

# QUINT-PS/ 1AC/24DC/40

SFB  
TECHNOLOGY

## Power supply unit

## INTERFACE

Data sheet  
104317\_en\_01



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### 1 Description

QUINT POWER power supply units – Maximum system availability with SFB technology  
Compact power supply units of the new QUINT POWER generation maximize the availability of your system. With the SFB technology (Selective Fuse Breaking Technology), six times the nominal current for 12 ms, even the standard power circuit-breakers can now also be triggered reliably and quickly. Faulty current paths are switched off selectively, the fault is located and important system parts continue to operate. Comprehensive diagnostics are provided through constant monitoring of output voltage and current. This preventive function monitoring visualizes critical operating modes and reports them to the control unit before an error can occur.

### Features

- Quick tripping of the standard power circuit-breakers using dynamic power reserve SFB technology
- Reliable starting of difficult loads with static POWER BOOST power reserve
- Preventive function monitoring
- Can be used worldwide
- High degree of operational safety due to high MTBF > 500 000 h, long mains buffering times > 20 ms, high dielectric strength up to 300 V AC



#### **DANGER OF EXPLOSION!**

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



#### **DANGER**

The device contains dangerous live elements and high levels of stored energy.  
Never carry out work when the power is turned on.



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. |
|---|-----------------------|-----------|-------------|
| 24 V DC/40 A DIN rail power supply unit, primary-switched, single-phase. SFB (selective fuse breaking) technology can be also used to trigger standard circuit breakers quickly and reliably. | QUINT-PS/ 1AC/24DC/40 | 2866789   | 1           |

| Accessories            | Type       | Order No. | Pcs. / Pkt. |
|------------------------|------------|-----------|-------------|
| Universal wall adapter | UWA 182/52 | 2938235   | 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 ... 300 V DC (UL 508: ≤ 250 V DC)  |
| AC frequency range          | 45 Hz ... 65 Hz  |
| DC frequency range          | 0 Hz   |
| Current consumption         | Approx. 8.8 A (120 V AC)<br>Approx. 4.6 A (230 V AC)<br>Approx. 8.8 A (120 V DC)<br>Approx. 4.2 A (250 V DC) |
| Inrush current limitation   | < 15 A (typical)   |
| $i^2t$                      | < 1.7 A <sup>2</sup> s   |
| Power failure bypass        | > 20 ms (120 V AC)<br>> 20 ms (230 V AC)   |
| Typical response time       | < 1 s  |
| Protective circuitry        | Transient surge protection Varistor  |
| Input fuse, integrated      | 20 A (slow-blow, internal)   |
| Discharge current to PE     | < 3.5 mA   |

#### Output data

|  |  |
|--|--|
| Nominal output voltage                           | 24 V DC ±1%  |
| Setting range of the output voltage              | 18 V DC ... 29.5 V DC (> 24 V constant capacity)   |
| Output current                                   | 40 A (-25°C ... 60°C, U <sub>OUT</sub> = 24 V DC)<br>45 A (with POWER BOOST, -25°C ... 40°C permanently, U <sub>OUT</sub> = 24 V DC)<br>215 A (with SFB technology, 12 ms) |
| Derating   | 60°C to 70°C: 2.5%/K. Below 100 V AC: 1%/V. Below 120 V DC: 0.5%/V.  |
| Efficiency                                       | > 92 % (for 230 V AC and nominal values)   |
| Residual ripple                                  | < 100 mV <sub>PP</sub> (with nominal values)   |
| Connection in parallel                           | Yes, for redundancy and increased capacity   |
| Connection in series                             | Yes  |
| Surge protection against internal surge voltages | Yes, limited to approx. 35 V DC  |
| Resistance to reverse feed                       | 35 V DC  |

#### Power consumption

|                                  |        |
|----------------------------------|--------|
| Maximum power dissipation idling | < 14 W |
| Power loss nominal load max.     | < 80 W |

**DC OK active**

|                    |  |
|--------------------|--|
| Output description | $U_{OUT} > 0.9 \times U_N$ : High signal   |
| Voltage            | + 18 V DC ... 24 V DC  |
| Current            | $\leq 20$ mA (short circuit resistant)   |
| Status display     | $U_{OUT} > 0.9 \times U_N$ : "DC OK" LED green / $U_{OUT} < 0.9 \times U_N$ : Flashing "DC OK" LED |

