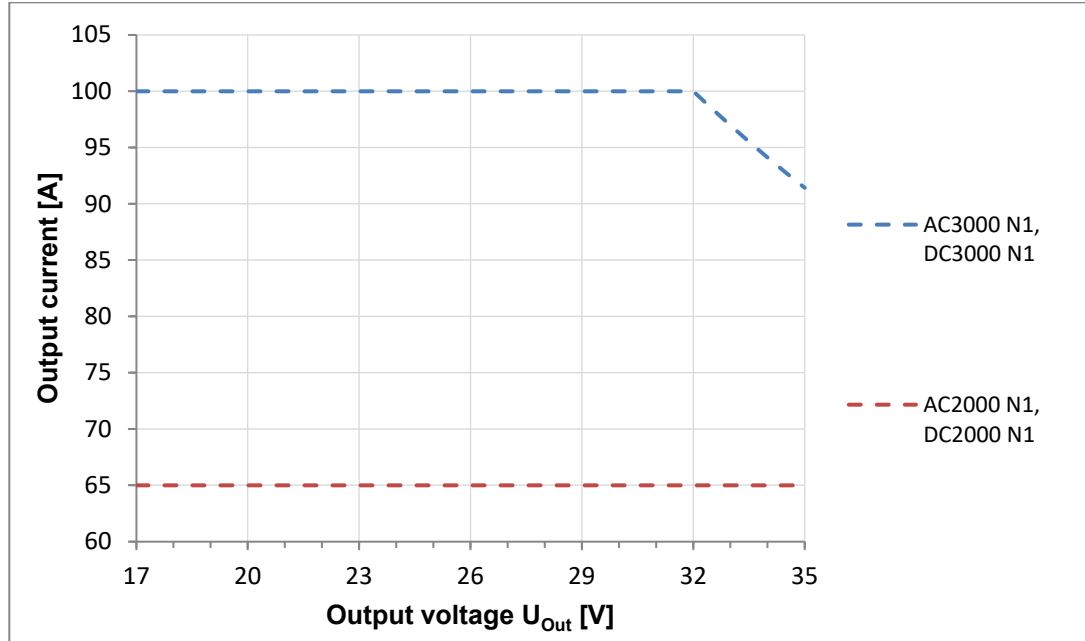


Illustration 3: Output voltage/current derating.

Note: The output current can be limited for all voltage setpoints by setting potentiometer R9. There is no automatic derating.

