

# Power Supply, Primary Switch Mode, Narrow Design MINI-PS-100-240AC/24DC/2

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## MINI POWER provides:

- **Extra narrow** widths of 22.5 and 45 mm (0.886 and 1.772 in.)
- **Global use** due to a wide range input
- **A high level of operational safety** in complex global networks
- **Reliable start up** of heavy loads due to POWER BOOST

The reliability of a power supply determines the availability of individual components in a system and whether complex systems can function safely.

The globalization of markets increases the demands placed on the power supply. A wide range input and a high level of availability are required. These requirements are met by MINI POWER.



## 1. Brief Description

MINI POWER is the extra narrow power supply, which is available in widths of 22.5 and 45 mm (0.886 and 1.772 in.).

In addition to a 24 V version with output currents of 0.65 A and 2 A, special voltages are also available with 5 V/3 A and +/- 15 V/1 A.

The POWER BOOST - a power reserve of up to 100% - ensures a reliable start of difficult loads.

The high level of operational safety is also ensured in complex global networks. MINI POWER also operates in applications where static voltage dips, transient power supply failures or phase failure are common.

Large capacitors ensure mains buffering of more than 20 ms at full load.

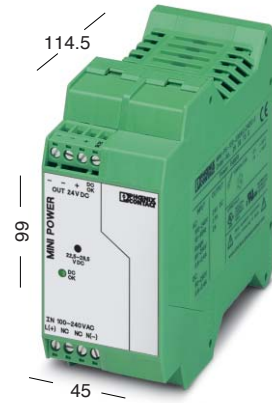
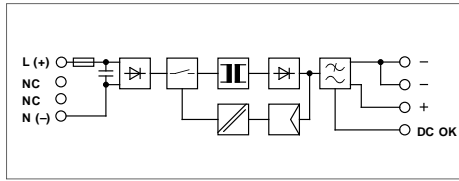
## 2. Area of Application

MINI POWER can be used globally due to the consistent conversion of a wide range input.

In this way, your entire system can be tested at any production location in the world and can be delivered to any location in the world without faulty switching of the input voltage. This reduces storage costs and logistical effort.

An international approval package including UL 60950 for IT equipment and UL 508 for industrial control equipment enables the device to be used globally.

### 3. Technical Data



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

8 mm (0.31 in.) 	solid	flexible		torque
		[mm <sup>2</sup> ]	AWG	[Nm]
Input	0.2 - 2.5	0.2 - 2.5	24 - 14	0.5 - 0.6
Output	0.2 - 2.5	0.2 - 2.5	24 - 14	0.5 - 0.6
Signal	0.2 - 2.5	0.2 - 2.5	24 - 14	0.5 - 0.6

1 AC



Description

**Power Supply,**  
primary switch mode, narrow design

Type

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

Order No.

29 38 73 0

Pcs.  
Pkt.

1

#### Technical Data

##### Input Data ①

Nominal input voltage  
Input voltage range  
Frequency  
Current consumption (for nominal values)  
Inrush current limiting/ $I^2t$  (+25°C [+77°F])  
Mains buffering for a nominal load (typical)  
Switch-on time after applying the AC supply voltage  
Transient surge protection  
Input fuse, internal  
Recommended fuse

100 - 240 V AC (wide range input)  
85 - 264 V AC (0.82-0.33 A) 90 - 350 V DC (0.65-0.19A)  
45 - 65 Hz 0 Hz  
1.4 A (120 V AC) - 0.8 A (230 V AC), approximately  
< 35 A/< 4.1 A<sup>2</sup>s, typical  
> 20 ms (120 V AC)/> 100 ms (230 V AC)  
< 1 s  
Varistor  
2.5 AT (device protection)  
Circuit breaker 10 A or 16 A Characteristic B (EN 60 898)

##### Output Data ②

Nominal output voltage  $U_N$ /tolerance  
Setting range for the output voltage  
Output current during convection cooling and nominal values  
POWER BOOST  $I_{BOOST}$  (t = 2, minutes [typical])  
Nominal output current  $I_N$  -25°C to +60°C (-13°F to +140°F)  
Derating  
Short-circuit current limit  
Startup of capacitive loads  
System deviation on:  
Load change static 10 - 90%  
Load change dynamic 10 - 90%  
Input voltage change ±10%  
No load/nominal load  
Maximum power loss  
Level of efficiency (typical)  
Response time  $U_{OUT}$  (10% - 90%)  
Residual ripple/switching peaks (20 MHz)  
Can be connected in parallel  
Internal surge protection  
Resistance to return supply



