

# MINI-PS-100-240AC/24DC/2

## Power supply unit

### INTERFACE

Data sheet

100298\_en\_05

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## 1 Description

MINI POWER is an extra slim power supply unit available in design widths of 22.5 mm, 45 mm, and 67.5 mm.

In addition to a 24 V DC version with output currents of 1.3 A, 2 A, and 4 A, special voltages with 5 V/3 A,  $\pm 15$  V/1 A, and 10 V ... 15 V/2 A are also available.

Reliable startup of heavy loads is ensured by a power reserve of up to 100%: the POWER BOOST.

The high level of operational reliability is reliably ensured even on complex global networks. MINI POWER can also be used in applications where static voltage dips, transient supply voltage failures or phase failure are to be expected.

Generously dimensioned capacitors ensure mains buffering of over 20 ms at full load.

## Features

- Reliable power supply unit even at high ambient temperatures
- Reliable starting of difficult loads with static POWER BOOST power reserve
- Can be used worldwide in all industrial sectors due to a wide-range input and an international approval package
- High operating safety due to long mains buffering under full load and high MTBF (> 500,000 h)



### DANGER OF EXPLOSION!

Only remove equipment when it is disconnected and not in the potentially explosive area.



### DANGER

Components with dangerously high voltage and high stored energy are located in the device!  
Never carry out work on live parts!  
Depending on the ambient temperature and the load, the housing can become very hot!



Make sure you always use the latest documentation.  
It can be downloaded from the product at [www.phoenixcontact.net/catalog](http://www.phoenixcontact.net/catalog).

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### 3 Ordering data

Description	Type	Order No.	Pcs. / Pkt.
DIN rail power supply unit 24 V DC/2 A, primary-switched mode, slim design	MINI-PS-100-240AC/24DC/2	2938730	1

### 4 Technical Data

Input data	
Input nominal voltage range	100 V AC ... 240 V AC
AC input voltage range	85 V AC ... 264 V AC
DC input voltage range	90 V DC ... 350 V DC
AC frequency range	45 Hz ... 65 Hz
DC frequency range	0 Hz
Current consumption	Approx. 0.7 A (120 V AC) 0.4 A (230 V AC) Approx. 0.65 A (for 90 V DC) Approx. 0.2 A (for 350 V DC)
Inrush current limitation	< 15 A (typical)
$I^2t$	4.1 A <sup>2</sup> s
Power failure bypass	> 35 ms (120 V AC) > 170 ms (230 V AC)
Typical response time	< 1 s
Input fuse, integrated	2.5 A (slow-blow, internal)
Output data	
Nominal output voltage	24 V DC $\pm$ 1%
Setting range of the output voltage	22.5 V DC ... 28.5 V DC (> 24 V constant capacity)
Output current	2 A (-25 °C ... 60 °C) 2.9 A (with POWER BOOST, -25°C ... 40°C permanent)
Derating	From +60°C to 70°C: 2.5% per Kelvin
Max. capacitive load	Unlimited
Control deviation	< 1 % (change in load, static 10% ... 90%) < 3 % (change in load, dynamic 10% ... 90%) < 0.1 % (change in input voltage $\pm$ 10%)
Efficiency	> 88 % (At 230 V AC and nominal values)
Residual ripple	< 20 mV <sub>PP</sub> (20 MHz)
Peak switching voltages	< 100 mV <sub>PP</sub> (20 MHz)
Connection in parallel	Yes, for redundancy and increased capacity
Connection in series	No
Protection against internal surge voltages	Yes, < 35 V DC
Resistance to reverse feed	35 V DC
DC OK active	
Output description	$U_{OUT} > 21.5$ V: High signal
Voltage	$\leq 24$ V
Status display	"DC OK" LED green / $U_{OUT} > 21.5$ V: LED lights up

**General data**

Insulation voltage input/output	3 kV (routine test) 4 kV (type test)
Mounting position	Horizontal DIN rail NS 35, EN 60715
Degree of protection	IP20
Class of protection	II (in an enclosed control cabinet)
MTBF	> 500 000 h in acc. with IEC 61709 (SN 29500)
Type of housing	Polyamide PA, color: green
Dimensions W / H / D (state of delivery)	45 mm / 99 mm / 107 mm
Weight	0.25 kg