4.3.2 Ambient temperature derating

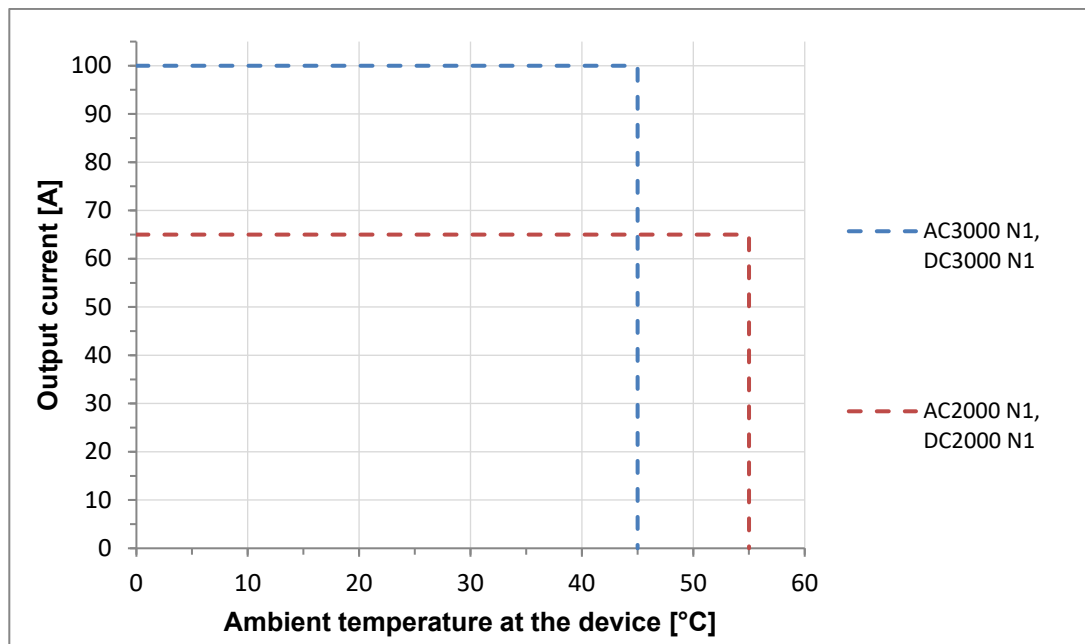
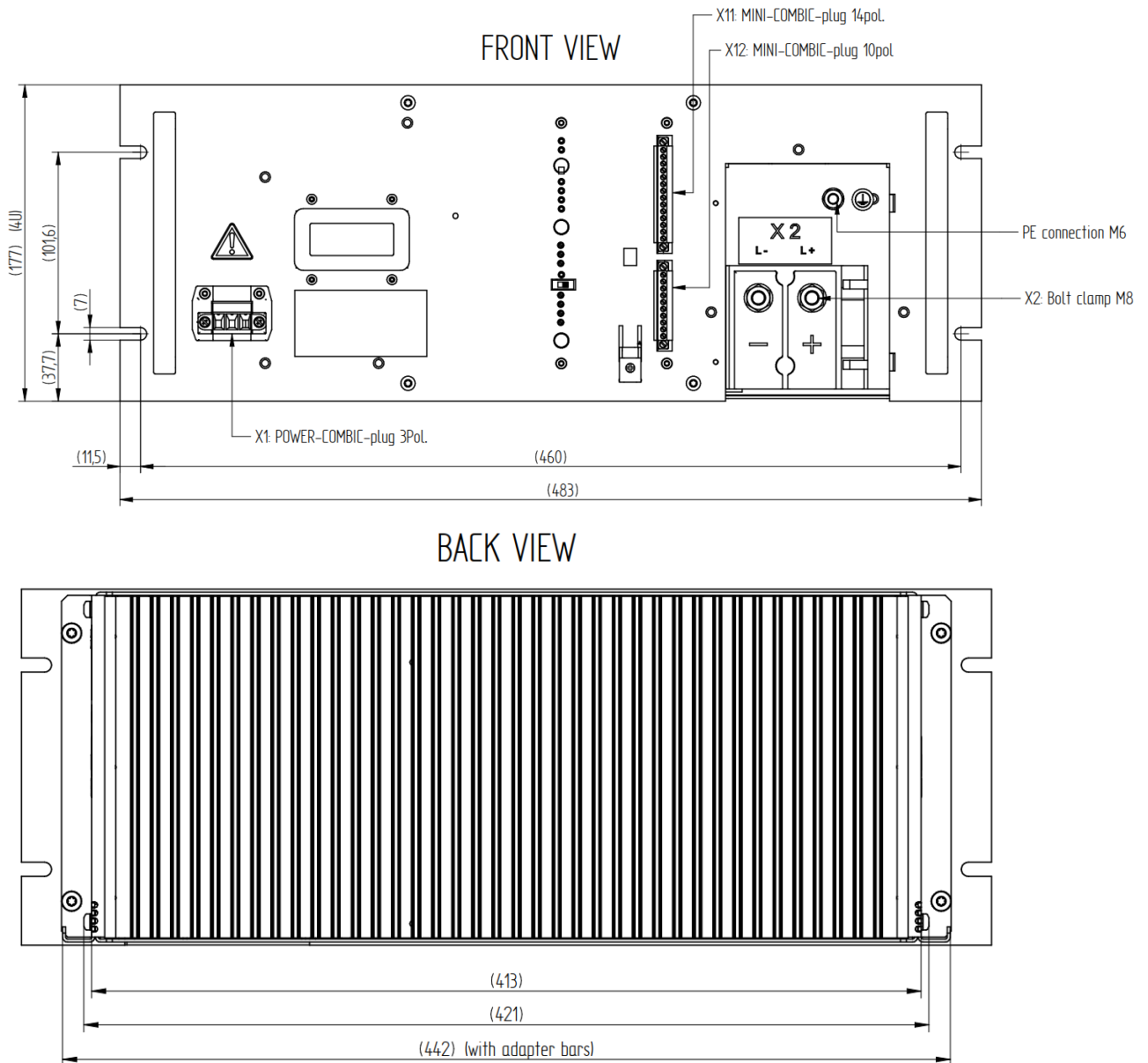


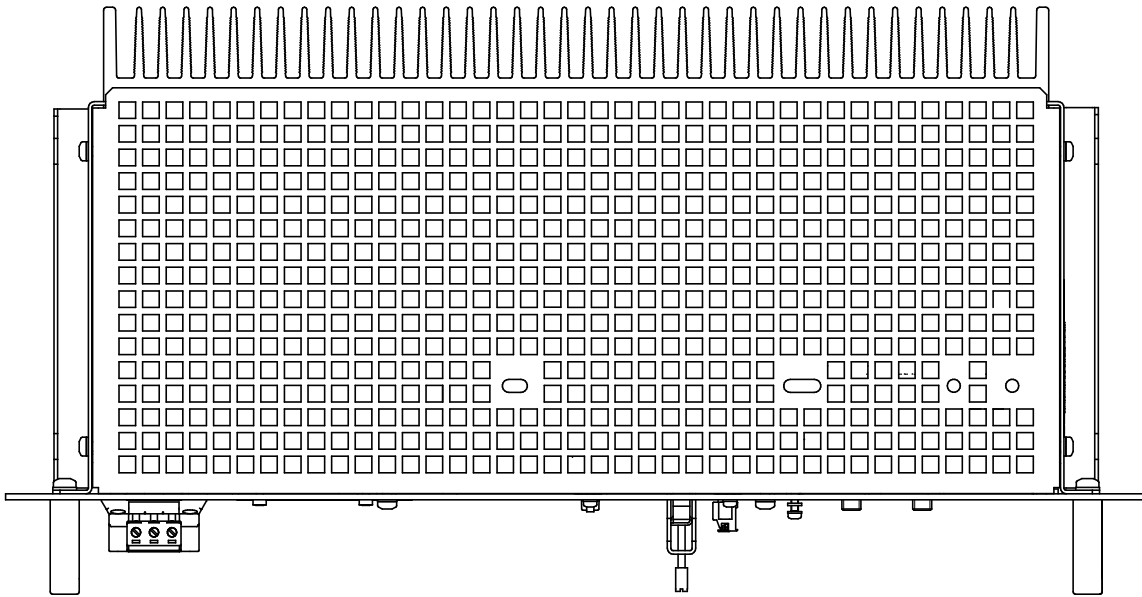
Illustration 4: Ambient temperature derating.