24 V DC/±1%  
22.5 - 28.5 V DC  
Up to 4 A ( $U_{out} = 24$  V DC)  
2 A ( $U_{out} = 24$  V DC)  
From +60°C (+140°F), 5% per Kelvin  
 $I_{BOOST} \approx 4$  A, approximately  
Unlimited  
< 1%, typical  
< 3%, typical  
< 0.1%, typical  
2 W/10W  
> 85% (for 230 V AC and nominal values)  
< 100 ms, typical  
< 100 mV<sub>pp</sub> (for nominal values)  
To increase redundancy and power  
Yes, limited to 33 V DC, approximately  
30 V DC

##### Signal Output Data

DC OK (active) ( $U_{out} > 0.9 \times U_N \hat{=}$  high signal)  
LED ( $U_{out} > 21.5$  V DC  $\hat{=}$  LED permanently on)

+24 V signal/20 mA, maximum  
Green LED

## Power Supply, Primary Switch Mode, Narrow Design – MINI-PS-100-240AC/24DC/2

General Data	
Isolation voltage:	Input/output
Approval package	
Safety transformers for switched-mode power supplies	
Electrical safety (of IT equipment)	
Industrial control equipment	
Equipping high voltage installations with electronic equipment	
Safety extra-low voltage	
Safe isolation	
Protection against dangerous shock currents, basic requirements for safe isolation in electrical equipment	
Limitation of harmonic line currents	
Mounting position	
Can be mounted with spacing	- Vertical - Horizontal
Degree of protection	
Class of protection	
MTBF	
Housing version	
Dimensions (W x H x D)	
Weight	
	4 kV AC (type test)/3 kV AC (routine test)
	EN 61 558-2-17 EN 60950/VDE 0805 UL/C-UL Recognized UL 60 950  <sup>1)</sup> UL/C-UL Listed UL 508  <sup>1)</sup> LISTED
	EN 50 178/VDE 0160 (Surge Voltage Category III) PELV (EN 50 178) SELV (EN 60 950) VDE 0100-410
	DIN VDE 0106-101 According to EN 61000-3-2
	On horizontal NS 35 DIN rail according to EN 50022 ≥ 8 cm (0.31 in.) 0 cm IP 20 II, (in closed control cabinets) > 500 000 h according to IEC 1709 (SN 29 500) Polyamide PA, color green (45 x 99 x 114.5 mm [1.722 x 3.898 x 4.508 in.]) 0.25 kg, approximately

Climatic Data	
Ambient temperature	Operation Storage
Humidity	
Vibration	according to IEC 68-2-6
Shock	according to IEC 68-2-27
Degree of pollution	
Climatic category	
	-25°C ° to +70°C (-13°F to +158°F) (> +60°C [+140°F] derating) -40 °C to +85°C (-40°F to +185°F) up to 95% at +25°C (+77°F), no condensation < 15 Hz, amplitude ±2.5 mm/15 Hz - 150 Hz, 2.3 g 30 g all space directions 2 (according to EN 50 178) 3K3 (according to EN 60 721)

### Conforms to the EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC

#### EMC (Electromagnetic Compatibility) Noise Immunity According to EN 61000-6-2:

Electrostatic discharge (ESD)	EN 61000-4-2 <sup>3)</sup>	Housing Contact discharge: Air discharge:
Electromagnetic HF field	EN 61000-4-3 <sup>2)</sup>	Housing Frequency: Field strength:
Fast transients (burst)	EN 61000-4-4 <sup>3)</sup>	Input: Output: Signal:
Surge current loads	EN 61000-4-5 <sup>3)</sup>	Input: Output:
Conducted interference	EN 61000-4-6 <sup>2)</sup>	I/O/S: Frequency: U <sub>0</sub> :
Voltage dips	EN 61000-4-11 <sup>3)</sup>	Input:
Simulation of radiophone	EN 50204	Frequency: Field strength:
<b>Noise Emission According to EN 50081-2:</b>		
Radio interference	EN 55011	
Radio interference	EN 55011	

EN 55011 corresponds to CISPR11/EN 55022 corresponds to CISPR22  
EN 61000 corresponds to IEC 1000

- <sup>2)</sup>Criterion A: Normal operating characteristics within the specified limits.  
<sup>3)</sup>Criterion B: Temporary adverse effects on the operating characteristics that the device corrects independently.

