3-Phase Power Supply, Primary Switch Mode for Universal Use QUINT-PS-3x400-500AC/48DC/10

QUINT POWER provides:

- **Preventive function monitoring** through professional signaling
- **Global use** due to a wide range input
- **A high level of operational safety** even 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 Generation 2 QUINT POWER.



1. Brief Description

The QUINT POWER product range offers universal DC power supplies from 60 - 960 W. Depending on the type, regulated and adjustable output voltages of 12 V DC, 24 V DC or 48 V DC are available for output currents of 2.5 A, 5 A, 10 A, 20 A, 30 A, and 40 A.

These devices, which are designed as primary switched-mode regulators, operate with a high level of efficiency so that the heat loss is kept to a minimum.

The high level of operational safety is also ensured in complex global networks. QUINT 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. All 3-phase QUINT POWER units provide the complete output power even in the event of a continuous phase failure.

Reliable startup of heavy loads is ensured by a power reserve of up to 50% - the POWER BOOST.

Preventive function monitoring diagnoses an impermissible operating state and minimizes downtimes in your system. An active transistor output and an electrically isolated relay contact are provided for remote monitoring of this state.

This signal not only provides information on the device function, but also indicates a system overload at an early stage.

2. Area of Application

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

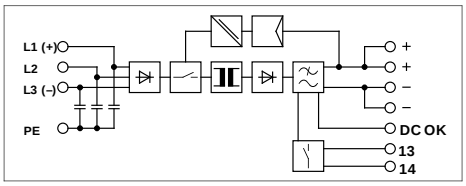
In this way, your entire system can be tested at any production location in the world and can be delivered to any location in the world without faulty switching of the input voltage. This reduces storage costs and logistical effort.

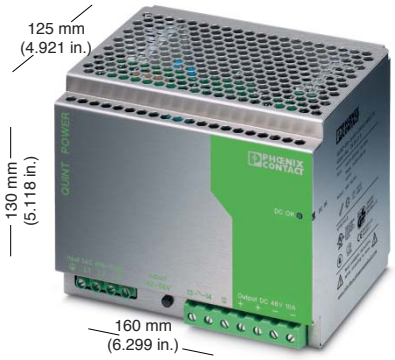
An international approval package including CB Scheme, UL 60950 for IT equipment, and UL 508 for industrial control equipment enables the device to be used globally.

Safe operation in adverse conditions is emphasized by the approval of all QUINT POWER units with 24 V output voltage by Germanischer Lloyd.

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3. Technical Data





QUINT 48 V DC/10 A

3 AC

	solid [mm²]	flexible [mm²]	AWG	torque [Nm]	torque [lb in.]
Input	0,2-6	0,2-4	24-10	0,5-0,6	4,4-5,3
Output	0,5-16	0,5-10	20-6	1,2-1,5	10,6-13,3
Signal	0,5-16	0,5-10	20-6	1,2-1,5	10,6-13,3

Stripping Lengths [mm]

8 mm (0.31 in.)
10 mm (0.39 in.)
10 mm (0.39 in.)

Description	Type	Order No.	Pcs. Pkt.
Power Supply, Primary switch mode for universal use	**QUINT-PS-3x400-500AC/48DC/10**	**29 38 21 9**	1