Note: An overtemperature warning/shutdown only occurs if the device temperature is critical. If the ambient temperature is exceeded, the power output is not automatically limited.

4.4 Dimension drawing



TOP VIEW



SIDE VIEW

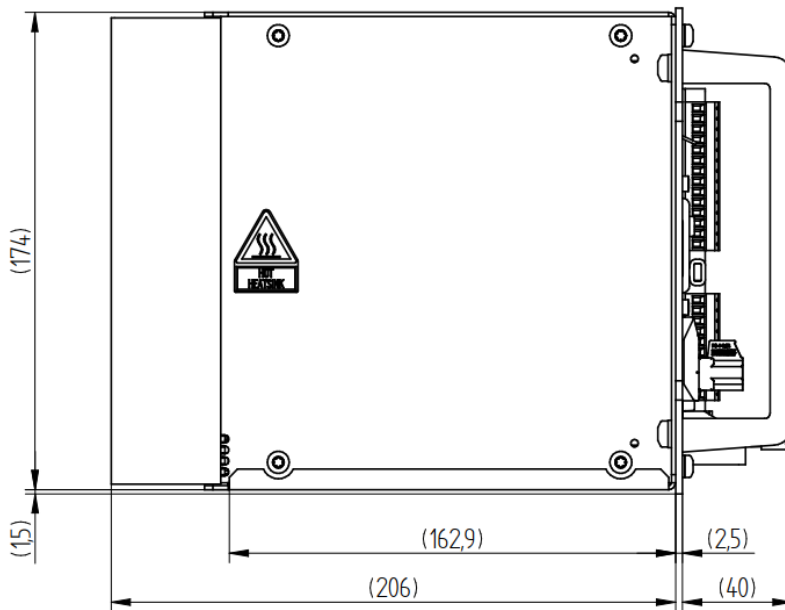


Illustration 5: Dimensional drawing.

5 PREPARING THE PRODUCT FOR USE

5.1 Safety measures before use

Before connecting to the mains, check that the mains voltage information on the rating plate corresponds to the existing mains voltage. The mains connection X1 is made via a 3-pole plug-in terminal (L(+), N(-), PE) on the front of the device. The direct current (DC) connection X2 and the additional protective conductor connection of the device are made via connection bolts behind the cover on the right-hand side of the front of the device.

5.2 Unpacking

Observe the following instructions:

- Only remove the molded parts and stretch film immediately before installing them in the system. This prevents unnecessary damage to the system.
- Remove any condensation that has formed inside and outside the system. Condensation is caused by pressure and temperature fluctuations between the place of manufacture and installation of the system.



The condensation evaporates within 48 hours when the system is stored at the installation site.

- Save the stretch film and the transport pallet if it is foreseeable that the system will be stored.



The stretch film and the polyethylene foam molded parts are chemically inert and can be disposed of with normal industrial waste or recycled.

5.3 Safe disposal of the packaging material

The following section provides information on how to dispose of the individual components of the system.

Packaging: Dispose of the stretch film and molded polyethylene foam parts with normal industrial waste. They are chemically inactive and can be disposed of or recycled.

Metal parts: Hand over the metal parts to a scrap metal dealer.

Electronic components: Hand over the electronic components to a recycling company that specializes in the disposal of electronic components.

Other components: Dispose of the plastic parts in the industrial waste. They can be disposed of or recycled.



Only dispose of **electrical and electronic waste** in accordance with local laws and regulations.

5.4 Preparatory work before installation



NOTE:

The leakage current is greater than 3.5 mA. A protective conductor connection must be established before commissioning; the use of RCDs alone is not permitted.

For the set output voltage, see section 4, Technical data.

5.5 Installing and mounting




NOTE:

The device contains reinforced smoothing with large electrolytic capacitors in the output. If the de-energized capacitors are connected to the battery by inserting the DC isolator or the DC fuse, this results in a large charging current surge.

This can be avoided by switching on the appliance before inserting the isolator and charging the capacitors to the appliance output voltage. The DC isolator or fuse can now be inserted. The input and output circuits of the appliance contain capacitors that may still be live after the mains voltage has been switched off (discharge time longer than 1 minute). Therefore, before removing the device, check that the terminals are voltage-free and, if necessary, discharge them via an external resistor at the mains terminals or the L+ and L- terminals.

ATTENTION!
<p>Risk of burns due to high heat sink temperature (> 65 °C).</p> <ul style="list-style-type: none"> → Do not cover the heat sink and ventilation openings. → Do not touch the heat sink area during operation. → Allow the appliance to cool down before removing it.

5.5.1 Mains connection X1

DANGER!
 <p>Risk of electric shock!</p> <ul style="list-style-type: none"> → Before carrying out any work on mains connector X1 or mounting/unmounting the device: Disconnect mains, prevent reconnection and check that all poles are de-energized. → Do not make or break connection while energized.

