0PS1020.0

1 General information

The 0PS1020.0 is an extra slim DIN-rail-mountable power supply unit with just 45 mm in width. The output power is 48 W at 24 V and 2 A.

The wide-range input and international certification package make it suitable for use anywhere in the world.

Reliable starting of complex loads is ensured by a power reserve – the POWER BOOST.

This also ensures high operational reliability in complex global networks. The supply of power is also maintained in applications where static voltage dips, transient failures of the supply voltage or phase failure are to be expected.

Generously dimensioned capacitors guarantee a mains buffering of more than 20 ms under full load.

- 100 to 240 VAC wide-range input
- Power boost for reliable startup of demanding loads (up to 2.9 A)
- Can be connected in parallel for increased capacity and redundancy
- Active DC OK switch output
- Reliable operation due to long power failure bypass function under full load and high MTBF (>500,000 h)
- International certification package
- Wide temperature range from -25 to 70°C
- Extra slender design

2 Organization of safety notices

The safety notices in this data sheet are organized as follows:

Safety notice	Description
Danger!	Disregarding safety guidelines and notices can be life-threatening.
Warning!	Disregarding safety guidelines and notices can result in severe injury or substantial damage to equipment.
Caution!	Disregarding safety guidelines and notices can result in injury or damage to equipment.
Information:	Important information for preventing errors.

Table 1: Description of the safety notices used in this documentation

3 Order data

Model number	Short description	Figure
	Single-phase power supplies	
0PS1020.0	24 VDC power supply, 1-phase, 2 A, input 100 to 240 VAC, wide range, top-hat rail installation	

Table 2: 0PS1020.0 - Order data

4 Technical data

Model number	0PS1020.0
General information	
Status display	Green LED (DC OK), threshold value U_{out} = 21.5 V
Insulation voltages	
Input - Output	3 kV (routine test) 4 kV (type test)
Active DC OK switch output	24 V, 20 mA
Connection type	Screw terminal
Connection cross section	
Wire end sleeves	Flexible cables require wire end sleeves in order to fulfill EN 62368 / UL 60950
Flexible	0.2 to 2.5 mm² / 24 to 12 AWG
Inflexible	0.2 to 2.5 mm² / 24 to 12 AWG
Wire stripping length	7 mm (input/output)
Certifications	
CE	Yes
UL	cULus E123528 Industrial control equipment
Input	
Nominal input voltage	100 to 240 VAC
Input voltage	AC 85 to 264 V (wide range), 45 to 65 Hz DC 90 to 350 V
Input current	Approx. 0.7 A (120 VAC) Approx. 0.4 A (230 VAC) Approx. 0.65 A (90 VDC) Approx. 0.2 A (350 VDC)
Inrush current limiting	<15 A (typical)
I^2t	4.1 A^2s
Power failure bypass	>35 ms (120 VAC) >170 ms (230 VAC)
Switch-on time	<1 s
Protective circuit	Transient surge protection with varistor
Internal fuse	2.5 A slow-blow
Required line fuse for line protection	6 A (characteristic B) 10 A (characteristic B) 16 A (characteristic B)
Output	
Nominal voltage	24 VDC ±1%
Output power	48 W
Setting range for output voltage	22.5 to 28.5 VDC
Output current	
-25 to 40°C	2.9 A
40 to 60°C	2.0 A
>60°C	Derating: 2.5% per °C
Current limiting	2.9 A (for short circuit)
Control deviation	<1% (static load change 10 to 90%) <3% (dynamic load change 10 to 90%) <0.1% (input voltage change ±10%)
Residual ripple	<20 mV_{SS} (20 MHz)
Switching peaks	<100 mV_{SS} (20 MHz)
Can be connected in parallel	Yes, to establish redundancy and increase capacity
Can be connected in series	No
Max. capacitive load	Unlimited
Protection against internal overvoltages	Yes, limited to <35 VDC
Protection functions	Output protected against continuous short circuit, open circuit and overload
Power back immunity	Max. 35 VDC
Output noise suppression	Device complies with EN 55011 (class B)
Efficiency, reliability	
Efficiency	>88% (at 230 VAC and nominal values)
MTBF	>500,000 h, per IEC 61709 (SN 29500)
Power dissipation	
Rated load	Max. 7 W
No-load operation	Max. 2 W
Operating conditions	
Mounting orientation	
Horizontal	Yes
Vertical	No
Installation elevation above sea level	
Maximum	3000 m
Ventilation/Cooling	Normal convection, no fan required
Degree of protection per EN 60529	IP20

Table 3: 0PS1020.0 - Technical data

Model number	0PS1020.0
Ambient conditions	
Temperature	
Operation	-25 to 70°C (>60°C derating)
Storage	-40 to 85°C
Transport	-40 to 85°C
Relative humidity	
Operation	Max. 95%, non-condensing
Vibration	
Operation	<15 Hz, amplitude ±2.5 mm, per IEC 60068-2-6 15 to 150 Hz, 2.3 g, 90 min
Shock	
Operation	30 g in each direction, per IEC 60068-2-27
Pollution degree	2, per EN 50178
Climate category	3K3, per EN 60721
Mechanical properties	
Housing	
Material	Polyamide PA (color: green)
Installation	Easy top-hat rail installation (NS 35 rails, EN 60715)
Dimensions	
Width	45 mm
Height	99 mm
Depth	107 mm
Weight	250 g

