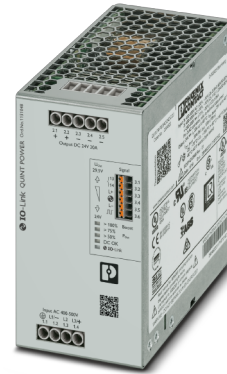


# QUINT4-PS/3AC/24DC/20/IOL

## Power supply unit



Data sheet  
110586\_en\_00

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## 1 Description

QUINT POWER power supplies with SFB Technology and preventive function monitoring ensure superior system availability.

### Powerful

- SFB Technology: 6 times the nominal current for 15 ms
- Power reserves:  
Static boost of up to 125% ( $P_N$ ) for a sustained period  
Dynamic boost of up to 200% ( $P_N$ ) for 5 s

### Communicative

- Use in all industrial networks with integrated IO-Link interface
- System integration with direct connection to the QUINT UPS or the CAPAROC circuit breaker system

### Robust

- Mains buffering  $\geq 20$  ms
- High degree of electrical immunity, thanks to integrated gas discharge tube (6 kV)

### Preventive

- Comprehensive signaling:  
Relay contact, LED bar graph
- Needs-based maintenance and effective replacement-part procurement with information on the remaining service life

### Technical data (short form)

Input voltage range	3x 400 V AC ... 500 V AC -20 % ... +10 % 2x 400 V AC ... 500 V AC -10 % ... +10 %
---------------------	--

Mains buffering	typ. 33 ms (3x 400 V AC) typ. 33 ms (3x 480 V AC)
-----------------	--

Nominal output voltage ( $U_N$ )	24 V DC
----------------------------------	---------

Setting range of the output voltage ( $U_{Set}$ )	24 V DC ... 29.5 V DC
---	-----------------------

Nominal output current ( $I_N$ )	20 A
Static Boost ( $I_{Stat.Boost}$ )	25 A
Dynamic Boost ( $I_{Dyn.Boost}$ )	30 A (5 s)
Selective Fuse Breaking ( $I_{SFB}$ )	120 A (15 ms)

Output power ( $P_N$ )	480 W
Output power ( $P_{Stat.Boost}$ )	600 W
Output power ( $P_{Dyn.Boost}$ )	720 W

Efficiency	typ. 94.1 % (400 V AC) typ. 94.9 % (480 V AC)
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Residual ripple	< 60 mV <sub>pp</sub>
-----------------	-----------------------

MTBF (IEC 61709, SN 29500)	> 638000 h (40 °C)
----------------------------	--------------------

Ambient temperature (operation)	-25 °C ... 70 °C -40 °C (startup type tested) > 60 °C Derating: 2,5 %/K
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Dimensions W/H/D	70 mm / 130 mm / 125 mm
------------------	-------------------------

Weight	1.1 kg
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All technical specifications are nominal values and refer to a room temperature of 25 °C and 70 % relative humidity at 100 m above sea level.

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### 3 Ordering data

Description	Type	Item no.	Pcs./Pkt.
Primary-switched power supply unit, QUINT POWER, Screw connection, DIN rail mounting, input: 3-phase, output: 24 V DC / 20 A	QUINT4-PS/3AC/24DC/20/IOL	1151048	1
<b>Accessories</b>	<b>Type</b>	<b>Item no.</b>	<b>Pcs./Pkt.</b>
Universal wall adapter for securely mounting the device in the event of strong vibrations. The device is screwed directly onto the mounting surface. The universal wall adapter is attached on the top/bottom.	UWA 182/52	2938235	1
2-piece universal wall adapter for securely mounting the device in the event of strong vibrations. The profiles that are screwed onto the side of the device are screwed directly onto the mounting surface. The universal wall adapter is attached on the left/right.	UWA 130	2901664	1
Fuse, for the photovoltaics industry according to UL 2579, nominal current: 6 A, length: 38 mm, diameter: 10.3 mm, color: white	FUSE 10,3X38 6A PV A	3062778	10
Plug-in device protection, according to type 3/class III, for 3-phase power supply networks with separate N and PE (5-conductor system: L1, L2, L3, N, PE), with integrated surge-proof fuse and remote indication contact.	PLT-SEC-T3-3S-230-FM	2905230	1
Type 3 surge protection, consisting of protective plug and base element, with integrated status indicator and remote signaling for single-phase power supply networks. Nominal voltage: 24 V AC/DC	PLT-SEC-T3-24-FM-PT	2907925	5
Type 3 surge protection, consisting of protective plug and base element, with integrated status indicator and remote signaling for single-phase power supply networks. Nominal voltage: 24 V AC/DC	PLT-SEC-T3-24-FM-UT	2907916	5
Electronic circuit breaker, number of positions: 1, mounting type: DIN rail: 35 mm, Color: light grey RAL 7035	CBMC E4 24DC/1-4A NO	2906031	1
Electronic circuit breaker, number of positions: 1, mounting type: DIN rail: 35 mm, Color: light grey RAL 7035	CBMC E4 24DC/1-10A NO	2906032	1
Electronic circuit breaker, number of positions: 1, mounting type: DIN rail: 35 mm, Color: light grey RAL 7035	CBMC E4 24DC/1-4A+ IOL	2910410	1
Electronic circuit breaker, number of positions: 1, mounting type: DIN rail: 35 mm, Color: light grey RAL 7035	CBMC E4 24DC/1-10A IOL	2910411	1
Electronic circuit breaker, number of positions: 1, mounting type: DIN rail: 35 mm, Color: light grey RAL 7035	CBM E4 24DC/0.5-10A NO-R	2905743	1

Accessories	Type	Item no.	Pcs./Pkt.
Electronic circuit breaker, number of positions: 1, mounting type: DIN rail: 35 mm, Color: light grey RAL 7035	CBM E8 24DC/0.5-10A NO-R	2905744	1
End clamp, material: Aluminum, color: silver	E/AL-NS 35	1201662	10
QUINT UPS, IQ Technology, DIN rail mounting, Screw connection, input: 24 V DC, output: 24 V DC / 20 A, charging current: 5 A	QUINT4-UPS/24DC/24DC/20	2907071	1
QUINT UPS, IQ Technology, EtherCAT®, DIN rail mounting, Screw connection, input: 24 V DC, output: 24 V DC / 20 A, charging current: 5 A	QUINT4-UPS/24DC/24DC/20/EC	2907076	1
QUINT UPS, IQ Technology, EtherNet/IP™, DIN rail mounting, Screw connection, input: 24 V DC, output: 24 V DC / 20 A, charging current: 5 A	QUINT4-UPS/24DC/24DC/20/EIP	2907074	1
QUINT UPS, IQ Technology, USB (Modbus/RTU), DIN rail mounting, Screw connection, input: 24 V DC, output: 24 V DC / 20 A, charging current: 5 A	QUINT4-UPS/24DC/24DC/20/USB	2907072	1
QUINT UPS, IQ Technology, PROFINET, DIN rail mounting, Screw connection, input: 24 V DC, output: 24 V DC / 20 A, charging current: 5 A	QUINT4-UPS/24DC/24DC/20/PN	2907073	1
Power module, mounting type: pluggable onto CAPAROC CR... current rail, Color: light grey RAL 7035	CAPAROC PM PN	1110986	1
Busbar, mounting type: DIN rail: 35 mm, Color: light grey RAL 7035	CAPAROC CR 8	1115672	12
Electronic circuit breaker, number of positions: 1, mounting type: pluggable onto CAPAROC CR... current rail, Color: light grey RAL 7035	CAPAROC E2 12-24DC/2-10A	1110984	1



The range of accessories is being continuously extended. The current range of accessories can be found in the download area for the product.

## 4 Technical data

### Input data



Unless otherwise stated, all data applies for 25°C ambient temperature, 400 V AC input voltage, and nominal output current ( $I_N$ ).

Input voltage range	3x 400 V AC ... 500 V AC -20 % ... +10 % 2x 400 V AC ... 500 V AC -10 % ... +10 % ± 260 V DC ... 300 V DC -13 % ... +30 %
Frequency range ( $f_N$ )	50 Hz ... 60 Hz -10 % ... +10 %
Network type	Star network
Current draw typ.	3x 0.99 A (400 V AC) 3x 0.81 A (480 V AC) 3x 0.8 A (500 V AC) 2x 1.62 A (400 V AC) 2x 1.37 A (480 V AC) 2x 1.23 A (500 V AC) 1.23 A (± 260 V DC) 1.06 A (±300 V DC)



The specified values for current consumption apply for 3AC operation in static boost and 2AC operation at nominal power.

Discharge current to PE typical	< 3.5 mA 1.7 mA (550 V AC, 60 Hz)
Mains buffering	typ. 33 ms (3x 400 V AC) typ. 33 ms (3x 480 V AC)
Switch-on time	< 1 s
Typical response time from SLEEP MODE	300 ms
Protective circuit	Transient surge protection Varistor, gas-filled surge arrester
Inrush current limitation after 1 ms	2 A
Inrush current integral ( $I^2t$ )	< 0.1 A <sup>2</sup> s



During the first few microseconds, the current flow into the filter capacitors is excluded.



The SCCR value (short-circuit current rating) of the power supply unit corresponds to the SCCR value of the backup fuse (see input protection table).



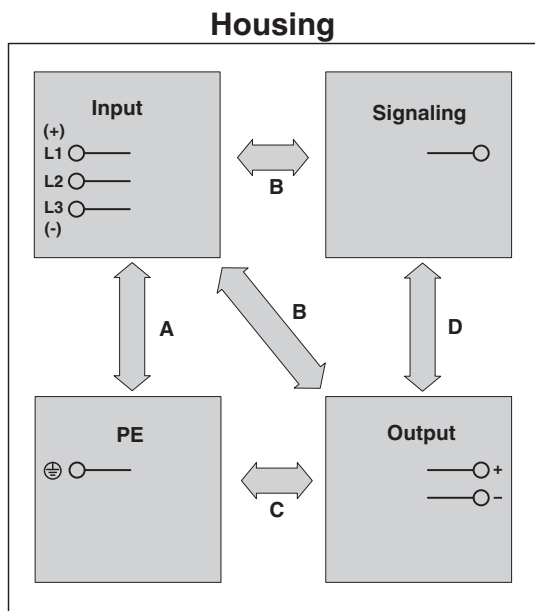
The external backup fuse must be approved for the (AC/DC) supply voltage used and the voltage level.

Input protection , AC/DC ( to be connected externally upstream )							
Input current $I_{In}$ Input protection	Circuit breaker					Neozed fuse or equivalent	Power switch
Characteristics	A	B	C	D	K	gG	$\leq 13 \times I_{In}$ (maximum magnetic tripping)
4 A	✓	✓	✓	✓	✓	✓	✓
6 A	✓	✓	✓	✓	✓	✓	✓
8 A	✓	✓	✓	✓	✓	-	✓
10 A	✓	✓	✓	✓	✓	-	✓
13 A	✓	✓	✓	-	✓	-	✓
16 A	✓	✓	✓	-	-	-	-
20 A	✓	✓	✓	-	-	-	-

**Input protection , ( to be connected externally upstream )**

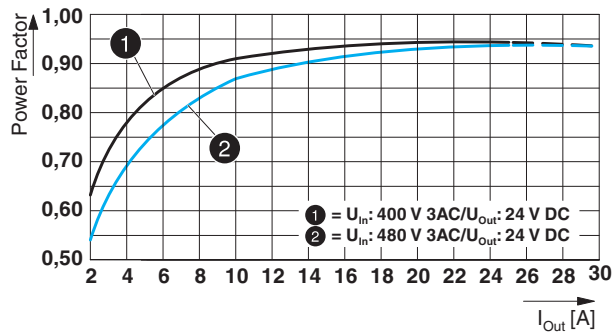
Recommended breaker for input protection 1x 6 A (10 x 38 mm, 30 kA L/R = 2 ms) ,  $\geq 1000$  V DC

**Electric strength of the insulation**



	A	B	C	D
Type test (IEC/EN 60950-1)	3.5 kV AC	4 kV AC	0.5 kV DC	0.5 kV DC
Production test	2.4 kV AC	2.4 kV AC	0.5 kV DC	0.5 kV DC
Field test (with gas-filled surge arrester)	0.8 kV AC 1.1 kV DC	0.8 kV AC 1.1 kV DC	0.5 kV DC	0.5 kV DC
Field test (gas-filled surge arrester de-contacted)	2 kV AC 2.83 kV DC	2 kV AC 2.83 kV DC	0.5 kV DC	0.5 kV DC

**POWER factor**



**Crest factor**

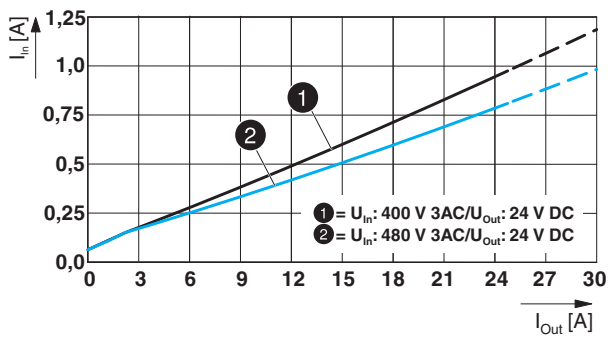
**400 V AC**

**480 V AC**

typ. 1.78

typ. 2.1

**Input current vs. output current**



**Input connection data**

Connection method	Screw connection
Conductor cross section, rigid	0.2 mm <sup>2</sup> ... 6 mm <sup>2</sup>
Conductor cross section, flexible	0.2 mm <sup>2</sup> ... 4 mm <sup>2</sup>
Conductor cross section flexible, with ferrule with plastic sleeve	0.25 mm <sup>2</sup> ... 4 mm <sup>2</sup>
Conductor cross section flexible, with ferrule without plastic sleeve	0.25 mm <sup>2</sup> ... 4 mm <sup>2</sup>
Conductor cross section AWG	24 ... 10
Stripping length	8 mm
Tightening torque	0.5 Nm ... 0.6 Nm

<b>Output data</b>	
Nominal output voltage ( $U_N$ )	24 V DC
Setting range of the output voltage ( $U_{Set}$ ) ( constant capacity )	24 V DC ... 29.5 V DC
Nominal output current ( $I_N$ )	20 A
Static Boost ( $I_{Stat.Boost}$ )	25 A
Dynamic Boost ( $I_{Dyn.Boost}$ )	30 A (5 s)
Selective Fuse Breaking ( $I_{SFB}$ )	120 A (15 ms)
Magnetic circuit breaker tripping	A1...A16 / B2...B13 / C1...C6 / Z1...Z16
Control deviation Static load change 10 % ... 90 %	< 0.5 %
Control deviation Dynamic load change 10 % ... 90 %, (10 Hz)	< 3 %
Control deviation change in input voltage $\pm 10$ %	< 0.25 %
Short-circuit-proof	yes
No-load proof	yes
Residual ripple ( with nominal values )	< 60 mV <sub>PP</sub>
Connection in parallel	yes, for redundancy and increased capacity
Connection in series	yes
Feedback voltage resistance	$\leq 35$ V DC
Protection against overvoltage at the output (OVP)	$\leq 32$ V DC
Rise time typical	< 80 ms ( $U_{Out} = 10$ % ... 90 %)
<b>Output connection data</b>	
Connection method	Screw connection
Conductor cross section, rigid	0.2 mm <sup>2</sup> ... 6 mm <sup>2</sup>
Conductor cross section, flexible	0.2 mm <sup>2</sup> ... 4 mm <sup>2</sup>
Conductor cross section flexible, with ferrule with plastic sleeve	0.25 mm <sup>2</sup> ... 4 mm <sup>2</sup>
Conductor cross section flexible, with ferrule without plastic sleeve	0.25 mm <sup>2</sup> ... 4 mm <sup>2</sup>
Conductor cross section AWG	24 ... 10
Stripping length	8 mm
Tightening torque	0.5 Nm ... 0.6 Nm
<b>LED signaling</b>	
$P_{Out} > 100$ %	LED lights up yellow, output power > 480 W
$P_{Out} > 75$ %	LED lights up green, output power > 360 W
$P_{Out} > 50$ %	LED lights up green, output power > 240 W
$U_{Out} > 0.9 \times U_{Set}$	LED lights up green
$U_{Out} < 0.9 \times U_{Set}$	LED flashes green
IO-Link master connected	LED lights up green
IO-Link communication active	LED flashes green



**Signal contact (configurable)**

Relay contact (configurable) 13/14

Function	N/O contact
Default	closed ( $U_{out} > 0.9 U_{Set}$ )
Maximum contact load	24 V DC 1 A , 30 V AC/DC 0.5 A

**IO-Link**

Specification	V1.1
Connection method	3-conductor port class A
Connection marking	3.3 (L+) 3.4 (⊕) 3.5 (L-)
Reverse polarity protection	yes
Electrical isolation	yes
Transmission speed	230 kbps (COM3)
Cycle time	2 ms
Amount of process data	6 Byte (Input data)
Vendor ID	00B0 <sub>hex</sub> / 176 <sub>dez</sub>
Device ID	262657 <sub>dec</sub> / 0x040201 <sub>hex</sub>

**System communication**

Connection method	2-conductor
Connection marking	3.6 (┘┘) 3.5 (L-/Sgnd)
Electrical isolation	yes

**Signal connection data**

Connection method	Push-in connection
Conductor cross section, rigid	0.2 mm <sup>2</sup> ... 1 mm <sup>2</sup>
Conductor cross section, flexible	0.2 mm <sup>2</sup> ... 1.5 mm <sup>2</sup>
Conductor cross section flexible, with ferrule with plastic sleeve	0.2 mm <sup>2</sup> ... 0.75 mm <sup>2</sup>
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm <sup>2</sup> ... 1.5 mm <sup>2</sup>
Conductor cross section AWG	24 ... 16
Stripping length	8 mm

**Reliability**

	<b>400 V AC</b>
MTBF (IEC 61709, SN 29500)	> 985000 h (25 °C) > 638000 h (40 °C) > 311000 h (60 °C)

Life expectancy (electrolytic capacitors) Output current ( $I_{Out}$ )	400 V AC	480 V AC
10 A	> 344000 h ( 40 °C )	> 320000 h ( 40 °C )
20 A	> 157000 h ( 40 °C )	> 152000 h ( 40 °C )
20 A	> 445000 h ( 25 °C )	> 432000 h ( 25 °C )



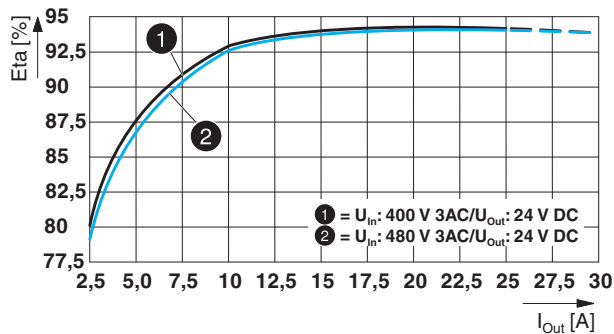
The expected service life is based on the capacitors used. If the capacitor specification is observed, the specified data will be ensured until the end of the stated service life. For runtimes beyond this time, error-free operation may be reduced. The specified service life of more than 15 years is simply a comparative value.