A minimum protective conductor cross-section of 2.5 mm² is required for the mains connection to X1. If this is not the case, the additional earthing connection next to X2 must be used (minimum cross-section 10 mm² Cu).

The input must be fused outside the appliance
(→ section 4).

5.5.2 DC output X2 (U)_{Out}

Please observe the torque specification in the technical data
(→ section 4).

Excessive torque can lead to damage.

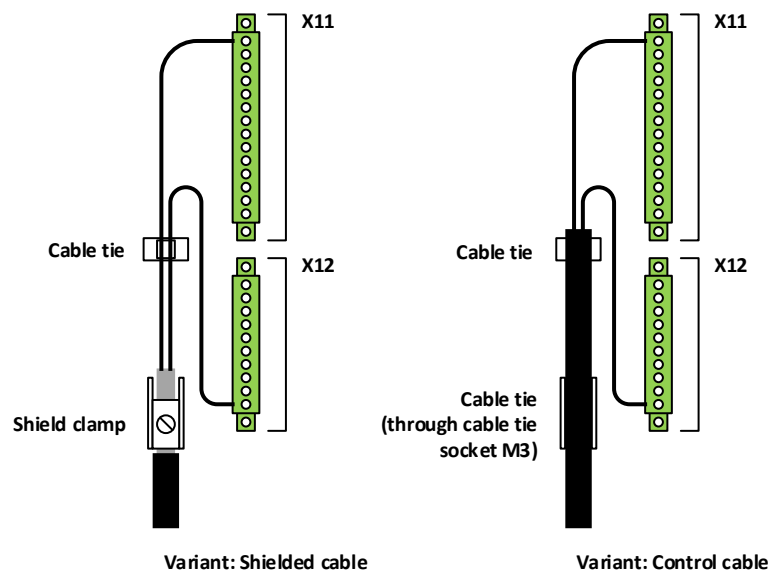
5.5.3 Remote signal connections X11 and X12

The signalling and external setpoint specifications/switchover take place via connectors X11 and X12 (pin assignment → section 3.1; functional description → section 6).

When wiring with a shielded control cable, the enclosed shield terminal to the left of X12 can be used if required.

Alternatively, the shield clamp can be removed to screw on an M3 cable lug or a screw base for cable ties .

Note: When using the shield clamp, remove the M3 screw underneath if necessary.




*Illustration 6: Example of routing the remote signal cables X11 and X12.
Cables are not included in the scope of delivery.*

5.5.4 Cooling and supply air

The switched-mode power supply works with convection cooling. The air flows from bottom to top through the device and over the heat sink at the rear. The supply and exhaust air must not be obstructed and must be routed in such a way that it does not lead to heat build-up. The supply air temperature must not exceed the specification in the technical data (section 4.2).

A maximum of six devices can be arranged one above the other in a cabinet. A distance of 134 mm (= 3 U) must be maintained between the appliances. Air ducts must be installed between the appliances in such a way that the supply air temperature of the individual appliances corresponds to the permissible ambient temperature.

The maximum power loss per appliance is approx. 200 W (depending on the type) and 90 % is generated in the rear part of the appliance.

	ATTENTION!
	<p>Risk of damage and fire due to obstructed heat sinks and ventilation openings.</p> <ul style="list-style-type: none">➔ Do not cover the heat sink and ventilation openings.➔ Do not bring highly flammable materials into contact with the heat sink.

6 OPERATING INSTRUCTIONS

6.1 Safe operation/safe functioning

The appliance is operated exclusively from the front using the controls located on the front panel. These are described in the respective chapters and can be assigned using the labelling on the front panel of the appliance.

6.2 Normal function

6.2.1 Electrical mode of operation

The device uses a booster to convert the input voltage into a higher, smoothed DC voltage for the DC link (for AC voltage: sinusoidal current consumption). MOSFETs generate a high-frequency AC voltage from this. A transformer is used to isolate the potential and adapt the voltage to the secondary side.

The high-frequency alternating voltage on the secondary side is rectified via synchronously controlled MOSFETs. An output filter is connected downstream to reduce the voltage ripple. The output voltage and output current are regulated by modulating the MOSFETs.

6.2.2 Input

After the mains voltage is applied and the switch is pressed, the device is switched on via a start-up stage that limits the inrush current to the rated input current ("soft start").

6.2.3 Output

The output characteristic curve is an IU characteristic curve with a 1 % slope of the voltage level. It does not matter which setpoint is selected (section 6.3.4)

The device is designed to be permanently short-circuit proof and operates in constant current control in the event of a short circuit until the output voltage monitor intervenes if necessary (depending on type).

Devices with double short-circuit current capability can be used to trigger load fuses in the event of a short circuit (depending on type).

Information on the short-circuit behaviour and behaviour of the undervoltage monitoring (→ section 4).

