Power Supply, Primary Switch Mode, Narrow Design
MINI-PS-100-240AC/24DC/1

MINI POWER provides:

- **Extra narrow** widths of 22.5, 45, and 67.5 mm (0.886, 1.772, and 2.657 in.)
- **Global use** due to a wide range input
- **A high level of operational safety** in complex global networks
- **Reliable startup** 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. Short Description

MINI POWER is the extra narrow power supply, which is available in widths of 22.5, 45, and 67.5 mm (0.886, 1.772, and 2.657 in.).

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

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

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.

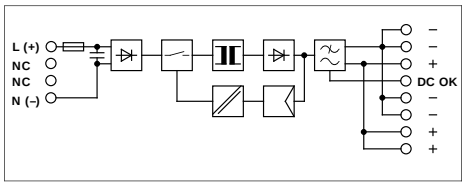
2. Area of Application

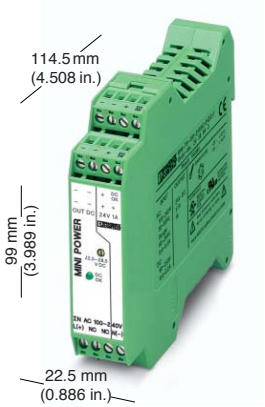
MINI POWER can be used globally due to the consistent provision of a wide range input.

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/1

1 AC NEC Class 2

7	solid [mm²]	flexible [mm²]	AWG	torque [Nm]	[lb in.]
Input	0.2 - 2.5	0.2 - 2.5	25 - 14	0.5 - 0.6	4.4 - 5.3
Output	0.2 - 2.5	0.2 - 2.5	25 - 14	0.5 - 0.6	4.4 - 5.3
Signal	0.2 - 2.5	0.2 - 2.5	25 - 14	0.5 - 0.6	4.4 - 5.3

Description	Type	Order No.	Pcs. Pkt.
Power Supply Primary switch mode, narrow design	**MINI-PS-100-240AC/24DC/1**	**29 38 84 0**	1

Technical Data

Input Data (1)	
Nominal input voltage	100 - 240 V AC (wide range input)
Input voltage range (current consumption)	85 - 264 V AC 90 - 350 V DC
Frequency	45 - 65 Hz 0 Hz
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 mains voltage Transient surge voltage protection	0.5 A (100 V AC)/0.2 A (230 V AC), approximately < 15 A/< 0.6 A^2s, typical > 20 ms (120 V AC)/> 110 ms (230 V AC) < 0.2 s Varistor
Input fuse, internal	T1.25 AL 250 V (device protection)
Recommended fuse	Line protection switch 6 A, 10 A, 16 A Characteristic B
Output Data (2)	
Nominal output voltage U_N/tolerance	24 V DC/±1%
Setting range for the output voltage	22.5 - 28.5 V DC
Output current during convection cooling and nominal values POWER BOOST I_{BOOST} (t = 2 min., typical)	1.3 A (U_{OUT} = 24 V)
Nominal output current I_N -25°C to +60°C (-13°F to +140°F)	1 A (U_{OUT} = 24 V)
-25°C to +40°C (-13°F to +104°F)	1.3 A (U_{OUT} = 24 V)
Derating	From +60°C (+140°F), 2.5% per Kelvin
Short-circuit current limit	1.7 A, approximately
Startup of capacitive loads	Unlimited
System deviation on: Load change static 10 - 90%	< 1%, typical
Load change dynamic 10 - 90%	< 3%, typical
Input voltage change ±10%No load/nominal load	< 0.1%, typical
Maximum power loss	1.4 W/4.5 W
Level of efficiency (typical)	> 80% (for 230 V AC and nominal values)
Response time U_{OUT} (10% - 90%)	< 1.2 ms, typical
Residual ripple/switching peaks (20 MHz)	< 100 mV_{pp} (for nominal values)
Can be connected in parallel	To increase redundancy and power
Internal surge voltage protection	Yes, limited to 35 V DC, approximately
Resistance to return supply	35 V DC
Signal Output Data	
DC OK (active) (U_{out} > 0.9 x U_N = high signal)	+24 V signal/20 mA, maximum
LED (U_{out} > 21.5 V DC = LED permanently on)	Green LED