Technical Data

Input Data ①	
Nominal input voltage	3 x 400 - 500 V AC (wide range input)
Input voltage range	3 x 320 - 575 V AC 450 - 800 V DC
Frequency	45 - 65 Hz 0 Hz
Current consumption (for nominal values)	3 x 1.2 A (400 V AC)/3 x 1.0 A (480 V AC), approximately
Inrush current limiting/I^2t (+25°C [+77°F])	15 A, approximately/1 A^2s, approximately
Mains buffering for a nominal load (typical)	> 20 ms (for 3 x 400 V AC)/> 30 ms (for 3 x 480 V AC)
Switch-on time after applying the mains voltage	< 1 s
Transient surge voltage protection	Varistor
Input fuse, internal	(Device protected by a circuit breaker)
Recommended fuse	3 x circuit breaker 6, 10 or 16 A Characteristic B (EN 60 898)
Discharge current for PE	< 3.5 mA
Output Data ②	
Nominal output voltage U_N/tolerance	48 V DC ±1%
Setting range for the output voltage	40 - 56 V DC
Output current (continuous) during convection cooling and nominal values POWER BOOST I_{BOOST} -25°C to +40°C (-13°F to +104°F)	13 A (U_{out} = 48 V DC)
Nominal output current I_N -25°C to +60°C (-13°F to +140°F)	10 A (U_{out} = 48 V DC)
Derating	From +60°C (+140°F), 2.5% per Kelvin
Short-circuit current limit	I_{BOOST} ≈ 13 A, approximately
Startup of capacitive loads	Unlimited
System deviation on: Load change static 10 - 90%	< 1%, typical
Load change dynamic 10 - 90%	< 5%, typical
Input voltage change ±10%	< 0.1%, typical
Maximum power loss No load/nominal load	10 W/45 W, approximately
Efficiency	> 90% (for 400 V AC and nominal values)
Response time U_{OUT} (10% - 90%)	< 10 ms, typical
Residual ripple/switching peaks (20 MHz)	< 200 mV_{pp} (for nominal values)
Can be connected in parallel	To increase redundancy and power
Internal surge voltage protection	Yes, limited to 60 V DC, approximately
Resistance to return supply	60 V DC
Signal Output Data	
DC OK (active) ③ (U_{out} > 0.9 x U_N ≙ high signal)	+24 V DC signal (with regard to the device weight) 20 mA, maximum
DC OK (electrically isolated) ④ (U_{out} > 0.9 x U_N ≙ contact closed)	60 V AC/DC, maximum; 0.5 A, maximum
LED ⑥ (U_{out} < 0.9 x U_N ≙ LED flashing)	Green LED

General Data		
Insulation voltage:	Input/output	3 kV AC (type test)/1.5 kV AC (routine test)
	Input/PE	1.5 kV AC (type test)/1.25 kV AC (routine test)
	Output/PE	1.25 kV AC (type test)/1.25 kV AC (routine test)
Approval package		CB Schem
Electrical equipment of machines		EN 60 204 (Surge Voltage Category III)
Safety transformers for switched-mode power supply units		EN 61 558-2-17
Electrical safety (of IT equipment)		EN 60950/VDE 0805,
Industrial control equipment		UL/C-UL Recognized UL 60 950 [1]
Equipping high voltage installations with electronic equipment		UL/C-UL Listed UL 508 [1] LISTED
Safety extra-low voltage		EN 50 178 (VDE 0160)
		PELV (EN 60 204)
		SELV (EN 60 950)
Safe isolation		VDE 0100-410
Protection against electric shock		DIN 57100-410
Protection against dangerous shock currents, basic requirements for safe isolation in electrical equipment		DIN VDE 0106-101
Limitation of harmonic line currents		According to EN 61000-3-2
Mounting position		On horizontal NS 35 DIN rail according to EN 50022
Degree of protection		IP 20
Class of protection		I, with PE connection
MTBF		> 500 000 h according to IEC 1709 (SN 29 500)
Housing version		AluNox (AlMg1), closed
Dimensions (W x H x D) + DIN rail		Default upon delivery: Rotated 90°: (160 x 130 x 125 mm [6.299 x 5.118 x 4.921 in.])(122 x 130 x 163 mm [4.803 x 5.118 x 6.417 in.])
Weight		

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 68-2-6	< 15 Hz, amplitude ±2.5 mm/15 Hz - 150 Hz, 2.3 g, 90 minutes in resonant frequency
Shock	according to IEC 68-2-27	30 g all space directions
Degree of pollution		2 (according to EN 50 178)
Climatic category		3K3 (according to EN 60 721)

CE

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

[1] UL approval for AC input voltage and ambient temperature up to +70°C (+158°F)