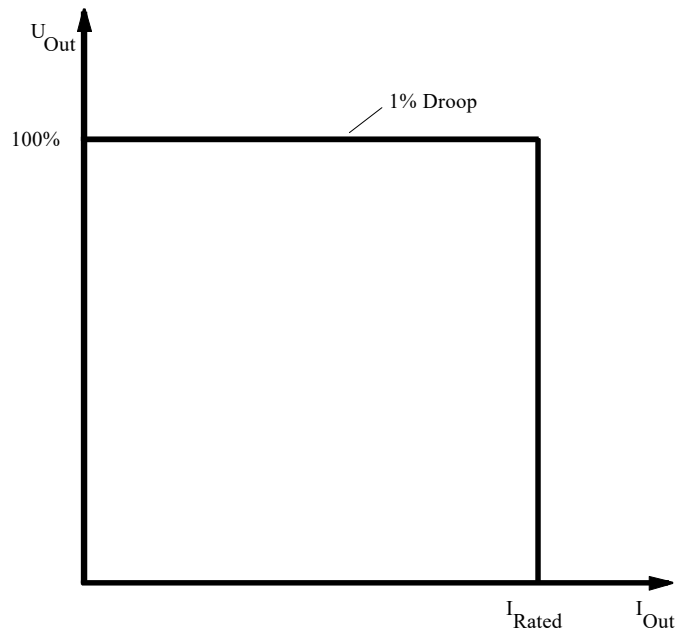


Illustration 7: IU characteristic curve.

6.2.4 Dynamics of the output voltage

With sudden load changes of 10-90 % or 90-10 %, the voltage deviation U_{Out} is $< 5 \%$. This is regulated within 1 ms.

6.2.5 Setting the output voltage and output current

The setting values for the output voltage, output current and monitoring can be found in the corresponding technical data (section 4.2). The designation and assignment of the operating elements can be found in section 3.1. You can choose between four different internal setpoints (section 6.3.4).



NOTE:

If the battery or consumer voltage is different, the output voltage must be adjusted. The procedure differs when using the external setpoint or when using the external setpoint switchover at X12.

These additional functions are described in section 6.3.3 / 6.3.4.

The output voltage is set via potentiometers R14 - R17.

This does not change the monitoring settings. Care should be taken to ensure that the voltage of the setpoints is within these monitoring limits. If a setting above the monitoring limits is necessary, the following applies:

Procedure:

- Disconnect the load and, if present, the battery at the output, as the response thresholds must be approached to set the monitoring.
- Set the desired monitoring values with the potentiometers $U_{Out} \geq$ (R10) and $U_{Out} \leq$ (R11) using a screwdriver.

$U_{Out} \geq$ setting:

- $U_{Out} \geq$ Set potentiometer R10 to the right stop.
- Set the output voltage U_{Out} to the desired $U_{Out} \geq$ value; S13 must be set to the internal setpoint. Select the desired potentiometer according to section 6.3.4.
- Turn $U_{Out} \geq$ potentiometer R10 to the left until $U_{Out} \geq$ responds.

$U_{Out} \leq$ setting:

- Setting is analogous to the $U_{Out} \geq$ setting with potentiometer R11 (a time delay of approx. 2 sec must be taken into account here).
- Set the output voltage U_{Out} to the desired value using the potentiometer and set S13 to the desired position.
- Connect load/battery.

$I_{Out} \leq$ setting:

The max. output current can also be set within a limited range using the potentiometer $I_{Out} \leq$ (R9).

However, the factory setting should only be adjusted in exceptional cases!

Procedure:

- Increase the load until the set current limit responds.
- Adjust potentiometer $I_{Out} \leq (R9)$ with a screwdriver.

6.2.6 Network monitoring

The mains monitoring module fulfils various functions. It serves to protect the device against overload and overvoltage with fixed response values.

The response values can be found in the technical data (section 4.3).

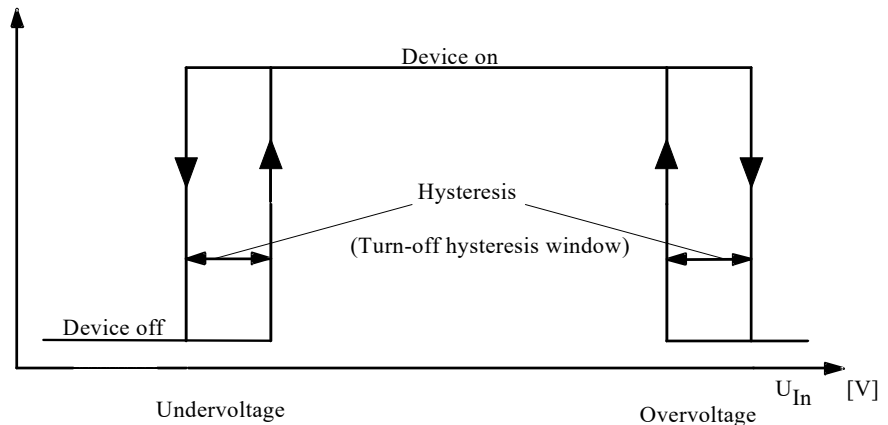


Illustration 8: Switching points of the grid monitoring.

Mains undervoltage monitoring

- The appliance is switched off when the voltage falls below the switching point. Once the hysteresis voltage has been exceeded, the device restarts automatically with "soft start".

Mains overvoltage monitoring

- If the maximum permissible mains voltage is exceeded, the SNT is set to stop for the duration of the overvoltage. After falling below the hysteresis voltage, the device restarts automatically with "soft start".

6.2.7 Output monitoring

The front panel contains the setting potentiometers and LED indicators for the following monitoring functions:

Supply status display (LED H1)

lights up when the input voltage is within the permissible range.