General Data		
Insulation voltage:	Input/output	3 kV AC (type test)/3 kV AC (routine test)
Approval package		
Electrical equipment of machines		EN 60 204 (Surge Voltage Category III)
Electrical safety		EN 60950/VDE 0805
(of IT equipment)		UL/C-UL Recognized UL 60 950 [1]
Industrial control equipment		UL/C-UL Listed UL 508 [1]
Limitation of output power		NEC Class 2
Equipping high voltage installations		
with electronic equipment		EN 50 178/VDE 0160
Safety extra-low voltage		PELV (EN 60 204)
		SELV (EN 60 950)
Safe isolation		VDE 0100-410
Limitation of harmonic line currents		According to EN 61000-3-2
Mounting position		On horizontal NS 35 DIN rail according to EN 50022
Can be mounted with spacing	- Vertical	≥ 5 cm (1.969 in.)
	- Horizontal	0 cm
Degree of protection		IP 20
Class of protection		II, (in closed control cabinets)
MTBF		> 500 000 h according to IEC 61709 (SN 29 500)
Housing version Weight		Polyamide PA, color green
Dimensions (W x H x D)		0.21 kg, approximately
		22.5 x 99 x 114.5 mm (0.886 x 3.898 x 4.508 in.)
Climatic Data		
Ambient temperature	Operation	-25°C to +70°C (-13°F to +158°F) (> +60°C [+140°F] derating)
	Storage	-40°C to +85°C (-40°F to +185°F)
Humidity		Up to 95% at +25°C (+77°F), no condensation
Vibration	according to IEC 60068-2-6	< 15 Hz, amplitude ±2.5 mm/15 Hz - 150 Hz, 2.3 g
Shock	according to IEC 60068-2-27	30 g all space directions
Degree of pollution		2 (according to EN 50 178)
Climatic category		3K3 (according to EN 60 721)

[1] UL approval for ambient tempertatunre up to +60 °C (+140 °F)

CE

Conforms to the EMC Directive 2004/108/EC and the Low Voltage Directive 2006/95/EC

EMC (Electromagnetic Compatibility) **Noise Immunity According to EN 61000-6-2:**			**Requirements** **EN 61 000-6-2**	**MINI-PS-100-240AC/24DC/1**
Electrostatic discharge (ESD)	EN 61000-4-2[3]	Housing Contact discharge: Air discharge:		> Level 3 4 kV 8 kV
Electromagnetic HF field	EN 61000-4-3[2]	Housing Frequency: Field strength:		Level 3 80 - 1000 MHz 10 V/m
Fast transients (burst)	EN 61000-4-4[3]	Input: Output: Signal:	2 kV asymmetrical[5] 2 kV asymmetrical[5] 1 kV asymmetrical[5]	4 kV (Level 4) 2 kV (Level 3) 1 kV (Level 2)
Surge current loads	EN 61000-4-5[3]	Input: Output:	2 kV asymmetrical[5] 1 kV symmetrical[4] 0.5 kV asymmetrical[5] 0.5 kV symmetrical[4]	4 kV (Level 4) 2 kV (Level 4) 1 kV (Level 1) 0.5 kV (Level 1)
Conducted interference	EN 61000-6-2[2]	I/O/S: Frequency: U_0:	asymmetrical[5] 0.15 - 80 MHz 10 V	Level 3 0.15 - 80 MHz 10 V
Voltage dips	EN 61000-4-11[3]	Input:	30% reduction of the input voltage for 0.5 periods	See input data: Mains buffering > 20 ms

Noise Emission According to EN 61000-6-3:			
Radio interference	EN 55011	Class A[6]	EN 55011 (EN 55022) Class B[7]
Radio interference	EN 55011	Class A[6]	EN 55011 (EN 55022) Class B[7]

[2] Criterion A: Normal operating characteristics within the specified limits.

[3] Criterion B: Temporary adverse effects on the operating characteristics that the device corrects independently.