Switching frequency	Min.	Max.
PFC stage	25 kHz	500 kHz
Auxiliary converter stage	90 kHz	110 kHz
Main converter stage	56 kHz	500 kHz

General data	
Degree of protection	IP20
Protection class	I
Inflammability class in acc. with UL 94 (housing / terminal blocks)	V0
Side element version	Aluminum
Hood version	Stainless steel X6Cr17
Dimensions W / H / D (state of delivery)	70 mm / 130 mm / 125 mm
Weight	1.1 kg

Power dissipation	400 V AC	480 V AC
Maximum no-load power dissipation	< 6 W	< 6 W
Power dissipation SLEEP MODE	< 5 W	< 5 W
Power loss nominal load max.	< 30 W	< 30 W

Efficiency	400 V AC	480 V AC
	typ. 94.1 %	typ. 94.9 %



**Ambient conditions**

Ambient temperature (operation) -25 °C ... 70 °C (> 60 °C Derating: 2,5 %/K)



The ambient temperature (operation) refers to UL 508 surrounding air temperature.

Ambient temperature (start-up type tested) -40 °C

Ambient temperature (storage/transport) -40 °C ... 85 °C

Max. permissible relative humidity (operation) ≤ 95 % (at 25 °C, non-condensing)

Installation height ≤ 5000 m (> 2000 m, observe derating)

Vibration (operation) 5 Hz ... 100 Hz resonance search 2.3g, 90 min., resonance frequency 2.3g, 90 min. (according to DNV GL Class C)



In order to achieve the specified vibration resistance, the power supply must be secured in place with two end brackets of type E/AL-NS 35 (1201662).

Shock 18 ms, 30g, in each space direction (according to IEC 60068-2-27)

Degree of pollution 2

Climatic class 3K22 (in accordance with EN 60721-3-3)

Overvoltage category

EN 61010-1 II (≤ 5000 m)

EN 62477-1 III (≤ 2000 m)

EN 61558-2-16 II (≤ 5000 m)

**Standards**

Safety transformers for power supply units EN 61558-2-16

Electrical safety (of information technology equipment) IEC 60950-1/VDE 0805 (SELV)

Electrical safety (of control and regulation devices) IEC 61010-1

Protective extra-low voltage IEC 61010-1 (SELV)  
IEC 61010-2-201 (PELV)

Safe isolation IEC 61558-2-16  
IEC 61010-2-201

Limitation of mains harmonic currents EN 61000-3-2

Network version/undervoltage SEMI F47-0706, EN 61000-4-11

Rail applications EN 50121-3-2  
EN 50121-5  
IEC 62236-3-2  
IEC 62236-5

EMC requirements, power plant EN 61000-6-5

HART FSK Physical Layer Test Specification Compliance Output voltage  $U_{Out}$  compliant

**Approvals**

UL UL Listed UL 61010-1  
UL Listed UL 61010-2-201  
UL 121201 & CSA C22.2 No. 213-17 Class I, Division 2, Groups A, B, C, D T4 (Hazardous Location)

CSA CAN/CSA-C22.2 No. 61010-1-12  
CAN/CSA-C22.2 No. 61010-2-201

SIQ CB-Scheme (IEC 61010-1, IEC 61010-2-201)

<b>Electromagnetic compatibility</b>		
<b>Conformance with EMC Directive 2014/30/EU</b>		
<b>Noise emission according to EN 61000-6-3 (residential and commercial) and EN 61000-6-4 (industrial)</b>		
<b>CE basic standard</b>	<b>Minimum normative requirements</b>	<b>Higher requirements in practice (covered)</b>
Conducted noise emission EN 55016	EN 61000-6-4 (Class A)	EN 61000-6-3 (Class B)
Noise emission EN 55016	EN 61000-6-4 (Class A)	EN 61000-6-3 (Class B)
Harmonic currents EN 61000-3-2	EN 61000-3-2 (Class A)	EN 61000-3-2 (Class A)
Flicker EN 61000-3-3	not required	EN 61000-3-3
<b>Immunity according to EN 61000-6-1 (residential), EN 61000-6-2 (industrial), and EN 61000-6-5 (power station equipment zone), IEC/EN 61850-3 (energy supply)</b>		
<b>CE basic standard</b>	<b>Minimum normative requirements of EN 61000-6-2 (CE) (immunity for industrial environments)</b>	<b>Higher requirements in practice (covered)</b>
Electrostatic discharge EN 61000-4-2		
Housing contact discharge	4 kV (Test Level 2)	8 kV (Test Level 4)
Housing air discharge	8 kV (Test Level 3)	15 kV (Test Level 4)
Comments	Criterion B	Criterion A
Electromagnetic HF field EN 61000-4-3		
Frequency range	80 MHz ... 1 GHz	80 MHz ... 1 GHz
Test field strength	10 V/m (Test Level 3)	20 V/m (Test Level 3)
Frequency range	1 GHz ... 6 GHz	1 GHz ... 6 GHz
Test field strength	3 V/m (Test Level 2)	10 V/m (Test Level 3)
Comments	Criterion A	Criterion A
Fast transients (burst) EN 61000-4-4		
Input	2 kV (Test Level 3 - asymmetrical)	4 kV (Test Level 4 - asymmetrical)
Output	2 kV (Test Level 3 - asymmetrical)	2 kV (Test Level 4 - asymmetrical)
Signal	1 kV (Test Level 3 - asymmetrical)	2 kV (Test Level 4 - asymmetrical)
Comments	Criterion B	Criterion B

**Immunity according to EN 61000-6-1 (residential), EN 61000-6-2 (industrial), and EN 61000-6-5 (power station equipment zone), IEC/EN 61850-3 (energy supply)**

CE basic standard	Minimum normative requirements of EN 61000-6-2 (CE) (immunity for industrial environments)	Higher requirements in practice (covered)
<b>Surge voltage load (surge) EN 61000-4-5</b>		
Input	1 kV (Test Level 3 - symmetrical) 2 kV (Test Level 3 - asymmetrical)	2 kV (Test Level 3 - symmetrical) 6 kV (Test Level 4 - asymmetrical)
Output	0.5 kV (Test Level 2 - symmetrical) 0.5 kV (Test Level 1 - asymmetrical)	1 kV (Test Level 3 - symmetrical) 2 kV (Test Level 3 - asymmetrical)
Signal	0.5 kV (Test Level 1 - asymmetrical)	1 kV (Test Level 2 - asymmetrical)
Comments	Criterion B	Criterion B
<b>Conducted interference EN 61000-4-6</b>		
Input/Output/Signal	asymmetrical	asymmetrical
Frequency range	0.15 MHz ... 80 MHz	0.15 MHz ... 80 MHz
Voltage	10 V (Test Level 3)	10 V (Test Level 3)
Comments	Criterion A	Criterion A
<b>Power frequency magnetic field EN 61000-4-8</b>		
	50 Hz , 60 Hz ( 30 A/m )	16.7 Hz , 50 Hz , 60 Hz ( 100 A/m 60 s )
	not required	50 Hz , 60 Hz ( 1 kA/m , 3 s )
	not required	0 Hz ( 300 A/m , DC, 60 s )
Comments	Criterion A	Criterion A
<b>Voltage dips EN 61000-4-11</b>		
<b>Input voltage ( 400 V AC , 50 Hz )</b>		
Voltage dip	70 % , 25 periods ( Test Level 2 )	70 % , 0.5 / 1 / 25 periods ( Test Level 2 )
Comments	Criterion C	Criterion A: 0.5 / 1 period Criterion B: 25 periods
Voltage dip	40 % , 10 periods ( Test Level 2 )	40 % , 5 / 10 / 50 periods ( Test Level 2 )
Comments	Criterion C	Criterion B
Voltage dip	0 % , 1 period ( Test Level 2 )	0 % , 0.5 / 1 / 5 / 50 / 250 periods ( Test Level 2 )
Comments	Criterion B	Criterion A: 0.5 / 1 period Criterion B: 5 / 50 / 250 periods

Additional basic standard EN 61000-6-5 (immunity in power station), IEC/EN 61850-3 (energy supply)		
Basic standard	Minimum normative requirements of EN 61000-6-5	Higher requirements in practice (covered)
Pulse-shape magnetic field EN 61000-4-9		
	not required	1000 A/m
Comments	none	Criterion A
Damped oscillating magnetic field EN 61000-4-10		
	not required	100 kHz 100 A/m
	not required	1 MHz 100 A/m
Comments	none	Criterion A
Attenuated sinusoidal oscillations (ring wave) EN 61000-4-12		
Input	not required	2 kV (Test Level 4 - symmetrical)
	not required	4 kV (Test Level 4 - asymmetrical)
Comments	none	Criterion A
Asymmetrical conducted disturbance variables EN 61000-4-16		
Input, Output, Signals	15 Hz ... 150 Hz , 10 V on 1 V 150 Hz ... 1.5 kHz , 1 V 1.5 kHz ... 15 kHz , 1 V on 10 V 15 kHz ... 150 kHz , 10 V ( Test Level 3 )	15 Hz ... 150 Hz , 10 V on 1 V 150 Hz ... 1.5 kHz , 1 V 1.5 kHz ... 15 kHz , 1 V on 10 V 15 kHz ... 150 kHz , 10 V ( Test Level 3 )
	50 Hz , 60 Hz , 10 V (Permanent) 50 Hz , 60 Hz , 100 V (1 s) ( Test Level 3 )	50 Hz , 60 Hz , 10 V (Permanent) 50 Hz , 60 Hz , 100 V (1 s) ( Test Level 3 )
Comments	Criterion A	Criterion A

**Key**

- Criterion A Normal operating behavior within the specified limits.
- Criterion B Temporary impairment to operational behavior that is corrected by the device itself.
- Criterion C Temporary adverse effects on the operating behavior, which the device corrects automatically or which can be restored by actuating the operating elements.

## 5 Safety and installation notes

### 5.1 Symbols used

Instructions and possible hazards are indicated by corresponding symbols in this document.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety measures that follow this symbol to avoid possible personal injuries.

There are different categories of personal injury that are indicated by a signal word.



#### **WARNING**

This indicates a hazardous situation which, if not avoided, could result in death or serious injury.



#### **CAUTION**

This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

The following symbols are used to indicate potential damage, malfunctions, or more detailed sources of information.



#### **NOTE**

This symbol together with the signal word NOTE and the accompanying text alert the reader to a situation which may cause damage or malfunction to the device, hardware/software, or surrounding property.



This symbol and the accompanying text provide the reader with additional information or refer to detailed sources of information.

### 5.2 Safety and warning notes



#### **WARNING: Danger to life by electric shock!**

- Only skilled persons may install, start up, and operate the device.
- The power supply must be switched off from outside (e.g. via the line protection on the primary side).
- Never carry out work when voltage is present.
- Establish connection correctly and ensure protection against electric shock.
- Cover termination area after installation in order to avoid accidental contact with live parts (e. g., installation in control cabinet).
- Protection may be impaired if the equipment is used in a manner not specified by the manufacturer.



#### **CAUTION: Hot surface**

The heatsinks of the power supply can reach temperatures >65 °C, depending on the load.



#### **NOTE**

- Observe the national safety and accident prevention regulations.
- Assembly and electrical installation must correspond to the state of the art.
- The power supply is a built-in device and is designed for mounting in a control cabinet.
- The IP20 degree of protection of the device is intended for use in a clean and dry environment.
- Observe mechanical and thermal limits.
- Ensure minimum clearances to external heat sources.
- Mount the power supply unit in the standard installation position. Position of the L1/L2/L3/⊕ connection terminal blocks at bottom.
- Connect the housing to ground via protective conductor device terminal block ⊕.
- Ensure that the primary-side wiring and secondary-side wiring are the correct size and have sufficient fuse protection.
- Use copper cables for operating temperatures of >75 °C (ambient temperature <55 °C) >90 °C (ambient temperature <75 °C).
- For the connection parameters for wiring the power supply, such as the required stripping length with and without ferrule, refer to the technical data section.

- The power supply is approved for the connection to 3-phase TN, TT and IT power grids (star networks) with a maximum phase-to-phase voltage of 500 V AC.
- If there is a DC source, then a center ground is required.
- Protect the device against foreign bodies penetrating it, e.g., paper clips or metal parts.
- The power supply is maintenance-free. Repairs may only be carried out by the manufacturer. The warranty no longer applies if the housing is opened.
- Improper use invalidates the device protection.
- Relay contact 13/14 can be used to max. 30 V AC/ 24 V DC.

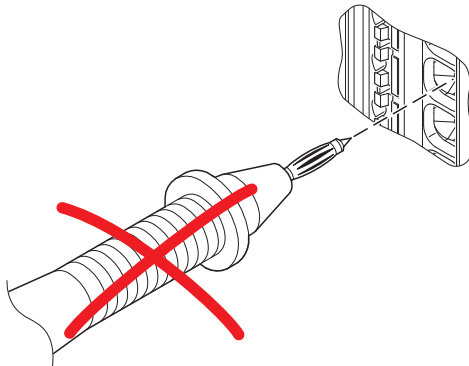


The continuous total output power may not exceed  $P_N$  at 60 °C ambient temperature and  $P_{Stat. Boost}$  at 40°C ambient temperature. Observe all the maximum output powers for all operating conditions.



**NOTE: Damage to the Push-in connection terminal blocks is possible**

Do not plug test pins into the Push-in connection terminal blocks. The maximum pluggable depth of the Push-in connection terminal blocks is limited. In addition, when the test pin is plugged in, the unlocking button (pusher) is covered to such an extent that unlocking is not possible or only possible to an insufficient extent. If you do not push the unlocking button (pusher) down completely when you are pulling the test pin out, then the Push-in connection terminal block will become damaged.





## 6 High-voltage test (HIPOT)

This protection class I power supply is subject to the Low Voltage Directive and is factory tested. During the HIPOT test (high-voltage test), the insulation between the input circuit and output circuit is tested for the prescribed electric strength values, for example. The test voltage in the high-voltage range is applied at the input and output terminal blocks of the power supply. The operating voltage used in normal operation is a lot lower than the test voltage used.



High-voltage tests up to 0.8 kV AC / 1.1 kV DC can be performed as described.

For high-voltage tests > 0.8 kV AC / 1.1 kV DC, the gas-filled surge arrester must be disconnected.

The test voltage should rise and fall in ramp form. The relevant rise and fall time of the ramp should be at least two seconds.

### 6.1 High-voltage dielectric test (dielectric strength test)

In order to protect the user, power supplies (as electric components with a direct connection to potentially hazardous voltages) are subject to more stringent safety requirements. For this reason, permanent safe electrical isolation between the hazardous input voltage and the touch-proof output voltage as safety extra-low voltage (SELV) must always be ensured.

In order to ensure permanent safe isolation of the AC input circuit and DC output circuit, high-voltage testing is performed as part of the safety approval process (type test) and manufacturing (routine test).

### 6.2 High-voltage dielectric test during the manufacturing process

During the manufacturing process for the power supply, a high-voltage test is performed as part of the dielectric test in accordance with the specifications of IEC/UL/EN 61010-1. The high-voltage test is performed with a test voltage of at least 1.5 kV AC / 2.2 kV DC or higher. Routine manufacturing tests are inspected regularly by a certification authority.

### 6.3 High-voltage dielectric test performed by the customer

Apart from routine and type tests to guarantee electrical safety, the end user does not have to perform another high-voltage test on the power supply as an individual component. According to EN 60204-1 (Safety of machinery - Electrical equipment of machines) the power supply can be disconnected during the high-voltage test and only installed once the high-voltage test has been completed.

### 6.3.1 Performing high-voltage testing

If high-voltage testing of the control cabinet or the power supply as a stand-alone component is planned during final inspection and testing, the following features must be observed.

- The power supply wiring must be implemented as shown in the wiring diagram.
- The maximum permissible test voltages must not be exceeded.

Avoid unnecessary loading or damage to the power supply due to excessive test voltages.


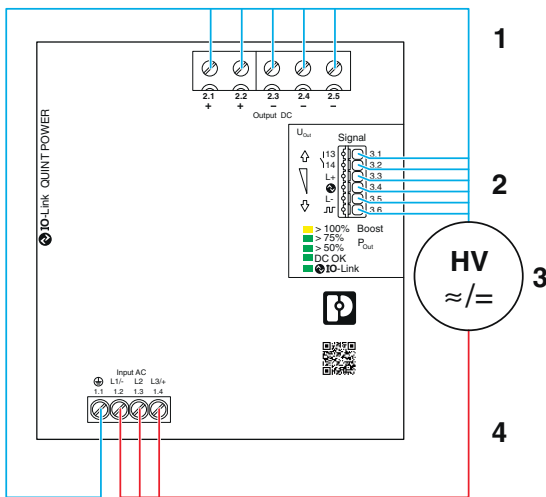
 For the relevant applicable test voltages and insulation distances, refer to the corresponding table (see technical data: electric strength of the insulation section).

