QUINT-ORING/24DC/2X20/1X40

Active redundancy module



Data sheet
104623_en_07

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1 Description

QUINT ORING is the active redundancy module from the QUINT POWER product family. The redundancy module can be used to 100% decouple power supplies from each other.

Features

Preventive

– Comprehensive signaling by LED indicators and switch output.

Minimum power dissipation

– The use of MOSFETs enables a very small voltage drop and therefore low power dissipation.

Double the service life

– Through symmetrical load distribution, ACB (Auto Current Balancing) Technology doubles the service life of the redundantly operated power supply.

SELV/PELV

– The output voltage is considered SELV or PELV if the input voltage meets the requirements of a SELV or PELV source.

Increased operational reliability

– OVP limits static overvoltages at the input to < 32 V.

Technical data (short form)	
Input voltage range	18 V DC ... 28 V DC (SELV)
Voltage drop, input/output	0.2 V (I_{OUT} = 40 A)
Output voltage	U_{In} - 0,2 V
Nominal output current (I_N) Static Boost ($I_{Stat.Boost}$) Selective Fuse Breaking (I_{SFB})	40 A (Increasing power) 1x 52 A 1x 240 A (12 ms)
Maximum power dissipation	8 W (I_{OUT} = 40 A)
Efficiency	> 98 %
MTBF (IEC 61709, SN 29500)	> 720000 h (40 °C)
Ambient temperature (operation)	-25 °C ... 70 °C -40°C (startup type tested) > 60 °C Derating: 2,5 %/K
Dimensions W/H/D	38 mm / 130 mm / 125 mm
Weight	0.6 kg

Observe these notes

Make sure you always use the latest documentation.
It can be downloaded from the product at phoenixcontact.com/products.

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3 Ordering data

Description	Type	Item no.	Pcs./Pkt.
Active QUINT redundancy module for DIN rail mounting with ACB (Auto Current Balancing) Technology and monitoring functions, input: 24 V DC/2x 20 A, output: 24 V DC/1 x 40 A, including mounted UTA 107/30 universal DIN rail adapter	QUINT-ORING/24DC/2X20/1X40	2320186	1

Accessories	Type	Item no.	Pcs./Pkt.
Universal DIN rail adapter	UTA 107/30	2320089	228
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

Our range of accessories is being continually extended, our current range can be found in the download area.

4 Technical data

Input data/output data	
Nominal input voltage	24 V DC
Input voltage range	18 V DC ... 28 V DC (SELV)
Voltage drop, input/output	0.2 V (I_{OUT} = 40 A)
Nominal current	2x 20 A (-25 °C ... 60 °C) 1x 40 A (-25 °C ... 60 °C)
Maximum current	2x 26 A (-25 °C ... 40 °C) 1x 52 A (-25 °C ... 40 °C) 240 A (12 ms, SFB Technology)
Transient surge protection	Varistor
Reverse polarity protection	yes , < 60 V
Nominal output voltage	U_{In} - 0,2 V
Output current	40 A (Increasing power) 20 A (Redundancy)
Derating	60 °C ... 70 °C (2.5 %/K)
Power loss nominal load max.	8 W (I_{OUT} = 40 A)
Efficiency	> 98 %
Protection against overvoltage at the output (OVP)	< 32 V DC
Redundancy OK, 13/14	
Output description	Group contact
Voltage	max. 30 V AC/DC
Current	≤ 100 mA (short-circuit-proof)
Status display	LED redundancy OK / green
ACB (Auto Current Balancing) OK, 23/24	
Output description	Contact closed: Δ U_{IN} ≤ 300 mV
Voltage	max. 30 V AC/DC
Current	≤ 100 mA (short-circuit-proof)
Status display	ACB OK LED / LED bar graph green
General data	
Insulation voltage input, output / housing	500 V AC (710 V DC)
MTBF (IEC 61709, SN 29500)	> 720000 h (40 °C)
Mounting position	horizontal DIN rail NS 35, EN 60715
Type of housing	Aluminum (AlMg3)
Hood version	Galvanized sheet steel, free from chrome (VI)
Dimensions W/H/D	38 mm / 130 mm / 125 mm
Dimensions W / H / D (90° turned)	122 mm / 130 mm / 41 mm
Weight	0.6 kg
Degree of protection	IP20
Protection class	III