EMC (Electromagnetic Compatibility) Noise Immunity According to EN 61000-6-2:			**Requirements EN 61 000-6-2**		**QUINT-PS-3x400-500AC/48DC/ 10**
Electrostatic discharge (ESD)	EN 61000-4-2[3]	Housing			Level 4
		Contact discharge:	4 kV		8 kV
		Air discharge:	8 kV		15 kV
Electromagnetic HF field	EN 61000-4-3[2]	Housing			Level 3
		Frequency:	80 - 1000 MHz		80 - 1000 MHz
		Field strength:	10 V/m		10 V/m
Fast transients (burst)	EN 61000-4-4[3]	Input:	2 kV	asymmetrical[5]	4 kV (Level 4)
		Output:	2 kV	asymmetrical[5]	2 kV (Level 3)
		Signal:	1 kV	asymmetrical[5]	1 kV (Level 2)
Surge current loads	EN 61000-4-5[3]	Input:	2 kV	asymmetrical[5]	4 kV (Level 4)
			1 kV	symmetrical[4]	2 kV (Level 4)
		Output:	0.5 kV	asymmetrical[5]	0.5 kV (Level 1)
			0.5 kV	symmetrical[4]	0.5 kV (Level 1)
		Signal:	1 kV	asymmetrical[5]	1 kV (Level 2)
Conducted interference	EN 61000-4-6[2]	I/O/S:		asymmetrical[5]	Level 3
		Frequency:	0.15 - 80 MHz		0.15 - 80 MHz
		U_0:	10 V		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 50081-2:					
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]