Figure 1 Potential-related wiring for the high-voltage test



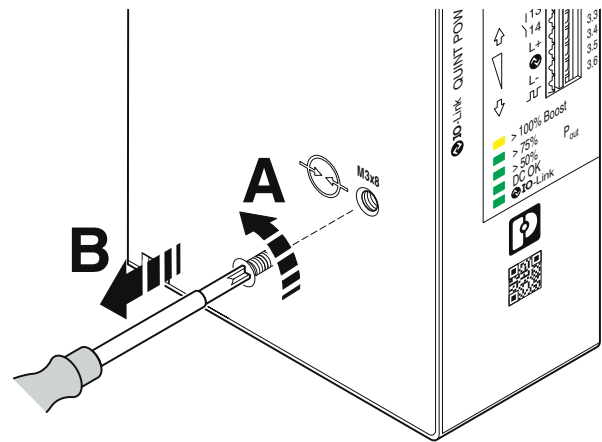
#### Key

No.	Designation	Color coding	Potential levels
1	DC output circuit	Blue	Potential 1
2	Signal contacts	Blue	Potential 1
3	High-voltage tester	--	--
4	AC input circuit	Red	Potential 2

### 6.3.2 Disconnecting the gas discharge tube

The built-in gas discharge tube inside the device ensures that the power supply is effectively protected against asymmetrical disturbance variables (e.g., EN 61000-4-5). Each surge voltage test represents a very high load for the power supply. Therefore avoid unnecessary loading or damage to the power supply due to excessive test voltages. If necessary, the gas discharge tube inside the device can be disconnected in order to use higher test voltages. Following successful completion of testing, please reconnect the gas-discharge tube.

Figure 2 Disconnect gas discharge tube



To disconnect the gas discharge tube, proceed as follows:

1. Remove power from the unit.
2. Unscrew the Phillips head screw completely and keep the gas discharge tube screw in a safe place. The gas-discharge tube is now disconnected and is no longer functional.
3. Perform the surge voltage test on the power supply.
4. Following successful high-voltage testing, screw the gas discharge tube screw fully back into the power supply.



**DANGER: Risk of electric shock or damage to the power supply due to using the wrong gas discharge tube screw**

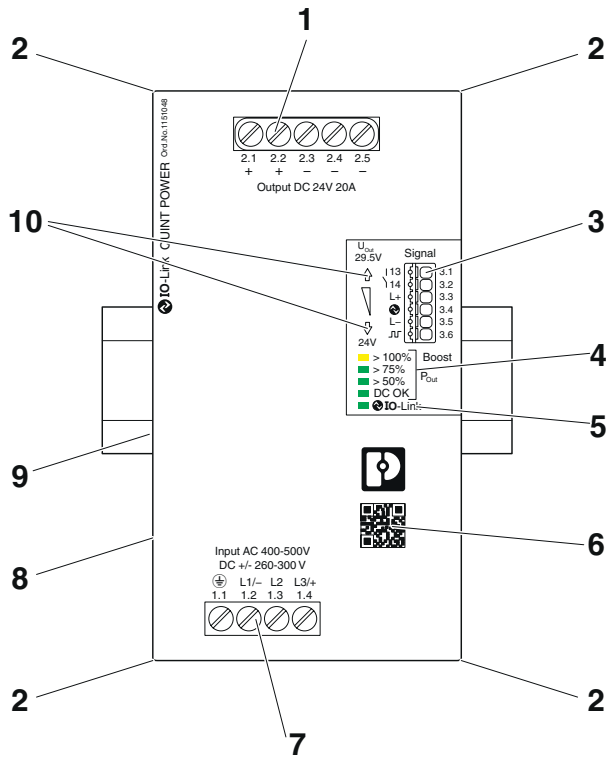
To connect the gas-filled surge arrester, only use the gas-filled surge arrester screw that was originally installed in the power supply.

## 7 Structure of the power supply

The fanless convection-cooled power supply can be snapped onto all DIN rails according to EN 60715.

### 7.1 Function elements

Figure 3 Operating and indication elements



#### Key

No.	Designation
1	DC output voltage connection terminal blocks
2	Accommodation for cable binders
3	Signaling connection terminal blocks
4	Status and diagnostics indicators
5	Status indicator IO-Link communication; LED (green)
6	QR code web link
7	AC input voltage connection terminal blocks
8	Gas discharge tube for surge protection (left side of housing)
9	Universal DIN rail adapter (rear of housing)
10	Output voltage button ↓(-) / ↑(+)

### 7.2 Device dimensions

Figure 4 Device dimensions (dimensions in mm)

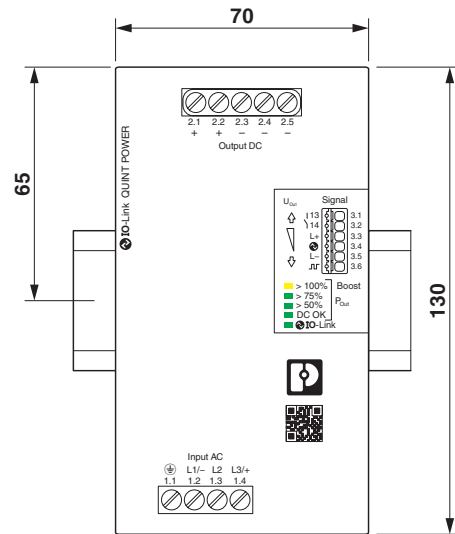
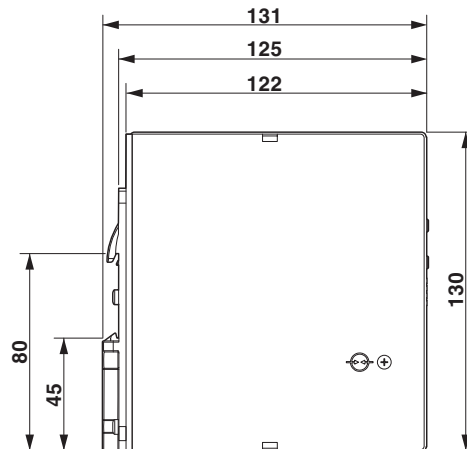


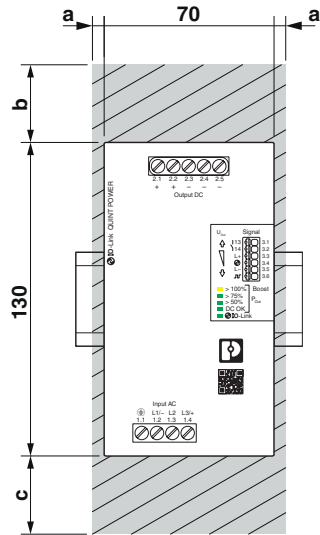
Figure 5 Device dimensions (dimensions in mm)



7.3 Keep-out areas

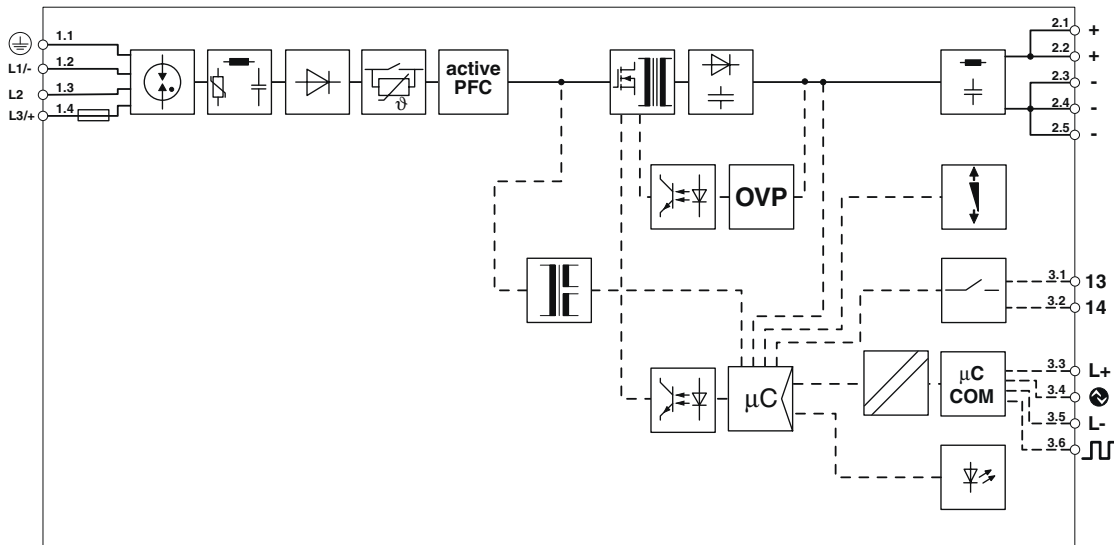
Nominal output capacity	Spacing [mm]		
	a	b	c
< 50 %	0	40	20
≥ 50 %	5	50	50

Figure 6 Device dimensions and minimum keep-out areas (in mm)



7.4 Block diagram

Figure 7 Block diagram



Key

Symbol	Designation
	Surge protection (gas discharge tube)
	Surge protection (varistor) with filter
	Bridge rectifier
	Inrush current limitation
	Power factor correction (PFC)
	Switching transistor and main transmitter (electrically isolating)
	Secondary rectification and smoothing
	Filter

Symbol	Designation
	Auxiliary converter (electrically isolating)
	Optocoupler (electrically isolating)
	Additional regulatory protection against surge voltage
	Microcontroller
	Output voltage button ↓(-) / ↑(+)
	Relay contact
	Electrical isolation
	Communication controller
	Signal/display LEDs (P <sub>Out</sub> , DC OK)

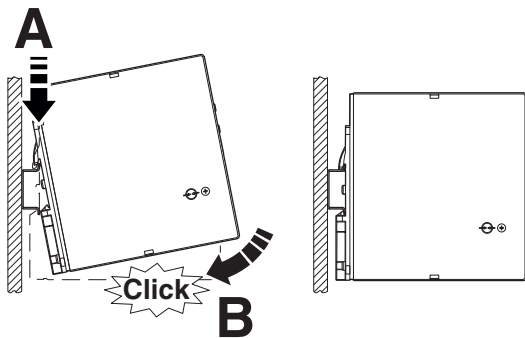
## 8 Mounting/removing the power supply

### 8.1 Mounting the power supply unit

Proceed as follows to mount the power supply:

1. In the normal mounting position the power supply is mounted on the DIN rail from above. Make sure that the universal DIN rail adapter is in the correct position behind the DIN rail (A).
2. Then press the power supply down until the universal DIN rail adapter audibly latches into place (B).
3. Check that the power supply is securely attached to the DIN rail.

Figure 8 Snapping the power supply onto the DIN rail



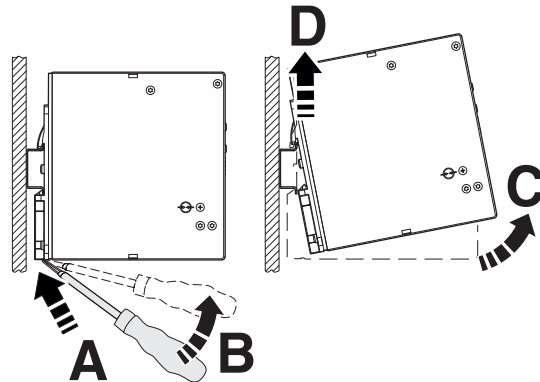
### 8.2 Removing the power supply unit

Proceed as follows to remove the power supply:

1. Take a suitable screwdriver and insert this into the lock hole on the universal DIN rail adapter (A).
2. Release the lock by lifting the screwdriver (B).
3. Carefully swivel the power supply forward (C) so that the lock slides back into the starting position.

4. Then separate the power supply from the DIN rail (D).

Figure 9 Removing the power supply from the DIN rail



### 8.3 Retrofitting the universal DIN rail adapter

For installation in horizontal terminal boxes it is possible to mount the power supply at a 90° angle to the DIN rail.

No additional mounting material is required.



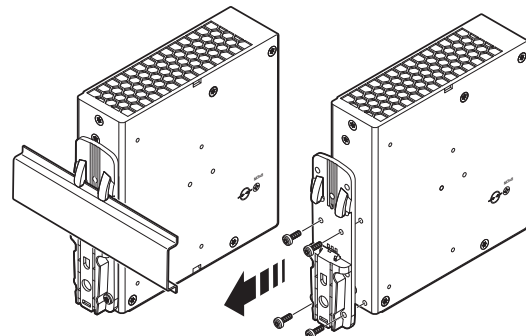
Use the Torx screws provided to attach the universal DIN rail adapter to the side of the power supply.

#### 8.3.1 Disassembling the universal DIN rail adapter

Proceed as follows to disassemble the universal DIN rail adapter that comes pre-mounted:

1. Remove the screws for the universal DIN rail adapter using a suitable screwdriver (Torx 10).
2. Separate the universal DIN rail adapter from the rear of the power supply.

Figure 10 Disassembling the universal DIN rail adapter



### 8.3.2 Mounting the universal DIN rail adapter

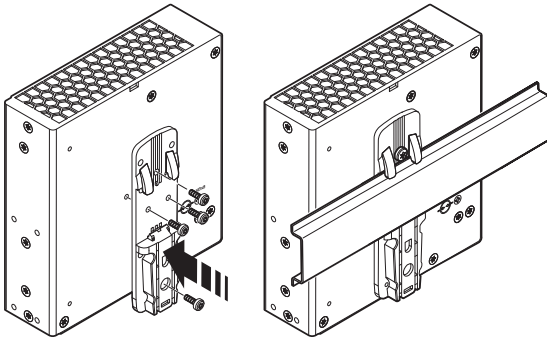
To mount the universal DIN rail adapter on the left side of the device, proceed as follows:

1. Position the universal DIN rail adapter on the left side of the housing so that the mounting holes are congruent with the hole pattern for the mounting holes.
2. Insert the Torx screws that were removed earlier into the appropriate hole pattern on the universal DIN rail adapter so that the necessary drill holes on the power supply can be accessed.
3. Screw the universal DIN rail adapter onto the power supply.



The maximum tightening torque of the Torx screw (Torx® T10) is 0.7 Nm.

Figure 11 Mounting the universal DIN rail adapter



### 8.4 Retrofitting the universal wall adapter

The UWA 182/52 universal wall adapter (Item No. 2938235) or UWA 130 universal wall adapter (Item No. 2901664) is used to attach the power supply directly to the mounting surface.

The use of universal wall adapters is recommended under extreme ambient conditions, e.g., strong vibrations. Thanks to the tight screw connection between the power supply and the universal wall adapter or the actual mounting surface, an extremely high level of mechanical stability is ensured.



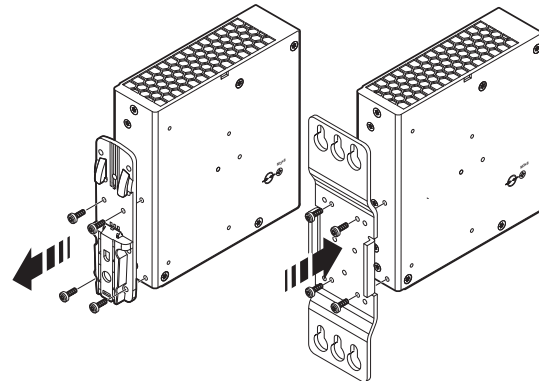
The power supply is attached to the UWA 182 or UWA 130 universal wall adapter by means of the Torx screws of the universal DIN rail adapter.

### 8.4.1 Mounting the UWA 182/52 universal wall adapter

Proceed as follows to disassemble the universal DIN rail adapter that comes pre-mounted:

1. Remove the screws for the universal DIN rail adapter using a suitable screwdriver (Torx 10).
2. Separate the universal DIN rail adapter from the rear of the power supply.
3. Position the universal wall adapter in such a way that the keyholes or oval tapers face up. The mounting surface for the power supply is the raised section of the universal wall adapter.
4. Place the power supply on the universal wall adapter in the normal mounting position (input voltage connection terminal blocks below).
5. Insert the Torx screws into the appropriate hole pattern on the universal wall adapter so that the necessary mounting holes on the power supply can be accessed.
6. Screw the universal wall adapter onto the power supply.

Figure 12 Mounting the UWA 182/52 universal wall adapter



The maximum tightening torque of the Torx screw (Torx® T10) is 0.7 Nm.



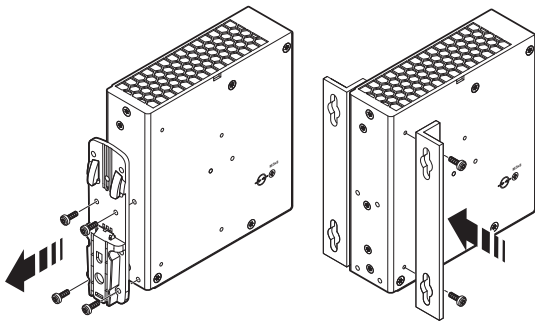
Make sure you use suitable mounting material when attaching to the mounting surface.

### 8.4.2 Mounting the UWA 130 2-piece universal wall adapter

Proceed as follows to disassemble the universal DIN rail adapter that comes pre-mounted:

1. Remove the screws for the universal DIN rail adapter using a suitable screwdriver (Torx 10).
2. Separate the universal DIN rail adapter from the rear of the power supply.
3. Position the universal wall adapter. The mounting surface for the power supply is the raised section of the universal wall adapter.
4. Place the power supply on the universal wall adapter in the normal mounting position (input voltage connection terminal blocks below).
5. Insert the Torx screws into the appropriate hole pattern on the universal wall adapter so that the necessary mounting holes in the side flanges of the power supply can be accessed.
6. Screw the two-piece universal wall adapter onto the power supply.