[4] symmetrical: Cable to cable

[5] asymmetrical: Cable to ground

[6] Class A: Industrial application

[7] Class B: Industrial and domestic applications

4. Device View, Connections, and Control Elements

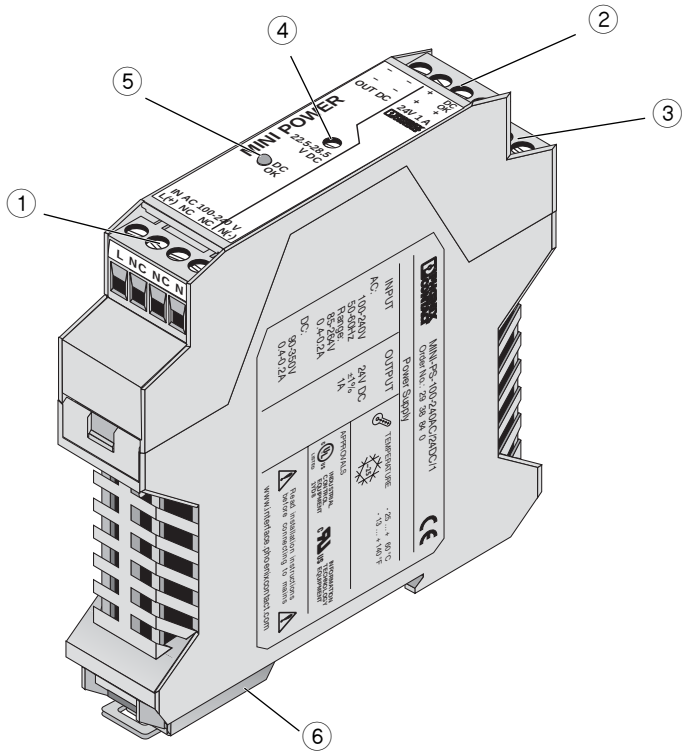


Figure 04

1 AC input:
Input voltage 85 - 264 V AC
Frequency 45 - 65 Hz
(0.2 mm^2 to 2.5 mm^2 solid)
(0.2 mm^2 to 2.5 mm^2 flexible)
(25 - 14 AWG)
Internal fuse T1.25 AL 250 V
Recommended fuse
6 A or 10 A LS/Characteristic B

2 DC output:
Output voltage 24 V DC (default),
can be set from 22.5 - 28.5 V DC using
a potentiometer (4) (0.2 mm^2 to 2.5 mm^2 solid)
(0.2 mm^2 to 2.5 mm^2 flexible) (25 - 14 AWG)
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

5. Safety and Warning Instructions

To ensure that the device can be operated safely and all functions can be used, please read these instructions carefully.

Caution: Never carry out work when the power is turned on, this is highly dangerous.

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 mains have 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.

6. Installation

6.1. Mounting

The power supply can be snapped onto all DIN rails according to EN 60715. The device must be mounted horizontally (input terminal blocks facing downwards).

Installation Dimensions

To ensure sufficient convection, we recommend a minimum spacing of 5 cm (1.969 in.) to other modules above and below the device.

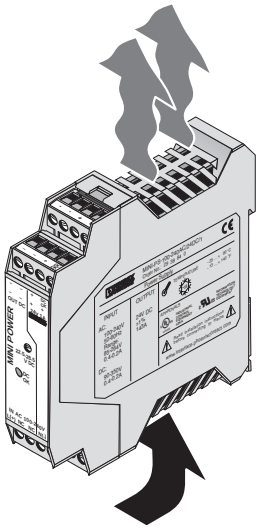


Figure 05

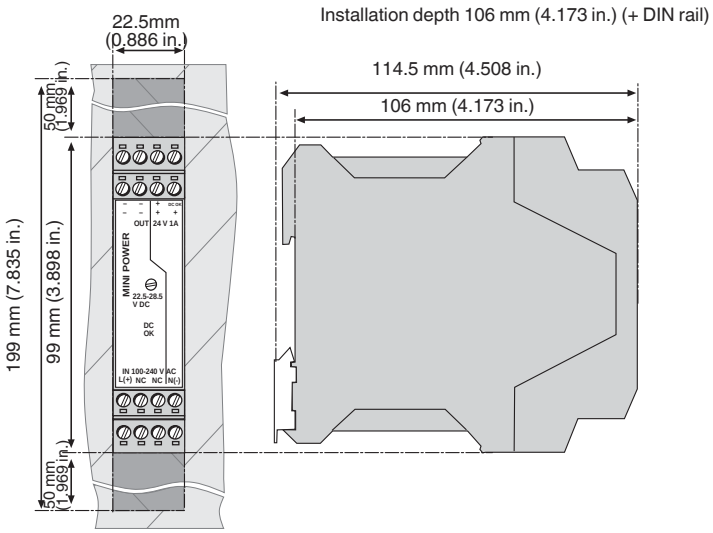


Figure 06

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.