**Ambient conditions**

Ambient temperature (operation)	-25 °C ... 70 °C (> 60 °C derating)
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Max. permissible relative humidity (operation)	95 % (at 25 °C, no condensation)
Vibration (operation)	< 15 Hz, amplitude ±2.5 mm in acc. with IEC 60068-2-6 15 Hz ... 150 Hz, 2.3g, 90 min.
Shock	30g in all directions in acc. with IEC 60068-2-27
Pollution degree in acc. with EN 50178	2
Climatic class	3K3 (in acc. with EN 60721)

**Approvals**

UL approvals	UL/C-UL listed UL 508 UL/C-UL Recognized UL 60950 UL/C-UL Listed UL 1604 Class I, Division 2, Groups A, B, C, D NEC Class 2 as per UL 1310
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**Conformance with EMC directive 2004/108/EC**

**Noise immunity according to EN 61000-6-2**

Electrostatic discharge	EN 61000-4-2	
	Housing	Level 3
	Contact discharge	8 kV
	Discharge in air	8 kV
Electromagnetic HF field	Comments	Criterion B
	EN 61000-4-3	
	Housing	Level 3
	Frequency range	80 MHz ... 1 GHz 10 V/m
	Field intensity	10 V/m
	Frequency range	1 GHz ... 2 GHz
Fast transients (burst)	Field intensity	3 V/m
	Frequency range	2 GHz ... 2.7 GHz
	Field intensity	1 V/m
	Comments	Criterion A
	EN 61000-4-4	
	Input	4 kV (level 4 - asymmetrical: conductor to ground)
Output	2 kV (level 3 - asymmetrical: conductor to ground)	
Surge current loads (surge)	Signal	1 kV (level 2 - asymmetrical: conductor to ground)
	Comments	Criterion B
EN 61000-4-5		

**Conformance with EMC directive 2004/108/EC**

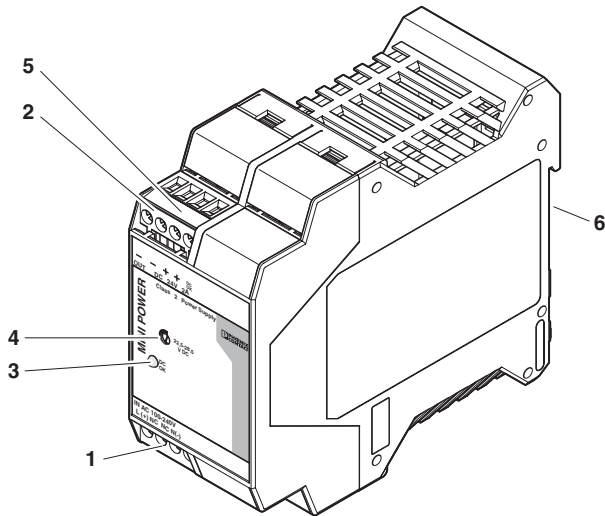
**Noise immunity according to EN 61000-6-2**

	Input	4 kV (level 4 - asymmetrical: conductor to ground) 2 kV (level 4 - symmetrical: conductor to conductor)
	Output	0.5 kV (level 1 - asymmetrical: conductor to ground) 0.5 kV (level 1 - symmetrical: conductor to conductor)
	Signal	0.5 kV (level 1 - asymmetrical: conductor to ground)
	Comments	Criterion B
Conducted interference	EN 61000-4-6	
	Input/Output/Signal	Level 3 - asymmetrical
	Frequency range	0.15 MHz ... 80 MHz
	Voltage	10 V
	Comments	Criterion A
Voltage dips	EN 61000-4-11	
	Input	(mains buffering > 20 ms)
	Comments	Criterion B

**Emitted interference in acc. with EN 61000-6-3**

Radio interference voltage in acc. with EN 55011	EN 55011 (EN 55022) Class B, area of application: Industry and residential
Emitted radio interference in acc. with EN 55011	EN 55011 (EN 55022) Class B, area of application: Industry and residential

## 5 Structure



- 1 AC input
- 2 DC output
- 3 "DC OK" LED, green
- 4 22.5 V DC ... 28.5 V DC potentiometer
- 5 "DC OK" output, active
- 6 Universal snap-on foot for EN DIN rails

	[mm <sup>2</sup> ]		AWG	[Nm] Torque
	solid	stranded		
Input	0.2 - 2.5	0.2 - 2.5	24 - 12	0.5 - 0.6
Output	0.2 - 2.5	0.2 - 2.5	24 - 12	0.5 - 0.6
Signal	0.2 - 2.5	0.2 - 2.5	24 - 12	0.5 - 0.6