Table 3: 0PS1020.0 - Technical data

5 Standards and conformity

Standards

Safety isolating transformers for switching power supplies	EN 61558-2-17
Industrial control equipment	UL/C-UL Listed UL 508
Electronic equipment for hazardous locations (explosions)	UL/C-UL Listed UL 1604 Class I, Division 2, Groups A, B, C, D
Electrical security (for IT equipment)	EN 62368 / VDE 0805 UL/C-UL Recognized UL 60950
Limitation of output power	UL 1310: Class 2 Power Supply
Electronic equipment for high voltage systems	EN 50178 / VDE 0160
Safety extra low voltage	EN 62368 (SELV) EN 60204 (PELV)
Safe isolation	DIN VDE 0100-410
Protection against shock current, basic requirements for safe isolation in electrical equipment	DIN VDE 0106-101
Harmonic current emission limits	EN 61000-3-2

Conformity to EMC directive 2004/108/EC

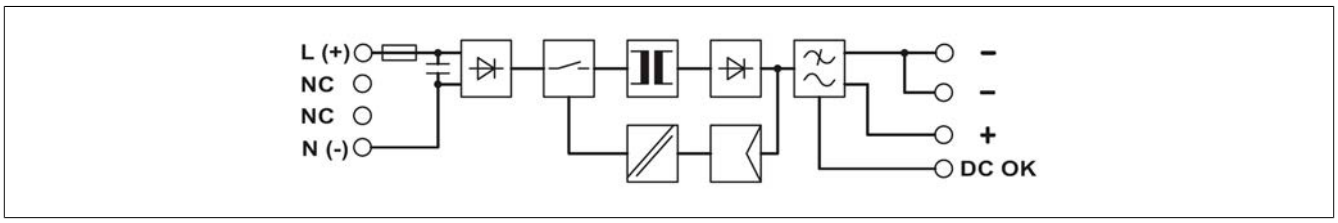
Immunity to disturbances EN 61000-6-2		
Electrostatic discharge	EN 61000-4-2	
	Housing	Level 3
	Contact discharge	8 kV
	Air discharge	8 kV
	Comment	Criteria B[1)]
Electromagnetic HF field	EN 61000-4-3	
	Housing	Level 3
	Frequency range	80 MHz to 1 GHz (10 V/m) 1 GHz to 2 GHz (3 V/m) 2 GHz to 2.7 GHz (1 V/m)
	Comment	Criteria A[2)]
Burst	EN 61000-4-4	
	Input	4 kV (Level 4 - asymmetrical: line to GND)
	Output	2 kV (Level 3 - asymmetrical: line to GND)
	Signal	1 kV (Level 2 - asymmetrical: line to GND)
	Comment	Criteria B[1)]
Surge	EN 61000-4-5	
	Input	4 kV (Level 4 - asymmetrical: line to GND) 2 kV (Level 4 - symmetrical: line to line)
	Output	0.5 kV (Level 1 - asymmetrical: line to GND) 0.5 kV (Level 1 - symmetrical: line to line)
	Signal	0.5 kV (Level 1 - asymmetrical: line to GND)
	Comment	Criteria B[1)]
Conducted interference	EN 61000-4-6	
	Input / output / signal	Level 3 - asymmetrical
	Frequency range	150 KHz to 80 MHz
	Voltage	10 V
	Comment	Criteria A[2)]
Voltage dips	EN 61000-4-11	
	Input	(Power failure bypass >20 ms)
	Comment	Criteria B[1)]

1 **Criteria B**: Temporary adverse effects on the operating characteristics that the device corrects automatically
2 **Criteria A**: Normal operating behavior within defined limits

Emissions in accordance with EN 61000-6-3	
RFI voltage EN 55011	EN 55011 (EN 55022) Class B for industry and office/home
Radiated emissions in accordance with EN 55011	EN 55011 (EN 55022) Class B for industry and office/home

Emissions in accordance with EN 61000-6-3	
RFI voltage EN 55011	EN 55011 (EN 55022) Class B for industry and office/home
Radiated emissions in accordance with EN 55011	EN 55011 (EN 55022) Class B for industry and office/home

6 Block diagram

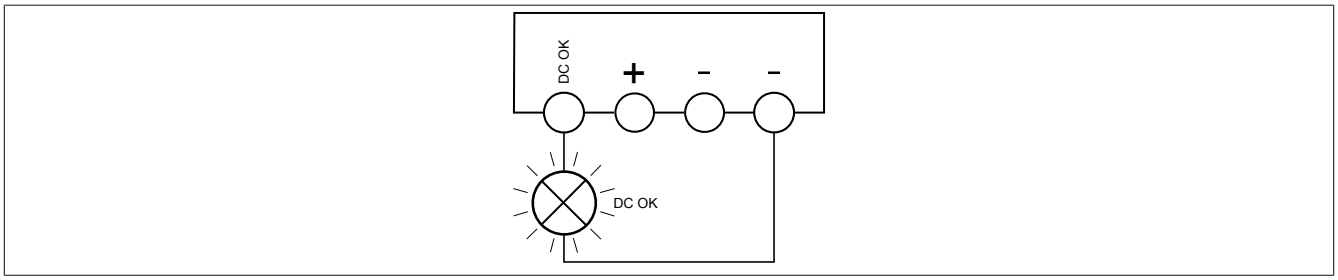


7 Signaling

The "DC OK" LED makes it possible to evaluate the functionality of the power supply direcly on-site.

	State 1	State 2
"DC OK" LED	Lit	Off
Active DC OK switch output	U = 24 V (with respect to "–")	U = 0 V (with respect to "–")
Meaning	Normal operation of power supply (U_{OUT} >21.5 V)	• The output voltage is lower than 21.5 V. Secondary consumer short-circuit or overload pending. • No input voltage or defective device.