**DC OK floating**

|                    |  |
|--------------------|--|
| Output description | Relay contact, $U_{OUT} > 0.9 \times U_N$ : Contact closed   |
| Voltage            | $\leq 30$ V AC/DC  |
| Current            | $\leq 1$ A ( $\leq 0.5$ A at 60 V DC)  |
| Status display     | $U_{OUT} > 0.9 \times U_N$ : "DC OK" LED green / $U_{OUT} < 0.9 \times U_N$ : Flashing "DC OK" LED |

**POWER BOOST, active**

|                    |                                      |
|--------------------|--------------------------------------|
| Output description | $I_{OUT} < I_N$ : High signal        |
| Voltage            | + 18 V DC ... 24 V DC                |
| Current            | $\leq 20$ mA                         |
| Status display     | $I_{OUT} > I_N$ : LED "BOOST" yellow |

**General data**

|  |   |
|--|---|
| Insulation voltage input/output          | 4 kV AC (type test)<br>2 kV AC (routine test)   |
| Insulation voltage input / PE            | 3.5 kV AC (type test)<br>2 kV AC (routine test) |
| Insulation voltage output / PE           | 500 V DC (routine test)                         |
| Degree of protection                     | IP20  |
| Class of protection                      | I, with PE connection                           |
| MTBF                                     | > 500 000 h in acc. with IEC 61709 (SN 29500)   |
| Type of housing                          | Steel sheet, zinc-plated                        |
| Housing material                         | Steel sheet, zinc-plated                        |
| Dimensions W / H / D (state of delivery) | 180 mm / 130 mm / 125 mm                        |
| Dimensions W / H / D (90° turned)        | 122 mm / 130 mm / 183 mm                        |
| Weight                                   | 3.3 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) | $\leq 95$ % (at 25 °C, no condensation)   |
| Vibration (operation)                          | < 15 Hz, amplitude $\pm 2.5$ mm in acc. with IEC 60068-2-6<br>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)   |

**Standards**

|  |                                      |
|--|--------------------------------------|
| Electrical Equipment for Machinery                             | EN 60204                             |
| Safety transformers for power supply units                     | IEC 61558-2-17                       |
| Electrical safety (of information technology equipment)        | IEC 60950/VDE 0805 (SELV)            |
| Electronic equipment for use in electrical power installations | EN 50178/VDE 0160 (PELV)             |
| SELV   | IEC 60950 (SELV) and EN 60204 (PELV) |
| Safe isolation   | DIN VDE 0100-410<br>DIN VDE 0106-101 |
| Protection against electric shock                              | DIN 57100-410                        |

**Standards (Continued)**

|  |                    |
|--|--------------------|
| Protection against electric shock, basic requirements for safe isolation in electrical equipment | DIN VDE 0106-101   |
| Limitation of mains harmonic currents  | EN 61000-3-2       |
| Device safety  | BG (design tested) |
| Certificate  | CB Scheme          |

**Approvals**

UL approvals UL applied for



Current approvals can be found for the product in the download area.

**Conformance with EMC guideline 2004/108/EC and for low-voltage guideline 2006/95/EC**

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

|                             |                     |  |
|-----------------------------|---------------------|--|
| Electrostatic discharge     | EN 61000-4-2        |  |
|                             | Housing             | Level 4  |
|                             | Contact discharge   | 8 kV   |
|                             | Discharge in air    | 15 kV  |
|                             | Comments            | Criterion B  |
| Electromagnetic HF field    | EN 61000-4-3        |  |
|                             | Housing             | Level 4  |
|                             | Frequency range     | 80 MHz ... 1000 MHz  |
|                             | Field intensity     | 20 V/m   |
|                             | Frequency range     | 1 GHz ... 3 GHz  |
|                             | Field intensity     | 10 V/m   |
|                             | Comments            | Criterion A  |
| Fast transients (burst)     | EN 61000-4-4        |  |
|                             | Input               | 4 kV (level 4 - asymmetrical: conductor to ground)   |
|                             | Output              | 2 kV (level 3 - asymmetrical: conductor to ground)   |
|                             | Signal              | 1 kV (level 1 - asymmetrical: conductor to ground)   |
|                             | Comments            | Criterion B  |
| Surge current loads (surge) | EN 61000-4-5        |  |
|                             | Input               | 4 kV (level 4 - asymmetrical: conductor to ground)<br>2 kV (level 4 - symmetrical: conductor to conductor) |
|                             | Output              | 2 kV (level 3 - asymmetrical: conductor to ground)<br>1 kV (Level 3 - symmetrical: Conductor to conductor) |
|                             | Signal              | 1 kV (level 3 - asymmetrical: conductor to ground)   |
|                             | Comments            | Criterion B  |
| Conducted interference      | EN 61000-4-6        |  |
|                             | Input/Output/Signal | Level 3  |
|                             | Frequency range     | 0.15 MHz ... 80 MHz  |
|                             | Voltage             | 10 V   |
|                             | Comments            | Criterion A  |
| Voltage dips                | EN 61000-4-11       |  |
|                             | Input               | (Mains buffering time > 20 ms (Semi F47-0706))   |
|                             | Comments            | Criterion B  |