#### Requirements EN 61 000-6-2

EN 61 000-6-2	MINI-PS-100-240AC/24DC/2
4 kV 8 kV	Level 3 8 kV 8 kV
80 - 1000 MHz 10 V/m	Level 3 80 - 1000 MHz/1.4 - 2.0 GHz 10 V/m
2 kV 2 kV 1 kV	asymmetrical <sup>5)</sup> asymmetrical <sup>5)</sup> asymmetrical <sup>5)</sup>
4 kV (Level 4) 2 kV (Level 3) 1 kV (Level 2)	
2 kV 1 kV 0.5 kV 0.5 kV 1 kV	asymmetrical <sup>5)</sup> symmetrical <sup>4)</sup> asymmetrical <sup>5)</sup> symmetrical <sup>4)</sup> asymmetrical <sup>5)</sup>
2 kV (Level 3) 1 kV (Level 3) 0.5 kV (Level 1) 0.5 kV (Level 1) 1 kV (Level 2)	
0.15 - 80 MHz 10 V	asymmetrical <sup>5)</sup> Level 3 0.15 - 80 MHz 10 V
30% reduction of the input voltage for 0.5 periods	See input data: Mains buffering > 20 ms
Not required	900 MHz/1800 MHz 20 V/m
Class A <sup>6)</sup>	EN 55011 (EN 55022) Class B <sup>7)</sup>
Class A <sup>6)</sup>	EN 55011 (EN 55022) Class B <sup>7)</sup>

- <sup>4)</sup>symmetrical: Cable to cable  
<sup>5)</sup>asymmetrical: Cable to ground  
<sup>6)</sup>Class A: Industrial application  
<sup>7)</sup>Class B: Industrial and domestic applications

