

3-Phase Power Supply, Primary Switch Mode for Universal Use

QUINT-PS-3x400-500AC/48DC/20

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

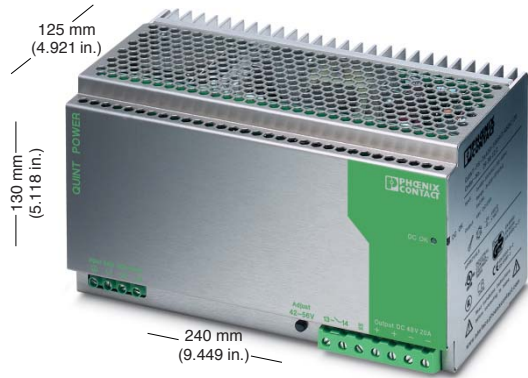
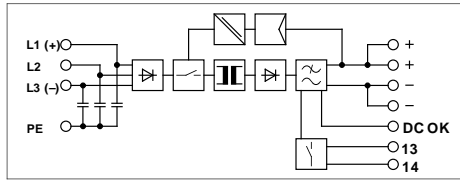
QUINT POWER can be used globally due to the consistent provision of a wide range input.

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.

3. Technical Data



QUINT 48 V DC/20 A

	solid [mm ²]	flexible AWG	torque [Nm]	torque [lb in.]
Input	0.2 - 6	0.2 - 4	25 - 10	0.5 - 0.6
Output	0.5 - 16	0.5 - 10	20 - 6	1.2 - 1.5
Signal	0.5 - 16	0.5 - 10	20 - 6	1.2 - 1.5

3 AC

Stripping Lengths [mm]
8 mm (0.31 in.)
10 mm (0.39 in.)
10 mm (0.39 in.)

Description
Power Supply, Primary switch mode for universal use

Type	Order No.	Pcs. Pkt.
QUINT-PS-3x400-500AC/48DC/20	29 38 22 2	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 mains voltage
 Transient surge voltage protection
 Input fuse, internal
 Recommended fuse

Discharge current for PE

3 x 400 - 500 V AC (wide range input)
 3 x 320 - 575 V AC 450 - 800 V DC
 45 - 65 Hz 0 Hz
 2.3 A (400 V AC)/1.9 A (480 V AC), approximately
 15 A, approximately/2 A²s, approximately
 20 ms (400 V AC)/30 ms (480 V AC)
 < 1 s
 Varistor
 – (Device protected by a circuit breaker)
 3 x circuit breaker 6, 10 or 16 A
 Characteristic B (EN 60 898)
 < 3.5 mA

Output Data ②
 Nominal output voltage U_N /tolerance
 Setting range for the output voltage
 Output current (continuous) during convection cooling and nominal values
 POWER BOOST I_{BOOST} -25°C to +40°C (-13°F to +104°F)
 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%
Maximum power loss	No load/nominal load

Efficiency
 Response time U_{OUT} (10% - 90%)
 Residual ripple/switching peaks (20 MHz)
 Can be connected in parallel
 Internal surge voltage protection
 Resistance to return supply

48 V DC ±1%
 40 - 56 V DC




22 A ($U_{out} = 48$ V DC)
 20 A ($U_{out} = 48$ V DC)
 From +60°C (+140°F), 2.5% per Kelvin
 $I_{BOOST} \approx 22$ A, approximately
 Unlimited
 < 1%, typical
 < 5%, typical
 < 0.1%, typical
 20 W/90 W, approximately
 > 90% (for 400 V AC and nominal values)
 < 10 ms, typical
 < 200 mV_{pp} (for nominal values)
 To increase redundancy and power
 Yes, limited to 60 V DC, approximately
 60 V DC

Signal Output Data
 DC OK (active) ③
 ($U_{out} > 0.9 \times U_N \hat{=}$ high signal)
 DC OK (electrically isolated) ④
 ($U_{out} > 0.9 \times U_N \hat{=}$ contact closed)
 LED ⑥ ($U_{out} < 0.9 \times U_N \hat{=}$ LED flashing)