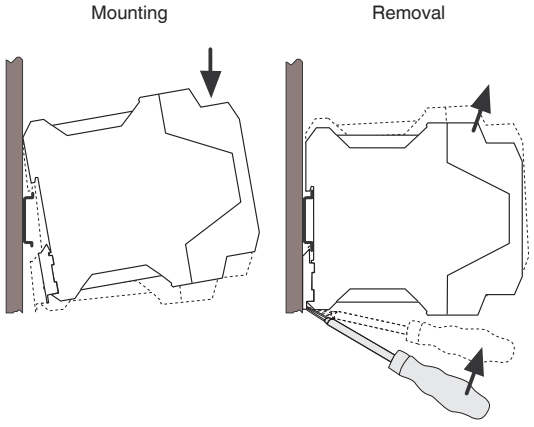


Figure 07

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

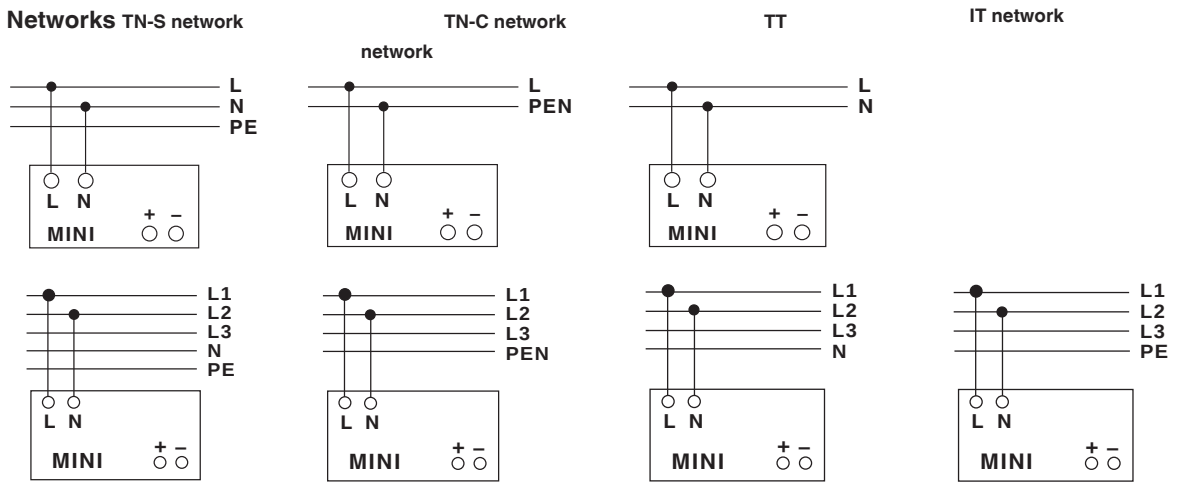


Figure 08

Connection Cable:

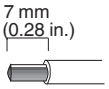
The device is equipped with COMBICON connectors. This reliable user-friendly connection method enables quick device connection and safe isolation of the electrical connection, if required.

Only operate connectors when the power is switched off.

The following cable cross sections can be connected:

		Solid [mm²]	Flexible [mm²]	AWG	[Nm]	Torque [lb in.]
1	Input	0.2 - 2.5	0.2 - 2.5	25 - 14	0.5 - 0.6	4.4 - 5.3
2	Output:	0.2 - 2.5	0.2 - 2.5	25 - 14	0.5 - 0.6	4.4 - 5.3
3	Signal:	0.2 - 2.5	0.2 - 2.5	25 - 14	0.5 - 0.6	4.4 - 5.3

For reliable and safe-to-touch connection: Strip 7 mm (0.28 in.) from the connector ends.



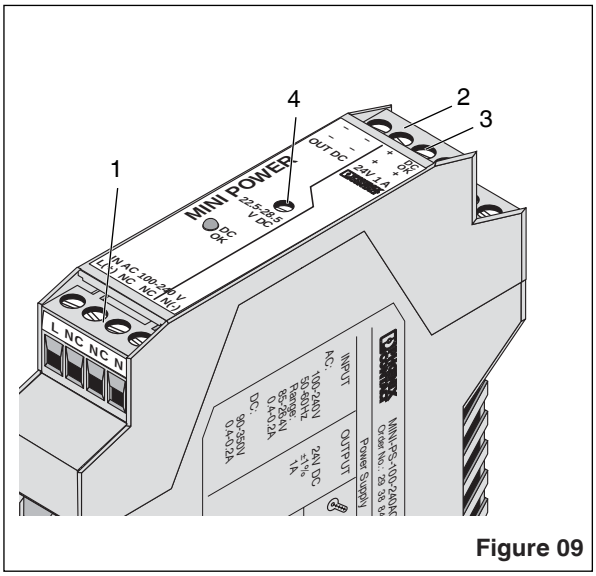


Figure 09

6.3. Input ((1), Figure 9)

The 100 - 240 V AC connection is made using screw connections L and N. The device can be connected to single-phase AC networks or to two external conductors for three-phase networks (TN, TT or IT network according to VDE 0100-300/ IEC 60364-3) with nominal voltages of 100 - 240 V AC.