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

[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

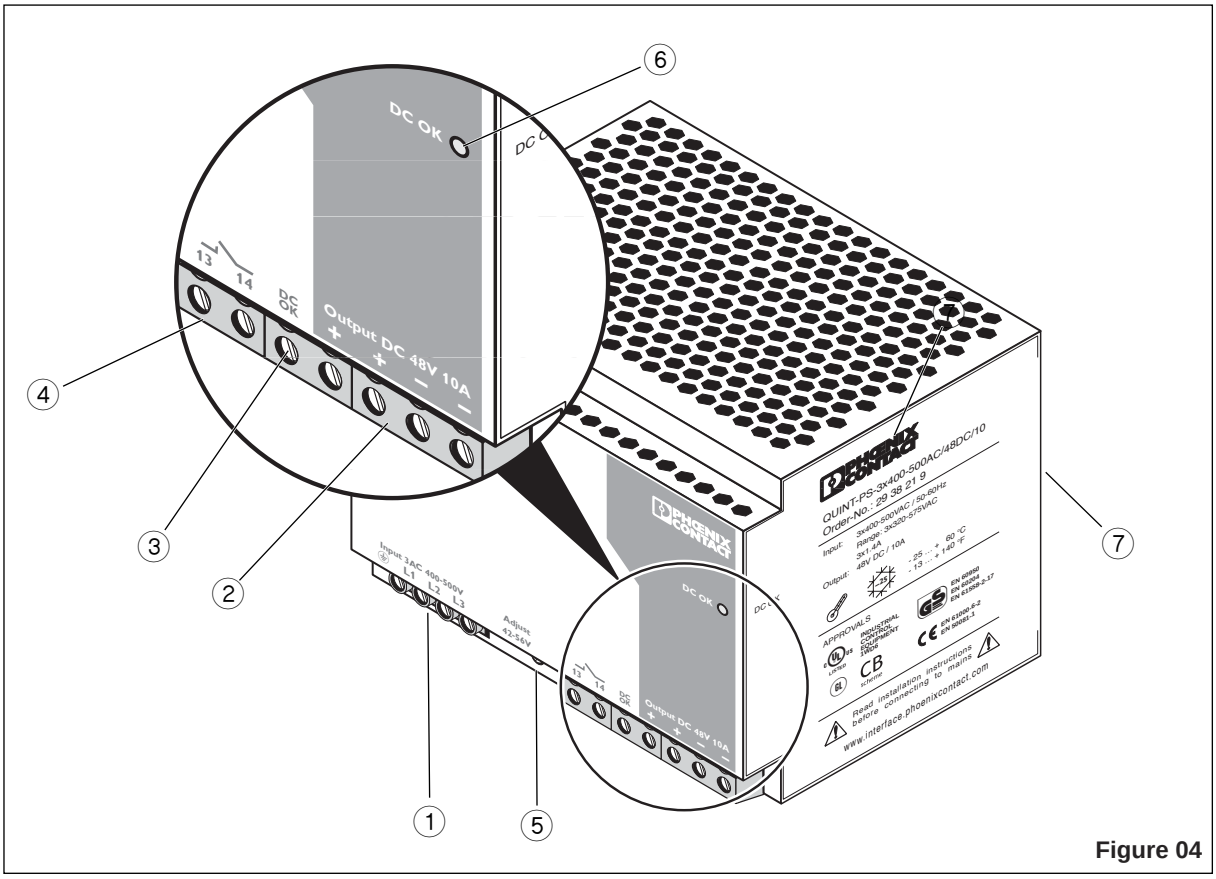


Figure 04

① **AC input:**
Input voltage 3 x 320 - 575 V AC
Frequency 45 - 65 Hz
(0.2 mm^2 to 6 mm^2 solid)
(0.2 mm^2 to 4 mm^2 flexible)
(25 - 10 AWG)
Recommended fuse
3 x 6 A, 10 A or 16 A c.b./Characteristic B

② **DC output:**
Output voltage 48 V DC (default),
can be set from 40 - 56 V DC using
a potentiometer ⑤ (0.5 mm^2 to 16 mm^2 solid)
(0.5 mm^2 to 10 mm^2 flexible) (20 - 6 AWG)
The device is idling-proof and short-circuit-proof.

③ **DC OK output active**

④ **DC OK output electrically isolated**

⑤ **Potentiometer (covered) 40 - 56 V DC**

⑥ **DC OK LED**

⑦ **Universal DIN rail adapter UTA 107**

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.

QUINT POWER is a built-in device. **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).
- The protective conductor is connected.
- 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.

The housing temperature can reach high values depending on the ambient temperature and the load of the device.

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 50022-35 and should 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. No minimum spacing to other modules at the sides is required for proper operation of the device.
The housing temperature can reach high values depending on the ambient temperature and the load of the device.

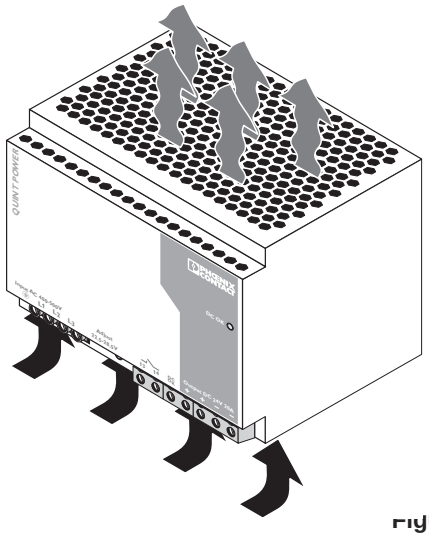


Figure 05

Flat mounting position:
Installation depth 125 mm (4.921 in.) (+ DIN rail)

Narrow mounting position:
Installation depth 163 mm (6.417 in.) (+ DIN rail)