Input connection data	
Connection method	Screw connection
Conductor cross-section, rigid	0.2 mm² … 6 mm²
Conductor cross-section, flexible	0.2 mm² … 6 mm²
Conductor cross-section AWG	24 … 10
Stripping length	8 mm
Screw thread	M3
Tightening torque	0.5 Nm … 0.6 Nm
Output connection data	
Connection method	Screw connection
Conductor cross-section, rigid	0.5 mm² … 16 mm²
Conductor cross-section, flexible	0.5 mm² … 16 mm²
Conductor cross-section AWG	20 … 6
Stripping length	10 mm
Screw thread	M4
Tightening torque	1.2 Nm … 1.5 Nm
Signal connection data	
Connection method	Screw connection
Conductor cross-section, rigid	0.2 mm² … 6 mm²
Conductor cross-section, flexible	0.2 mm² … 6 mm²
Conductor cross-section AWG	24 … 10
Stripping length	8 mm
Screw thread	M3
Tightening torque	0.5 Nm … 0.6 Nm
Ambient conditions	
Ambient temperature (operation)	-25 °C … 70 °C (> 60 °C Derating: 2,5 %/K)
Ambient temperature (start-up type tested)	-40 °C
Ambient temperature (storage/transport)	-40 °C … 85 °C
Max. permissible relative humidity (operation)	≤ 100 % (at 25 °C, non-condensing)
Vibration (operation)	< 15 Hz, amplitude ±2.5 mm (according to IEC 60068-2-6) 15 Hz … 150 Hz, 2.3g, 90 min.
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)
Standards	
Electrical safety (information and communication technology)	IEC 62368-1 (SELV)

Approvals	
ATEX	II 3 G Ex ec nC IIC T4 Gc DEKRA 20ATEX0136 X
IECEx	Ex ec nC IIC T4 Gc DEK 20.0082X
INMETRO	DNV 22.0237 X Ex ec nC IIC T4 Gc
UL approvals	UL/C-UL listed UL 508 UL/C-UL Recognized UL 60950-1 UL ANSI/ISA-12.12.01 Class I, Division 2, Groups A, B, C, D T4 (Hazardous Location)
Temp code	T4 (-25 … +70 °C; > 60 °C, Derating: 2,5 %/K)
Shipbuilding	DNV, NK

Current approvals/permissions for the product can be found in the download area under phoenixcontact.com/products.

Conformance with EMC Directive 2014/30/EU		
Immunity in accordance with EN 61000-6-2		
	EN 61000-6-2 requirement	**tested**
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)	2 kV (Test Level 3 - asymmetrical)
Output	2 kV (Test Level 3 - asymmetrical)	2 kV (Test Level 3 - asymmetrical)
Signal	1 kV (Test Level 3 - asymmetrical)	1 kV (Test Level 3 - asymmetrical)
Comments	Criterion B	Criterion A
Surge voltage load (surge) EN 61000-4-5		
Input	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)
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)
Comments	Criterion B	Criterion A
Conducted interference EN 61000-4-6		
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

Key	
Criterion A	Normal operating behavior within the specified limits.
Criterion B	Temporary impairment to operational behavior that is corrected by the device itself.

Emitted interference in acc. with EN 61000-6-3	
Radio interference voltage in acc. with EN 55011	EN 55011 (EN 55022) Class B, area of application: Industry and residential
Emitted radio interference in acc. with EN 55011	EN 55011 (EN 55022) Class B, area of application: Industry and residential

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

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.



WARNING: Danger to life by electric shock!

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.

5.2 Safety and warning notes



Prior to startup, read the installation notes and check the active redundancy module for damage.



WARNING: Danger to life by electric shock!

- Only skilled persons may install, start up, and operate the device.
- 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).



NOTE

- Observe the national safety and accident prevention regulations.
- Assembly and electrical installation must correspond to the state of the art.
- The active redundancy module is a built-in device designed for mounting in a control cabinet.
- The IP20 degree of protection of the active redundancy module is intended for use in a clean and dry environment.
- Observe mechanical and thermal limits.
- Ensure minimum clearances to external heat sources.
- Install the active redundancy module in the normal mounting position. Position of the input DC terminals above.
- Make sure that the wiring on the primary side and the secondary side is adequately dimensioned.
- You can find the connection parameters, such as the necessary stripping length for the wiring with and without ferrule, in the associated table.
- When using the active redundancy module, observe the maximum permissible current carrying capacity of each channel.
- Protect the device against foreign bodies penetrating it, e.g., paper clips or metal parts.
- Improper use invalidates the device protection.
- The active redundancy module may only be used for its intended use.