+24 V DC signal (with regard to the device weight)
 20 mA, maximum
 60 V AC/DC, maximum; 0.5 A, maximum

Green LED

3-Phase Power Supply, Primary Switch Mode for Universal Use – QUINT 48 V DC/20 A

General Data	
Insulation voltage:	Input/output Input/PE Output/PE
Approval package Electrical equipment of machines Safety transformers for switched-mode power supply units Electrical safety (of IT equipment) Industrial control equipment Equipping high voltage installations with electronic equipment Safety extra-low voltage	3 kV AC (type test)/1.5 kV AC (routine test) 1.5 kV AC (type test)/1.25 kV AC (routine test) 1.25 kV AC (type test)/1.25 kV AC (routine test)  EN 60 204 (Surge Voltage Category III) EN 61 558-2-17 EN 60950/VDE 0805, UL/C-UL Recognized UL 60 950  ¹⁾ UL/C-UL Listed UL 508  ¹⁾ LISTED
Safe isolation Protection against electric shock Protection against dangerous shock currents, basic requirements for safe isolation in electrical equipment Limitation of harmonic line currents	EN 50 178 (VDE 0160) PELV (EN 60 204) SELV (EN 60 950) VDE 0100-410 DIN 57100-410
Mounting position Degree of protection Class of protection MTBF Housing version Dimensions (W x H x D) + DIN rail	DIN VDE 0106-101 According to EN 61000-3-2
Weight	On horizontal NS 35 DIN rail according to EN 50022 IP 20 I, with PE connection > 500 000 h according to IEC 1709 (SN 29 500) AluNox (AlMg1), closed Default upon delivery: Rotated 90°: (240 x 130 x 125 mm [9.449 x 5.118 x 4.921 in.]) (122 x 130 x 243 mm [4.803 x 5.118 x 9.567 in.]) 3.5 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	

CE
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:

Test	Standard	Configuration
Electrostatic discharge (ESD)	EN 61000-4-2 ³⁾	Housing Contact discharge: Air discharge:
Electromagnetic HF field	EN 61000-4-3 ²⁾	Housing Frequency: Field strength:
Fast transients (burst)	EN 61000-4-4 ³⁾	Input: Output: Signal:
Surge current loads	EN 61000-4-5 ³⁾	Input: Output: Signal:
Conducted interference	EN 61000-4-6 ²⁾	I/O/S: Frequency: U ₀ :
Voltage dips	EN 61000-4-11 ³⁾	Input:

Noise Emission According to EN 50081-2:

Radio interference	EN 55011
Radio interference	EN 55011

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.

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

Requirements EN 61 000-6-2	QUINT-PS-3x400-500AC/48DC/ 20
4 kV 8 kV	Level 4 8 kV 15 kV
80 - 1000 MHz 10 V/m	Level 3 80 - 1000 MHz 10 V/m
2 kV 2 kV 1 kV	asymmetrical ⁵⁾ asymmetrical ⁵⁾ asymmetrical ⁵⁾
2 kV 1 kV 0.5 kV 0.5 kV 1 kV	4 kV (Level 4) 2 kV (Level 3) 1 kV (Level 2) 2 kV (Level 4) 0.5 kV (Level 1) 0.5 kV (Level 1) 1 kV (Level 2)
0.15 - 80 MHz 10 V	asymmetrical ⁵⁾ 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
Class A ⁶⁾	EN 55011 (EN 55022) Class B ⁷⁾
Class A ⁶⁾	EN 55011 (EN 55022) Class B ⁷⁾