#### 4. Device View, Connections , and Control Elements

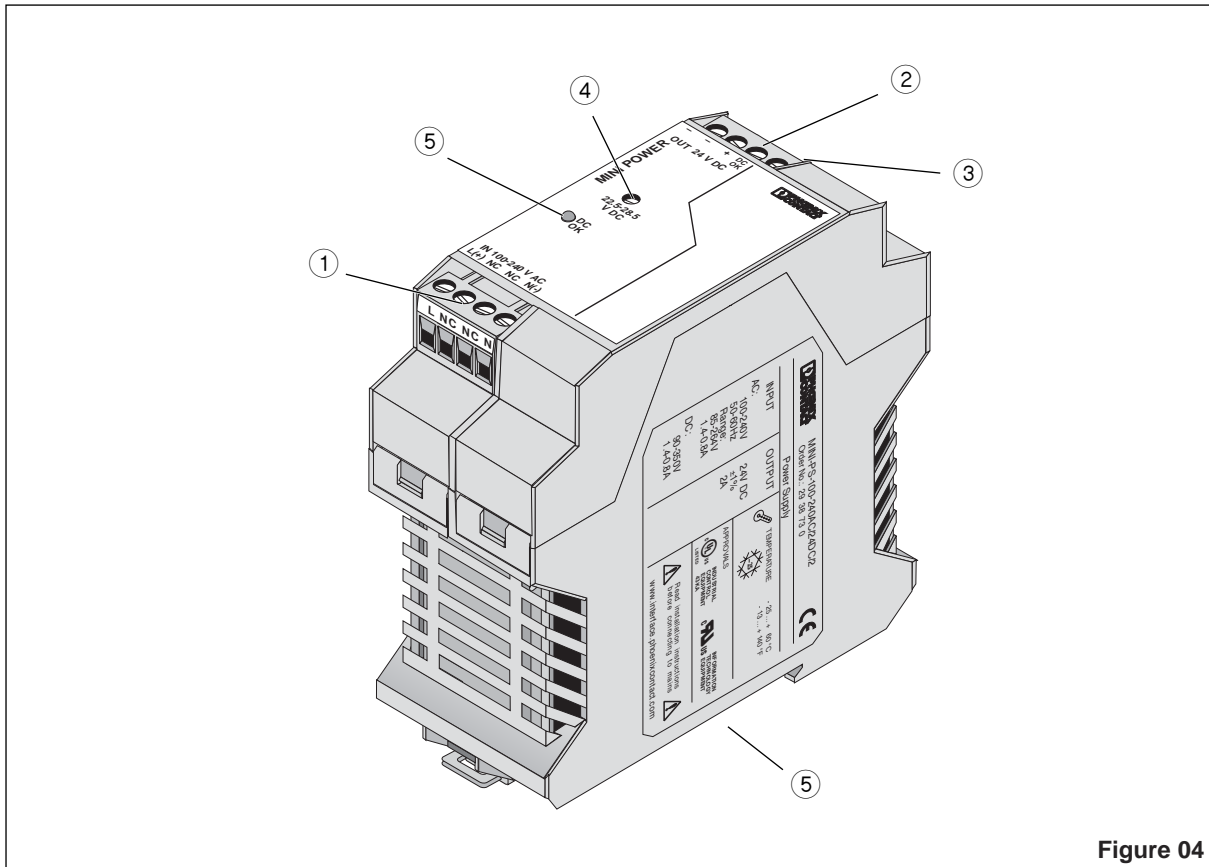


Figure 04

- ① **AC input:**  
 Input voltage 85 - 264 V AC  
 Frequency 45 - 65 Hz  
 (0.2 mm<sup>2</sup> to 2.5 mm<sup>2</sup> solid)  
 (0.2 mm<sup>2</sup> to 2.5 mm<sup>2</sup> flexible)  
 (24 - 14 AWG)  
 Internal fuse 2.5 AT  
 Recommended fuse  
 10 A or 16 A c.b./Characteristic B
- ② **DC output:**  
 Output voltage 24 V DC (default),  
 can be set from 22.5 - 28.5 V DC using  
 a potentiometer③ (0.2 mm<sup>2</sup> to 2.5 mm<sup>2</sup> solid)  
 (0.2 mm<sup>2</sup> to 2.5 mm<sup>2</sup> flexible) (AWG 24 - 14)  
 The device is idling-proof and short-circuit-proof.
- ③ **DC OK output active**
- ④ **Potentiometer 22.5 - 28.5 V DC**
- ⑤ **DC OK LED**
- ⑥ **Universal latching foot for EN DIN rails**

**Installation and startup** must only be carried out by qualified personnel. The relevant country-specific regulations (e.g., VDE, DIN) must also be observed.

Before startup it is particularly important to ensure that:

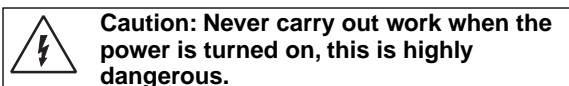
- The line has been connected correctly and protection is provided against electric shock.
- The device can be switched off outside the power supply according to EN 60950 regulations (e.g., by the line protection on the primary side).
- All supply lines have sufficient fuse protection and are the correct size.
- All output cables are the correct size for the maximum device output current or have separate fuse protection.
- Sufficient convection is ensured.

MINI POWER is a built-in device. After installation the terminal area must be covered to provide sufficient protection against unauthorized access to live parts. This is ensured by installing the device in the control cabinet or distributor box.

**The device contains dangerous live components and high levels of stored energy.**

#### 5. Safety and Warning Instructions

To ensure safe operation of the device and that all functions can be used, please read these instructions carefully.




## 6. Installation

### 6.1. Mounting

The power supply can be snapped onto all DIN rails according to EN 50022-35. The device must be mounted horizontally (input terminals facing downwards).