**Conformance with EMC guideline 2004/108/EC and for low-voltage guideline 2006/95/EC (Continued)**

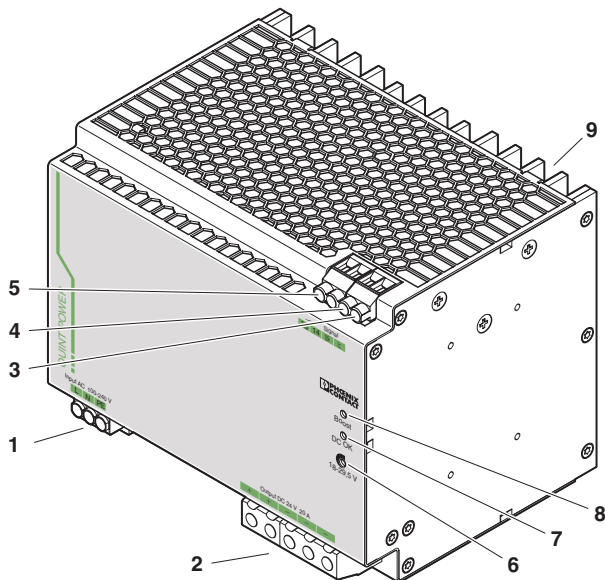
**Noise immunity according to EN 61000-6-2**

|                          |                    |
|--------------------------|--------------------|
| Simulation mobile phones | ENV 50204          |
| Frequency                | 900 MHz / 1800 MHz |
| Field intensity          | 20 V/m             |

**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 POWER BOOST switching output, active
- 4 DC OK switching output active
- 5 DC OK output, floating
- 6 Potentiometer 18 ... 29.5 V DC
- 7 "DC OK" LED, green
- 8 LED "BOOST", yellow
- 9 Universal DIN rail adapter UTA 107/30

|        | [mm <sup>2</sup> ] |          | AWG     | [Nm]<br>Torque |
|--------|--------------------|----------|---------|----------------|
|        | solid              | stranded |         |                |
| Input  | 0.2 - 6            | 0.2 - 4  | 18 - 10 | 0.5 - 0.6      |
| Output | 0.5 - 16           | 0.5 - 16 | 8 - 6   | 1.2 - 1.5      |
| Signal | 0.2 - 6            | 0.2 - 4  | 18 - 10 | 0.5 - 0.6      |

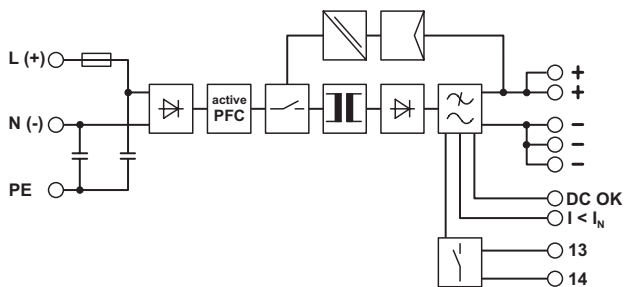
### Input data

|                             |   |
|-----------------------------|---|
| 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 ... 300 V DC (UL 508: ≤ 250 V DC) |
| AC frequency range          | 45 Hz ... 65 Hz                           |
| DC frequency range          | 0 Hz                                      |
| Input fuse, integrated      | 20 A (slow-blow, internal)                |
| Type of connection          | Screw connection                          |
| Stripping length            | 7 mm                                      |

### Output data

|                                     |  |
|-------------------------------------|--|
| Nominal output voltage              | 24 V DC ±1%  |
| Setting range of the output voltage | 18 V DC ... 29.5 V DC (> 24 V constant capacity)   |
| Output current                      | 40 A (-25°C ... 60°C, U <sub>OUT</sub> = 24 V DC)<br>45 A (with POWER BOOST, -25°C ... 40°C permanently, U <sub>OUT</sub> = 24 V DC)<br>215 A (with SFB technology, 12 ms) |
| Type of connection                  | Screw connection   |
| Stripping length                    | 10 mm  |

## 6 Block diagram



## 7 Safety and warning notes



### **DANGER OF EXPLOSION!**

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

### **DANGER**

The device contains dangerous live elements and high levels of stored energy. Never carry out work when the power is turned on.