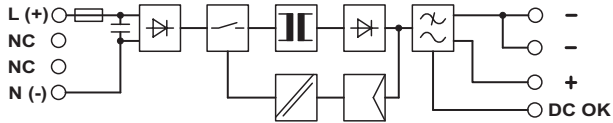
### Input data

Input nominal voltage range	100 V AC ... 240 V AC
AC input voltage range	85 V AC ... 264 V AC
DC input voltage range	90 V DC ... 350 V DC
AC frequency range	45 Hz ... 65 Hz
DC frequency range	0 Hz
Input fuse, integrated	2.5 A (slow-blow, internal)
Type of connection	Pluggable screw connection
Stripping length	7 mm

### Output data

Nominal output voltage	24 V DC $\pm$ 1%
Setting range of the output voltage	22.5 V DC ... 28.5 V DC (> 24 V constant capacity)
Output current	2 A (-25 °C ... 60 °C) 2.9 A (with POWER BOOST, -25 °C ... 40 °C permanent)
Type of connection	Pluggable screw connection
Stripping length	7 mm

## 6 Block diagram



## 7 Safety notes



### **DANGER OF EXPLOSION!**

Only remove equipment when it is disconnected and not in the potentially explosive area.

### **DANGER**

Components with dangerously high voltage and high stored energy are located in the device!

Never carry out work on live parts!

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



### **CAUTION:**

Before startup please ensure:

The mains connection has been carried out by a competent person and protection against electric shock is guaranteed!

The device can be disconnected outside the power supply unit in accordance with the regulations as in EN 60950 (e.g. through primary side line protection)!

All feed lines are sufficiently protected and dimensioned!

All output lines are dimensioned according to the maximum output current of the device or separately protected!

Sufficient convection must be guaranteed.



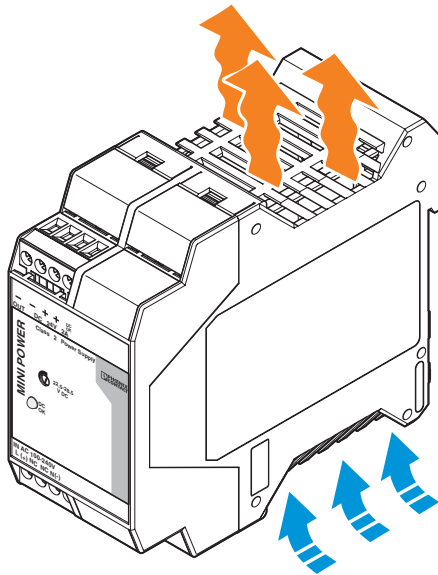
### **ATTENTION: Danger if used improperly**

The power supply units are built-in devices. The device may only be installed and put into operation by qualified personnel. The corresponding national regulations must be observed.

### **Note: Electrical damage**

Plug connectors may only be connected/disconnected when under no load.

## 8 Installation



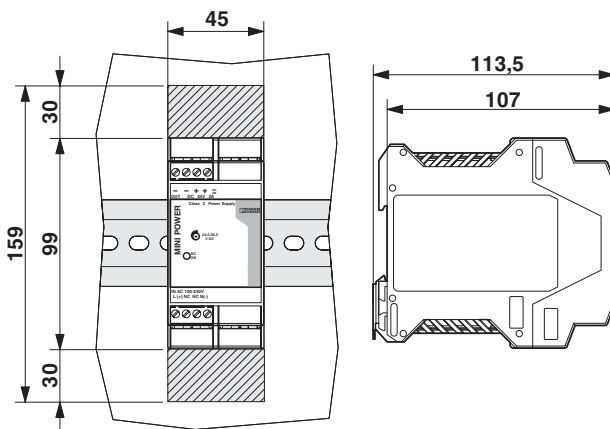
**ATTENTION: Module can become damaged**

To ensure sufficient convection, we recommend the following minimum spacing be used between modules: 5 cm for vertical installation and 0 cm for horizontal installation.