#### Installation Dimensions



**To ensure sufficient convection, we recommend the following minimum spacing be used between modules:**

**8.0 cm (3.150 in.) for vertical installation**

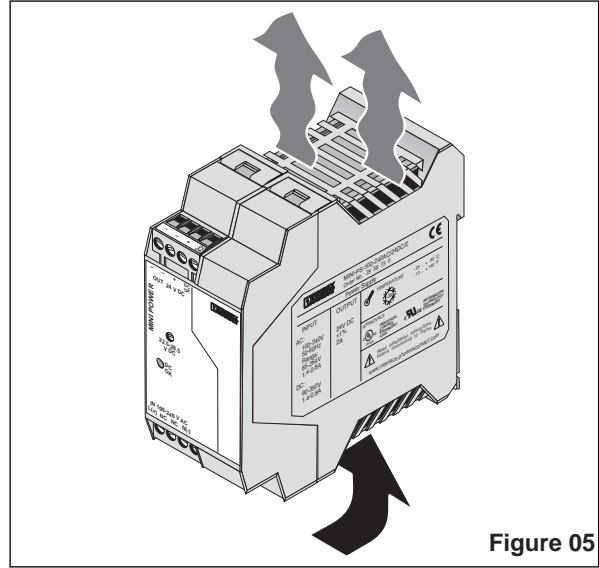


Figure 05

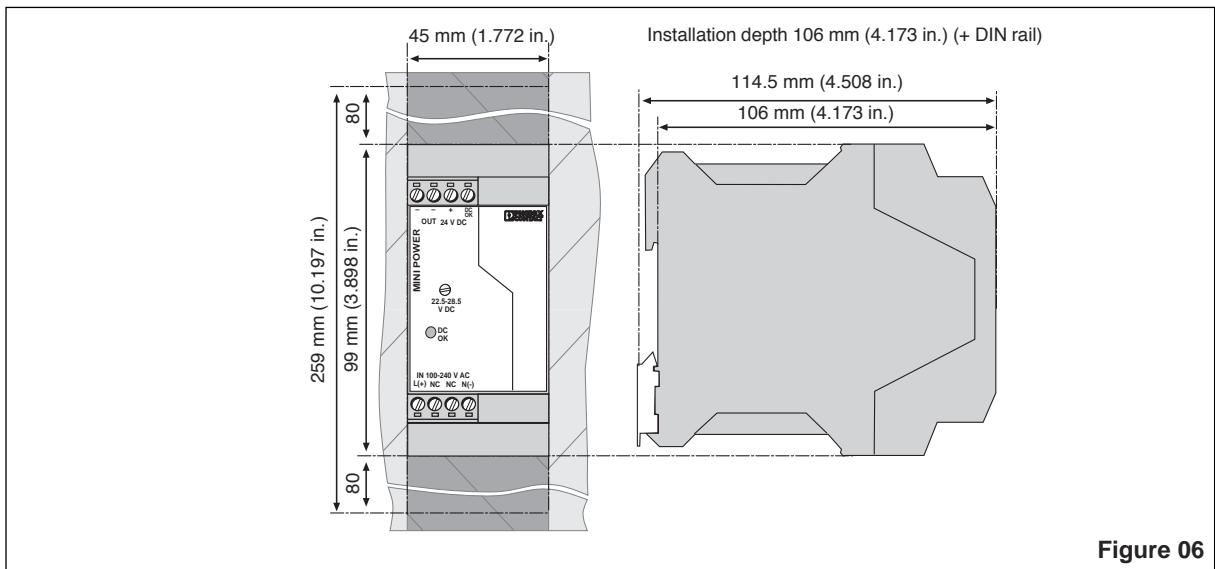


Figure 06

#### Mounting:

Place the module with the DIN rail guideway on the **top edge** of the DIN rail and then snap it **downwards**.

#### Removal:

Release the snap-on catch using a screwdriver and then detach the module from the **bottom edge** of the DIN rail.