### **WARNING**

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)!

The ground conductor is connected!

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.

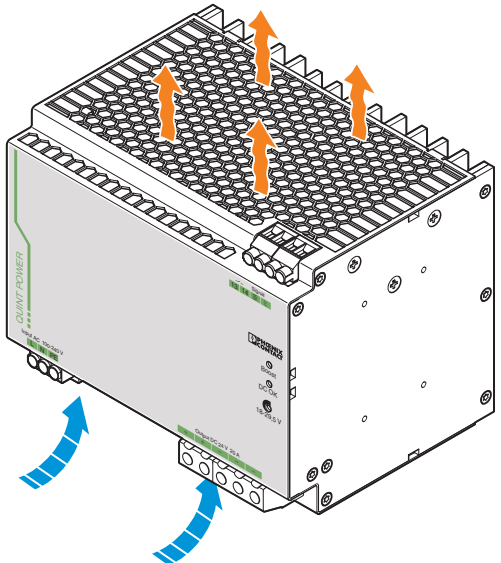


### **CAUTION**

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.



### 8 Installation

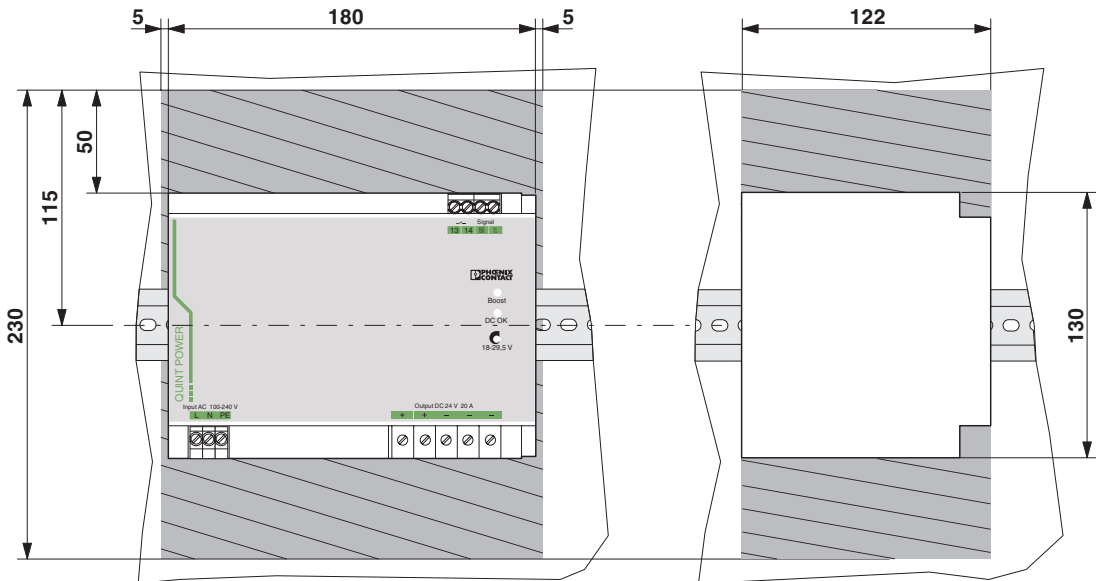


**ATTENTION**  
 In order to ensure sufficient convection, we recommend a minimum vertical distance of 5 cm to the other modules.  
 A lateral distance of 5 mm, and in the case of active components, that of 15 mm is necessary for proper functioning of the module.  
 Depending on the ambient temperature and the load of the module, the housing can become very hot.