- 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

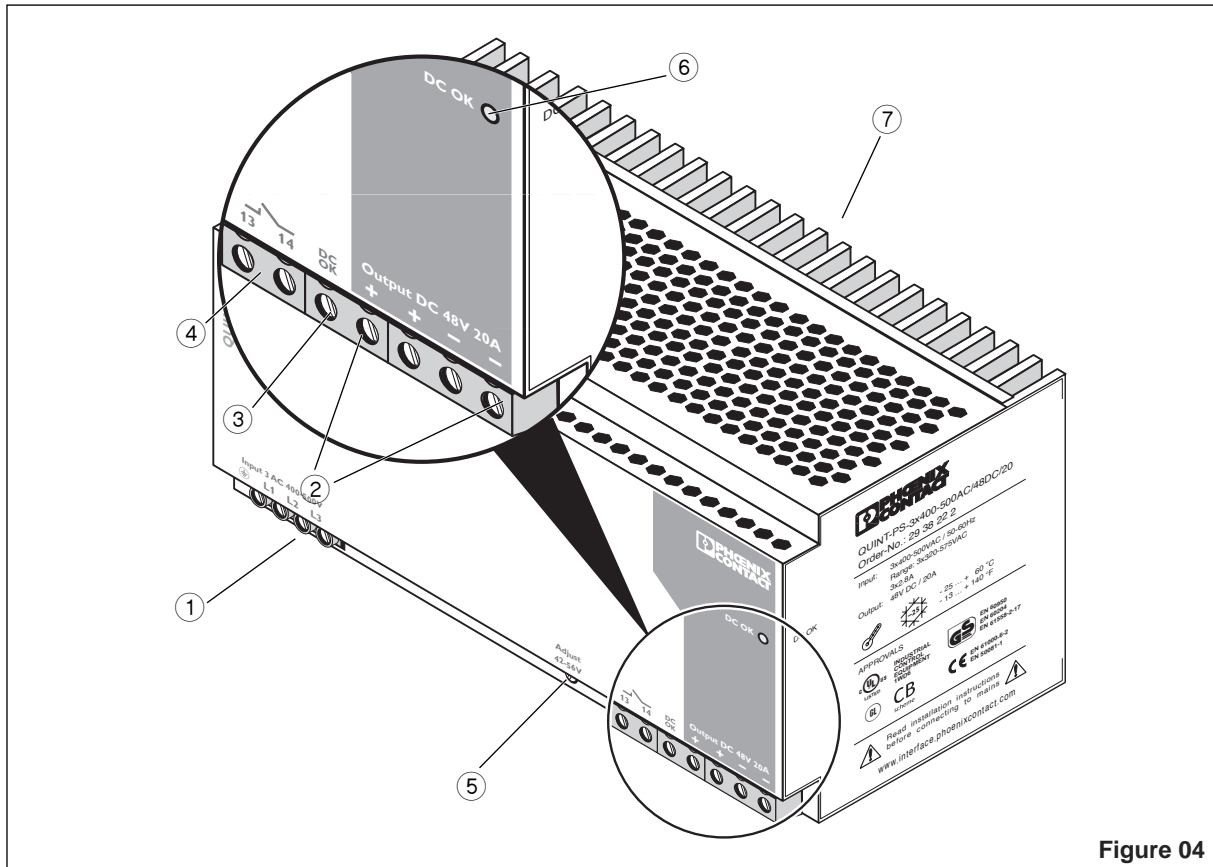


Figure 04

- ① **AC input:**
Input voltage 3 x 320 - 575 V AC
Frequency 45 - 65 Hz
(0.2 mm² to 6 mm² solid)
(0.2 mm² to 4 mm² 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 mm² to 16 mm² solid)
(0.5 mm² to 10 mm² 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.