Active signal output



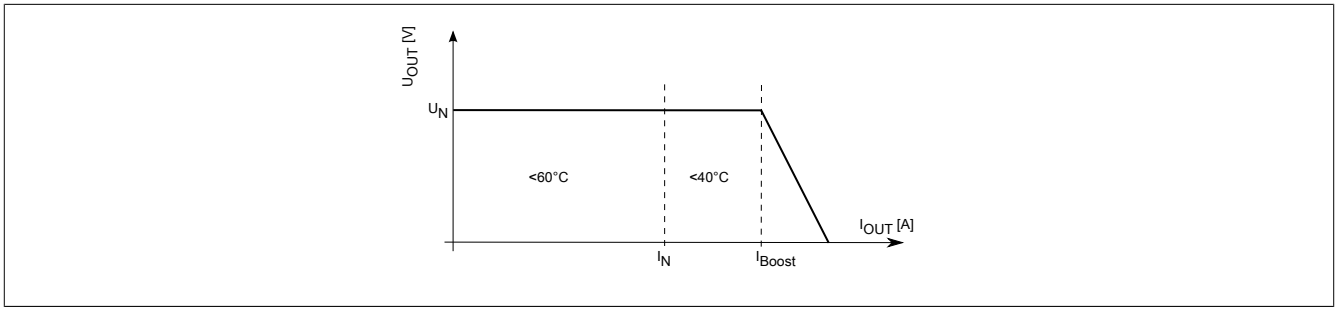
The 24 VDC signal is between the connection terminals "DC OK" and "-" and can carry up to 20 mA. This signal output changes from "active high" to "low" to indicate the voltage has fallen below the 21.5 VDC output voltage.

The DC OK signal is decoupled from the power output. This eliminates the possibility of external supply via devices connected in parallel.

The 24 VDC signal can be directly connected to a logic input.

8 Characteristic curves

Output characteristics



The device provides the rated output current I_N up to an ambient temperature of 60°C. At an ambient temperature of up to 40°C, the unit supplies a continuous output current of I_N. The operating point follows the U/I curve when a heavy load is applied.

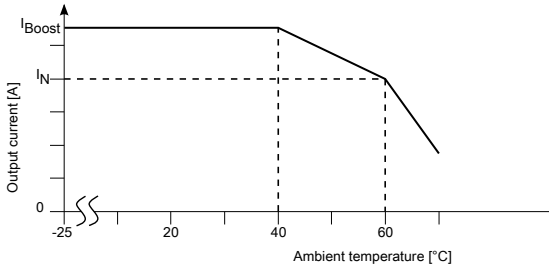
The full output current I_{BOOST} is provided continuously at a lower output voltage if a short-circuit or overload occurs. The device is not shut off. The full secondary voltage is available again as soon as the overload or short-circuit has been corrected.

The U/I characteristic curve ensures that highly capacitive loads as well as consumers with DC/DC converters in the input circuit can be supplied.

Downstream fuses are tripped reliably. Selectivity in the design of your system is thus guaranteed at all times.

U_N = 24 V
I_N = 2 A
I_{Boost} = 2.9 A
P_N = 48 W

Temperature characteristics



The device provides the rated output current I_N up to an ambient temperature of 60°C. At an ambient temperature of up to 40°C, the unit supplies a continuous output current of I_N.

At ambient temperatures over 60°C, the output power must be derated by 2.5% per Kelvin.

At 70°C and higher or when thermal overload occurs, the device reduces its output power as a self-defense mechanism and returns to normal operation after cooling down.

9 Safety notices

Information:

Please note before commissioning:

The mains connection must be implemented properly and provide protection against electrical shock.

According to the regulations in EN 62368, it must be possible to switch the device to a voltage-free state outside the power supply (e.g. using line protection on the primary side)!

All lines must be sufficiently dimensioned and protected.

All output lines must be dimensioned to handle the maximum output current for the unit or special protective measures must be implemented.

Sufficient convection must be ensured!

Caution!

The power supply units are built-in devices. They must be installed and commissioned by appropriately qualified personnel in adherence with local regulations.

Danger!

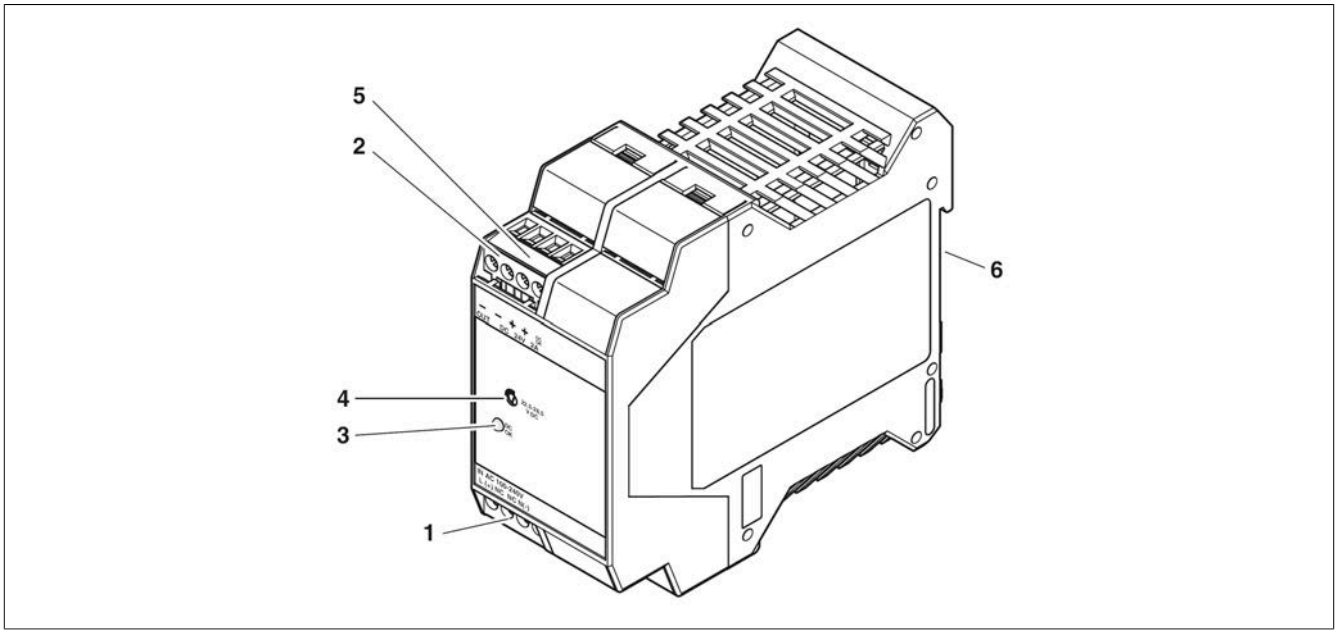
The units contain components with life-threatening levels of voltage and large amounts of stored power!