– The active redundancy module does not require maintenance. Repairs may only be carried out by the manufacturer. Opening the housing invalidates the warranty.

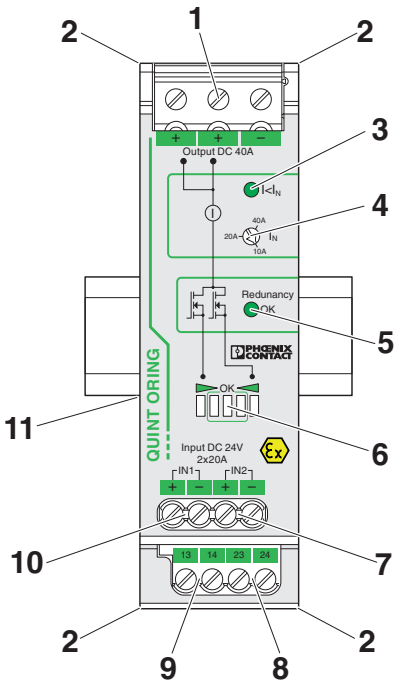


WARNING - Explosion Hazard

– Install the device in suitable housing with at least IP54 degree of protection in accordance with EN 60079-0 and EN 60079-7.
– The installation in the enclosure must be carried out in such a way that the ambient temperature is not exceeded during operation.
– The equipment shall only be used in an area of at least pollution degree 2, as defined in IEC 60664-1.
– Enclosure of the equipment shall be earthed by installation on earthed DIN Rail.
– The category 3 device is suitable for installation in zone 2 potentially explosive areas in accordance with directive 2014/34/EU.
– The device is not designed for use in dust explosion hazardous atmosphere.

6 Structure

Figure 1 Function elements



1 IN1/IN2 DC input:
24 V input voltage, I_N = 2 x 20 A

2 Floating relay contact
13/14 "Redundancy OK"
(max. 30 V, 100 mA, short-circuit-proof)

3 Floating relay contact
23/24 "ACB OK"
(max. 30 V, 100 mA, short-circuit-proof)

4 Bar graph for displaying the current balance I_1/I_2

5 "Redundancy OK" LED, green

6 LED "I < I_N", green

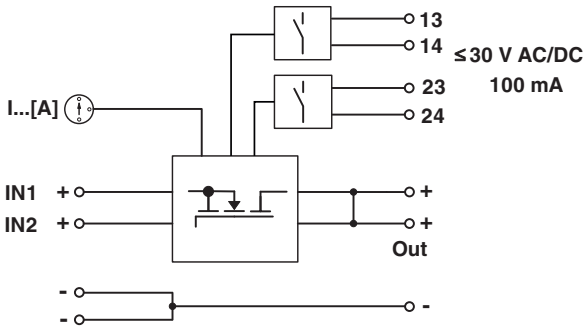
7 Rotary selector switch for selecting the nominal current of the power supply units