Figure 13 Mounting the UWA 130 universal wall adapter



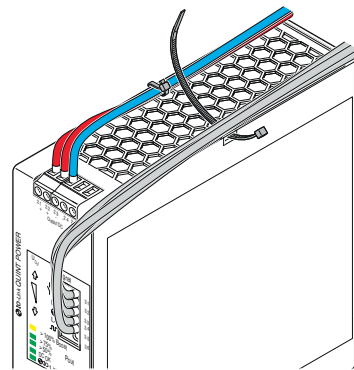
### 8.5 Fix connection wiring to the power supply

Two receptacles for the bundled attachment of the connection wiring are integrated in the left and right housing panel. Use cable binders to secure the connection wiring (optional WT-HF 3,6X140 - Item No. 3240744).

Proceed as follows to secure the connection wiring:

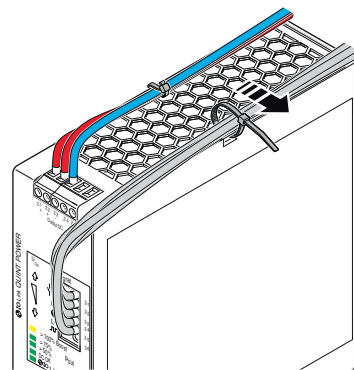
- Wire the power supply with sufficient connection reserve (input terminal blocks, output terminal blocks, signal terminal blocks)
- Bundle and set up the connection wiring so that the cooling grilles on the top and bottom of the housing are covered as little as possible.
- Thread the cable binders into the necessary receptacles for the cable binders.

Figure 14 Lay and align connection wiring



- Secure the connection wiring with the cable binders. Make sure that the connection wiring is attached safely and securely without damaging the connection wiring.

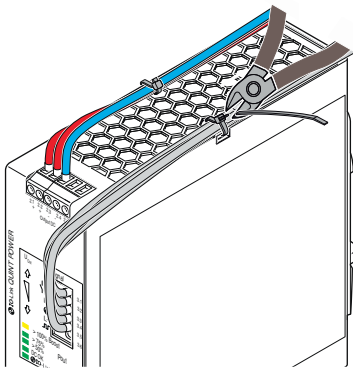
Figure 15 Secure connection wiring with cable binder





- Shorten the excess length of the cable ties.
- Then check again that the connection wiring is properly secured.

Figure 16 Shorten protruding ends of the cable binder



**NOTE:** Mechanical damage to the connection wiring caused by friction

In extreme ambient conditions, e.g., strong vibrations, protect the connection wiring against mechanical damage using additional insulation material. The additional insulation material for protecting the connection wiring is limited to the area where the cable binders are attached.

## 9 Device connection terminal blocks

The AC input and DC output terminal blocks on the front of the power supply feature screw connection technology. The signal level is wired without tools by means of Push-in connection technology.



For the necessary connection parameters for the connection terminal blocks, refer to the technical data section.

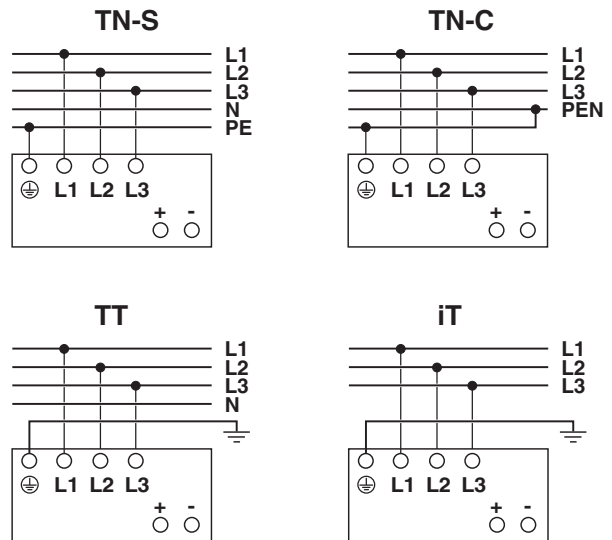
### 9.1 Input

The power supply is operated in a three-phase AC power grid (star network). The power supply is connected on the primary side via the INPUT L1/L2/L3/⊕ connection terminal blocks.



The power supply is approved for connection to TN, TT, and IT power grids (star networks) with a maximum phase-to-phase voltage of 500 V AC.

Figure 17 Network configurations in star network



### 9.2 Protection of the primary side

Installation of the device must correspond to EN 61010 regulations. It must be possible to switch off the device using a suitable disconnecting device outside the power supply. The line protection on the primary side is suitable for this (see technical data section).

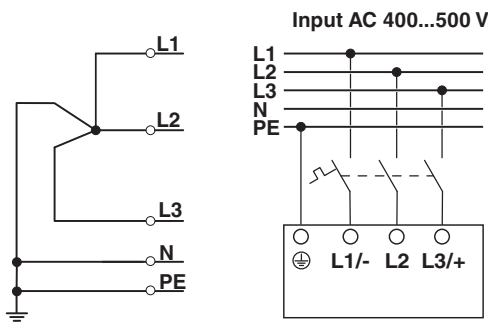


**DANGER: Hazardous voltage**

An all-pos. fuse must be present for operation on three-phase and DC systems.

#### Protection for AC supply

Figure 18 Pin assignment for AC supply voltage

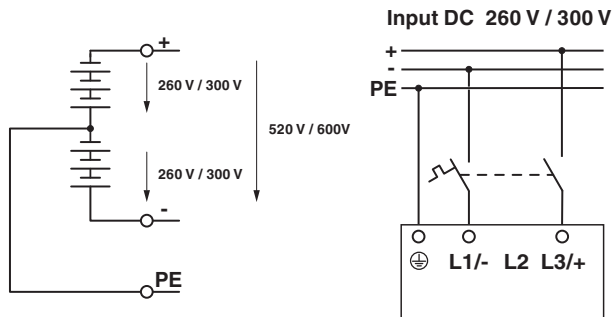


#### Protection for DC supply



If the power supply is operated with a DC voltage, the star point of the DC supply system used for supply must be grounded.

Figure 19 Pin assignment for DC supply voltage



DC applications require upstream installation of a fuse that is permitted for the operating voltage.

### 9.3 Output

By default, the power supply is pre-set to a nominal output voltage of 24 V DC.

The output voltage is adjusted via the two arrow keys ↓(-) and ↑(+) on the front of the power supply.

When you press the arrow key once briefly, the output voltage is reduced ↓(-) or increased ↑(+) by 3 mV. When you press the arrow key for longer, the voltage is adjusted in 100 mV increments.

### 9.4 Protection of the secondary side

The power supply is electronically short-circuit-proof and no-load-proof. In the event of an error, the output voltage is limited






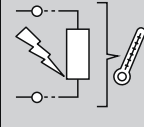



If sufficiently long connecting cables are used, fuse protection does not have to be provided for each individual load.

If each load is protected separately with its own protective device, the selective shutdown in the event of a fault enables the system to remain operational.

## 10 Output characteristic curves

This section describes the various output characteristic curves together with their areas of application for customization to your specific application. The U/I Advanced characteristic curve is set by default.

							
<b>Application</b>	Normal load	System expansion	Loads with high inrush current	Energy storage charging	Selective tripping of fuses	Keeping temperatures low when faults occur	Short circuit, non-fused
<b>Your benefits</b>	Reliable power supply	Stable 24 V, even in the event of sustained overload	No over-dimensioned power supply unit required	Fast charging	Parallel loads continue working	Low thermal stress when faults occur	Enables configuration without fuse

### Characteristics

<b>U/I Advanced</b>	✓	✓	✓	✓	✓	✓	—
<b>Smart HICCUP</b>	✓	✓	✓	✓	—	✓	—
<b>FUSE MODE</b>	✓	✓	—	—	—	✓	✓
<b>Secure shut-off</b>	✓	✓	✓	—	✓	✓	—

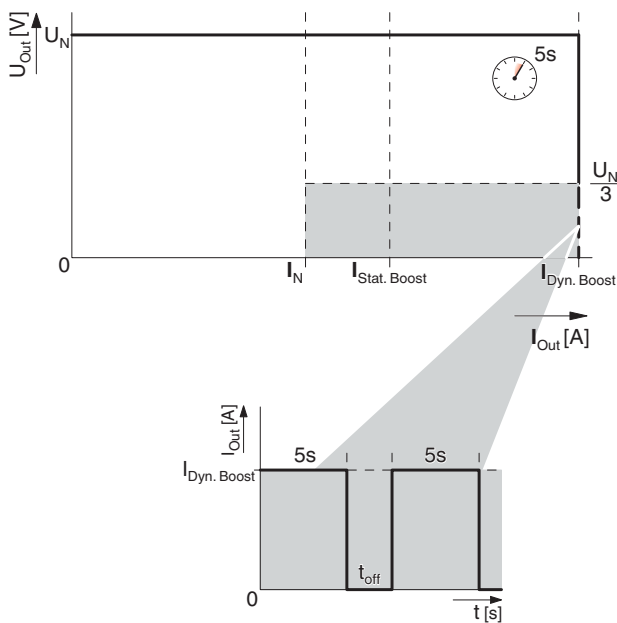
Icon	Designation
✓	Suitable for the application
—	Not suitable for the application

### 10.1 U/I Advanced output characteristic curve

The preset U/I Advanced output characteristic curve is optimized for the following applications:

- For selective tripping of standard circuit breakers (SFB technology). The power supply supplies up to 6 times the nominal current for 15 ms. Loads connected in parallel continue working.
- When supplying loads with high switch-on currents, such as motors. The dynamic boost of the power supply supplies up to 200% of the nominal power for 5 s. This ensures that sufficient reserve energy is available; overdimensioning of the power supply is not necessary.
- For system extension. With the static boost, up to 125% of the nominal output power is available for a sustained period (up to 40°C).
- For fast energy storage charging (e.g., of batteries) to supply a wide range of loads. The power supply operates in the nominal operating range. Energy supply to the load is ensured.

Figure 20 U/I Advanced output characteristic curve



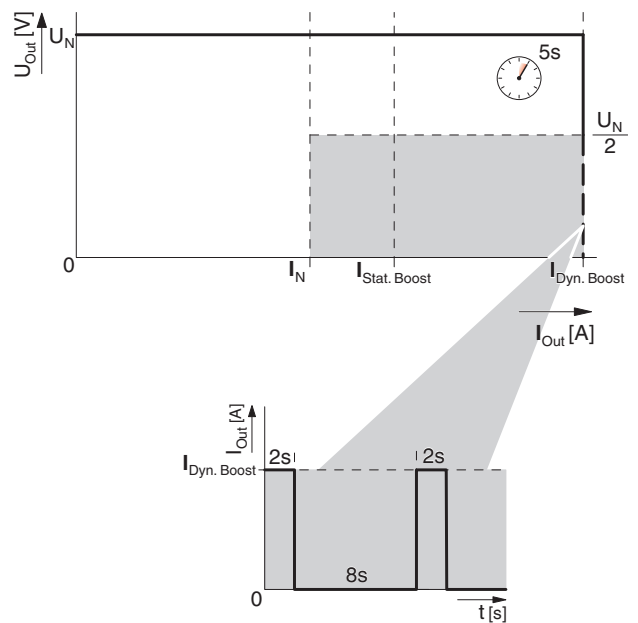
### 10.2 Smart HICCUP output characteristic curve

The SMART HICCUP output characteristic curve keeps the thermal load of the connecting cables at a low level in the event of a sustained overload. If loads are not protected or are protected in a way that is not permitted, the loads are supplied for 2 s. The DC output of the power supply is then switched off for 8 s. This procedure is repeated until the cause of the overload has been remedied.

The Smart HICCUP output characteristic curve is optimized for the following applications:

- If only a low short-circuit current is permitted.
- If following an overload or short circuit the output voltage should be made available again automatically.

Figure 21 Smart HICCUP output characteristic curve

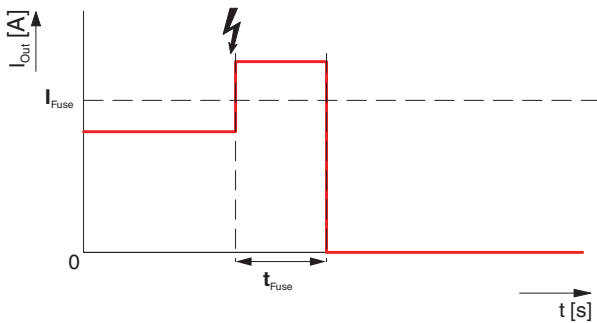


### 10.3 FUSE MODE output characteristic curve

In the event of an overload (e.g., short circuit), the power supply switches off the DC output permanently. The value of the switch-off threshold and the time period for which it may be exceeded can be freely selected. The power supply can be restarted via IO-Link, system communication, or by switching the supply voltage on the primary side off and on. Selecting the FUSE MODE output characteristic curve sets the following default values.

- $t_{Fuse} = 100 \text{ ms}$
- $I_{Fuse} = I_N$

Figure 22 FUSE MODE output characteristic curve



### 10.4 Secure shut-off output characteristic curve

In the event of a sustained overload, the power supply switches off the DC output based on the voltage to ensure safe operation.

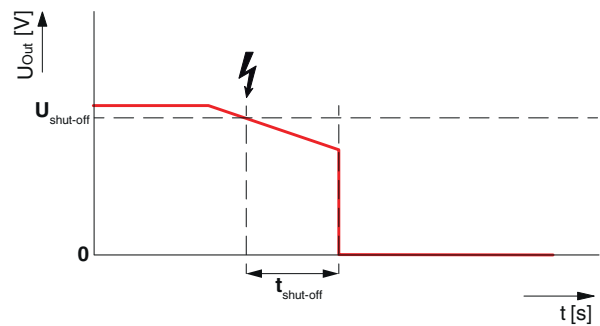
SFB Technology and the dynamic boost are available to trigger the protection on the secondary side. If the output voltage still dips due to a sustained overload, the power supply switches off the DC output permanently when the voltage drops below a parameterizable threshold. The value of the switch-off threshold and the time period for which it may be exceeded can be set.

The power supply can be restarted via IO-Link, system communication, or by switching the supply voltage on the primary side on and off.

Selecting the “Secure shut-off” output characteristic curve sets the following default values.

- $t_{shut-off} = 100 \text{ ms}$
- $U_{shut-off} = 75\% U_N$

Figure 23 Secure shut-off output characteristic curve



## 11 IO-Link

The power supply is equipped with an electrically isolated IO-Link interface via the signal terminal on the front of the device. This is used to integrate data from the power supply unit into industrial networks.

In the power supply's delivery state, all configurable parameters are in their default setting.

Data is exchanged between the power supply and IO-Link master.

The data from the power supply can be used for the following applications, among others:

- Device identification
- Condition monitoring
- Energy monitoring
- Diagnostics
- Configuration

The device supports the data storage function of the IO-Link standard. The configuration data is stored in an external EEPROM. This means that it is still available if the IO-Link master is no longer connected or communication errors occur.

### Connection of IO-Link communication

IO-Link communication takes place via a three-position connection.


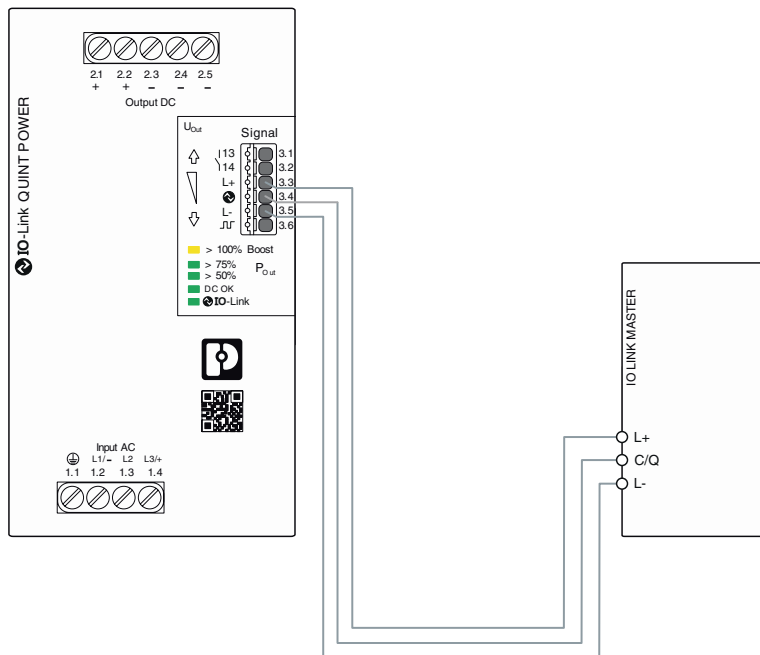
Connection		Function
3.3	L+	Positive supply voltage of IO-Link communication
3.4		Data channel
3.5	L-	0 V power supply of IO-Link communication

Figure 24 QUINT4-PS and IO-Link master




## 12 System communication

System communication combines the data from the power supply with the data from the CAPAROC circuit breaker system or the QUINT UPS uninterruptible power supply. The data can thus be bundled together and transferred to a higher-level controller via one interface.

### 12.1 Connection of system communication

System communication takes place via a two-position connection. An additional 24 V supply voltage (e.g., from the battery) can be connected to L+ as an option. This means that system communication is also available without primary-side input voltage.