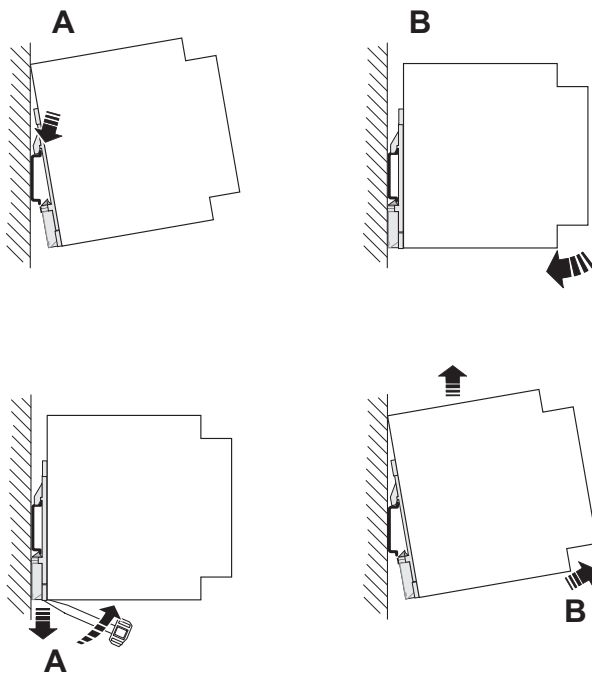
The power supply unit can be snapped onto all DIN rails in acc. with EN 60715. They must be mounted horizontally (connecting terminal blocks top and bottom).

### 9 Installation position



Slim-style installation: Installation depth 125 mm (+ DIN rail)  
 (state at delivery)  
 Mounting position rotated 90°: Installation depth 180 mm  
 (+ DIN rail)

## 10 Mounting on DIN rails



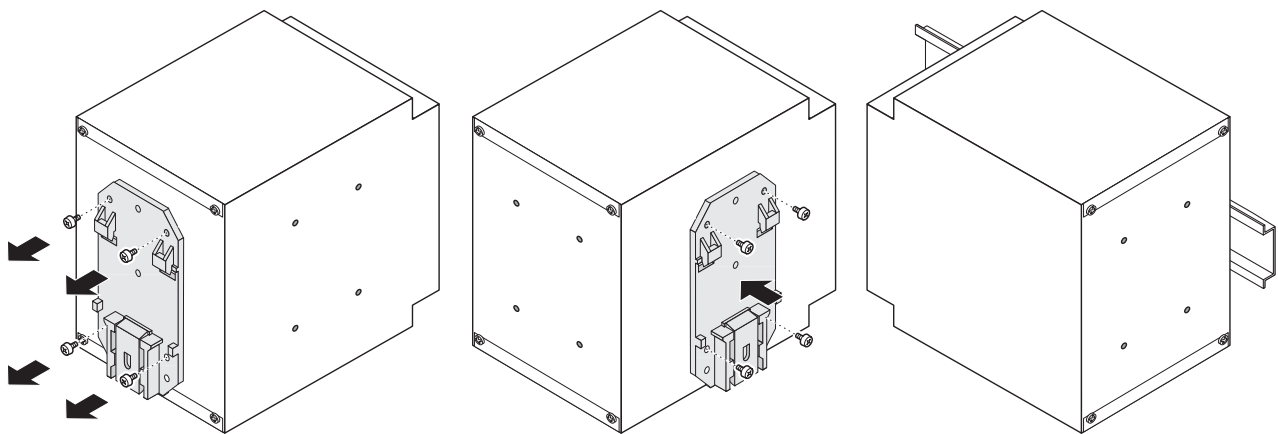
### Slim-style installation

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:

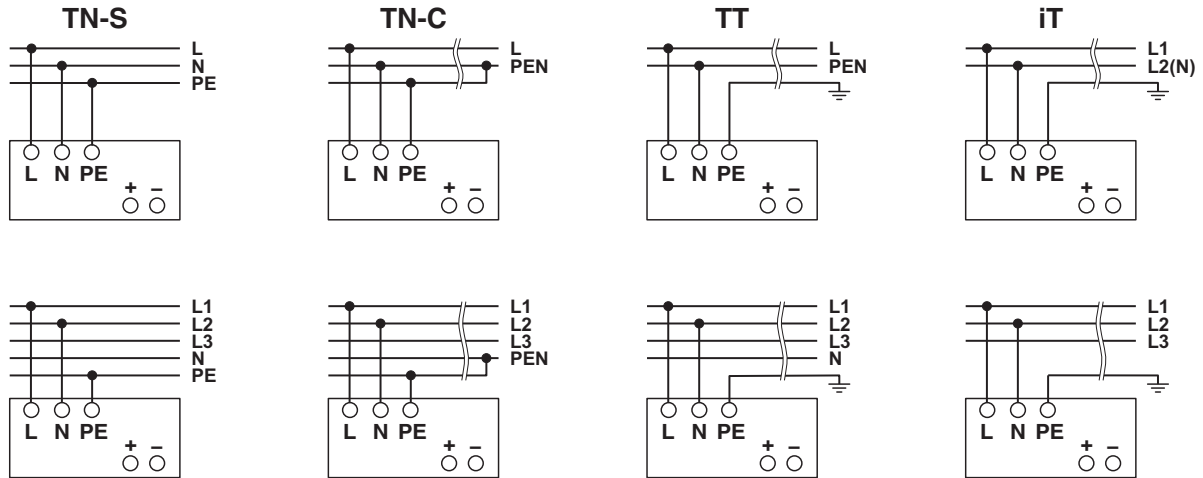
Pull the snap lever open with the aid of a screwdriver and slide the module out at the lower edge of the DIN rail.