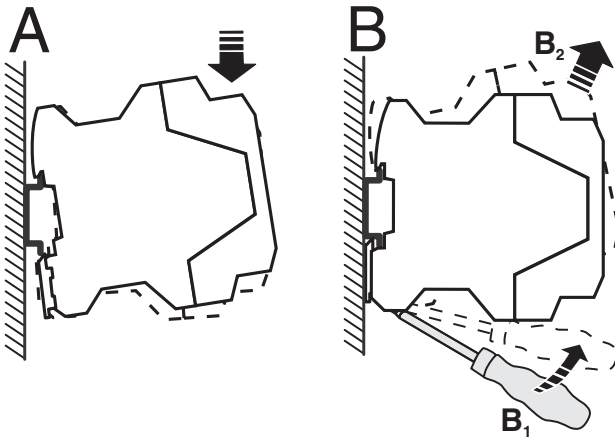
The power supply unit can be snapped onto all DIN rails in acc. with EN 60715.

## 9 Installation position



Mounting position: Installation depth 107 mm (+ DIN rail)





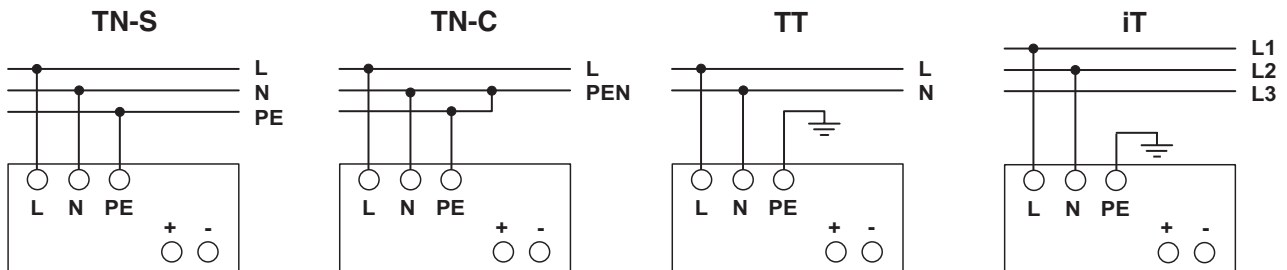
**Assembly**

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

**Removing**

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

**10 Connection to various systems**



The 100 V AC ... 240 V AC connection is made using the L and N screw connections.

The device can be connected to 1-phase AC networks or to two of the phase conductors of three-phase systems (TN, TT or IT networks in acc. with VDE 0100-300/IEC 60364-3) with nominal voltages of 100 V AC ...240 V AC.



**ATTENTION: Module can become damaged**

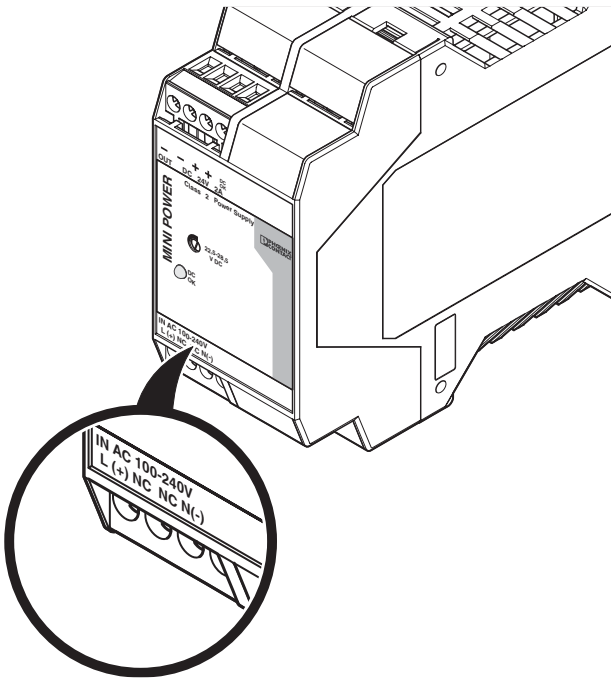
In order to comply with the UL certification, use copper cables that are designed for operating temperatures of > 75°C.

In order to comply with EN 60950/UL 60950, flexible cables require ferrules. To safely connect a device, the ferrules should have a length of at least 10 mm. To achieve a reliable and shockproof connection, strip the connecting ends according to section "Structure".

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

In order to comply with EN 60950/UL60950, flexible cables require ferrules. In order to fulfill GL requirements, unused terminal spaces must be closed. Strip the connection ends as per the table in the chapter "Structure" for a reliable and shockproof connection.