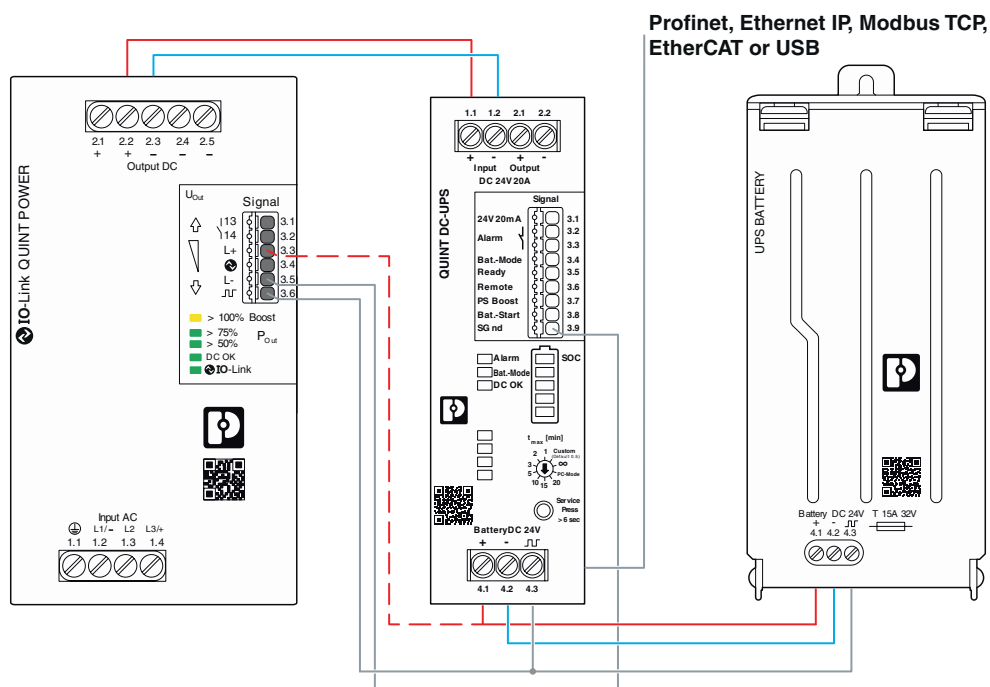
Connection		Function
3.5	L-	Reference potential for system communication
3.6		Data channel

### 12.2 System configuration with QUINT UPS

The data from the power supply is forwarded to the QUINT UPS uninterruptible power supply via the system interface and integrated into the network protocol. Communication is bidirectional. Data can be read and parameterized.

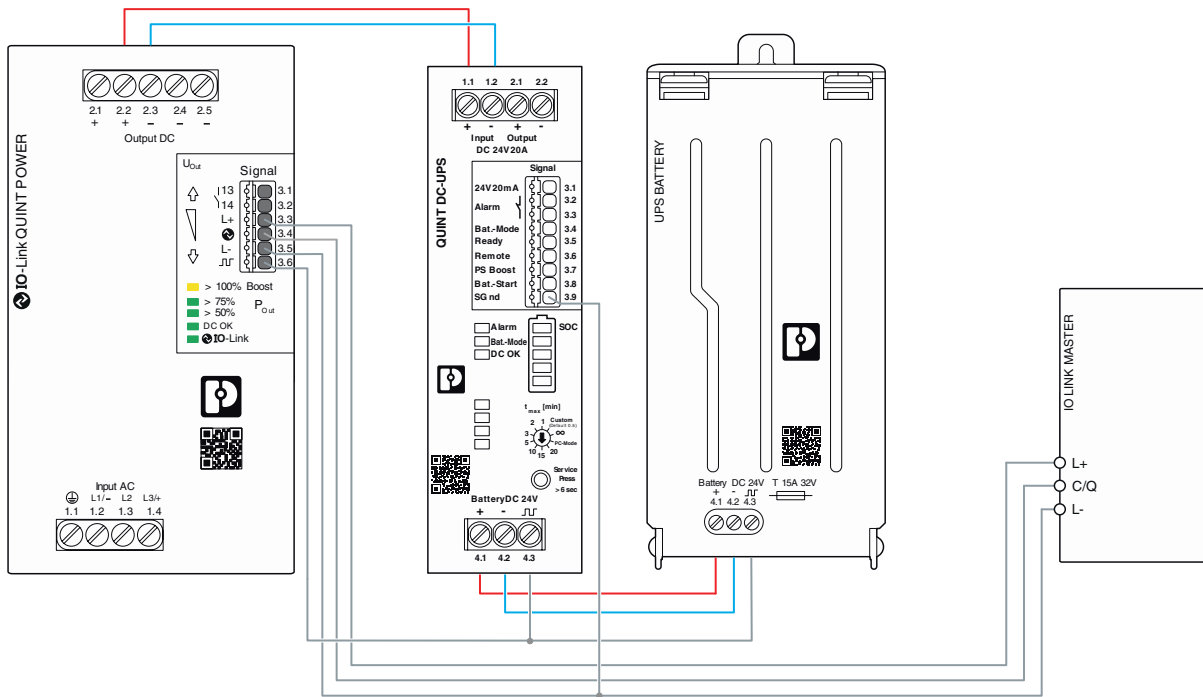
The data register is described in the data sheet for the QUINT UPS (Item No. 107558 DB EN QUINT4-UPS/24DC/24DC/40 (USB, PN, EIP, EC))

Figure 25 QUINT4 PS and QUINT4 UPS



In addition, the power supply receives relevant data from the QUINT UPS via system communication and can output this via IO-Link. The data register is described in Section 18 (Attachment - register tables).

Figure 26 QUINT4 PS, QUINT4 UPS, and IO-Link master



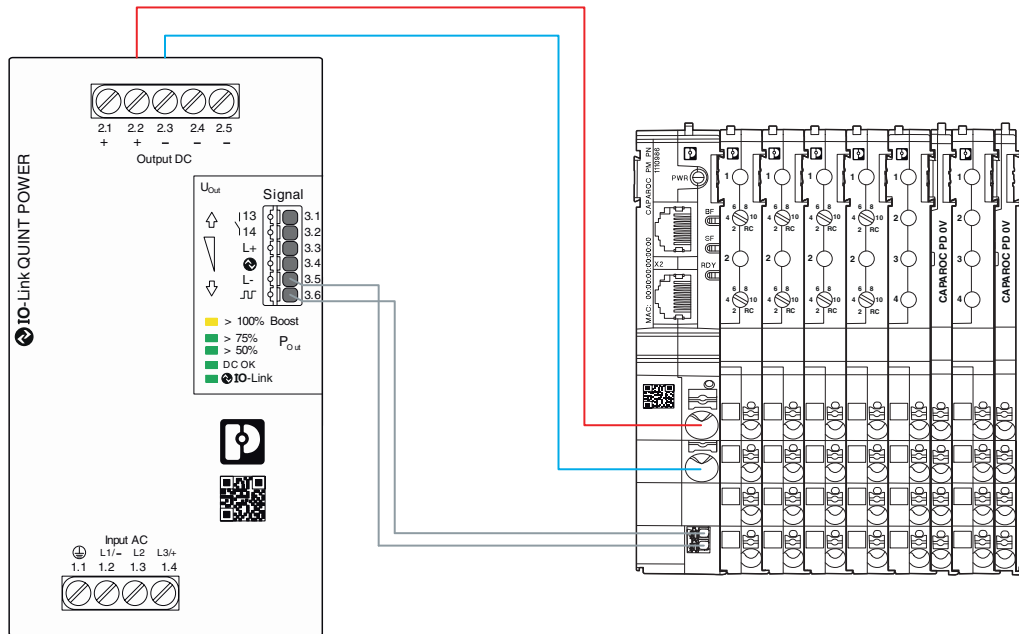


### 12.3 System configuration with CAPAROC

The data from the power supply is forwarded to the CAPAROC circuit breaker system via the system interface and integrated into the network protocol. Communication is bidirectional. Data can be read and parameterized.

The data register is described in the "CAPAROC: System and installation" user manual (Item No. 109745).

Figure 27 QUINT4 PS and CAPAROC



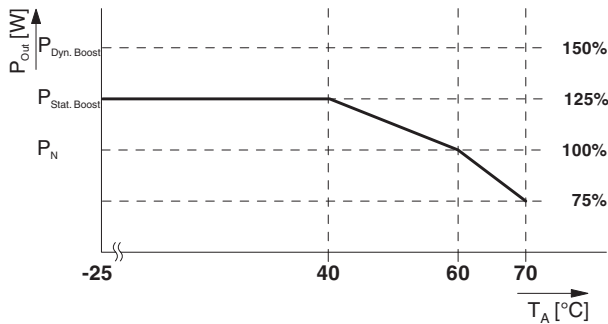
### 13 Boost currents

The power supply provides the static boost ( $I_{Stat. Boost}$ ) for a sustained load supply or the time-limited dynamic boost ( $I_{Dyn. Boost}$ ).

#### 13.1 Static Boost

For system expansion purposes, the sustained static boost ( $I_{Stat. Boost}$ ) supports the load supply with up to 125 % of the nominal current of the power supply. The static boost is available at an ambient temperature of up to 40 °C.

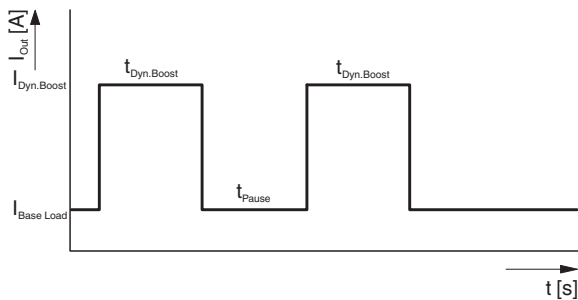
Figure 28 Performance characteristic in static boost



#### 13.2 Dynamic Boost

Dynamic boost ( $I_{Dyn. Boost}$ ) delivers up to 150 % of the power supply nominal current to supply high loads. This temporary power supply to the load lasts a maximum of 5 s at an ambient temperature of up to 60 °C. The energy supplied adaptively for the load supply and the recovery time ( $t_{Pause}$ ) are calculated based on the specific load situation using algorithms (see recovery time tables).

Figure 29 Basic curve of the dynamic boost process



Use the following tables to determine the required recovery time ( $t_{Pause}$ ) at the maximum dynamic boost current ( $I_{Dyn. Boost}$ ) based on the following values:

- $I_{Base Load}$
- Duration of the boost current ( $t_{Dyn. Boost}$ )
- Ambient temperature (40 °C or 60 °C)



If a current that is lower than the maximum available dynamic boost current ( $I_{Dyn. Boost}$ ) is required for the same period, the recovery time may ( $t_{Pause}$ ) decrease.

#### 13.2.1 Recovery times at an ambient temperature of 40 °C

Figure 30 Required recovery times at  $\leq 40^\circ\text{C}$

$I_{Base Load}$ [A]	$I_{Dyn. Boost}$ [A]	$t_{Dyn. Boost}$ [s]					$t_{Pause}$ [s]
		1	2	3	4	5	
0	30	0,5	1	1,5	1,8	2	
5	30	0,5	1	1,8	2	2,3	
10	30	0,6	1,2	2	2,2	2,7	
15	30	0,8	1,6	2,4	2,8	3,2	
20	30	1,3	2,6	3,2	3,8	4,7	
25	30	6	11	13	16	19	

#### 13.2.2 Recovery times at an ambient temperature of 60 °C

Figure 31 Required recovery times at  $\leq 60^\circ\text{C}$

$I_{Base Load}$ [A]	$I_{Dyn. Boost}$ [A]	$t_{Dyn. Boost}$ [s]					$t_{Pause}$ [s]
		1	2	3	4	5	
0	30	0,8	1,5	2,3	3	3,8	
5	30	1	2	2,9	3,9	4,9	
10	30	1,3	2,5	3,8	5	7	
15	30	1,8	3,6	6	8	9	
20	30	4,4	9	14	18	22	

**13.2.3 Example: Determining the recovery time (t<sub>Pause</sub>)**

At an output current (I<sub>Base Load</sub>) of 10 A, the dynamic output current (I<sub>Dyn. Boost</sub>) of 30 A increases for 2 s (t<sub>Dyn. Boost</sub>). After a recovery time (t<sub>Pause</sub>) of 1.2 s, the dynamic boost is available once again.

Figure 32 Example recovery time for ≤ 40°C

I <sub>Base Load</sub> [A]	I <sub>Dyn. Boost</sub> [A]	t <sub>Dyn. Boost</sub> [s]					t <sub>Pause</sub> [s]
		1	2	3	4	5	
0	30	0,5	1	1,5	1,8	2	
5	30	0,5	1	1,8	2	2,3	
10	30	0,6	1,2	2	2,2	2,7	
15	30	0,8	1,6	2,4	2,8	3,2	
20	30	1,3	2,6	3,2	3,8	4,7	
25	30	6	11	13	16	19	

## 14 SFB Technology

SFB Technology (selective fuse breaking) can be used to quickly and reliably trip miniature circuit breakers and fuses connected on the secondary side. In the event of a short circuit on the secondary side, the power supply supplies up to 6 times the nominal current for 15 ms. The faulty current path is switched off selectively.

Loads that are connected in parallel are still supplied with energy. Operation of these system parts is ensured. In order to always enable the reliable tripping of circuit breakers and fuses, certain framework conditions must be observed (see SFB configuration section).

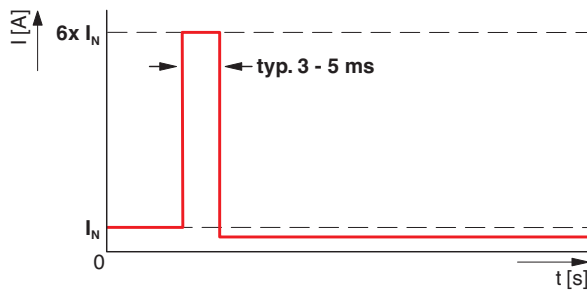


The U/I Advanced output characteristic curve supports SFB Technology.

### 14.1 Tripping circuit breakers

The circuit breaker is tripped by the high SFB current of the power supply, typically within 3 to 5 ms. As a result, voltage dips at loads that are connected in parallel are avoided.

Figure 33 SFB pulse trips circuit breakers



### 14.2 Tripping a fuse

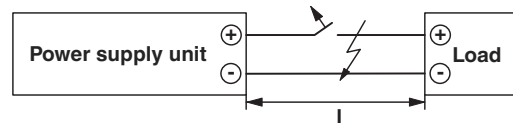
Fuses are tripped by melting the predetermined breaking point inside the fuse capsule. The tripping characteristic of the fuse is described by the melting integral ( $I^2t$ ). A high current is crucial in order to achieve a very short tripping time.

### 14.3 SFB configuration

Observe the following framework conditions for determining the maximum distance between the power supply and load:

- The performance class of the power supply
- The cross section of the connecting cable
- The tripping characteristic of the fuse component

Figure 34 Schematic diagram of the maximum cable length



**14.4 Maximum distance between the power supply and load**

The distances given in the table are worst-case values and therefore cover the entire tolerance range for the magnetic tripping of circuit breakers. The possible distances are often greater in practice.

**14.4.1 Thermomagnetic device circuit breaker, type: Phoenix Contact CB TM1 SFB**

Maximum distance l [m] with device circuit breaker		Conductor cross section						
		A [mm <sup>2</sup> ]	0.75	1.0	1.5	2.5	4.0	6.0
		AWG	18	(17)	16	14	12	10
Phoenix Contact	CB TM1 1A SFB P		27	36	54	91	< 130	< 200
	CB TM1 2A SFB P		18	25	37	63	< 100	< 140
	CB TM1 3A SFB P		13	18	27	46	73	< 100
	CB TM1 4A SFB P		10	14	21	35	57	86
	CB TM1 5A SFB P		8	11	17	29	46	70
	CB TM1 6A SFB P		6	8	12	20	32	48
	CB TM1 8A SFB P		--	5	7	12	20	30
	CB TM1 10A SFB P		--	3	4	8	13	19

The cable lengths determined are based on the following parameters:

- Tripping: magnetic
- DC correction factor (0 Hz): Phoenix Contact = 1,0
- Characteristics: C  
Characteristic C (10 times the rated current) x correction factor
- Ambient temperature: +20 °C
- Internal resistance R<sub>i</sub> of the device circuit breaker: taken into consideration
- Comments: In addition to the short-circuit current, the power supply unit also supplies half the nominal current for load paths connected in parallel.

14.4.2 Thermomagnetic circuit breaker, type: Siemens 5SY, ABB S200

Maximum distance l [m] with circuit breaker		Conductor cross section						
		A [mm <sup>2</sup> ]	0.75	1.0	1.5	2.5	4.0	6.0
		AWG	18	(17)	16	14	12	10
Siemens 5SY	A1		78	105	157	263	420	631
	A1.6		58	77	116	194	311	467
	A2		49	65	98	164	262	394
	A3		35	47	71	118	190	285
	A4		27	36	54	90	144	217
	A6		18	25	37	62	100	150
	A8		14	19	28	48	76	115
	A10		11	15	23	38	61	92
	A13		8	11	16	27	44	66
	A16		5	7	11	18	30	45
	B2		28	37	56	93	149	224
	B4		16	21	32	53	85	128
	B6		10	14	21	36	57	86
	B10		5	6	10	17	27	41
	B13		3	4	6	10	16	24
	C1		10	14	21	35	56	84
	C1.6		12	17	25	42	68	102
	C2		11	15	23	39	62	94
	C3		9	12	18	30	48	72
	C4		6	8	12	21	34	51
C6		2	3	5	9	15	23	
ABB S200	Z1		64	85	128	214	343	514
	Z1.6		46	62	93	156	250	375
	Z2		42	57	85	143	229	343
	Z3		33	44	66	110	176	264
	Z4		24	33	49	82	132	198
	Z6		16	21	32	54	87	131
	Z8		12	17	25	42	68	102
	Z10		10	14	21	36	57	86
	Z16		4	6	9	16	26	39
	B6		10	13	20	33	53	80
	B8		6	9	13	22	36	55
	B10		4	5	8	14	23	35
	B13		2	3	5	8	13	20
	C1		3	4	6	11	17	26
	C1.6		7	10	15	25	41	62
	C2		7	9	14	23	38	57
	C3		8	10	16	26	42	64
	C4		4	6	9	16	26	39
	C6		2	2	4	7	11	17

The cable lengths determined are based on the following parameters:

Tripping:	magnetic
DC correction factor (0 Hz):	Siemens = 1.4; ABB = 1.5
Characteristics:	A, B, C, Z Characteristic A (3 times the rated current) x correction factor Characteristic B (5 times the rated current) x correction factor Characteristic C (10 times the rated current) x correction factor Characteristic Z (3 times the rated current) x correction factor
Ambient temperature:	+20 °C
Internal resistance $R_i$ of the device circuit breaker:	taken into consideration
Comments:	In addition to the short-circuit current, the power supply unit also supplies half the nominal current for load paths connected in parallel.