8 DC output approx. 0.2 V < DC input

9 Universal snap-on foot for EN DIN rails

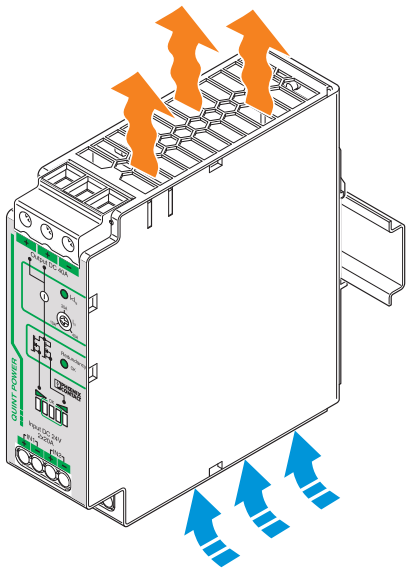
10 Strain relief for connecting cables

7 Block diagram



8 Installation

Figure 2 Convection

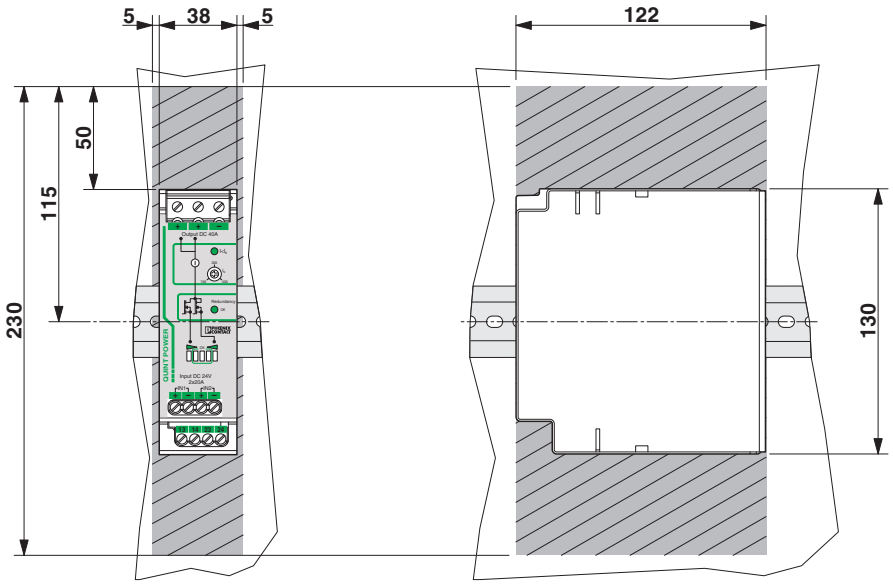


In order to ensure sufficient convection, we recommend a minimum vertical distance of 50 mm to the other modules.
A lateral distance of 5 mm, and in the case of active components, that of 15 mm is necessary for proper functioning of the module.
Depending on the ambient temperature and the load of the module, the housing can become very hot.

The module can be snapped onto all DIN rails in accordance with EN 60715 and should be mounted in the normal mounting position (horizontal device orientation, connection terminal blocks facing up and down).

9 Mounting position

Figure 3 Installation dimensions



Possible mounting positions:

Normal mounting position, installation depth 125 mm (+ DIN rail) (delivery state)

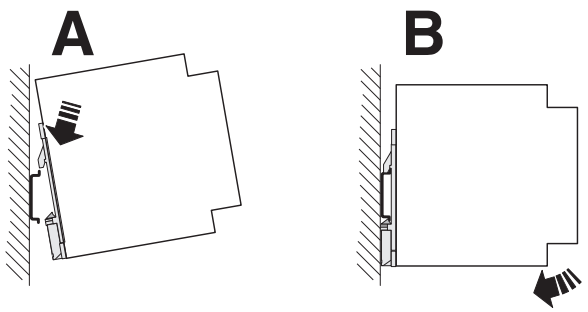
Rotated mounting position, 270° Y-axis, installation depth: 41 mm (+ DIN rail)

10 Mounting on DIN rails

Mounting

Position the module with the DIN rail guide on the upper edge of the DIN rail, and snap it in with a downward motion.