## 11 Input



**ATTENTION: Module can become damaged**

If an internal fuse is triggered, there is a device malfunction. In this case, the device must be inspected in the factory.

### Protection of the primary side

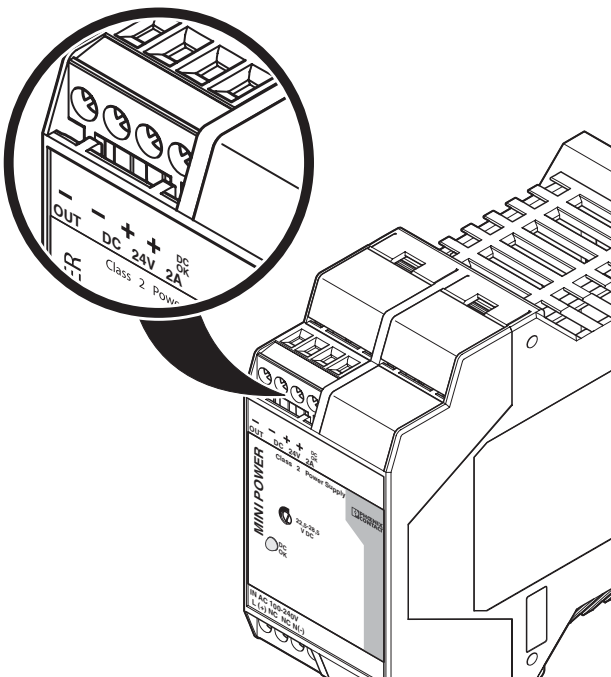
The device must be installed in acc. with the regulations as in EN 60950. It must be possible to disconnect the device using a suitable isolating facility outside the power supply.

The primary side line protection, for example, is suitable. For device protection, there is an internal fuse. Additional device protection is not necessary.

### Permissible backup fuse for mains protection

Power circuit-breaker 6 A, 10 A or 16 A, characteristic B (or identical function).

## 12 Output



**ATTENTION: Module can become damaged**

Make sure that all output lines are dimensioned according to the maximum output current or are separately protected. The cables on the secondary side must have sufficiently large cross sections in order to keep the voltage drops on the lines as low as possible.

The connection is made using the "+" and "-" screw connections on the screw connection of the DC output. At the time of delivery, the output voltage is 24 V DC. The output voltage can be set on the potentiometer.

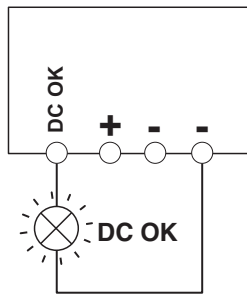
### Protection of the secondary side

The device is electronically protected against short circuit and idling. In the event of a malfunction, the output voltage is limited to 35 V DC.

### 13 Signaling

For function monitoring, there is the active DC OK switching output and the DC OK LED.

	State 1	State 2
"DC OK" LED	ON	OFF
Active DC OK switching output	U = +24 V (in reference to "-")	U = 0 V (in reference to "-")
Meaning	Normal operation of the power supply unit ( $U_{OUT} > 21.5 \text{ V}$ )	1. The output voltage is less than 21.5 V. There is a secondary consumer short circuit or overload. 2. There is no input voltage or there is a device fault.



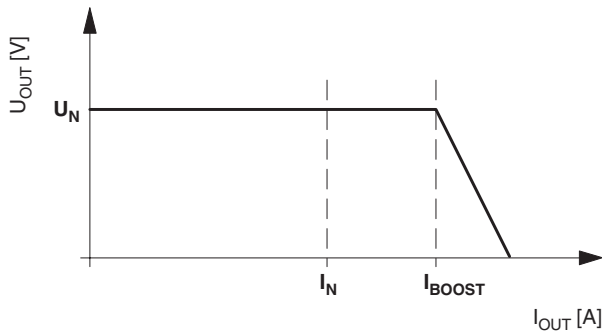
#### Active signal output

The 24 V DC signal is applied between the "DC OK" and "-" connecting terminal blocks and can carry up to 20 mA. When the output voltage drops below 21.5 V DC, this signal output signals by switching from "active high" to "low".

The DC OK signal is decoupled from the power output. It is thus not possible for parallel switched devices to provide external supply.

The 24 V DC signal can be directly connected to a logic input for evaluation.