14.4.3 Fuse, type: Cooper Bussmann GMA xA, GMC xA

Maximum distance l [m] with fuse		Melting integral I <sup>2</sup> t [A <sup>2</sup> s]	Conductor cross section						
			A [mm <sup>2</sup> ]	0.75	1.0	1.5	2.5	4.0	6.0
			AWG	18	(17)	16	14	12	10
Cooper Bussmann	GMA 1A	0.48		48	64	97	162	259	389
	GMA 1.25A	0.84		36	49	73	122	196	294
	GMA 1.5A	1.6		26	35	53	88	142	212
	GMA 1.6A	2		23	31	47	79	127	190
	GMA 2A	3.1		19	25	38	63	101	152
	GMA 2,5A	4.9		15	20	30	51	81	122
	GMA 3A	8.8		11	15	22	37	60	90
	GMA 3,15A	9.7		10	14	21	36	57	86
	GMA 3,5A	13		9	12	18	31	49	74
	GMA 4A	19		6	8	12	21	34	51
	GMA 5A	29		4	5	8	14	22	34
	GMC 1A	1.8		23	31	47	78	125	188
	GMC 1,25A	3.4		17	23	34	58	93	140
	GMC 1,5A	5.4		13	18	27	46	74	111
	GMC 1,6A	5.8		13	18	27	45	72	108
	GMC 2A	8.9		11	14	22	37	59	89
	GMC 2.5A	13		9	12	18	30	49	73
	GMC 2.5A	19		6	8	12	21	34	51
	GMC 3,15A	23		5	7	10	17	28	42
	GMC 3,5A	25		4	6	9	16	26	39
GMC 4A	36		3	4	6	11	18	27	

The cable lengths determined are based on the following parameters:

- Tripping: thermal
- Characteristics: Cooper Bussmann GMA (fast-blow - fast acting)  
Cooper Bussmann GMC (medium-blow - medium time delay)
- Ambient temperature: +20 °C
- Internal resistance R<sub>i</sub> of the fuse: taken into consideration
- Comments: In addition to the short-circuit current, the power supply unit also supplies half the nominal current for load paths connected in parallel.



## 15 Signaling

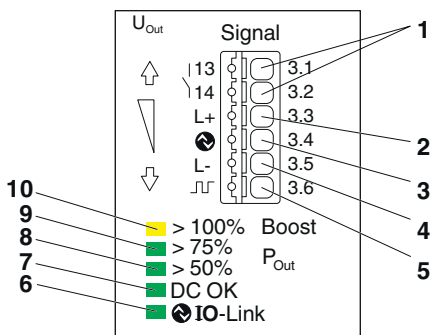
A floating signal contact is available for preventive function monitoring of the power supply.

The current device status of the power supply is signaled using five LED status indicators. The function of each LED status indicator is assigned to a fixed event.

The signal outputs are configured via the communication interfaces.

### 15.1 Location and function of the signaling elements

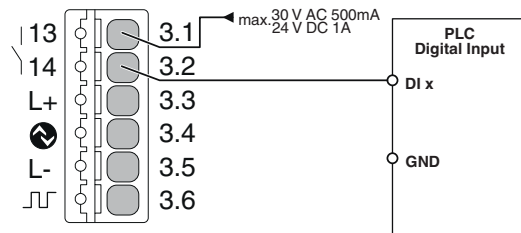
Figure 35 Position of signaling elements



### 15.1.1 Floating signal contact

In the default configuration, the floating switch contact opens to indicate that the set output voltage has been undershot by more than 10 % ( $U_{Out} < 0.9 \times U_N$ ). Signals and ohmic loads can be switched. For heavily inductive loads (e. g. a relay), a suitable protective circuit (e. g. a freewheeling diode) is necessary.

Figure 36 Signaling










### Key

No.	Signaling elements
1	13/14 floating switch contact (N/O contact)
2	L+: 24 V for IO-Link
3	⊙: IO-Link communication signal
4	L-: Reference potential for IO-Link and system communication, electrically isolated from the output side
5	⏏: System communication with QUINT UPS or CAPAROC PM PN
6	IO-Link LED status indicator
7	LED status indicator DC OK
	LED on: $U_{Out} > 90\% \times U_{Set}$
	LED flashing: $U_{Out} < 90\% \times U_{Set}$
8	LED status indicator $P_{Out} > 50\%$ (output power >240 W)
9	LED status indicator $P_{Out} > 75\%$ (output power >360 W)
10	LED status indicator $P_{Out} > 100\%$ , boost mode (output power >480 W)

### 15.2 Preventive function monitoring

In contrast to the default signaling set upon delivery, you can customize this to the specific needs of the system. The following signal options can be selected to signal system states.

QUINT POWER default settings upon delivery			Relay 13/14 floating 24 V DC / ≤ 1 A 30 V AC / ≤ 0.5 A
	Output voltage	① 25 ... 135 % ② 90 %	Default
	Output current	① 5 ... 150 % ② 100 %	✓
	Output power	① 5 ... 150 % ② 100 %	✓
	Operating hours	① 0 ... ∞ h ② 10 years	✓
	Early warning of high temperature	Warning of derating	✓
<b>OVP</b>	Voltage limitation active	Surge voltage at output	✓
<b>AC<sub>OK</sub></b>	Input voltage OK	10 ms after mains failure	✓
<b>3AC<sub>OK</sub></b>	Phase monitoring	Warning 2AC operation	✓
	Remaining service life	Warning preventive maintenance	✓
	Phase sequence monitoring	Warning incorrect direction of rotation	✓

#### Key

Symbol	Description
①	Setting range
②	Default setting of the standard item
Default	Configuration set upon delivery
✓	Configuration that can be selected

The use of logic operations to link multiple signal options to one control is also possible. The power supply is configured via IO-Link or via system communication.

### 15.3 Description of signaling

#### 15.3.1 Output voltage

Signals whether the output voltage is in the preset range. If the output voltage of the power supply falls below the set threshold value, the signal state changes.

##### Example of use

Indicates whether the connected load is being supplied. Used to quickly detect a load circuit that is not being supplied (e.g., in the event of mains failure or short circuit in the supply line).

#### 15.3.2 Output current

If the output current of the power supply exceeds the set threshold value, the signal state changes.

##### Example of use

In the case of system extensions, loads are added. This increases the utilization of the power supply. Preventive function monitoring detects critical operating states in good time. Action can be taken before system downtime occurs.

#### 15.3.3 Output power

If the output power of the power supply exceeds the set threshold value, the signal state changes.

##### Example of use

In the case of system extensions, loads are added. This increases the utilization of the power supply. Preventive function monitoring detects critical operating states in good time. Action can be taken before system downtime occurs.

#### 15.3.4 Operating hours

If the preset operating time of the power supply is exceeded, the signal state changes.

##### Example of use

For systems with a very long operating time, such as wind turbine generators or refineries, maintenance intervals are planned. You can even schedule the maintenance date during configuration based on the ambient temperature and utilization of the power supply.

#### 15.3.5 Early warning of high temperature

Before the power supply protects itself through power derating in the event of an overtemperature, the signal state changes.

##### Example of use

Outdoor control cabinets can reach a high internal temperature depending on the position of the sun. The same

is true if a control cabinet fan or cooling system fails. In the event of any form of overtemperature, the power supply provides a warning by means of this signal, well before the supply of the loads is in any danger.

Specifications regarding the available output power (see derating section).

#### 15.3.6 Voltage limitation active

If the circuit inside the device for protecting against surge voltages is activated at the output, the signal state changes.

##### Example of use

Normative requirements stipulate that an upper voltage limit must be observed at the output in the event of an error. It must therefore be ensured, for example, that safety-related controllers are not supplied with an output voltage that exceeds 32 V DC, even in the event of an error. If foreign bodies (ferrules, screws, etc.) enter the power supply and generate an error, the signal state changes.

#### 15.3.7 Input voltage OK

The power supply signals a mains failure at least 10 ms before shutting off.

##### Example of use

In the event of a mains failure, the power supply continues to supply the load with nominal power for at least 20 ms. Failure of the input voltage is signaled 10 ms before the output voltage falls, which means that this information is provided to the higher-level controller at an early stage. System states can therefore be stored promptly without any loss of data as a result of the unexpected failure of the supply voltage.

#### 15.3.8 Phase monitoring (3AC operation)

If one phase fails completely or the voltage difference between the outer conductors is > 10%, the signal state changes.

##### Example of use

It is possible that the voltage of one phase may drop or fail completely due to an asymmetrical load on the 3-phase supply network or a fuse tripping. If one phase fails completely or the voltage difference between the outer conductors is > 10%, the power supply signals 2AC operation. Permanent supply of the load by the power supply is still ensured in 2AC operation.

Specifications regarding the available output power (see derating section).

### 15.3.9 Service life monitoring

If the remaining service life calculated on the basis of the operating data falls below the set threshold value, the signal state changes.

#### Example of use

With the power supply, the remaining service life is determined over the entire operating time. This is based on the operating and ambient parameters that influence the service life of a power supply. For example, temperature, output current, input voltage, and mains frequency are taken into consideration.

As soon as the calculated remaining service life falls below the set threshold value, the signal changes. Device replacement can thus be scheduled as necessary. This protects against unexpected system failure.

When the service life expires, this does not necessarily result in device failure. However, the technical data of the power supply may no longer be maintained due to aging and wear.

### 15.3.10 Phase sequence monitoring

When the supply voltage is applied, the relay closes when all three phases are present and the phase sequence is correct. In the event that a phase fails or there is an incorrectly connected rotating field, a signal change occurs.

#### Example of use

If the three-phase supply network is connected incorrectly by mixing up two of the line conductors, this can affect the direction of rotation of motors that are connected in parallel. This may lead to undefined system states.

Some 3AC loads (e.g., heat pumps) may only be started once it has been ensured that the rotating field is connected correctly.

The power supply itself can be operated with inverted phase sequence and provides information on the rotating field direction for loads connected in parallel.

### 15.4 LED status indicators

Five LED status indicators are integrated in the front of the power supply, which indicate the current device state.

The green DC OK LED indicates the current status of the output voltage ( $U_{Out}$ ). The DC OK LED is permanently on as long as the value of the output voltage  $U_{Out}$  is  $\geq 0.9 \times U_{Set}$ . If the value of the output voltage is  $< 0.9 \times U_{Set}$ , the green DC OK LED flashes.

Depending on the required output power of the connected load, the three  $P_{Out}$  LEDs, which indicate the current output power, light up. Assuming that the provided output power is  $> 50\%$  of the nominal output power, the  $> 50\%$  LED lights up green. If the demanded power continues to increase until it is above  $75\%$ , the  $> 75\%$  LED lights up green in addition













to the  $> 50\%$  LED. If the required output power is then greater than the nominal device power, the power supply operates in boost mode. In boost mode, the  $> 100\%$  LED additionally lights up yellow.

The green IO-Link LED lights up when an IO-Link master is connected and supply voltage L+ and L- is thus present. The LED flashes when communication is also active between the power supply and the IO-Link master.

### 15.5 U/I Advanced characteristic curve signaling

The following table shows the standard assignment for signaling for the U/I Advanced characteristic curves which is set by default.

Figure 37 Signal image for U/I Advanced







		Normal operation $P_{Out} < P_N$	BOOST $P_{Out} > P_N$	Overload operation $U_{Out} < 0.9 \times U_{Set}$
LED: $P_{Out} > 100\%$	yellow			
LED: $P_{Out} > 75\%$	green			
LED: $P_{Out} > 50\%$				
LED: DC OK				
Relay: 13/14, DC OK	default	closed	closed	open



### 15.6 Smart HICCUP characteristic curve signaling

The following table shows the standard assignment for signaling for the Smart HICCUP characteristic curve.

Figure 38 Signal image for Smart HICCUP













		Normal operation $P_{Out} < P_N$	BOOST $P_{Out} > P_N$	Overload operation $U_{Out} < 0.9 \times U_{Set}$
LED: $P_{Out} > 100\%$	yellow			
LED: $P_{Out} > 75\%$	green			
LED: $P_{Out} > 50\%$				
LED: DC OK				
Relay: 13/14, DC OK	default	closed	closed	open



### 15.7 FUSE MODE characteristic curve signaling

The following table shows the standard assignment for signaling for the FUSE MODE characteristic curve.

Figure 39 Signal image for FUSE MODE













		Normal operation $P_{Out} < P_N$	BOOST $P_{Out} > P_N$	Overload operation $I > I_{Fuse}$ for $t > t_{Fuse}$
LED: $P_{Out} > 100\%$	yellow			
LED: $P_{Out} > 75\%$	green			
LED: $P_{Out} > 50\%$				
LED: DC OK				
Relay: 13/14, DC OK	default	closed	closed	open



### 15.8 Signaling for Secure shut-off characteristic curve

The following table shows the standard assignment for signaling for the Secure shut-off characteristic curve.

Figure 40 Signal image secure shut-off characteristic curve

		Normal operation $P_{Out} < P_N$	BOOST $P_{Out} > P_N$	Overload operation $U > U_{Fuse}$ for $t > t_{Fuse}$
LED: $P_{Out} > 100\%$	yellow			
LED: $P_{Out} > 75\%$	green			
LED: $P_{Out} > 50\%$				
LED: DC OK				
Relay: 13/14, DC OK	default	closed	closed	open



### 15.9 SLEEP MODE signaling

In SLEEP MODE, all LEDs are off and the relay switching contact is open.

## **15.10 Special immunity for the signal level**

### **15.10.1 Surge protection for the high-voltage area at the power plant**

Surge protection (Phoenix Contact Item No.: 2907925 or comparable protection) must be implemented for power plant applications when using signal connection types t (telecommunications area), h (high voltage area) or f (field) in accordance with IEC/EN 61850-3 or signal connection types 3 (process area) and 4 (high voltage area) in accordance with EN 61000-6-5.

### **15.10.2 Surge protection for signals in railway applications**

Surge protection (Phoenix Contact Item No.: 2907925 or comparable protection) must be implemented for railway applications when using signals in accordance with EN 62236-4 and EN 50121-4.

### **15.10.3 Surge protection for devices in use in safety-related systems**

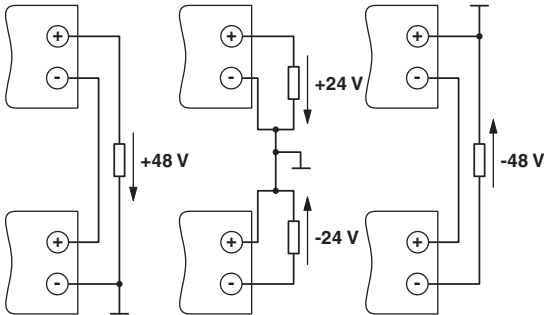
Surge protection (Phoenix Contact Item No.: 2907925 or comparable protection) must be implemented for railway applications when using signals in accordance with EN 61000-6-7 for devices provided to perform functions in safety-related systems (functional safety) in industrial settings.

## 16 Operating modes

### 16.1 Series operation

To double the output voltage, connect two power supplies in series. Only use power supplies with the same performance class and configuration for series operation. If two 24 V DC power supplies are connected in series, an output voltage of 48 V DC is available to supply the loads.

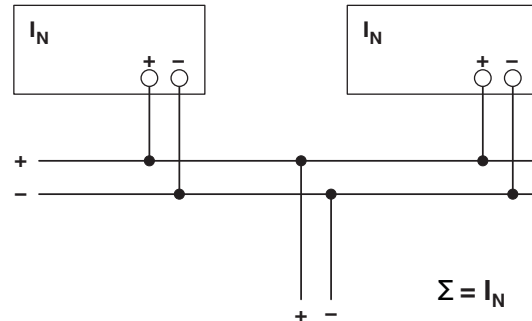
Figure 41 Schematic diagrams in series operation



### 16.2 Parallel operation

You can connect several power supplies in parallel in order to increase the power or to supply the loads redundantly.

Figure 42 Schematic diagram in parallel operation



Observe the following points when carrying out parallel connection:

1. Use power supplies of the same type and performance class
2. Setting the same output voltages
3. Using the same cable cross sections for wiring
4. Using the same cable lengths for the DC convergence point
5. Operating power supplies in the same temperature environment
6. When three or more power supplies are connected in parallel, each output must be protected (e.g., with circuit breakers, fuses or decoupling modules)



We recommend the configuration "parallel operation" for a parallel connection.



### 16.2.1 Redundancy operation

Redundant circuits are suitable for supplying systems and system parts which place particularly high demands on operational reliability.

If energy is to be supplied to the load with 1+1 redundancy, two power supplies of the same type and performance class must be used. In the event of an error, it must be ensured that one of the power supplies is able to provide the total required power for the load. This means that in redundancy mode, two 20 A power supplies supply a load with a nominal current of 20 A, for example. During normal operation of the power supplies, each power supply therefore supplies 10 A.

Always use cables with the same cross sections and lengths when wiring the power supplies on the DC output side.

Redundancy modules can be used to 100% decouple two power supplies from one another and to ensure the supply. A distinction is made here between passive and active redundancy modules. Optimum decoupling with simultaneous monitoring and minimal power dissipation can be achieved with the QUINT ORING or QUINT S-ORING active redundancy module.

Figure 43 Schematic diagram, redundant operation with QUINT ORING

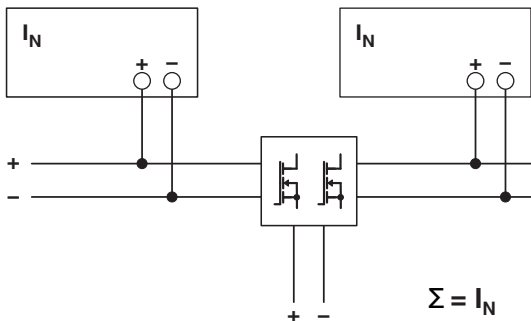
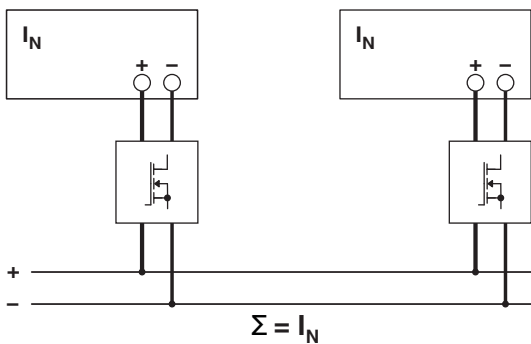


Figure 44 Schematic diagram, redundant operation with QUINT S-ORING



Certain specifications apply in redundancy operation with regard to the configuration of the keepout areas. In redundancy operation, the power supplies are operated with maximum half the nominal power. The keepout areas are therefore reduced.