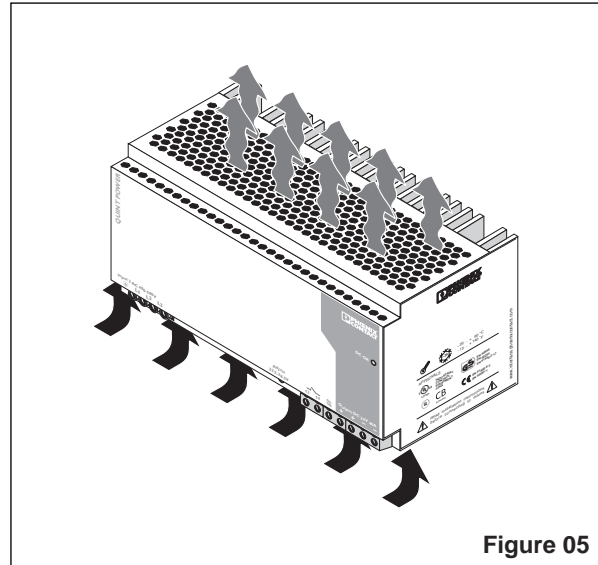


Figure 05

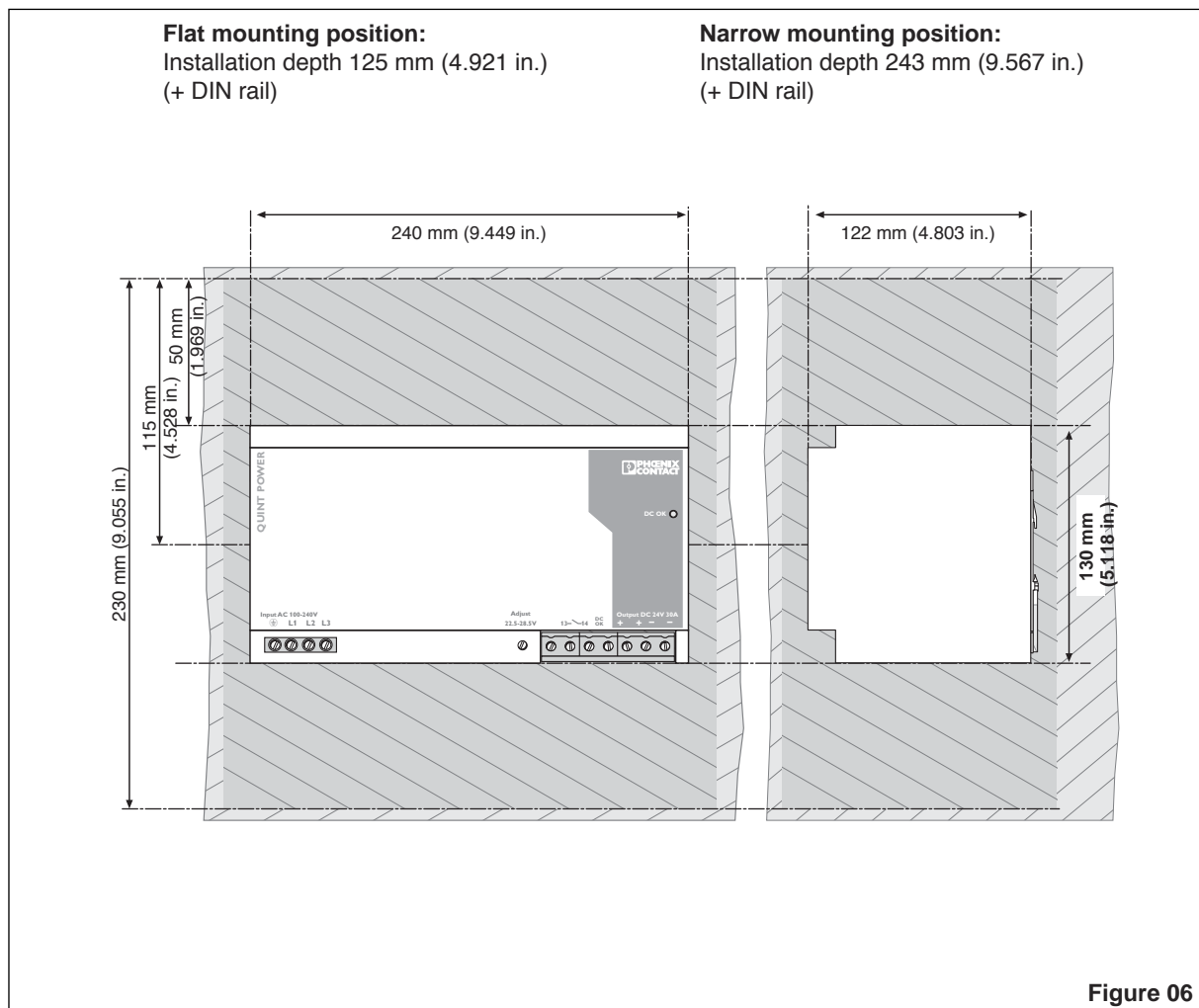


Figure 06

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.).