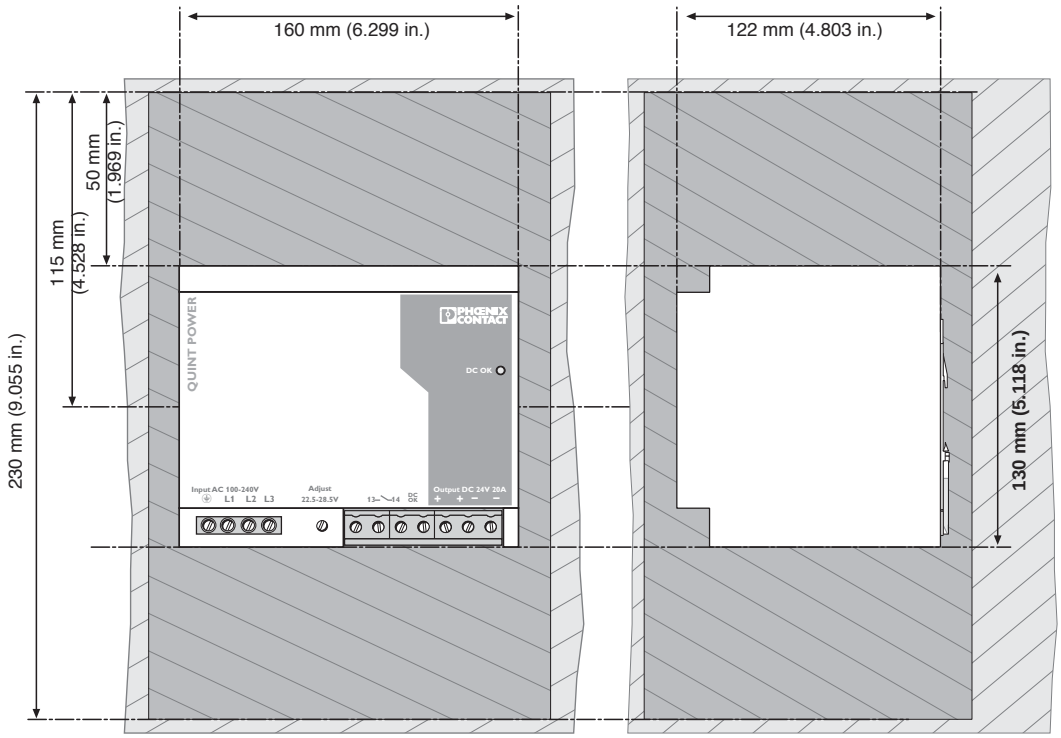


Figure 06

6.2. Flat Mounting Position

The device is supplied ex works for a flat mounting position.

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.

6.3. Narrow Mounting Position

A narrow mounting position can be achieved by mounting the module onto the DIN rail at a 90° angle. To do this, mount the DIN rail adapter (UTA 107) ⑦ as shown in Figure 08. No additional mounting material is required. Mounting screws: Torx T10
(torque 0.8 - 0.9 Nm/7 - 8 lb in.).