Always ensure that the power is turned off before handling them.

Disconnect equipment from the power source and ensure that it is not located in a potentially explosive atmosphere before removing it.

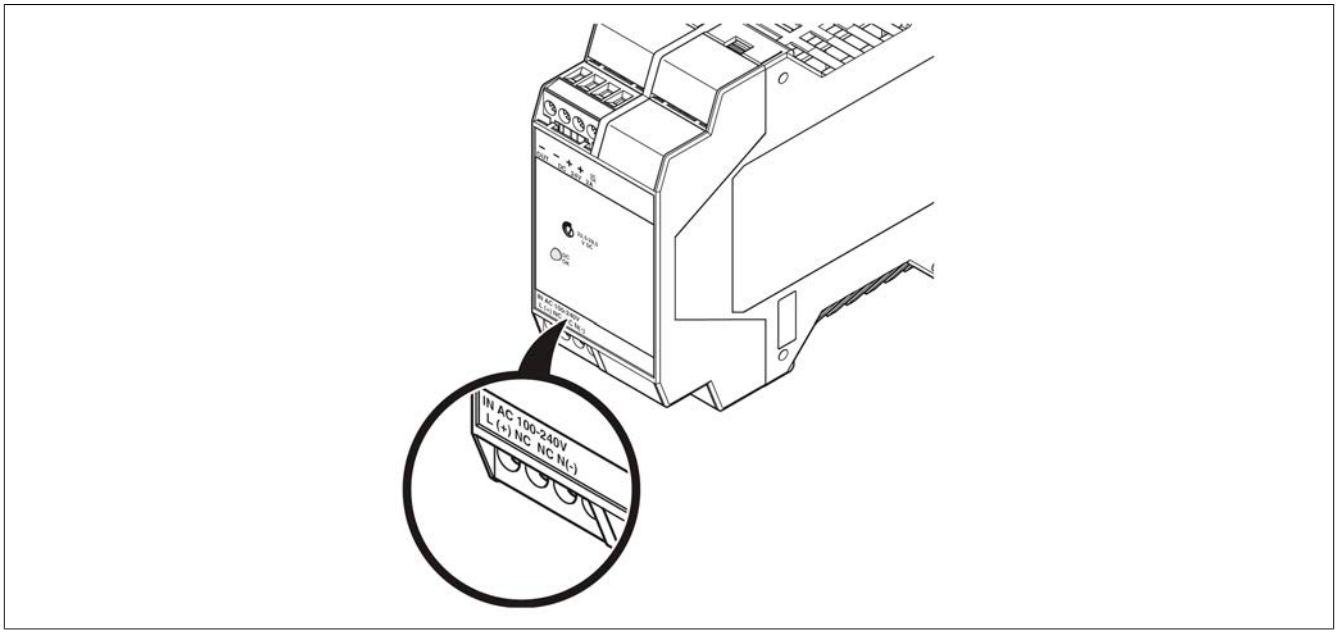
Depending on the ambient temperature and the operating load, the housing may become very hot!

10 Layout



1) AC input
2) DC output
3) "DC OK" LED
4) Potentiometer (22.5 to 28.5 VDC)
5) "DC OK" output, active
6) Universal snap in mounting foot for DIN rails

11 Input



Information:

Can cause damage to module!

If an internal fuse is tripped, it is very likely that the unit is defective. In this case it needs to be sent back to the factory to be checked.