Using the signaling settings, you can monitor whether both power supplies are being operated with  $\leq$  half the nominal load. In the case of system extension, an overload is prevented if one of the power supplies fails.

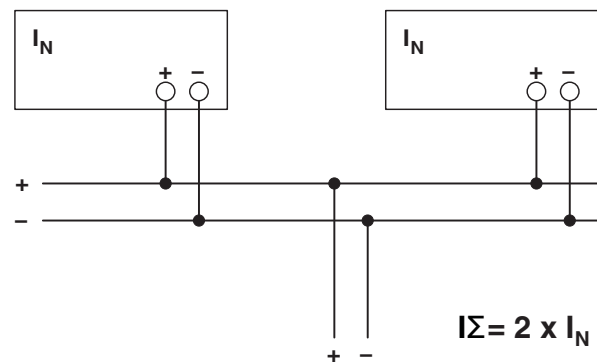
### 16.2.2 Increased power

When n power supplies are connected in parallel, the output current is increased to  $n \times I_N$ . Parallel connection for increased power is used when extending existing systems. If the individual power supply does not cover the current consumption of the most powerful load, parallel connection of power supplies is recommended.



When three or more power supplies are connected in parallel, each output must be protected separately, e.g., by a circuit breaker, fuse or decoupling module such as QUINT ORING, QUINT S-ORING or QUINT DIODE.

Figure 45 Schematic diagram of increased performance



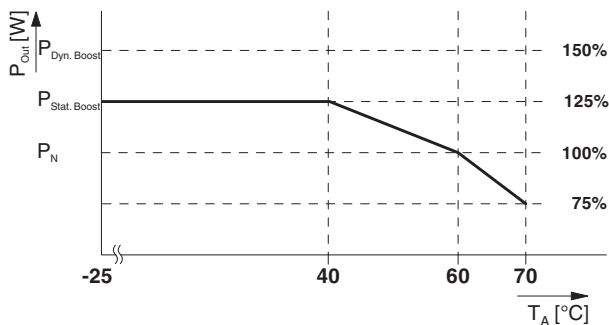
## 17 Derating

The QUINT POWER power supply runs in nominal operation without any limitations. For operation outside the nominal range, the following points should be observed depending on the type of use.

### 17.1 Ambient temperature

When operating the power supply at an ambient temperature of  $> 60\text{ }^{\circ}\text{C}$ , a power derating of  $2.5\text{ } \%/ \text{K}$  should be observed. Up to an ambient temperature of  $40\text{ }^{\circ}\text{C}$ , the power supply can take power from the static boost for a sustained period. In the  $40\text{ }^{\circ}\text{C}$  to  $60\text{ }^{\circ}\text{C}$  temperature range, the power supply can output more than the nominal power for a sustained period.

Figure 46 Output power depending on the ambient temperature



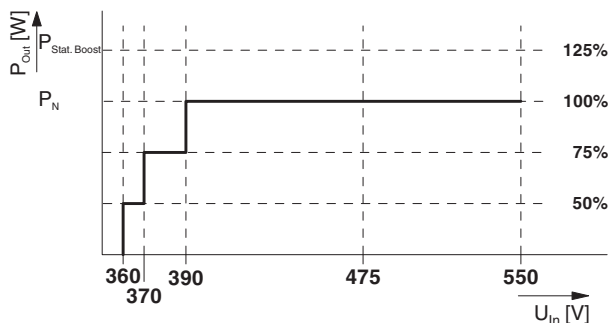
### 17.2 Input voltage

The power supply is designed for operation in a three-phase network. If one phase fails or drops in the event of a fault (e.g., due to starting a load on the affected phase as in the case of a cooling unit), sustained operation on two phases is possible. This type of scenario is already covered for QUINT POWER by virtue of its approval.



The maximum available output power in 2AC operation depends on the input voltage value.

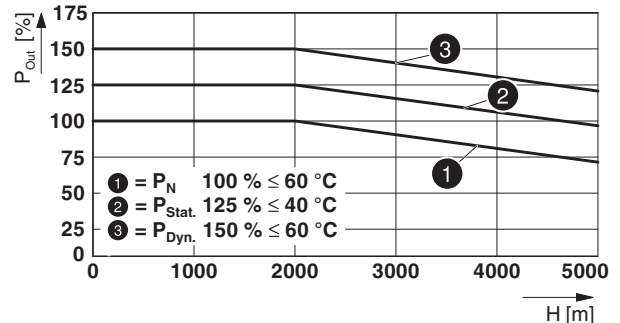
Figure 47 Output power in 2AC operation



### 17.3 Installation height

The power supply can be operated at an installation height of up to 2000 m without any limitations. Different data applies for installation locations above 2000 m due to the differing air pressure and the reduced convection cooling associated with this (see technical data section). The data provided is based on the results of pressure chamber testing performed by an accredited test laboratory.

Figure 48 Output power depending on the installation height



### 17.4 Position-dependent derating

The fanless convection-cooled power supply can be snapped onto all DIN rails according to EN 60715.

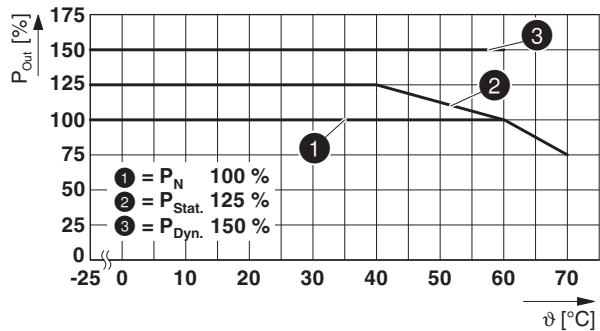
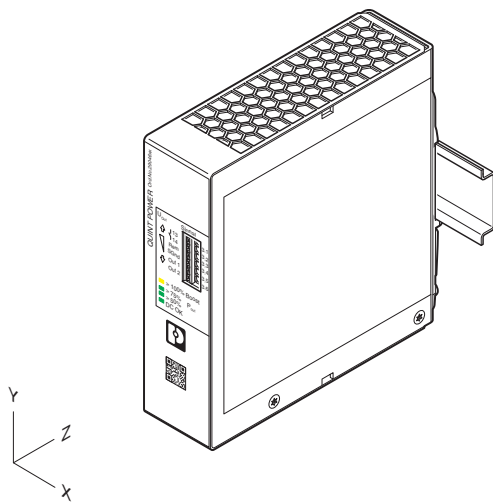


The power supply should be mounted horizontally for heat dissipation reasons (AC connection terminal blocks facing downward). Please observe the derating for any mounting other than the normal mounting position. Reduce the output power based on the prevailing ambient temperature.

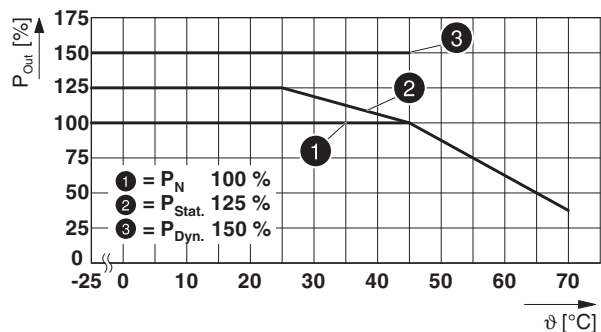
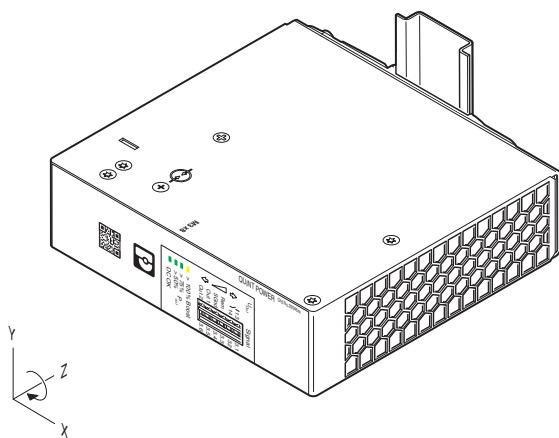
The recommended output power for different mounting positions and ambient temperatures can be found in the characteristic curves below.

Exceeding these values will reduce the service life of the power supply.

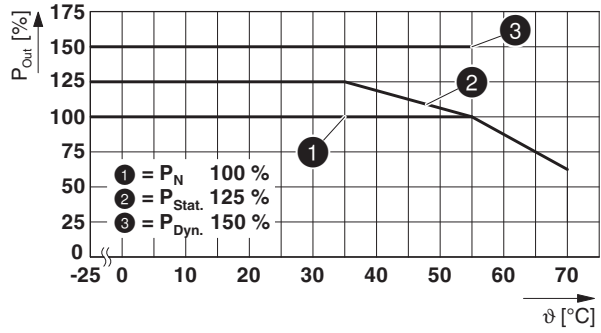
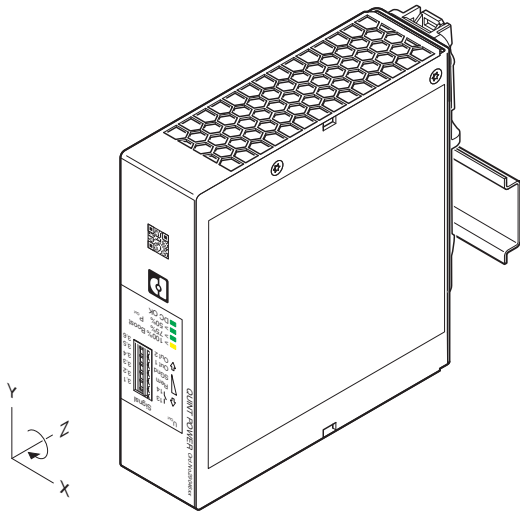
#### 17.4.1 Normal mounting position



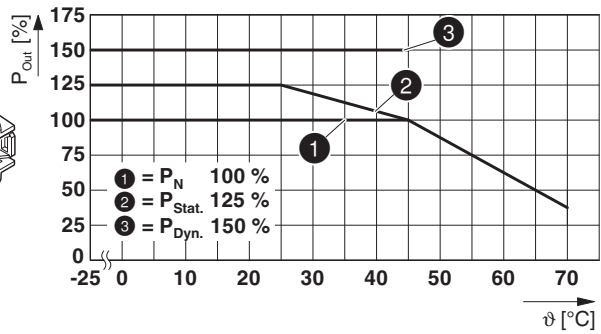
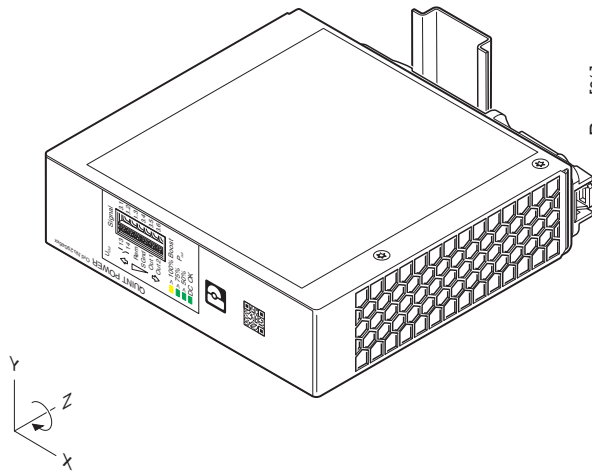
#### 17.4.2 Rotated mounting position 90° Z-axis



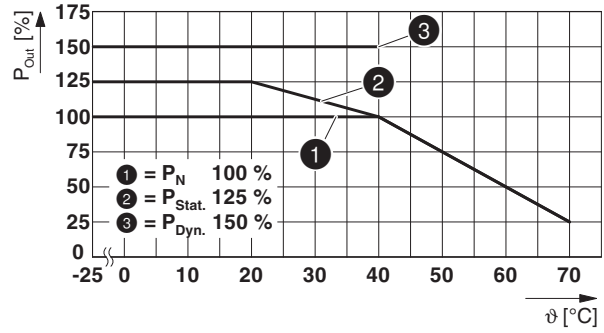
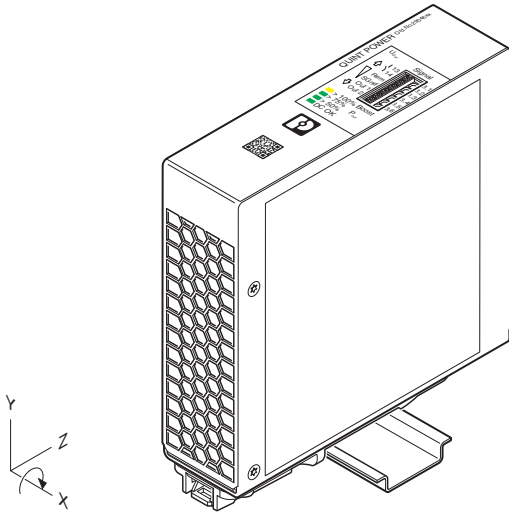
17.4.3 Rotated mounting position 180° Z-axis



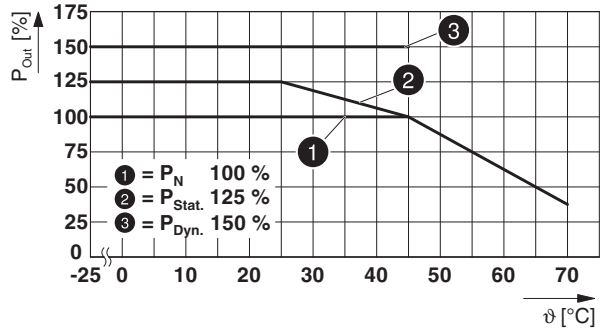
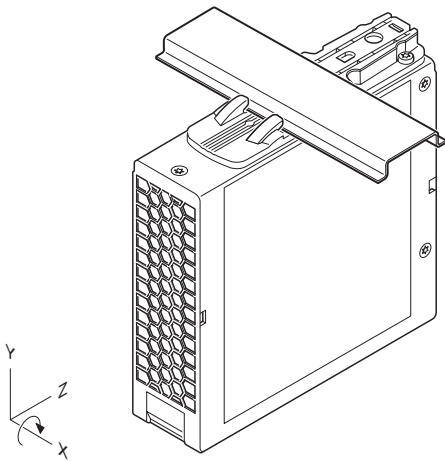
17.4.4 Rotated mounting position 270° Z-axis



17.4.5 Rotated mounting position 90° X-axis



17.4.6 Rotated mounting position 270° X-axis



## 18 Attachment – Register tables

### 18.1 Cyclic data

The power supply provides the IO-Link master with the process data based on a cycle time of 2 ms.

The process data contains the current output current, the output voltage, the operating mode, and the status messages described in Section 15.3.

Index	Sub-index	Description	Value [unit]	Size	Access
0x28 <sub>hex</sub> 40 <sub>dez</sub>	1	Status output voltage	0: Output voltage > Threshold output voltage (0x83 <sub>hex</sub> ) 1: Output voltage < Threshold output voltage (0x83 <sub>hex</sub> )	1 bit	RO
	2	Status output power	0: Output power < Threshold output power (0x83 <sub>hex</sub> ) 1: Output power > Threshold output power (0x83 <sub>hex</sub> )	1 bit	RO
	3	Status operating time	0: Operating time < Threshold operating time (0x83 <sub>hex</sub> ) 1: Operating time > Threshold operating time (0x83 <sub>hex</sub> )	1 bit	RO
	4	Status early warning of high temperature	0: Warning not active 1: Warning active	1 bit	RO
	5	Status input voltage	0: Input voltage OK 1: Input voltage not OK	1 bit	RO
	6	Status voltage limitation (OVP)	0: Voltage limitation not active 1: Voltage limitation active	1 bit	RO
	7	Status phase monitoring	0: Phase monitoring OK (3 AC) 1: Phase failure (2 AC)	1 bit	RO
	8	Status lifetime monitoring	0: Remaining service life > service life threshold value (0x83 <sub>hex</sub> ) 1: Remaining service life < service life threshold value (0x83 <sub>hex</sub> )	1 bit	RO
	9	Operating mode	0: Normal operation 1: Startup 2: No input voltage 3: Restart (e.g., due to a secondary-side overload in U/I Advanced mode) 4: FUSE MODE or Secure shut-off triggered: DC output switched off 5: Sleep mode active: DC output switched off 6: Mains interruption: DC output voltage still present (see input voltage status) 7: Smart HICCUP mode: power supply restarts at regular intervals due to a secondary-side overload.	3 bits	RO
10 - 12	Reserved	0	3 bits	RO	
13	QUINT4-UPS Alarm (collective)	0: No alarm 1: Alarm	1 bit	RO	
14	QUINT4-UPS Replace Battery	0: No alarm 1: Alarm	1 bit	RO	
15	Output voltage	[0.01 V]	2 bytes	RO	
16	Output current	[0.01 A]	2 bytes	RO	

## 18.2 Acyclic diagnostic data

### 18.2.1 IO-Link-specific data

Index	Sub-index	Description	Notes	Size	Access
0x02 <sub>hex</sub> 02 <sub>dez</sub>	0	System command	Command 0x81: Application reset Resets the values from the data logging. Command 0x82: Default setting Resets the power supply configuration to the default settings.	1 byte	WO
0x0C <sub>hex</sub> 12 <sub>dez</sub>	0	Device access lock	Bit 2: Local parameterization lock Locks parameterization via system communication and via the buttons on the front.	2 bytes	RW
0x10 <sub>hex</sub> 16 <sub>dez</sub>	0	Vendor name		15 bytes	RO
0x11 <sub>hex</sub> 17 <sub>dez</sub>	0	Vendor text		22 bytes	RO
0x12 <sub>hex</sub> 18 <sub>dez</sub>	0	Product name		7 bytes	RO
0x13 <sub>hex</sub> 19 <sub>dez</sub>	0	Product ID	Item No.	52 bytes	RO
0x14 <sub>hex</sub> 20 <sub>dez</sub>	0	Product text		10 bytes	RO
0x15 <sub>hex</sub> 21 <sub>dez</sub>	0	Serial number	For the full serial number, the item number must also be prefixed.	4 bytes	RO
0x16 <sub>hex</sub> 22 <sub>dez</sub>	0	Hardware version		4 bytes	RO
0x17 <sub>hex</sub> 23 <sub>dez</sub>	0	Firmware version		32 bytes	RO
0x18 <sub>hex</sub> 24 <sub>dez</sub>	0	Application-specific tag		32 bytes	RW

### 18.2.2 Digital rating plate

Index	Sub-index	Description	Size	Access
0x21 <sub>hex</sub> 65 <sub>dec</sub>	1	Physical address /Street	32 bytes	RO
	2	Physical address/ZIP	8 bytes	RO
	3	Physical address/City	32 bytes	RO
	4	Physical address/State	32 bytes	RO
	5	Physical address/Country	2 bytes	RO
	6	Link to homepage	64 bytes	RO
	7	Production date	1 byte	RO

### 18.2.3 Operating data

Index	Sub-index	Description	Value [unit]	Size	Access
0x60 <sub>hex</sub> 96 <sub>dez</sub>	1	Total operating time	[0,1 h]	4 bytes	RO
	2	Operating time since last restart	[0,1 h]	2 bytes	RO
	3	Temperature in the device	[K]	2 bytes	RO
	4	Remaining service life	0 ... 5475 [d]	2 bytes	RO
	5	SOH (State of Health)	0 ... 10000 [0,01 %]	2 bytes	RO

#### Total operating time

The overall total number of operating hours since initial startup of the power supply.