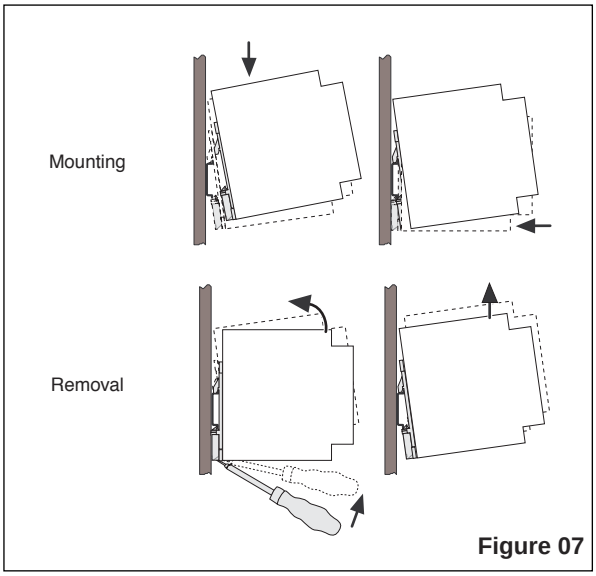


Figure 07

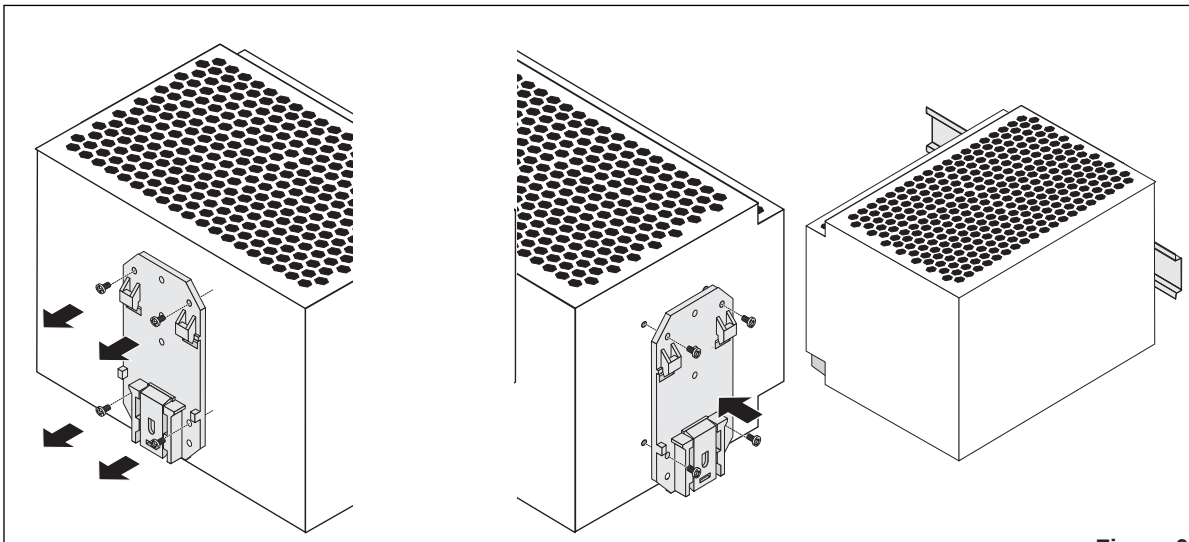


Figure 08

6.4. Connection of Various Types of Network: 3 x 400 - 500 V AC Networks

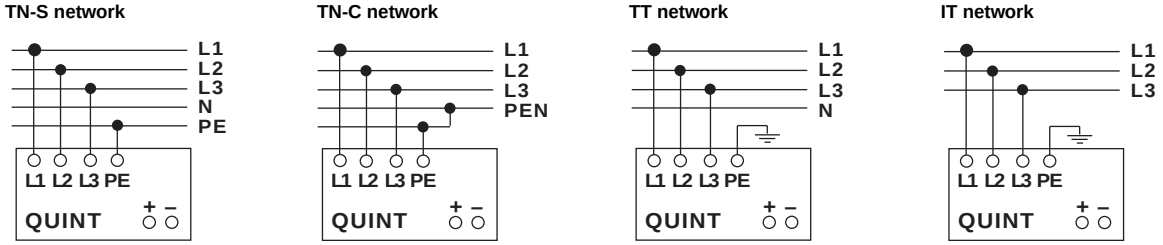
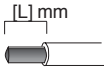


Figure 09

Connection Cable:

The following cable cross sections can be connected:

		Solid [mm²]	Flexible [mm²]	AWG	Torque [Nm]	[lb in.]
①	Input:	0.2 - 6	0.2 - 4	25 - 10	0.5 - 0.6	4.4 - 5.3
②	Output:	0.5 - 16	0.5 - 10	20 - 6	1.2 - 1.5	10.6 - 13.3
③	Signal:	0.5 - 16	0.5 - 10	20 - 6	1.2 - 1.5	10.6 - 13.3



For reliable and safe-to-touch connection: Strip 8 mm (0.31 in.) from the input side connector ends and 10 mm (0.39 in.) from the output/signal connector ends.

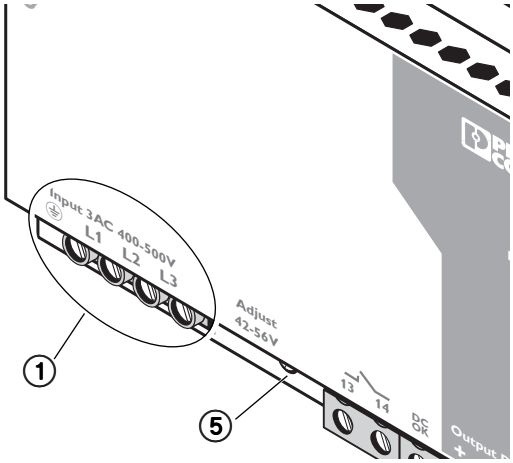


Figure 10

6.5. Input (①, Figure 10)

The 3 x 400 - 500 V AC connection is made using screw connections L1, L2, L3, and ⏚.

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.

Three external thermomagnetic fuses are required to protect the device. Even in the event of a phase failure, continuous operation is ensured with nominal power.

Recommended Fuse:

3 x circuit breaker 6 A, 10 A or 16 A, Characteristic B (or equivalent). A suitable fuse must be fitted for DC applications.

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

6.6. Output (Figure 11)

The 48 V DC connection is made using the "+" and "–" screw connections on the screw connection ②. The output voltage set upon delivery is 48 V DC.

The output voltage can be adjusted from 40 to 56 V DC on the potentiometer ⑤.

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 60 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.