Protection on the primary side

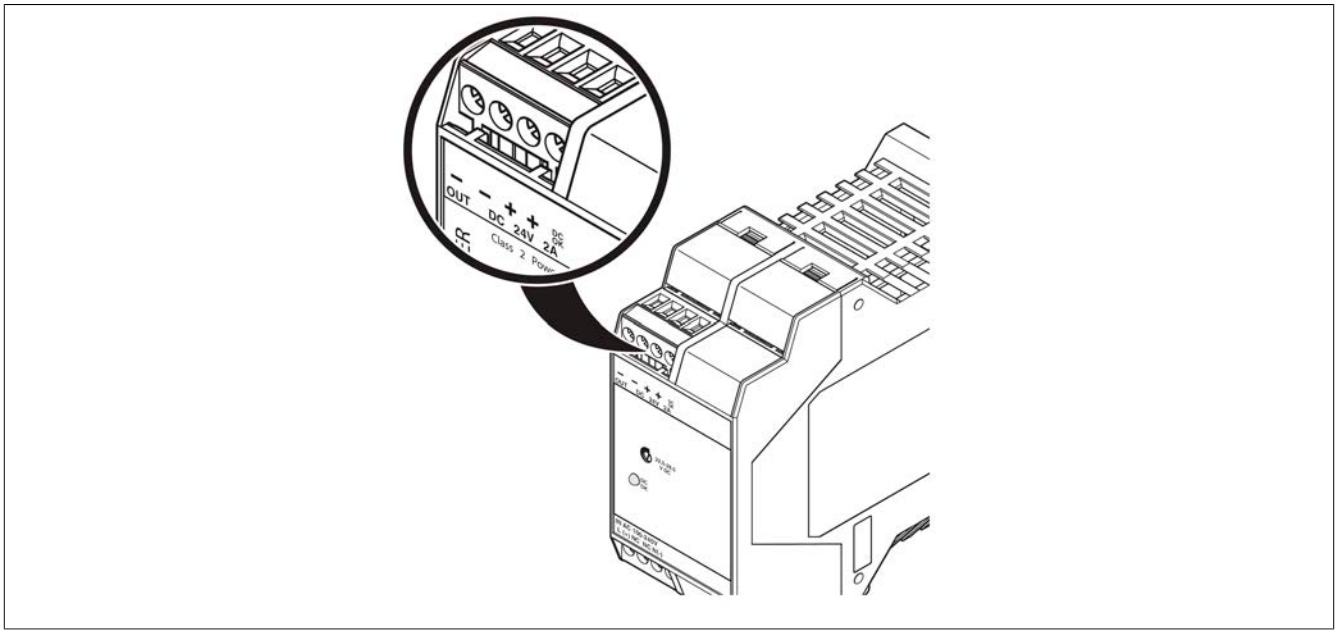
The device must be installed in accordance with the regulations in EN 62368. It must be possible to switch the device to a voltage-free state outside the power supply using a suitable disconnect device. Line protection on the primary side is suitable for this purpose, for example.

The device is protected by an internal fuse. Additional device protection is not necessary.

Required line fuse for line protection

6 A, 10 A or 16 A circuit breakers; Characteristic B (or functional equivalent)

12 Output



The connection is made via the "+" and "-" screw connectors on the DC output. The configured output voltage upon delivery is 24 VDC. The output voltage can be configured using the potentiometer.

The active DC OK switch output is connected via the "DC OK" and "–" connections.

Protection on the secondary side

The device is electronically protected against short circuit and idling. When a fault occurs, the output voltage is limited to a maximum of 35 VDC.

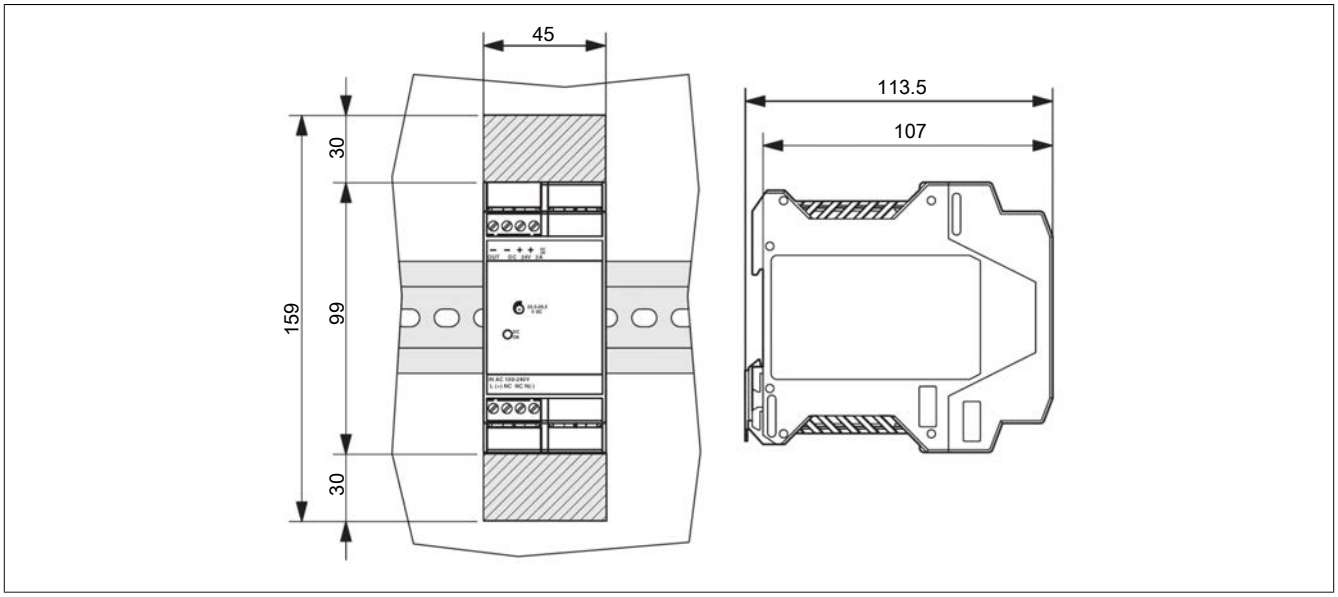
Information:

Can cause damage to module!

Make sure that all output lines are dimensioned to handle the maximum output current or that special protective measures have been implemented.