#### Operating time since last restart

The overall total number of operating hours since the power supply was last switched on.

#### Temperature in the device

The temperature in the device is measured at the primary-side capacitor of the power supply. To output the valid temperature value, the power supply must be connected to the primary-side supply voltage.

#### Remaining lifetime

The service life of a power supply very much depends on the individual operating and ambient conditions in the system. Extreme ambient temperatures can thus shorten the service life prematurely.

With the power supply, the remaining service life is determined over the entire operating time. This is based on the operating and ambient parameters that influence the service life of a power supply. For example, temperature, output current, input voltage, and mains frequency are taken into consideration.

Information on the remaining service life makes it possible to detect the rapid aging of devices at an early stage. Critical ambient conditions can thus be identified and possibly eliminated.

Furthermore, needs-based device replacement protects against unexpected system failure.

When the service life expires, this does not necessarily result in device failure. However, the technical data of the power supply may possibly no longer be maintained due to aging and wear.

#### SOH (State of Health)

The SOH value indicates the remaining service life as a percentage and also supports preventive maintenance.



### 18.2.4 Input data

The information on the primary-side supply voltage can be evaluated using the index shown below. The input data is invalid if the power supply is in “No input voltage” operating mode (see Section 18.1 Cyclic data, index 0x28<sub>hex</sub>, subindex 10).

Index	Sub-index	Description	Value [unit]	Size	Access
0x61 <sub>hex</sub> 97 <sub>dec</sub>	1	Input voltage L1 → L2	[V]	2 bytes	RO
	2	Input voltage L2 → L3	[V]	2 bytes	RO
	3	Input voltage L3 → L1	[V]	2 bytes	RO
	4	Input voltage DC	[V]	2 bytes	RO
	5	Frequency	[Hz]	2 bytes	RO
	6	Phase sequence	0: Clockwise rotating field 1: Counterclockwise rotating field 2: Invalid (2AC or DC operation)	1 byte	RO
	7	Input voltage AC/DC detection	0: AC 1: DC	1 byte	RO

#### Input voltage Lx → Ly

RMS value of the phase-to-phase voltage between two phases.

### 18.2.5 Signaling data

The signaling data comprises the status of relay contact 13/14 as well as the status LED display on the front of the power supply.

Index	Sub-index	Description	Value [unit]	Size	Access
0x63 <sub>hex</sub> 99 <sub>dez</sub>	1	Status Relay 13/14	0: Open 255: Closed	1 byte	RO
	2	Status LED 1 (DC OK)	0: Off 1: On 2: Flashing	1 byte	RO
	3	Status LED 2 (> 50 %)	0: Off 1: On 2: Flashing	1 byte	RO
	4	Status LED 3 (> 75 %)	0: Off 1: On 2: Flashing	1 byte	RO
	5	Status LED 4 (> 100 %)	0: Off 1: On 2: Flashing	1 byte	RO
	6	Status LED 5 (IO-Link)	0: Off 1: On 2: Flashing	1 byte	RO

### 18.2.6 Data logging

Data that was also logged during operation can be collected using the index shown below.

Index	Sub-index	Description	Value [unit]	Size	Access
0x80 <sub>hex</sub> 128 <sub>dez</sub>	1	Minimum output voltage	[V]	2 bytes	RO
	2	Maximum output voltage	[V]	2 bytes	RO
	3	Maximum static output current	[A]	2 bytes	RO
	4	Maximum dynamic output current	[A]	2 bytes	RO
	5	Minimum temperature	[K]	2 bytes	RO
	6	Maximum temperature	[K]	2 bytes	RO
	7	Transient counter	0 ... 65535	2 bytes	RO
	8	Counter for SFB pulses	0 ... 65535	2 bytes	RO
	9	Counter for OVP	0 ... 65535	2 bytes	RO
	10	Counter for device start	0 ... 65535	2 bytes	RO
	11	Counter for dynamic boost pulses	0 ... 65535	2 bytes	RO

#### Minimum output voltage

The minimum output voltage that was measured during the total operating time of the power supply. The minimum output voltage is not recorded until the power supply start phase is complete.

#### Maximum output voltage

The maximum output voltage that was measured during the total operating time of the power supply.

#### Maximum static output current

The maximum output current that was measured during the total operating time of the power supply and which is below the static boost (125%). The dynamic boost and SFB pulses are not taken into consideration here. The maximum static output current is not recorded until the power supply start phase is complete.

#### Maximum dynamic output current

The maximum output current that was measured during the total operating time of the power supply and which is above the static boost (150%). The SFB pulses are not taken into consideration. The maximum dynamic output current is not recorded until the power supply start phase is complete.

#### Minimum temperature

The minimum temperature that was measured during the total operating time of the power supply.

#### Maximum temperature

The maximum temperature that was measured during the total operating time of the power supply.

#### Transient counter

Number of transients that were detected on the primary side of the power supply.

#### Counter for SFB pulses

Number of SFB pulses that were detected during the total operating time of the power supply.

#### Counter for OVP

Counts how many times the circuit inside the device for protecting against overvoltages was activated at the output.

**Counter for device start**

Incremented on every device start triggered by the supply voltage being switched on.

**Counter for dynamic boost pulses**

Counts how many times the dynamic boost was triggered during the total operating time of the power supply.

### 18.3 Parameter data

The parameter data of the power supply can be read and set via R/W access.

#### Deactivation of events

The function of the events described in Section 18.5 is deactivated via index 0x80<sub>hex</sub>.

Index	Sub-index	Description	Value [unit]	Default setting	Size	Access
0x80 <sub>hex</sub> 128 <sub>dez</sub>	1	DC not OK	0: Not activated 255: Activated	1: Activated	1 byte	RW
	2	Static power reserve active	0: Not activated 255: Activated	1: Activated	1 byte	RW
	3	Dynamic power reserve active	0: Not activated 255: Activated	1: Activated	1 byte	RW
	4	Sustained overload (short circuit) at output	0: Not activated 255: Activated	1: Activated	1 byte	RW
	5	Warning temperature too high	0: Not activated 255: Activated	1: Activated	1 byte	RW
	6	No input voltage present	0: Not activated 255: Activated	1: Activated	1 byte	RW
	7	Input voltage too high	0: Not activated 255: Activated	1: Activated	1 byte	RW
	8	Input voltage too low	0: Not activated 255: Activated	1: Activated	1 byte	RW
	9	Voltage limitation at output active (OVP)	0: Not activated 255: Activated	1: Activated	1 byte	RW
	10	Phase failure	0: Not activated 255: Activated	1: Activated	1 byte	RW
	11	Preventive maintenance recommended Remaining service life < service life limit (0x83 <sub>hex</sub> , subindex 13)	0: Not activated 255: Activated	1: Activated	1 byte	RW
	12	FUSE MODE or Secure shut-off triggered	0: Not activated 255: Activated	1: Activated	1 byte	RW
	13	QUINT4-PS internal EEPROM not available	0: Not activated 255: Activated	1: Activated	1 byte	RW
	14	QUINT4-PS not available	0: Not activated 255: Activated	1: Activated	1 byte	RW
	15	QUINT4-UPS Replace Battery	0: Not activated 255: Activated	1: Activated	1 byte	RW
	16	QUINT4-UPS Alarm (collective)	0: Not activated 255: Activated	1: Activated	1 byte	RW

18.3.1 Configuration of the output data

Index	Sub-index	Description	Value [unit]	Default setting	Size	Access
0x82 <sub>hex</sub> 130 <sub>dez</sub>	1	Output voltage	2390 - 2960 [0,01 V]	2410 [24,10 V]	2 bytes	RW
	2	Switch off power supply	0: Switch on power supply 255: Switch off power supply	0: Switch on power supply	1 byte	RW
	3	Parallel mode	0: Parallel operation inactive 255: Parallel operation active	0: Parallel operation inactive	1 byte	RW
	4	Lock button	0: Keys not locked 255: Keys locked	0: Keys not locked	1 byte	RW
	5	Output characteristic curve	Bit 0: SFB Technology 0: Inactive/1: Active Bit 1: Dynamic boost 0: Inactive/1: Active Bit 2: Static boost 0: Inactive/1: Active Bit 3: Reserved Bit 4 - 6: Output characteristics 1: U/I Advanced (0bx001xxxx) 2: FUSE MODE Current (0bx010xxxx) 3: Secure shut-off (0bx011xxxx) 4: Smart HICCUP (0bx100xxxx) Bit 7: Reserved  1) U/I Advanced: Without boost: 0b0001 0000 With static boost: 0b0001 0100 With static and dynamic boost: 0b0001 0110 With static boost, dynamic boost, and SFB: 0b0001 0111 2) FUSE MODE Current: Without boost: 0b0010 0000 With static boost: 0b0010 0100 3) Secure shut-off: Without boost: 0b0011 0000 With static and dynamic boost: 0b0011 0100 With static boost, dynamic boost, and SFB: 0b0011 0111	U/I Advanced, static and dynamic boost, and SFB Technology active (0b0001 0111)	1 byte	RW
6	Tripping current FUSE MODE	25 - 125 [%]	100 [100 %]	2 bytes	RW	
7	Tripping time FUSE MODE and Secure shut-off	1 - 1200 [0,01 s]	1 [0.01 s]	2 bytes	RW	
8	Tripping voltage Secure shut-off	40 - 90 [%]	75 [75 %]	2 bytes	RW	

**Output voltage**

The output voltage in no-load operation can be set between 23.9 V and 29.6 V.

**Parallel operation**

Power supplies of the same type can be connected in parallel for redundancy and to increase performance. In parallel operation, specify the voltage drop between no-load operation and nominal load as -0.5 V. This ensures optimum current distribution. If parallel operation is not activated, the voltage drop between no-load operation and nominal load is set to -0.1 V by default.

**Lock button**

On the front of the power supply, there are two buttons for manually setting the output voltage. By activating the “Key lock” function, manual adjustment of the output voltage is prevented.

**Output characteristic curve**

You can choose between four characteristic curves: U/I Advanced, Smart HICCUP, FUSE MODE, and Secure shut-off. This allows you to optimally adapt the power supply to the supplied load. Depending on the output characteristic curve that is selected, activate or deactivate the static boost, the dynamic boost, or SFB Technology. Further information on the different output characteristic curves is provided in Section 10.

**Tripping current FUSE MODE**

The “Tripping current FUSE MODE” parameter is used to set the switch-off threshold ( $I_{\text{Fuse}}$ ) for the “FUSE MODE” characteristic curve.

**Tripping time FUSE MODE and Secure shut-off**

The “Tripping time FUSE MODE and Secure shut-off” parameter is used to set the switch-off threshold ( $t_{\text{Fuse}}$ ) for the “FUSE MODE” and “Secure shut-off” characteristic curves.

**Tripping voltage Secure shut-off**

The “Tripping voltage Secure shut-off” parameter is used to set the switch-off threshold ( $U_{\text{shut-off}}$ ) for the “Secure shut-off” characteristic curve.

### 18.3.2 Configuration of group message for relay contact 13/14

Floating relay contact 13/14 can also be used for preventive function monitoring. Different signal dependencies can be configured as required. If more than one signal option is activated, the result is generated by ANDing the individual signals. The various signal options (subindex 1 to 9) are described in Section 15.3.

Index	Sub-index	Description	Value [unit]	Default setting	Size	Access
0x83 <sub>hex</sub> 131 <sub>dez</sub>	1	Activate output voltage signal option	0: Not activated 255: Activated	1: Activated	1 byte	RW
	2	Activate output power signal option	0: Not activated 255: Activated	0: Not activated	1 byte	RW
	3	Activate operating time signal option	0: Not activated 255: Activated	0: Not activated	1 byte	RW
	4	Activate temperature early warning signal option	0: Not activated 255: Activated	0: Not activated	1 byte	RW
	5	Activate input voltage OK signal option	0: Not activated 255: Activated	0: Not activated	1 byte	RW
	6	Activate output-side voltage limitation (OVP) signal option	0: Not activated 255: Activated	0: Not activated	1 byte	RW
	7	Activate phase monitoring signal option	0: Not activated 255: Activated	0: Not activated	1 byte	RW
	8	Activate service life monitoring signal option	0: Not activated 255: Activated	0: Not activated	1 byte	RW
	9	Phase sequence monitoring signal option	0: Not activated 255: Activated	0: Not activated	1 byte	RW
	10-11	Reserved			2 bytes	
	12	Output relay 13/14	0: High active 255: Low active	0: High active	1 byte	RW
	13	Threshold output voltage	25 - 135 [%]	90 [90 %]	2 bytes	RW
	14	Threshold output power	50 – 200 [%]	100 [100 %]	2 bytes	RW
	15	Threshold operating time	0 – 65536 [days]	3650 [3650 days]	2 bytes	RW
	16	Threshold Remaining lifetime	0 – 5475 [days]	0 [0 days]	2 bytes	RW

#### Output relay 13/14

Inversion of relay output 13/14.

#### Threshold output voltage

A relative threshold value can be set to monitor the output voltage. The threshold value for the output voltage can be parameterized in the range from 25% to 135% based on the output voltage currently set. The threshold value is used for process input data (index 0x28) as well as for the configuration of the relay contact.

#### Threshold output power

A relative threshold value can be set to monitor the output power. The threshold value for the output power can be parameterized in the range from 50% to 200% based on the nominal output power. The threshold value is used for process input data (index 0x28) as well as for the configuration of the relay contact.

#### Threshold operating time

An absolute threshold value can be set to monitor the operating time. The threshold value is used for process input data (index 0x28) as well as for the configuration of the relay contact.

### Threshold Remaining lifetime

An absolute threshold value can be set to monitor the remaining service life.  
The threshold value is used for process input data (index 0x28) as well as for the configuration of the relay contact.

### 18.4 Acyclic diagnostic data of the connected QUINT4-UPS

If a QUINT4-UPS is connected via the system interface, the following information for the uninterruptible power supply system can also be read.

Index	Sub-index	Description	Value [unit]	Size	Access
0x1060 <sub>hex</sub> 4192 <sub>dez</sub>	1	QUINT4-UPS Current alarm		4 bytes	RW
	2	QUINT4-USV SOH	[%]	2 bytes	RW
	3	QUINT4-UPS Remaining lifetime	[d]	2 bytes	RW
	4	QUINT4-USV SOC	[%]	2 bytes	RW
	5	QUINT4-UPS Remaining buffer time	[min]		



## 18.5 Events

Event codes	Event type	Description
0x1800 <sub>hex</sub>	Warning	DC not OK: Output voltage < output voltage limit (0x83 <sub>hex</sub> , subindex 10)
0x1801 <sub>hex</sub>	Message	Static power reserve active Output power > output power limit (0x83 <sub>hex</sub> , subindex 11)
0x1802 <sub>hex</sub>	Message	Dynamic power reserve active
0x1803 <sub>hex</sub>	Warning	Sustained overload (short circuit) at output
0x1804 <sub>hex</sub>	Warning	Warning temperature too high
0x1805 <sub>hex</sub>	Warning	No input voltage present
0x1806 <sub>hex</sub>	Warning	Input voltage too high
0x1807 <sub>hex</sub>	Warning	Input voltage too low
0x1808 <sub>hex</sub>	Warning	Voltage limitation at output active (OVP)
0x1809 <sub>hex</sub>	Warning	Phase failure
0x180A <sub>hex</sub>	Warning	Preventive maintenance recommended Remaining service life < service life limit (0x83 <sub>hex</sub> , subindex 13)
0x180B <sub>hex</sub>	Warning	FUSE MODE or Secure shut-off triggered
0x180C <sub>hex</sub>	Error	QUINT4-PS internal EEPROM not available
0x180D <sub>hex</sub>	Error	QUINT4-PS no supply voltage at input
0x1820 <sub>hex</sub>	Error	QUINT4-UPS Replace Battery
0x1821 <sub>hex</sub>	Error	QUINT4-UPS Alarm (collective)