Operation indicator (LED H2)

lights up when power is supplied.

Deviation of the output voltage $U_{\text{Out Dev.}}$ (LED H4)

lights up when the output voltage deviates from the set value. Indicator for operation in current limit.

Overtemperature monitoring Temp. > (LED H5)

Indicates critical appliance temperature. LED lights up when the warning threshold is exceeded. If the appliance continues to heat up, it switches off.

For behaviour, see type overview (→ section 4.2)

DC overvoltage indicator $U_{\text{Out}} >$ (LED H6)

Behaviour see type overview (→ section 4.2)

Setting with potentiometer $U_{\text{Out}} \geq$

DC undervoltage indicator $U_{\text{Out}} <$ (LED H7)

Behaviour see type overview (→ section 4.2)

Setting with potentiometer $U_{\text{Out}} \leq$

Digital display (P1)

A double-row LC display is used to show the current values.

6.2.8 Reset button/functions

A fault message (response of an output monitor) can be acknowledged with the "Reset button" (S8). The device will then restart if it was switched off.

A fault message can also be acknowledged by switching off the mains voltage or using the "External on/off" function.

6.2.9 LED test

All LEDs light up when button S18 is pressed.

6.3 Secondary functions

6.3.1 External on/off switching with an external potential-free contact

The device can be switched on and off externally via a potential-free contact (contact load 24 V / 12 mA, contact open = "Device stop"). To do this, remove the jumper on the signal connector X11:7 and X11:8 and loop in a relay contact (→ section 6.8).

Note: The front panel switch S3 (On/Off) is logically AND-linked, i.e. S3 and the external contact described here must be set to "ON" for the device to start up.

6.3.2 External sensing line output voltage U_{Out}

It is possible to regulate a voltage drop of max. 1 V on both the plus and minus output lines.

For regulation, X11:9 is connected to the positive terminal of the consumer and X11:10 to the negative terminal of the consumer. In the event of a sensor line break, regulation is carried out via the device's internal sensor lines on X2.

The sensor cable must be at least twisted and laid separately from power cables.

6.3.3 External setpoint specification

The "internal/external" changeover switch (S13) can be used to switch between the internal and an external voltage setpoint. In the "Int." position, the device operates with the values for output voltage and current specified in the technical data (→ section 4.3.). In the "Ext." position, the output voltage can be set using an external setpoint. The "ext." setting is indicated by an LED (H12) on the front of the device.

The current setpoint function is set to the internal setpoint at the factory and can be changed to an external setpoint on request. The setpoint for voltage and/or current is specified via the signal connector X11 with the signals shown in the block diagram. The maximum setting ranges for current and voltage are achieved with a setpoint value of 4.0 V. Fine adjustment can be carried out with the potentiometers U_{Out} (R14 to R17) and $I_{Out} \leq$ (R9). It does not matter which setpoint is selected for U_{Out} .

The overvoltage and undervoltage monitoring U_{Out} must be adjusted when using external setpoints. To do this, proceed as described in 6.2.5.

The inputs for external setpoints are galvanically connected to the output U_{Out} (X2:L-)! To obtain defined states, the earth point of the external setpoints (X11:3 and X11:5) must be connected to the device earth X11:1.



NOTE:

There is no electrical isolation from the device output voltage U_{Out} , i.e. in the event of positive pole earthing, these inputs assume the potential of the output voltage! To avoid a short circuit, the external setpoint input must be electrically isolated from the SNT. The SNT also offers the option of addressing an external voltage divider with the device's own +7.5 V voltage in order to realize the external setpoint setting. The maximum load current of the +7.5 V voltage must not exceed 10 mA.



NOTE for sections 6.3.2 and 6.3.3:

In order to achieve immunity to HF fields, shielded cables must be used for analog signals, whereby the shield must be connected to the earth connection (PE) or to the shield terminal on the front of the device.

6.3.4 Internal setpoint specification

If the internal setpoint is selected (factory setting), it is possible to select one of 4 internal setpoints via terminals X12:1-4. To do this, either X12:1 and X12:2 or X12:3 and X12:4 must be bridged (see table below). Potentiometers R14, R15, R16 and R17 can then be used to set the setpoints for trickle charging (default setting; all terminals open), heavy charging, mains backup system and manual charging. The procedure is to be carried out according to 6.2.5 for the respective voltages, whereby the voltage must be selected via the terminals.

The output voltage monitors can only be set once and the same for all voltage values.

The desired voltage setpoint is set using the following table:

Setpoint selection via terminal X12 and potentiometer assignment

X12:1 - X12:2	X12:3 - X12:4	Setpoint	Potentiometer
Open	Open	Trickle charge	R14 Trickle Charge
Bridged	Bridged	Charge	R15 Batch
Bridged	Open	EPS / diode test	R16 EPS/Test
Open	Bridged	Ext. Adjust	R17 Ext. adjust

6.3.5 Actual value output

- The actual values can be displayed via the connections
 - X12:7 (actual voltage value) and X12:8 (actual ground value)
 - X12:9 (actual current value) and X12:10 (actual ground value)
 can be tapped.

A 0-20 mA signal is present as standard. When jumper X12:5 - X12:6 is closed, a 0-10 V signal is output (via an internal 500 Ω load).

A quiescent current or voltage offset is not possible.