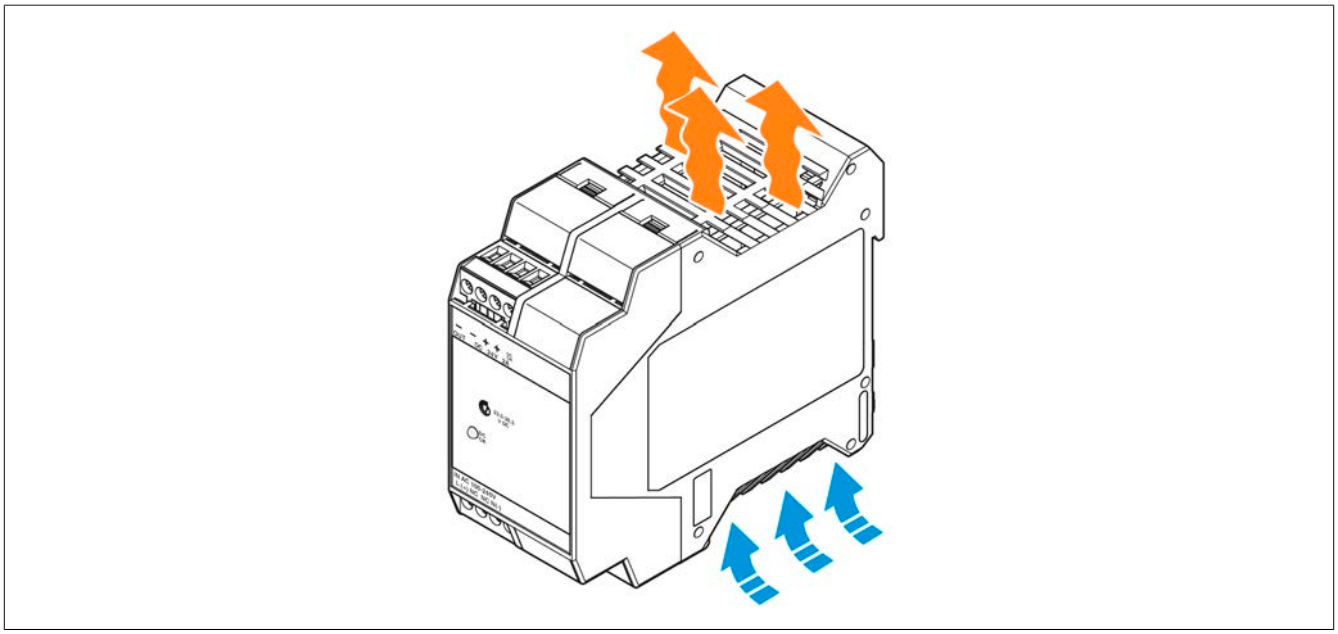
Secondary cables must have sufficiently large cross sections to keep voltage drops on the lines as small as possible.

13 Dimensions



Installation depth 107 mm + DIN rail

14 Installation



Information:

Can cause damage to module!

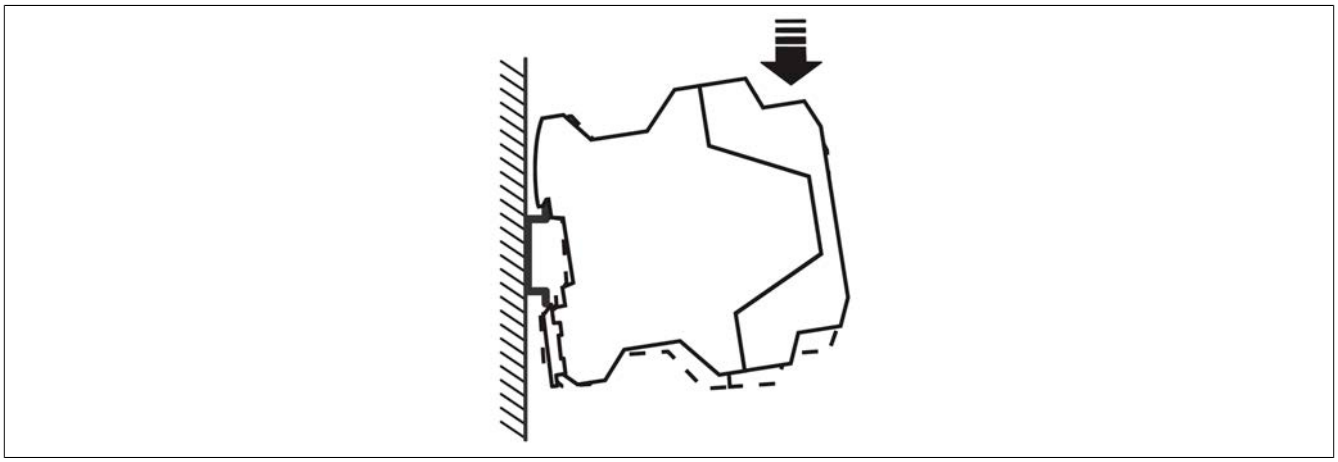
To ensure sufficient convection, we recommend the following minimum spacing between modules: 5 cm vertically and 0 cm horizontally.

The DIN rail must be mounted horizontally with the ventilation slots facing up and down.