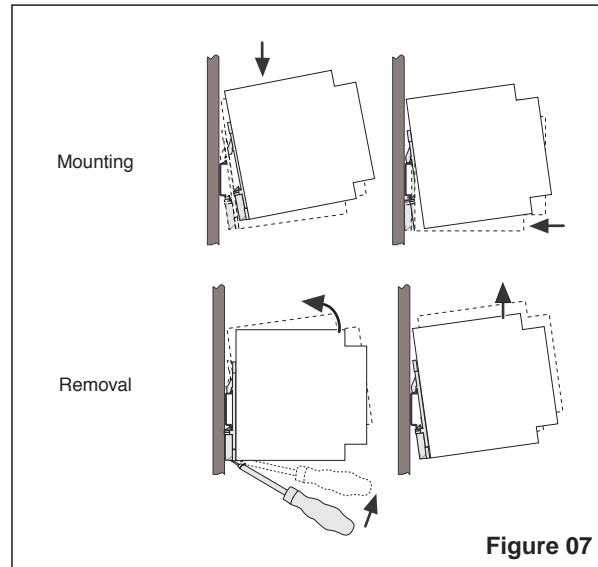


Figure 07

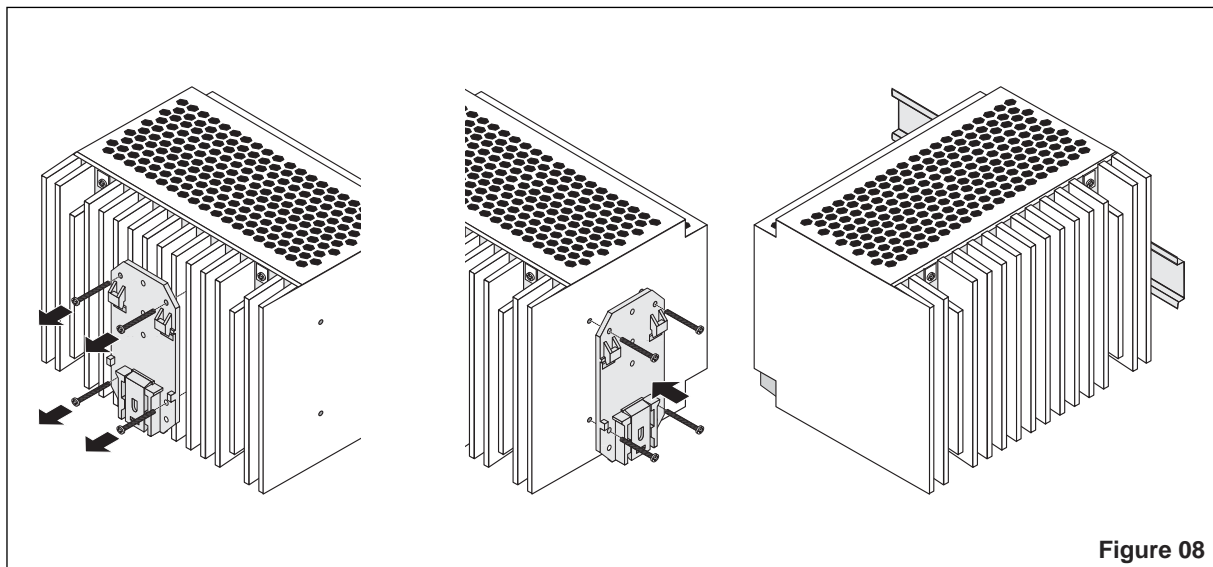


Figure 08

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

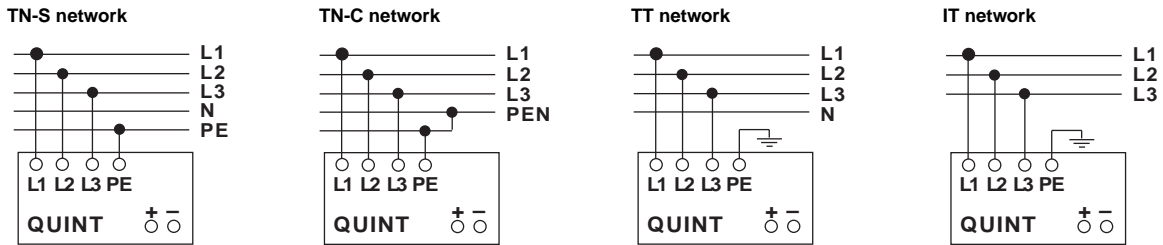


Figure 09

Connection Cable:

The following cable cross sections can be connected:

	Solid [mm ²]	Flexible [mm ²]	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.

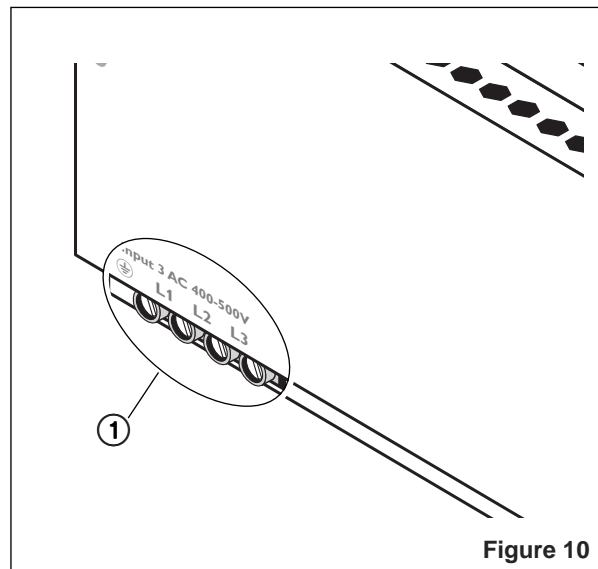
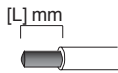