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.

Note that an all-pole disconnecting device must be provided for two-phase operation using two external conductors for a three-phase network.

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 6 A or 10 A, 16 A
Characteristic B (or equivalent).

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 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 35 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 terminal blocks 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.

Signaling

The active DC OK switching output and the DC OK LED provide function monitoring.

	Status 1	Status 2
Green "DC OK" LED5555	ON	OFF
Active DC OK switching output	U = +24 V (with reference to "-")	U = 0 V (with reference to "-")
Meaning	Normal operation of the power supply U_{OUT} > 21.5 V	U_{OUT} ≤ 21.5 V DC • Secondary load short circuit or overload • No mains voltage or device fault

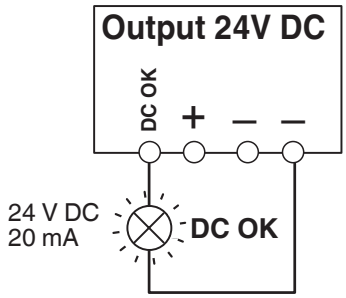


Figure 10

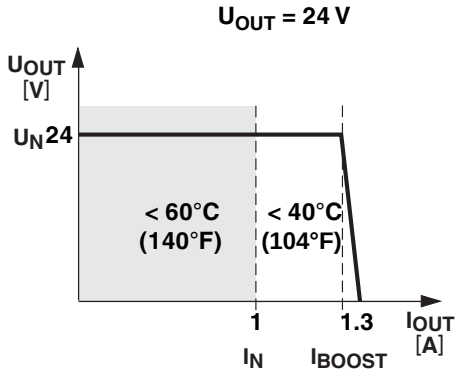


Figure 11

Once the overload or short circuit has been removed, the entire set secondary voltage is available again.

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.

7. Installation

7.1. Output Characteristic Curve

The device can supply a nominal output current of 1 A up to an ambient temperature of 60°C (140°F). With an ambient temperature of up to 40°C (104°F) the device continuously supplies an output current of 1.3 A. At temperatures up to 60°C (140°F), the POWER BOOST provides a short-term output current of 1.3 A for a few minutes.

With high loads, the working point demonstrates the U/I characteristic curve shown in Figure 11.

On an overload or short circuit, the entire output current I_{BOOST} is provided permanently at a reduced output voltage.

7.2. Temperature Response

The device can supply a nominal output current of 1 A up to an ambient temperature of 60°C (140°F). With an ambient temperature of up to 40°C (104°F) the device continuously supplies an output current of 1.3 A. At temperatures up to 60°C (140°F), the POWER BOOST provides a short-term output current of 1.3 A for a few minutes.

The output power must be decreased by 2.5% per Kelvin temperature increase for ambient temperatures above +60°C (+140°F). At ambient temperatures above +70°C (+158°F) or in the event of a thermal overload, the device reduces the output power to protect itself and returns to normal operation once it has cooled down.

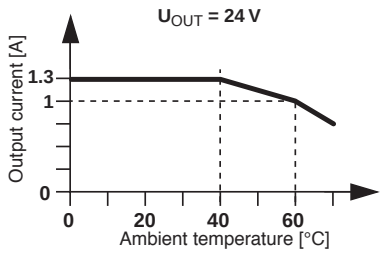


Figure 12

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 or DC fuse). 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 1, device 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 fully met by one power supply. External decoupling diodes are required for 100% redundancy.

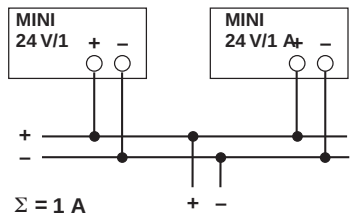


Figure 13

7.5. Power Increase

The output current can be increased to **n x 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.

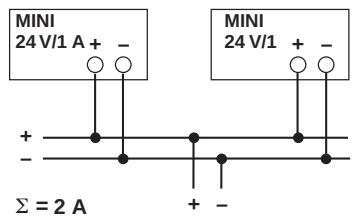


Figure 14