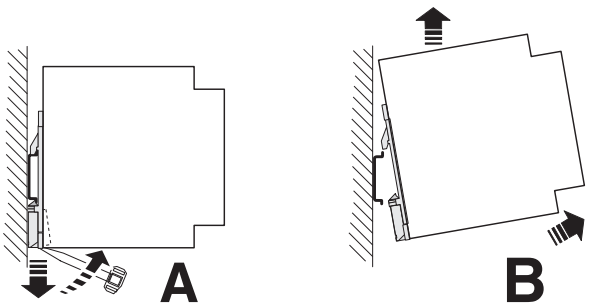
Figure 4 Mounting



Removing

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

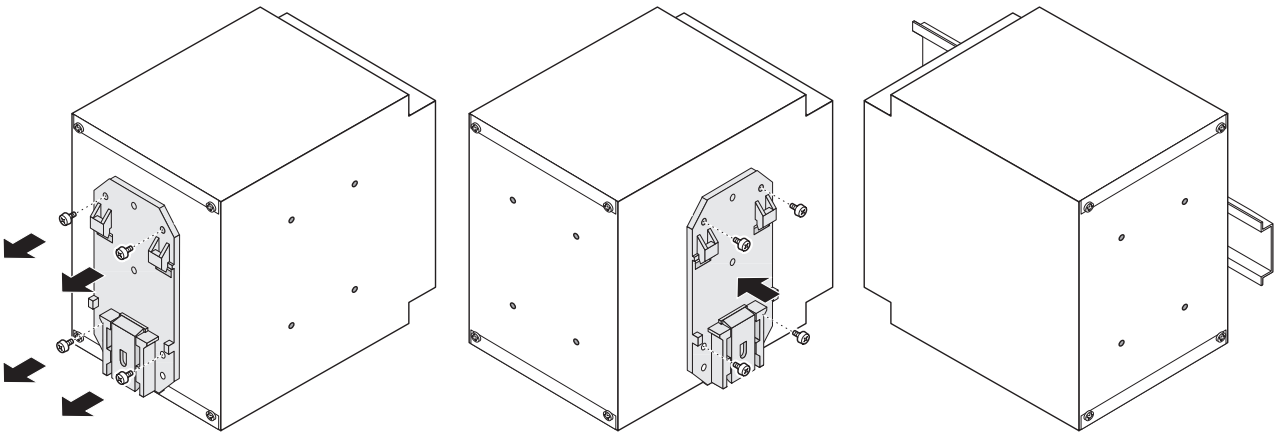
Figure 5 Removal



Rotated mounting position (270° Y-axis)

A rotated mounting position can be achieved by mounting the module onto the DIN rail at a 270° angle. Mount the DIN rail adapter (UTA 107/30) as shown in the figure. No additional assembly material is required. Mounting screws: Torx® T10 (0.8 Nm ... 0.9 Nm tightening torque).

Figure 6 Rotated mounting position (270° Y-axis)

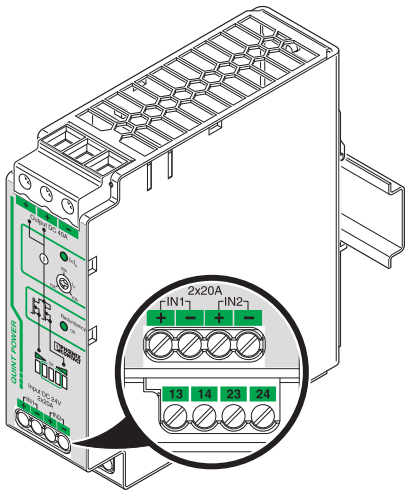


Other mounting positions are also possible. Always observe position-dependent derating.

11 Input

Connection of the input is made via connection terminal blocks "In1+" and "In2+".

Figure 7 Input



Protection of the primary side

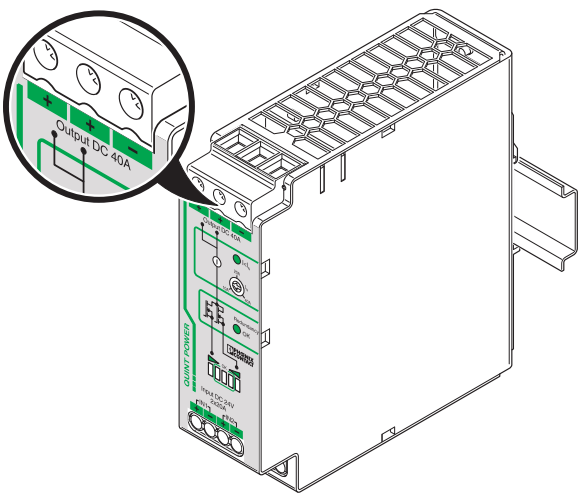
The maximum current for each input is 26 A.

Therefore use a current-limited source (e. g., QUINT POWER) or a suitable fuse.

12 Output

Connection of the output takes place via the internally connected "+" terminals and the "-" terminal.

Figure 8 Output



13 Signaling

The "Redundancy OK" (13/14) and "ACB OK" (23/24) floating signal contacts are available for function monitoring.

In addition, the "Redundancy OK" and "I < I_N" LEDs as well as the bar graph allow onsite function evaluation of the redundancy module.

To monitor the redundancy, the nominal current of the upstream power supply units can be set on the redundancy module using the rotary selection switch

The following table shows the possible states.