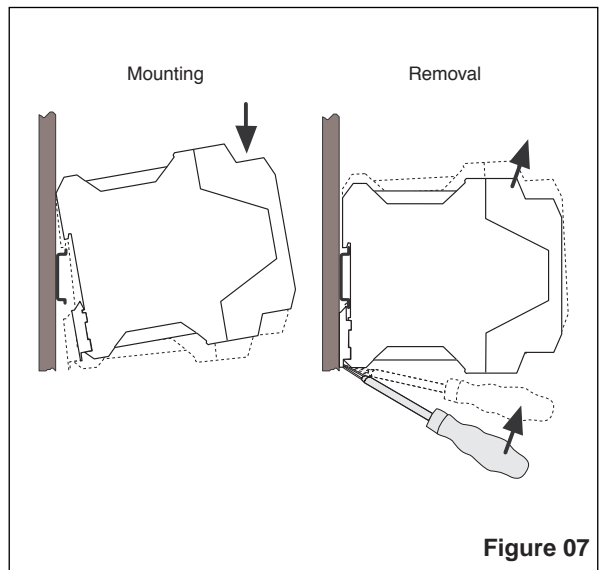


Figure 07

### 6.2. Connection of Various Types of Network: 100 - 240 V AC Networks

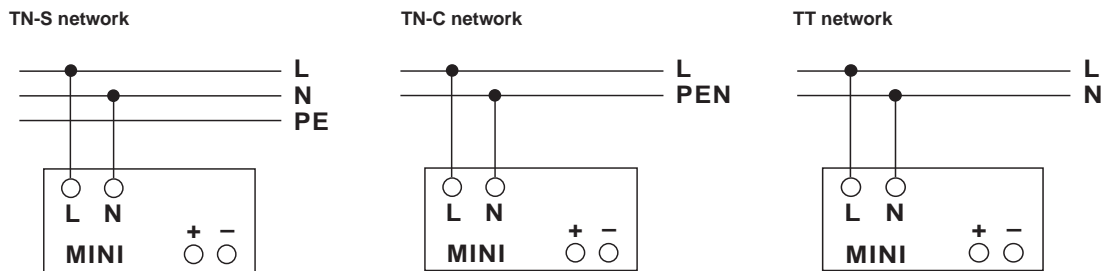


Figure 08

#### Connection Cable:

The device is equipped with COMBICON connectors. This reliable user-friendly connection method enables quick device connection and safe isolation of the electrical connection, if required. **Only operate connectors when the power is switched off.**

The following cable cross sections can be connected:

	Solid [mm <sup>2</sup> ]	Flexible [mm <sup>2</sup> ]	AWG	Torque [Nm]
① Input:	0.2 - 2.5	0.2 - 2.5	24 - 14	0.5 - 0.6
② Output:	0.2 - 2.5	0.2 - 2.5	24 - 14	0.5 - 0.6
③ Signal:	0.2 - 2.5	0.2 - 2.5	24 - 14	0.5 - 0.6

**For reliable and safe-to-touch connection:** Strip 8 mm (0.31 in.) from the connector ends.

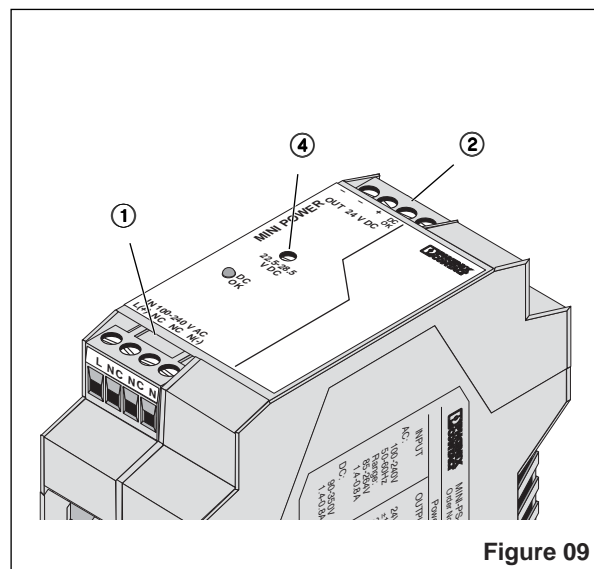


Figure 09

### 6.3. Input (①, Figure 9)

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

#### Protecting the Primary Side

The device must be installed according to the specifications of EN 60 950. It must be possible to switch off the device using a suitable disconnecting device outside the power supply. For example, primary side line protection could be used.

Additional device protection is not required, as an internal fuse is present.

#### Recommended Fuse:

Circuit breaker 10 A or 16 A, Characteristic B (or equivalent).

A suitable fuse must be fitted for DC applications.