15 Mounting rail installation

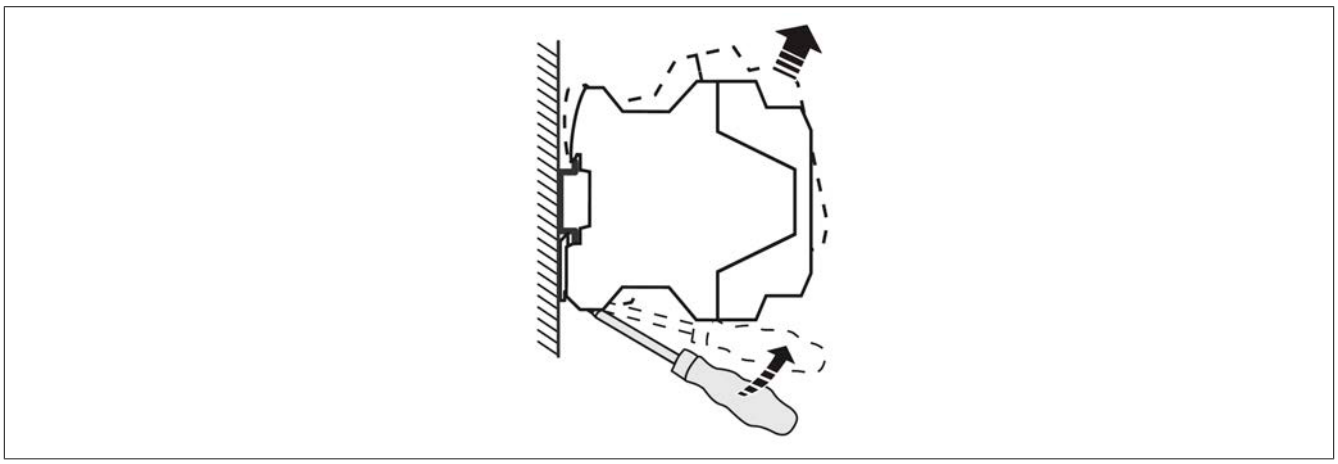
The power supply unit can be snapped onto all 35 mm DIN rails in acc. with EN 60715.

Mounting



Position the module with the DIN rail guide on the **upper edge** of the DIN rail, and snap it in with a **downward** motion.

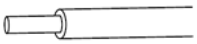
Removal



Pull the snap lever open with the aid of a screwdriver and slide the module out at the **lower edge** of the DIN rail.

16 Cable data

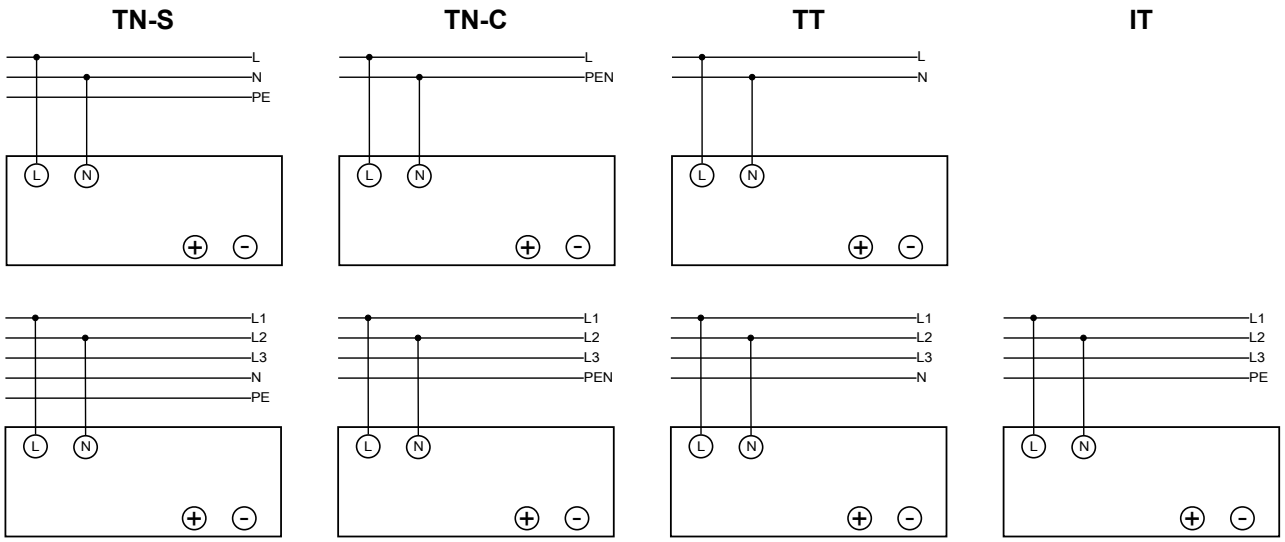
Type of connection: Screw clamp
Stripping length: 7 mm



Wire tip sleeves: 10 mm

	[mm²]		AWG	[Nm]
	Fixed	Flexibility		Torque
Input / output / signal	0.2 - 2.5	0.2 - 2.5	24 - 14	0.5 - 0.6

17 Connection to supply voltage



The 100 to 240 VAC connection is made using the L and N screw connections.

The device can be connected to single-phase AC networks or to two phases of a three-phase network (TN, TT or IT networks in acc. with VDE 0100 T300 / IEC364-3) with nominal voltages of 100 to 240 VAC.

An all-pole disconnection device is required when operating on two phases of a three phase network.

Information:

In order to comply with the UL certification, use copper cables that are designed for operating temperature of >75°C.

Flexible cables require wire end sleeves in order to comply with EN 62368 / UL 60950. For a reliable and touch-proof connection, strip the connection ends. For the required lengths, see the cable data table.