### Mounting position rotated 90°

For a mounting position rotated at 90° to the DIN rail, mount the DIN rail adapter (UTA 107/30) as shown in the figure. No additional assembly material is required. Fixing screws: Torx T10 (torque 0.8 Nm ... 0.9 Nm).

## 11 Connection to various systems



The connection for 100 V AC ... 240 V AC is established using the L, N, and P screw connections.

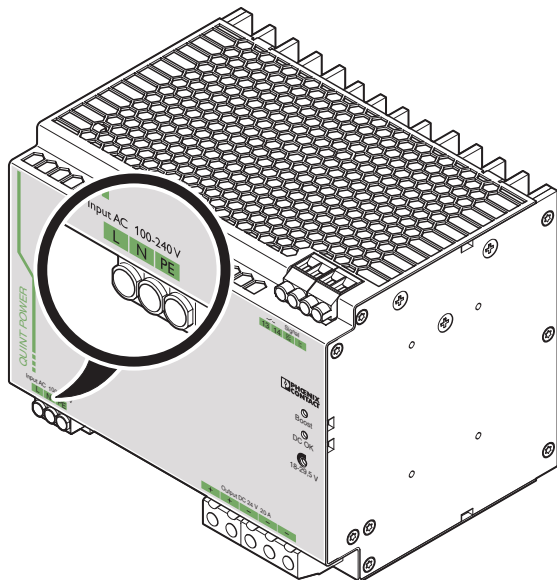
The device can be connected to 1-phase AC networks or to two of the phase conductors of three-phase systems (TN, TT or IT systems) in accordance with VDE 0100-300/IEC 60364-3) with nominal voltages of 100 V AC ... 240 V AC.

The device also continues to work on short-term input voltages > 300 V AC.



For operation on two of the phase conductors of a three-phase system, an isolating facility for all poles must be provided.

## 12 Input



### CAUTION

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

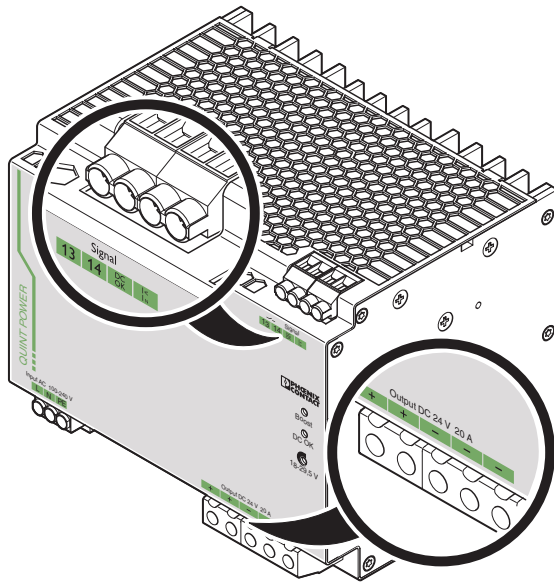
The device must be installed in acc. with the regulations as in EN 60950. It must be possible to disconnect the device using a suitable isolating facility outside the power supply.

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 16 A or 20 A, characteristic B (or identical function). In DC applications, a suitable fuse must be wired upstream.

### 13 Output



**CAUTION**

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 established using screw connections on the screw connection of the DC output:  
 24 V DC: "+" and "-"; DC OK switching output active: "DC OK" and "-"; DC OK output floating: "13" and "14"; POWER BOOST switching output active: "I < I<sub>N</sub>" and "-".  
 At the time of delivery, the output voltage is 24 V DC. The output voltage can be set on the potentiometer.