**If the internal fuse is blown, this is most probably due to a device fault. In this case, the device should be checked in the factory.**

**6.4. Output (② , Figure 9)**

The 24 V DC connection is made using the "+" and "-" screw connections on the screw-cage connection ②. The output voltage set upon delivery is 24 V DC.

The output voltage can be adjusted from 22.5 to 28.5 V DC on the potentiometer ④.

**Protecting the Secondary Side:**

The device is electronic short-circuit-proof and idling-proof. In the event of an error, the output voltage is limited to a maximum of 33 V DC.

It should be ensured that all output cables are the correct size for the maximum output current or have separate fuse protection.

The secondary side cables should have large cross sections to keep voltage drops on the cables to a minimum.

**Active signal output (③ , Figure 10)**

The 24 V DC signal is between the "DC OK" and "-" connection terminals and can be loaded with 20 mA maximum. This signal output indicates that the output voltage has fallen below 21.5 V DC when "active high" changes to "low".

The DC OK signal is isolated from the power output. This ensures that a separate supply does not enter from devices connected in parallel.

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

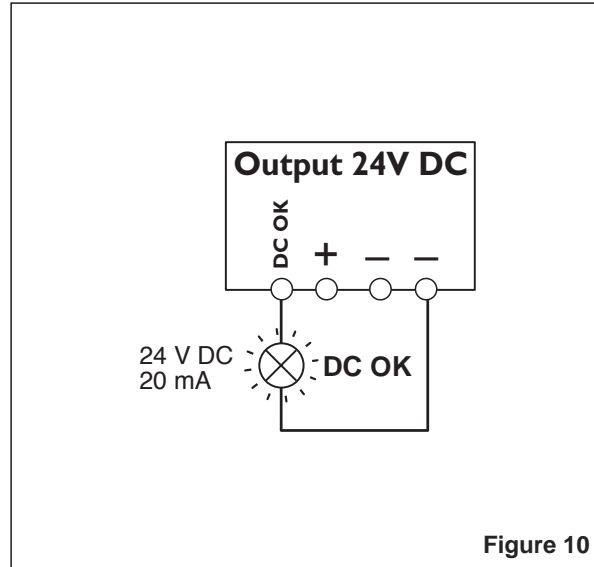


Figure 10

**DC OK LED**

The green DC OK LED enables local function evaluation in the control cabinet.

<b>LED on</b>	Normal operation of the power supply
<b>LED off</b>	<p>a) The output voltage is <math>\leq 21.5</math> V DC. There is a secondary load short circuit or overload outside the POWER BOOST area.</p> <p>b) No AC supply voltage is present or there is a device fault.</p>

**7. Installation**

**7.1. Output Characteristic Curve**

The device can supply up to 4 A at 24 V DC output voltage for a few minutes ( $P_{out} = 96$  W).

With high loads, the working point demonstrates the U/I characteristic curve shown in Figure 11. The output current is limited to  $I_{BOOST}$ . The secondary voltage is reduced until the short circuit on the secondary side is removed.

The U/I characteristic curve ensures that both heavy capacitive loads and devices with DC/DC converters can be supplied by MINI POWER in the input circuit without any problems.

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

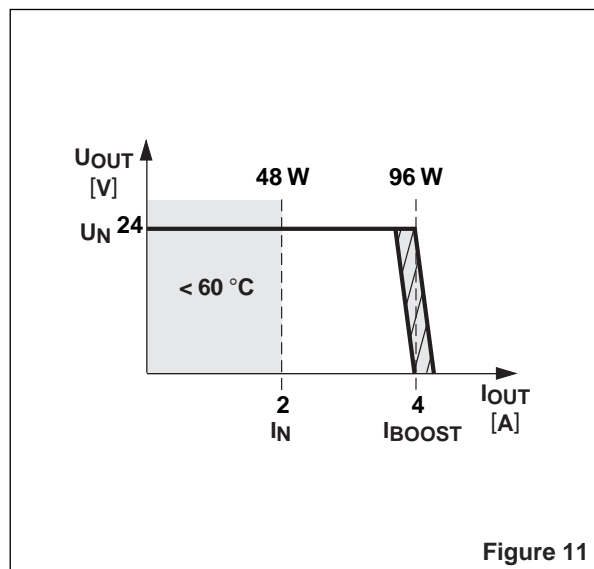


Figure 11



### 7.2. Temperature Response

At an ambient temperature of up to +60°C (+140°F) the device can supply a nominal current of 2 A. POWER BOOST is available for a few minutes. The output power must be decreased by 5% per Kelvin temperature increase for ambient temperatures over +60°C (+140°F).