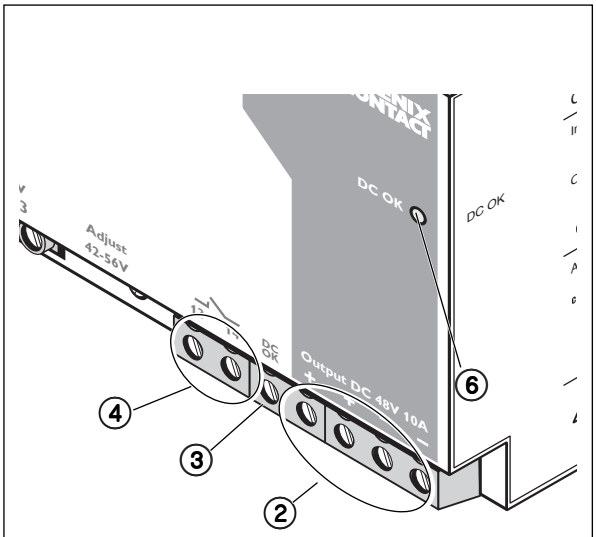


Figure 11

6.7. Signaling

Both DC OK outputs are used for preventive function monitoring of the power supply. An electrically isolated signal contact ④ and an active DC OK signal ③ are available. In addition, the DC OK LED ⑥ can be used to evaluate the function of the power supply directly at the installation location.

Green "DC OK" LED	ON	Flashing	OFF
Active signal output	U = 24 V	U = 0 V	U = 0 V
Electrically isolated	Closed	Open	Open
Meaning	Output voltage greater than 90% of the set voltage	Output voltage less than 90% of the set voltage	No voltage at the output
Description	Output voltage and current OK	QUINT POWER operating, but: • Error at the load • Current consumption greater than I_{BOOST} • Output short circuit	QUINT POWER not operating, because: • No mains voltage present • Primary side fuse is blown • Device is faulty

Electrically Isolated Contact (Figure 12)

When opened, the electrically isolated signal contact indicates that the output voltage has fallen more than 10% below the set value. Signals and ohmic loads up to a maximum of 60 V and currents up to a maximum of 0.5 A can be switched.

With heavy inductive loads, e.g., a relay, a suitable protective circuit (e.g., free-wheeling diode) is required.

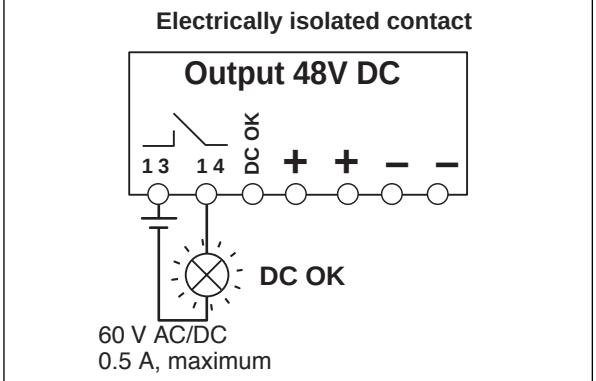


Figure 12

Active Signal Output (Figure 13)

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 more than 10% below the set value 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.

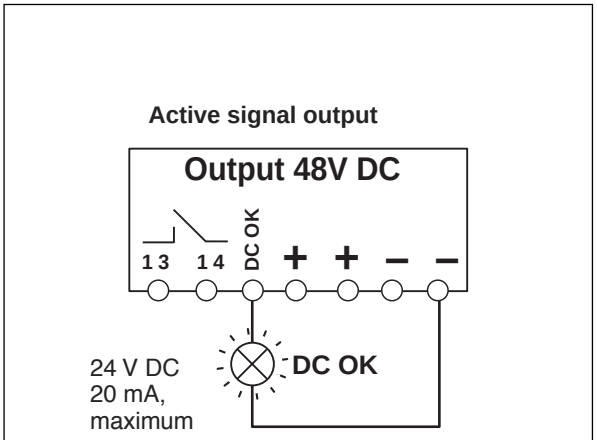


Figure 13

Signal Loop (Figure 14)

The two signal outputs mentioned above can be combined easily.

Example: Monitoring two devices

Use the active alarm output of device 1 and loop in the electrically isolated alarm output of device 2. In the event of an error, a group error message is generated. It is possible to loop any number of devices.

This signal combination saves on wiring costs and logic inputs.