Any external supply to the connections of the actual value output is not permitted.

The actual value output is at the same potential as external on/off and the setpoint switchover.

Information on scaling, tolerance and measuring range: → see section 4.

6.4 Special functions

6.4.1 Parallel operation

Due to the inclination of the voltage level of approx. 1 %, a load distribution of approx. 10 % of the nominal system current is achieved when several switched-mode power supply units are operated in parallel. If the load sharing is to be optimized, the output voltage of the device with the lowest load current must be increased and the output voltage of the device with the highest load current must be reduced. Selective monitoring of the individual SNTs is only possible with external decoupling diodes in the output.

Systems with redundancy:

As the devices can be connected in parallel, it is possible to set up systems for redundant operation according to the n+1 principle.

6.4.2 Island networks

Mains overvoltages in the range of seconds are to be expected when connecting the switched-mode power supply unit to stand-alone grids. For example, up to 20 % overvoltage in the range of seconds can occur when feeding through rotating converters. The switched-mode power supply is protected against this.

Mains overvoltage monitoring (→ section 6.2.6) sets the appliance to stop for the duration of the overvoltage and restarts it with "Soft start" once the voltage peak has subsided.

The devices in the DC series are designed for a transient overvoltage at the input of 1.6 times the rated input voltage (for 3 seconds).

6.5 Signalling

The faults are displayed via LEDs on the front and reported as a collective message via a potential-free collective fault relay (changeover contact) on signal connector X11. The contact between X11:12 and X11:13 is closed in the event of a device failure or fault.

The LEDs are set to the European/international colour scheme at the factory (→ see section 6.6). The inverted colour scheme (red and green reversed) is available on request for the Asian market.

6.6 Block diagram

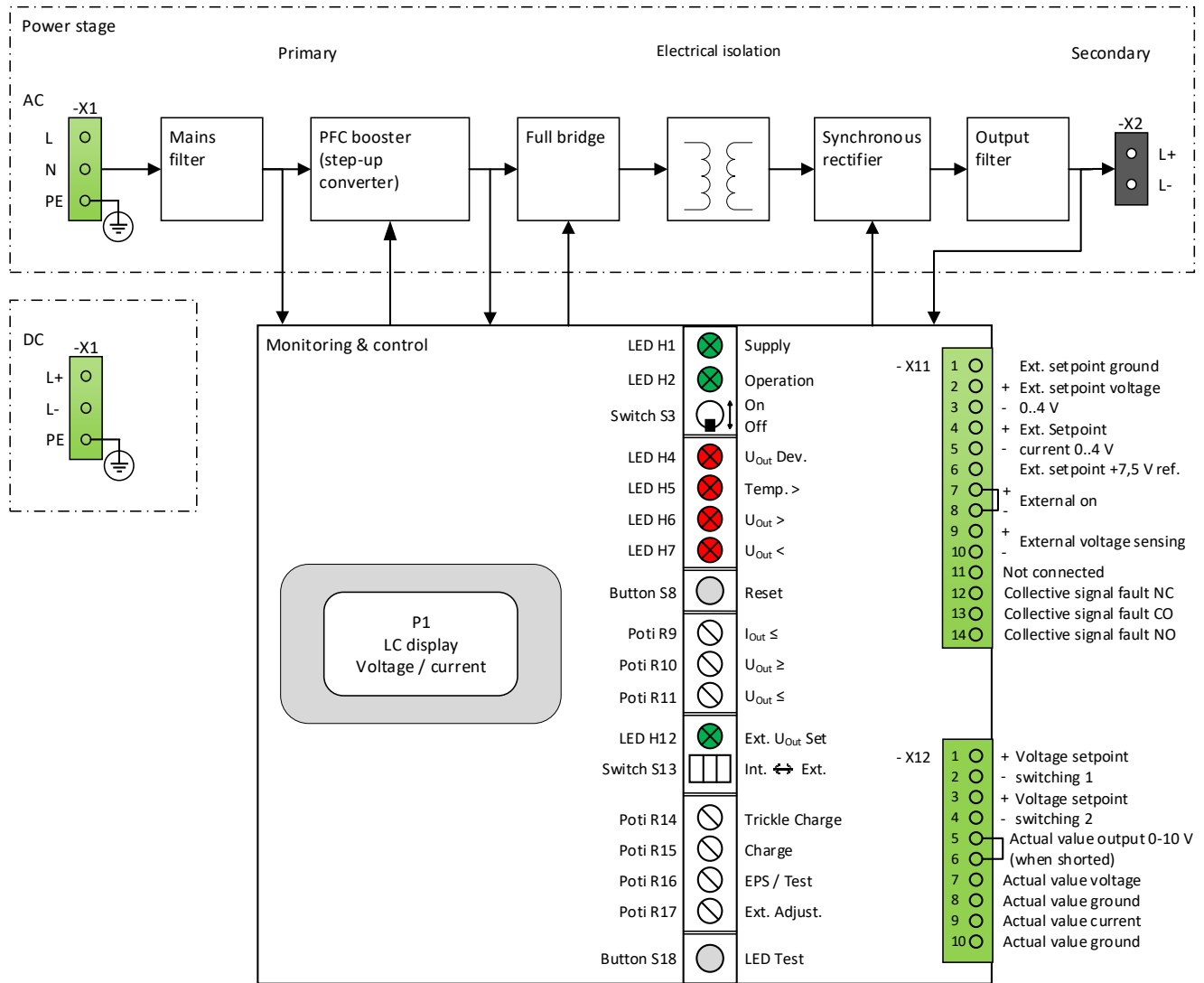



Illustration 9: Block diagram. The European colour scheme is shown for the LEDs.