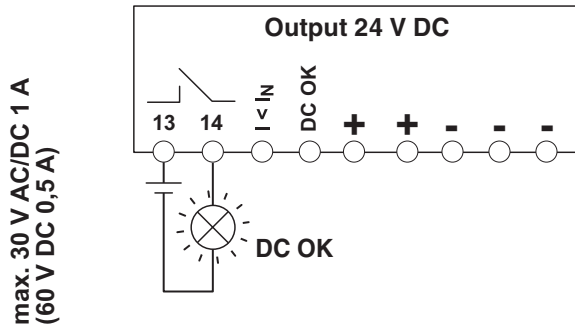
**Protection of the secondary side**

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.

### 14 Signaling

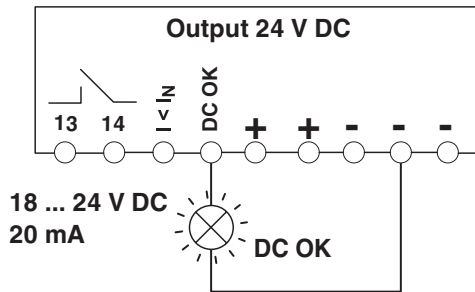
An active signal output DC OK, a floating signal contact DC OK and an active signal output POWER BOOST are available for function monitoring. In addition, the DC OK LED and the BOOST LED can be used to evaluate the function of the power supply directly at the installation location (see output characteristic curve).

|                                     | $I < I_N$  | $I > I_N$                                  | $U_{OUT} < 0.9 \times U_N$                             |
|-------------------------------------|--|--|--|
| "DC OK" LED                         | ON   | ON   | Flashing   |
| "BOOST" LED                         | OFF  | ON   | ON   |
| Active DC OK switching output       | ON   | ON   | OFF  |
| Floating DC OK output               | Closed   | Closed                                     | Open   |
| Active POWER BOOST switching output | ON   | OFF  | OFF  |
| Meaning                             | Normal operation of the power supply unit ( $U_{OUT} > 21.5 \text{ V}$ ) | POWER BOOST operation, e.g. to start loads | Overload mode, e.g. consumer short circuit or overload |



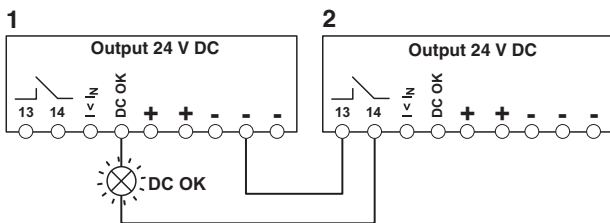
**Floating contact**

The floating signal contact opens and indicates that the set output voltage has been undershot by more than 10 %. Signals and ohmic loads up to a maximum of 30 V AC/DC and currents to a maximum of 1 A (or maximum of 60 V DC with a maximum of 0.5 A) can be switched. For heavily inductive loads such as a relay, a suitable protection circuit (e.g., damping diode) is necessary.



**Active signal outputs**

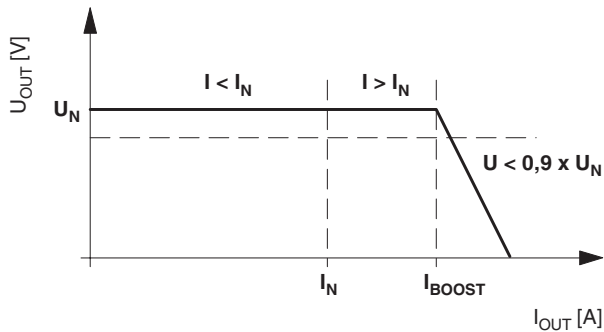
The 18 ... 24 V DC signal is applied between the "DC OK" and the "-" connecting terminal blocks or between "I < I<sub>N</sub>" and "-" and can carry a maximum of 20 mA. By switching from "active high" to "low", the DC OK signal output signalizes when the set output voltage is fallen short of by more than 10 %. The DC OK signal is decoupled from the power output. It is thus not possible for devices connected in parallel to act as an external power supply. The POWER BOOST signal output I < I<sub>N</sub> signalizes that the nominal current is exceeded. The power supply is then in POWER BOOST mode. Thanks to this preventive function monitoring, critical operating states can be responded to at an early stage, prior to a voltage dip occurring. The 18 ... 24 V DC signal can be directly connected to a logic input for evaluation.



**Signal loop**

Monitoring two devices: Use the active signal output of device 1 and loop in the floating signal output of device 2. In the event of malfunctioning, a common alarm is output. Any number of devices can be looped in. This signal combination saves wiring costs and logic inputs.