DC OK LED

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

LED ON	Normal operation of the power supply
LED flashing	The output voltage has fallen by more than 10%. There is a secondary load short circuit or overload outside the POWER BOOST area.
LED OFF	No mains voltage is present or there is a device fault.

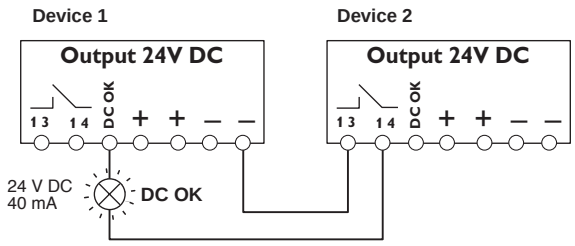


Figure 14

7. Function

7.1. Output Characteristic Curve

At ambient temperatures T_{amb} < +40°C (+104°F), the device can continuously supply 13 A with a 48 V DC output voltage (P_{out} = 620 W).

With heavy loads, the working point demonstrates the U/I characteristic curve shown in Figure 14. 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 QUINT POWER in the input circuit without any problems.

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

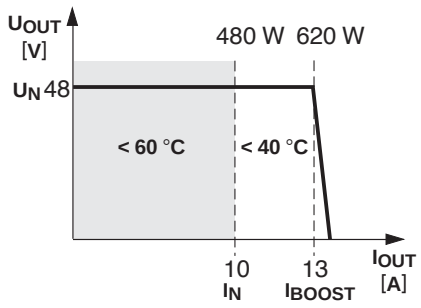


Figure 15

7.2. Temperature Response

At an ambient temperature of up to +40°C (+104°F) the device continuously supplies an output current of 13 A.

The device can supply a nominal output current of 10 A up to an ambient temperature of +60°C (+140°F).

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 does not switch off. The output power is decreased so low that device protection is provided. Once the device has cooled, the output power is increased again.

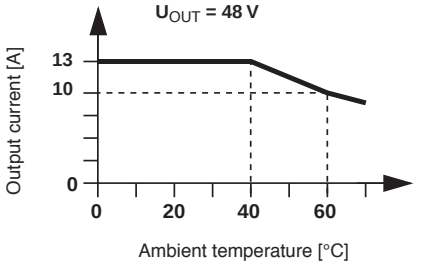


Figure 16

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.

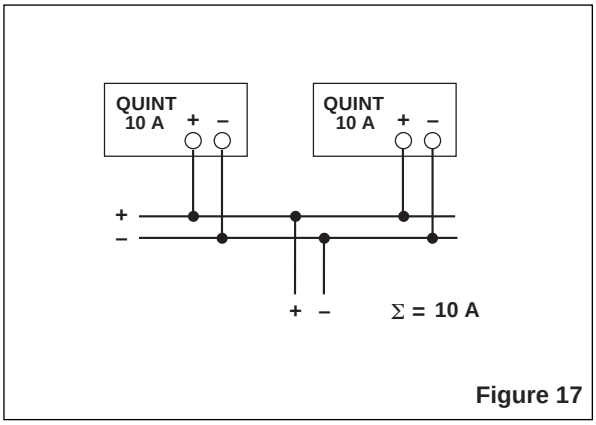


Figure 17

7.4. Redundancy Operation (Figure 17)

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.

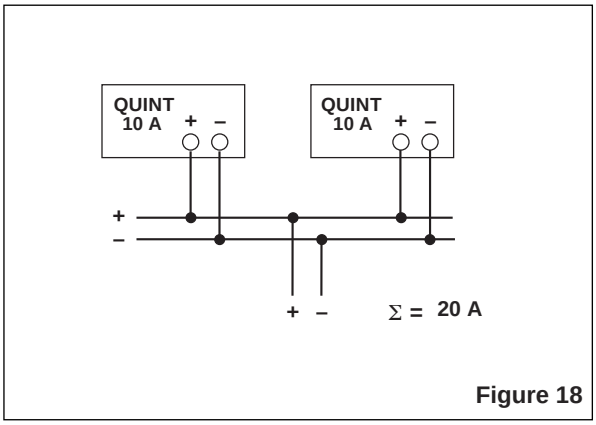


Figure 18

7.5. Power Increase (Figure 18)

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.

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