Figure 9 Signaling

a)		b)	I < IN	Redundancy OK		ACB OK	Description
			LED	LED	Relay 13/14	Relay 23/24	
rd ye gr ye rd	or	rd ye gr ye rd	●	●	closed	closed	Redundancy OK, load distribution OK
	or		●	●	closed	closed	Redundancy OK Load distribution OK by ACB however, power supply not optimally adjusted a) increase voltage at IN2 or decrease voltage at IN1 b) increase voltage at IN1 or decrease voltage at IN2
	or		●	●	closed	open	Redundancy OK No load distribution because power supply not adjusted a) increase voltage at IN2 or decrease voltage at IN1 b) increase voltage at IN1 or decrease voltage at IN2
X	or	X	✳	✳	open	X	No redundancy because I>In Verify load current
	or		●	✳	open	open	No redundancy because an input is not being supplied with power a) Check input IN2 and its connections b) Check input IN1 and its connections
	or		○	○	open	open	Short circuit at output of the redundancy module or Device is not being supplied with power
X X X X	or	X X X X	X	✳	open	X	If a red LED lights up permanently, the device must be checked by the manufacturer.

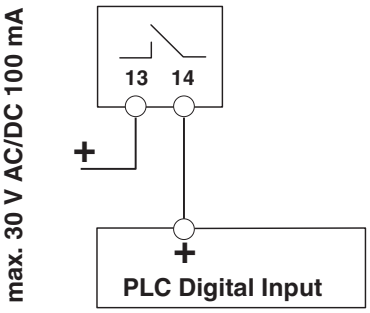
✳ LED flashing ● LED on ○ LED off X Not relevant

13.1 "Redundancy OK" floating signal contact

The floating signal contact reports the loss of redundancy by opening.

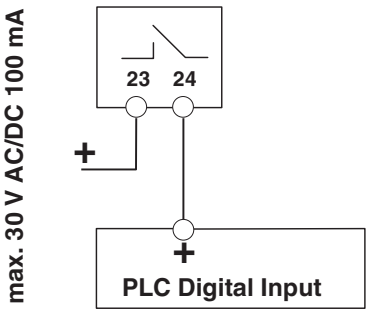
The following causes are possible:

– The decoupled component is defective.
– At least one input voltage is too low or does not exist.
– If the load current is higher that the set threshold value of I_N , a single power supply unit can no longer sustain the load. This is reported after 4 seconds.



13.2 "ACB OK" floating signal contact

The floating signal contact opens and reports that the load current is not distributed symmetrically on both parallel connected power supply units.

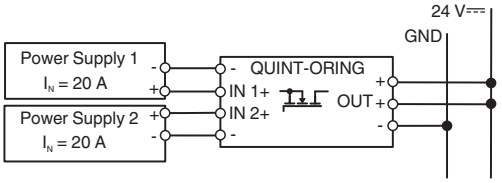


14 Function

The redundancy module decouples the outputs of two power supply units and ensures safe redundancy.

14.1 Input/output

Only one redundancy module is required for decoupling two power supply units 1 and 2 switched in parallel with nominal currents of up to 20 A.



14.2 ACB technology

The service life of the redundantly operated power supply unit can be doubled by the Auto Current Balance (ACB) technology, which evenly loads both power supply units. The load current is automatically distributed symmetrically. Use connection cables of the same length and cross section.

14.3 Protection against overvoltage at the output (OVP)

The redundancy module also provides a protective function against overvoltage (OVP) for connected loads. If a supply voltage or power supply connected on the primary side supplies an overvoltage, the redundancy module short-circuits the affected input (crowbar). In this way, the redundancy module ensures that loads are protected against overvoltage. The safe supply then takes place via the second input of the redundancy module.

If a non-current-limiting source (QUINT) is used to supply the load, appropriate protection must be implemented that shuts down the respective channel in the event of overvoltage/short circuit.

The integrated relay contact 13/14 for “Redundancy OK” signals this error pattern and enables remote monitoring.

The threshold of the OVP is 32 V DC.

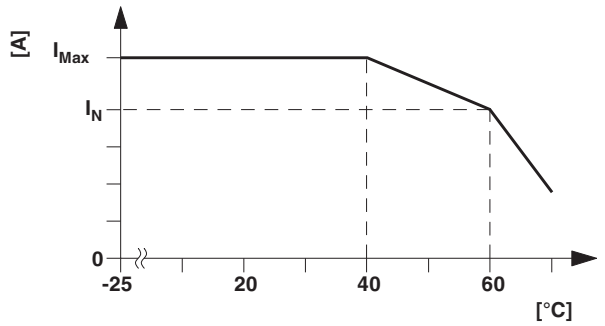
To prevent the OVP from accidentally triggering as a result of critical operating situations (e.g., load shedding or dynamic load change), use the following condition as a guideline:
$U_{In\ max} = U_{OVP}$ - 2.5 V DC