Figure 10

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 - 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.

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.

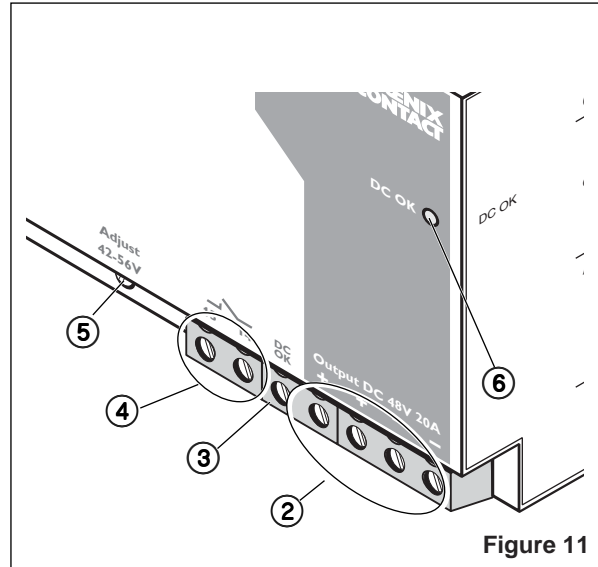


Figure 11

Green "DC OK" LED	ON	Flashing	OFF
Active signal output (with reference to "-")	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.

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.