## 14 Function



### Output characteristic curve

The device supplies a nominal output current of 2 A up to an ambient temperature of 60°C. At an ambient temperature of up to 40°C, the device supplies a continuous output current of 2.9 A. In the event of heavier loads the working point demonstrates the U/I characteristic curve shown in the figure.

In the event of overload or short circuit, the device continuously supplies the full  $I_{BOOST}$  output current with reduced output voltage, but does not shut down. As soon as the overload or short circuit has been removed, the full secondary voltage is available again.

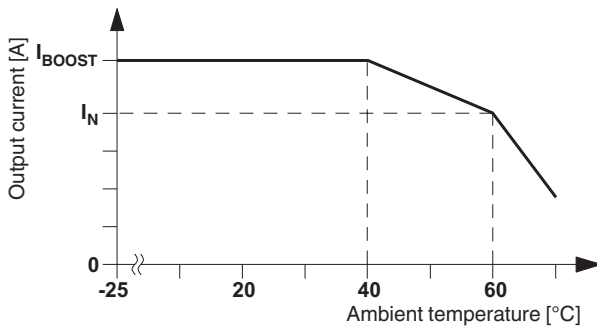
The U/I characteristic curve ensures that both heavy capacitive loads and loads with DC/DC converters can be supplied reliably with MINI POWER in the input circuit.

Connected fuses are tripped reliably. Selectivity in your system configuration is ensured at all times.

$$U_N = 24 \text{ V}$$

$$I_N = 2 \text{ A}$$

$$I_{BOOST} = 2.9 \text{ A}$$



### Thermal behavior

The device supplies a nominal output current of 2 A up to an ambient temperature of 60°C. At an ambient temperature of up to 40°C, the device supplies a continuous output current of 2.9 A.

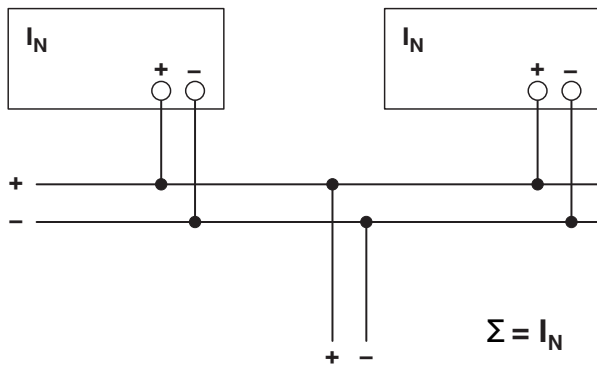
The output power must be decreased by 2.5% per Kelvin temperature increase for ambient temperatures above 60°C. From 70°C or in the event of thermal overload, the device reduces the output power for its own protection and returns to normal operation when it has cooled down.

**Parallel operation**

Devices of the same type can be connected in parallel to increase both redundancy and power. By default upon delivery, no further adjustments are required.

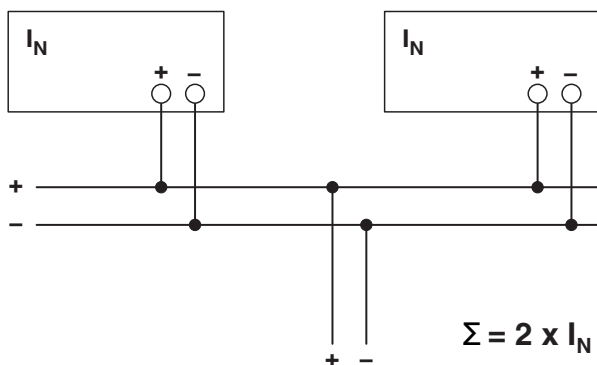
If the output voltage is adjusted, a uniform distribution of power is guaranteed by setting all parallel operated power supply units to exactly the same output voltage.

To ensure symmetrical current distribution we recommend that all cable connections from the power supply unit to the busbar are the same length and have the same cross section. Depending on the system, for parallel connection of more than two power supplies a protective circuit should be installed at each individual device output (e.g., decoupling diode, DC fuse or circuit breaker). This prevents high return currents in the event of a secondary device fault.



**Redundant operation**

Redundant circuits are suitable for supplying systems, which place particularly high demands 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 (TRIO-DIODE/12-24DC/2X10/1X20, Order No. 2866514).



**Increased performance**

For n parallel connected devices, the output current can be increased to  $n \times I_N$ . 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 load should be divided between individual devices that are independent from one another.