At ambient temperatures over +70°C (+158°F) or in the event of a thermal overload, the device switches off to protect itself. The device switches on again once it has cooled down.

### 7.3. Parallel Operation

Devices of the same type can be connected in parallel to increase both redundancy and power. The default setting does not have to be adjusted.

If the output voltage is adjusted, an even current distribution can be ensured by precisely setting all power supplies that are operated in parallel to the same output voltage.

To ensure symmetrical current distribution we recommend that all cable connections from the power supply to the DIN rail 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). This means that in the event of a secondary device fault high return currents are avoided.

### 7.4. Redundancy Operation

Redundant connections are designed for supplying systems, which place particularly high requirements on operational safety. If a fault occurs in the primary circuit of device no. 1, device no. 2 automatically takes over the complete power supply without interruption and vice versa.

For this purpose, the power supplies to be connected in parallel must be large enough that the total current requirements of all loads can be completely covered by one power supply. External decoupling diodes or DC fuse are required for 100% redundancy.

### 7.5. Power Increase

The output current can be increased to  $n \times I_N$  where  $n$  is the number of devices connected in parallel.

The parallel connection for power increase can be used to extend existing systems. A parallel connection is recommended if the power supply does not cover the current consumption of the most powerful load. Otherwise, the loads should be divided over independent individual devices.

A maximum of five devices can be connected in parallel.

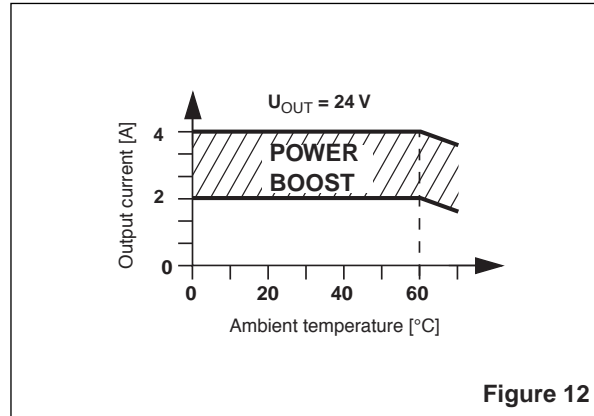


Figure 12

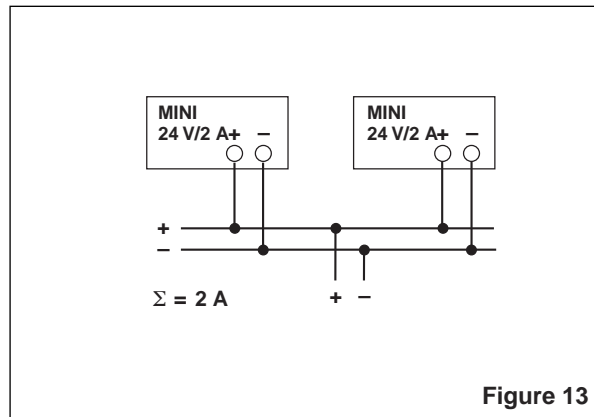


Figure 13

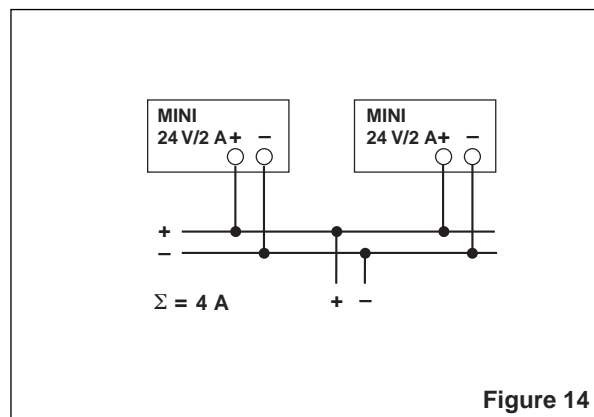


Figure 14



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