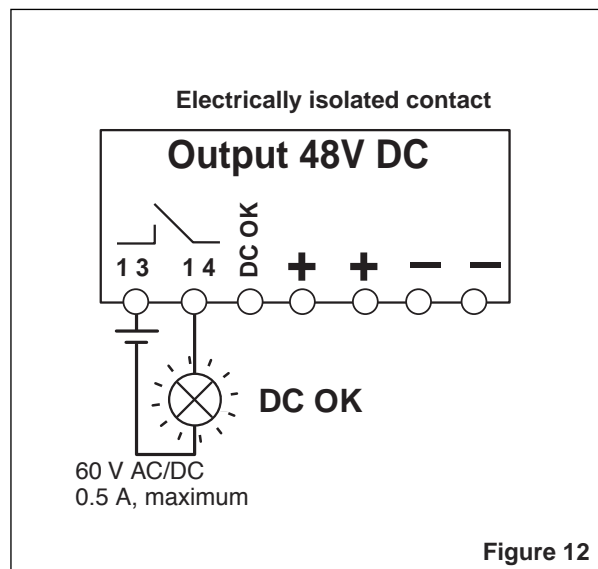


Figure 12

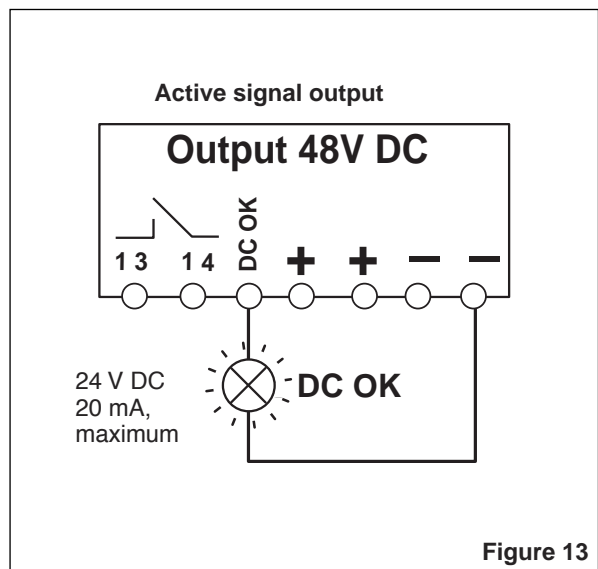


Figure 13

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.

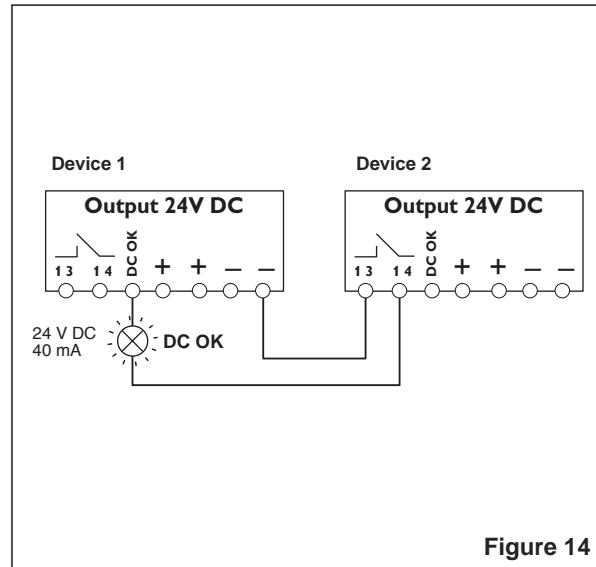


Figure 14

7. Function

7.1. Output Characteristic Curve

At ambient temperatures $T_{amb} < +40^{\circ}\text{C}$ ($+104^{\circ}\text{F}$), the device can continuously supply 22 A with a 48 V DC output voltage ($P_{out} = 1060 \text{ W}$).

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.