7 MAINTENANCE AND REPAIR

7.1 Safety measures

	DANGER!
	Risk of electric shock! → The appliance must be disconnected from the power supply before maintenance work. Always observe the safety instructions!

	ATTENTION!
	Risk of burns due to high heat sink temperature (> 65 °C). → Do not cover the heat sink and ventilation openings. → Do not touch the heat sink area during operation. → Allow the appliance to cool down before removing it.

7.2 Maintenance and cleaning by the user

The switching power supply is low-maintenance due to the components used. However, it is advisable to check the dust accumulation inside the device from time to time. If there is a lot of dust, the device should be blown out with dry compressed air in order to prevent a reduction in cooling and thus a reduction in service life.

7.3 Maintenance and cleaning by qualified persons

All work on the appliance may only be carried out by trained specialist personnel.

7.4 Maintenance schedule

Compliance with the maintenance schedule is necessary to maintain availability.

Period	Activity
Every 12 months	Visual inspection and cleaning of the appliance if necessary. A functional test is recommended. Optionally, a diagnostic device can be used for particularly critical applications.
Every 8 years	Replacement of the electrolytic capacitors, to be carried out by AEG PS.
Every 8 years	Calibration check to be carried out by AEG PS.

7.5 Qualified AEG PS Service



Power Solutions GmbH
Emil-Siepmann-Strasse 32
59581 Warstein
Germany



+49 2902 763 100

Fax:

+49 2902 763 645

E-Mail: service.aegps@aeqps.com

Internet: <http://www.aegps.com>

7.6 Troubleshooting, fault diagnosis and repair

7.6.1 No output voltage present

- Mains voltage present at X1 and within tolerance?
Upstream fuses checked?
For devices in the DC series: correct polarity?
- For parallel operation: Are any decoupling diodes in output X2 correctly polarized?
- Are jumper X11:7 and X11:8 present or is the contact for External On/Off closed? Is switch S3 (On/Off) switched on?
- Output X2 polarity reversed?
- Has the monitoring $U_{Out} \geq$ responded (LED H6 $U_{Out} >$ lights up)?
- Press reset S8 (→ section 6.2.8) and check the overvoltage monitoring setting with potentiometer R10 $U_{Out} \geq$ (→ section 6.2.5). Make sure which setpoint value U_{Out} is selected (→ section 6.3.4).
- Has the overtemperature monitor responded (LED H5 Temp. > illuminated)?
- Press reset S8 (→ section 6.2.8)!

7.6.2 Deviation of the output voltage

- Is the device operating in the current limit due to overload?
Reduce the load!
- Is the wrong internal setpoint U_{Out} selected?
- Is the setting of the selected potentiometer U_{Out} (R14-R17) incorrect?
Adjust the output voltage (→ section 6.2.5)!
- Are the bridges X12:1-2 and X12:3-4 available?
Build bridges!
- If an external sensor line is used, is the sensor line open?
- If external setpoint specification, setpoint correct?

7.7 Spare parts list

Naming	AEG part no.	Installed quantity
Accessory set, consisting of the following individual parts, among others:	20010565	1
3-pin mains plug X1	40013216	1
14-pin remote signalling connector X11	40013189	1
10-pin remote signalling connector X12	40013188	1
Shield clamp	40000385	1
Connection cover X2	40000962	1
M3x10 screw for connection cover	40009742	2

Spare parts are not included in the scope of delivery.

8 DECOMMISSIONING AND DISPOSAL

The device must be disconnected before removal.

Then remove the supply lines from the input, output and control circuit.

The input and output circuits of the device contain capacitors that may still be live after the mains voltage has been switched off (discharge time longer than 1 minute).

Therefore, before removing the appliance, check that the terminals are de-energized and, if necessary, discharge them via an external resistor at the mains terminals or the L+ and L- terminals. The protective conductor connection must be removed last, as the leakage current can be greater than 3.5 mA.

8.1 Disposal

The following section provides information on how to dispose of the individual components of the system.

- **Packaging:** Dispose of the stretch film and molded polyethylene foam parts with normal industrial waste. They are chemically inactive and can be disposed of or recycled.
- **Metal parts:** Hand over the metal parts to a scrap metal dealer. The housing of the system, the cables, the inverters, rectifiers and transformers can be recycled as normal.
- **Electronic components:** Hand over the electronic components to a recycling company that specializes in the disposal of electronic components.
- **Batteries:** Observe the battery manufacturer's instructions for toxic and hazardous substances.

Batteries must be separated from all other parts of the system and disposed of in accordance with the regulations for toxic and hazardous substances.

- **Other components:** Dispose of the rubber seals and plastic parts in the industrial waste. They can be disposed of or recycled.



Only dispose of **electrical and electronic waste** in accordance with local laws and regulations.



Never dispose of used **batteries or battery material** in the waste. Comply with local laws and regulations for the storage, handling and disposal of batteries and battery material.