## 15 Function



### Output characteristic curve

The power supply works with the static POWER BOOST power reserve as shown in the U/I characteristic curve in the figure. At ambient temperatures  $T_{amb} < +40\text{ °C}$ ,  $I_{BOOST}$  is available continuously. At higher temperatures, it is available for a few minutes. In the event of a secondary-side short circuit or overload, the output current is limited to  $I_{BOOST}$ . Thereby, the module does not switch off, but rather supplies a continuous output current. The secondary voltage is reduced here until the short circuit is eliminated. The U/I characteristic curve with the POWER BOOST power reserve ensures that both high inrush currents of capacitive loads as well as loads with DC/DC converters in the primary circuit can be supplied.

In order to trip standard circuit breakers magnetically and therefore quickly, power supply units have to provide a multiple of the nominal current for a short time.

The characteristic curve shows when  $I < I_N$ ,  $I > I_N$  and  $U < 0.9 \times U_N$ . The "signaling" table is to be consulted for the respective signaling.

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

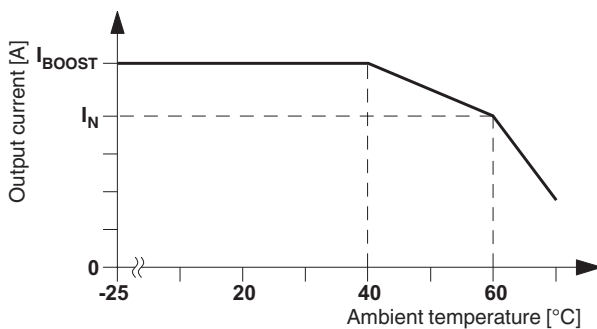
$$I_N = 40\text{ A}$$

$$I_{BOOST} = 45\text{ A}$$

$$\text{SFB technology} = 215\text{ A (for 12 ms)}$$

$$P_N = 960\text{ W}$$

$$P_{BOOST} = 1080\text{ W}$$

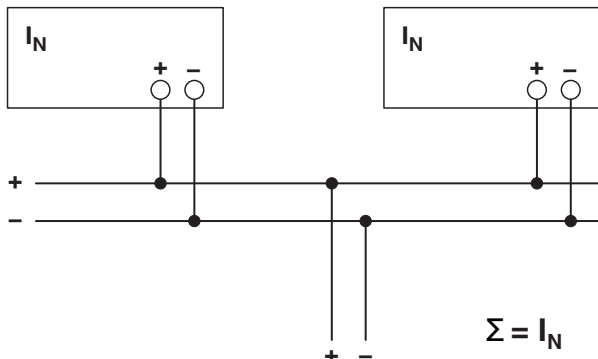


### Thermal behavior

With an ambient temperature of up to  $+40\text{ °C}$ , the device supplies the continuous output current of  $I_{BOOST}$ . The device can supply a nominal output current of  $I_N$  with ambient temperatures of up to  $+60\text{ °C}$ . In the case of ambient temperatures above  $+60\text{ °C}$ , the output current must be reduced by 2.5% per Kelvin increase in temperature. The device does not switch off at ambient temperatures of  $+70\text{ °C}$  or thermal overload. The output capacity is reduced as far as necessary to provide device protection. After it has cooled down, the output capacity is increased again.

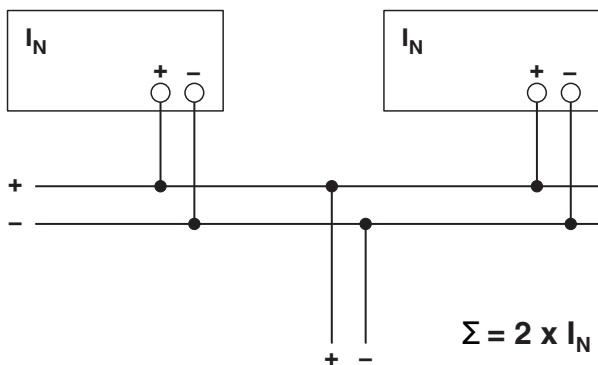
**Parallel operation**

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 the supply of systems which make especially high requirements on the operational safety. If a fault occurs in the primary circuit of the first power supply unit, the second device automatically takes over the entire power supply, without interruption, and vice versa. For this reason, the power supply units to be connected in parallel are dimensioned in such a way that the total current requirement of all consumers can be completely covered by one power supply unit. 100% redundancy makes external decoupling diodes necessary (QUINT-DIODE/40, Order No. 2938963)!



**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.

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А