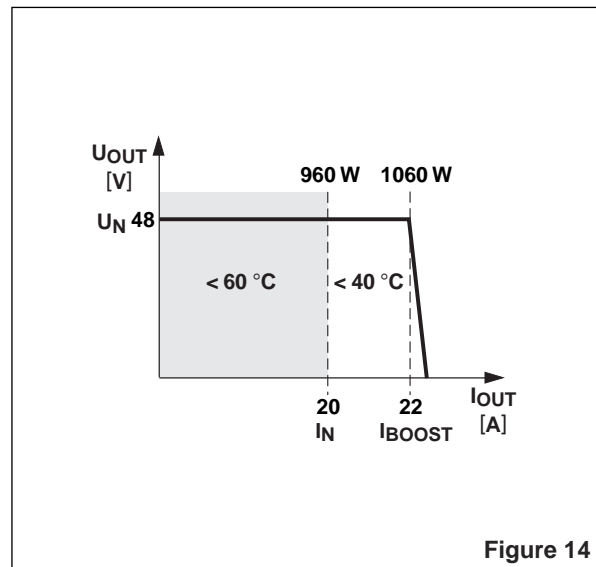


Figure 14

7.2. Temperature Response

At an ambient temperature of up to $+40^{\circ}\text{C}$ ($+104^{\circ}\text{F}$) the device continuously supplies an output current of 22 A.

The device can supply a nominal output current of 20 A up to an ambient temperature of $+60^{\circ}\text{C}$ ($+140^{\circ}\text{F}$).

The output power must be decreased by 2.5% per Kelvin temperature increase for ambient temperatures above $+60^{\circ}\text{C}$ ($+140^{\circ}\text{F}$).

At ambient temperatures above $+70^{\circ}\text{C}$ ($+158^{\circ}\text{F}$) 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.

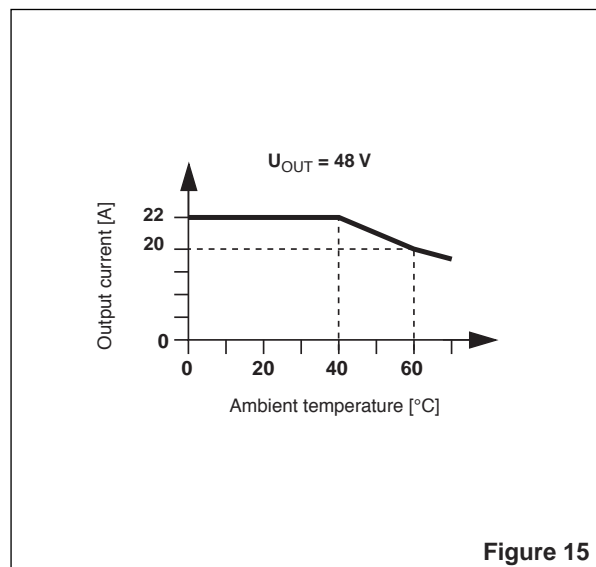


Figure 15

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 (Figure 16)

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.

7.5. Power Increase (Figure 17)

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.

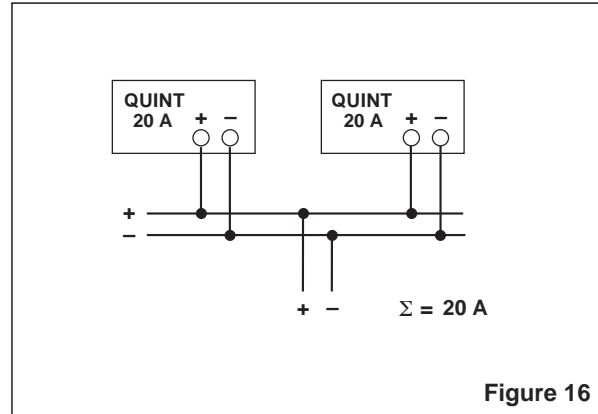


Figure 16

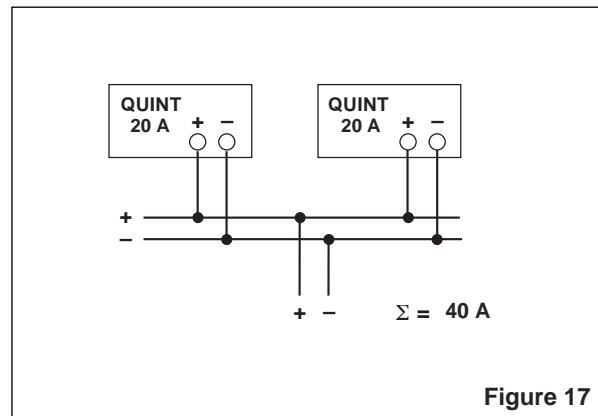


Figure 17