18 Parallel operation

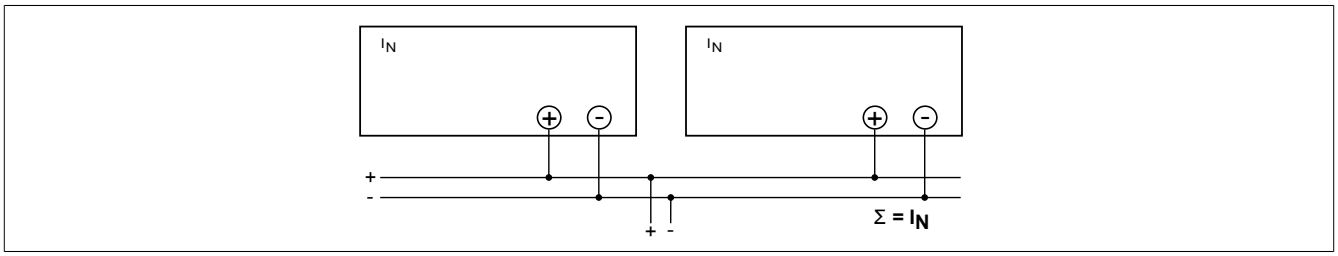
Devices of the same type can be connected in parallel for redundancy and increased capacity. No further comparison is required in factory default state.

If the output voltage is adjusted, an even distribution of current is ensured by setting all power supplies connected in parallel to the exact same output voltage.

To ensure a symmetrical distribution of current, we recommend that all cable connections from the power supply unit to the DIN rail are the same length and have the same cross section.

Depending on the system, a protective circuit should be installed at each individual device output (e.g. decoupling diode or DC fuse) for the parallel connection of two or more power supplies. This prevents high return currents in the event of a secondary device fault.

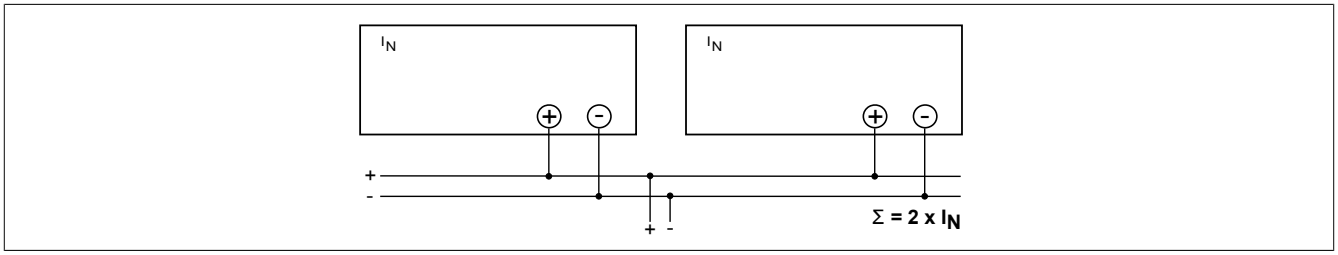
Redundant operation



Redundant connections are designed for supplying systems with particularly high requirements on operational safety. If a fault occurs in the primary circuit of the first power supply unit, the second device automatically takes over the complete power supply without interruption, and vice versa.

For this purpose, the power supply units to be connected in parallel must be large enough that the total current requirements of all loads can be fully met by one power supply unit. External decoupling diodes are required for 100% redundancy!

Increasing power



The output current can be increased to **n x I_N** where **n** is the number of devices connected in parallel.

Parallel connection for increasing power is used when extending existing systems. A parallel connection is recommended if the power supply unit does not cover the current consumption of the most powerful load. Otherwise, the loads should be divided over separate individual devices.

19 Forming DC bus capacitors

Electrolytic capacitors are installed in B&R servo drives, inverter modules, stepper motor modules and power supplies. In these cases, the oxide layer that acts as a dielectric can become weakened by electrochemical processes when stored for a lengthy period with the power is switched off. In the worst case, this can cause a short circuit and subsequent destruction of the capacitor and irreparable damage to B&R modules.

When stored for periods over 1 year, the electrolytic capacitors may be destroyed during commissioning if not preconditioned. If preconditioning takes place using a forming process defined for B&R modules, then proper operation can be guaranteed. Forming is performed by applying a defined voltage over a defined period of time. This reforms the oxide layer to ensure the functionality of the electrolytic capacitors.

Caution!

DC bus capacitors can become damaged or destroyed when switching on at the nominal voltage after being stored for periods over 1 year.

Forming B&R modules stored over a long period of time before commissioning avoids damage to the capacitors.

19.1 Forming specifications for DC bus capacitors

Procedure for modules stored for a long period of time

If modules are not supplied with nominal voltage for a longer period of time, the DC bus capacitors must be formed as follows.

The nominal voltage is the voltage permitted at the mains connections on the respective module.

Power is only supplied to the module; the output stage or controller is NOT permitted to be switched on during this!

Storage time up to 1 year: → No action required

Storage time 1 to 2 years: → Supply the module with nominal voltage 1 hour before commissioning.

Storage time 2 to 3 years: Supply the module with an adjustable power supply and increase the voltage in steps. Observe the following sequence:

1. Supply with 25% of the nominal voltage for 30 minutes.
2. Supply with 50% of the nominal voltage for 30 minutes.
3. Supply with 75% of the nominal voltage for 30 minutes.
4. Supply with 100% of the nominal voltage for 30 minutes.

Total forming time: >2 hours
The module is now ready for operation.

Storage time 3 or more years: Supply the module with an adjustable power supply and increase the voltage in steps. Observe the following sequence:

1. Supply with 25% of the nominal voltage for 2 hours.
2. Supply with 50% of the nominal voltage for 2 hours.
3. Supply with 75% of the nominal voltage for 2 hours.
4. Supply with 100% of the nominal voltage for 2 hours.

Total forming time: >8 hours
The module is now ready for operation.

Information:

B&R recommends forming at nominal voltage for 1 hour once a year.

B&R modules that have been stored for more than 5 years without forming should no longer be put into operation.
The storage period is valid from the time of delivery by B&R.