15 Derating

15.1 Temperature response

The active redundancy module can be operated with a maximum current of 2 x 26 A up to an ambient temperature up to +40 °C. In the case of ambient temperatures up to +60 °C, the device can be operated continually with the nominal current. In the case of ambient temperatures of more than +60 °C, the output power must be reduced by 2.5 % for each Kelvin increase of temperature. In the case of ambient temperatures of more than +70 °C or thermal overload, the device is not switched off. Reduce the output power enough to ensure protection of the device.
When using the QUINT POWER (20 A) power supply unit, the derating curve is maintained automatically.

Figure 10 Derating diagram



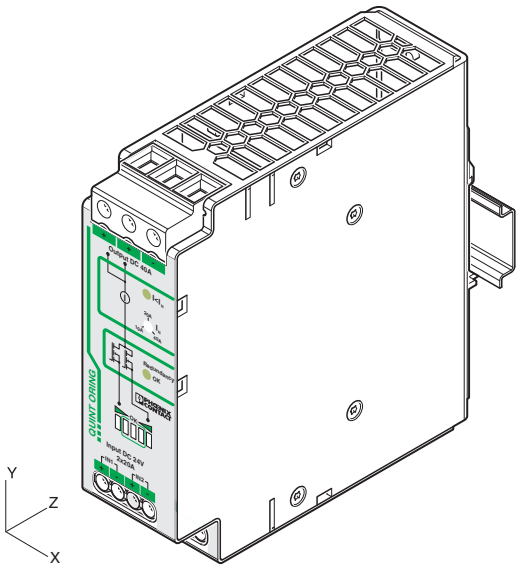
15.2 Position-dependent derating

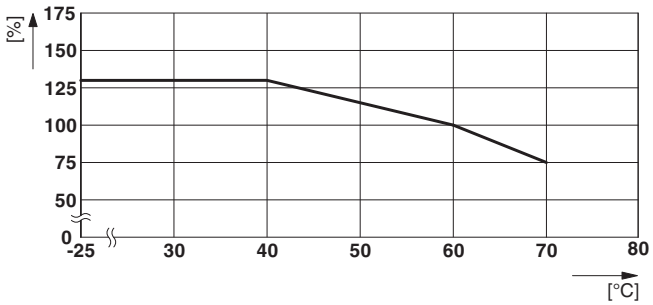
The redundancy module can be snapped onto all DIN rails in accordance with EN 60715. It should be mounted horizontally in the normal mounting position (input terminals facing down).

When installing in a different mounting position, derating should be adhered to.

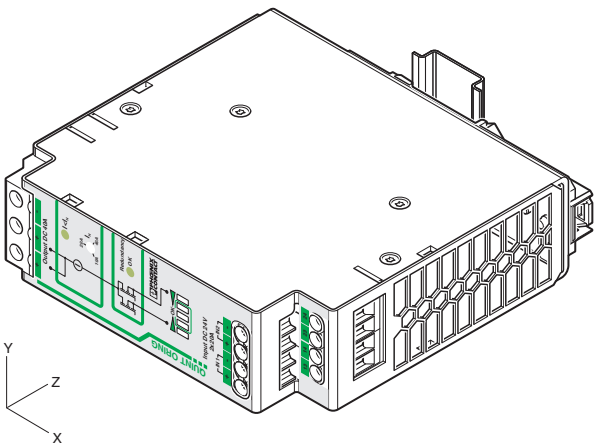
The characteristic curve can be used to determine the maximal output power to be drawn for each ambient temperature for different mounting positions.

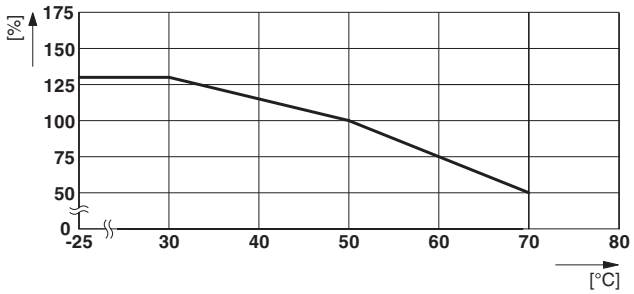
Normal mounting position



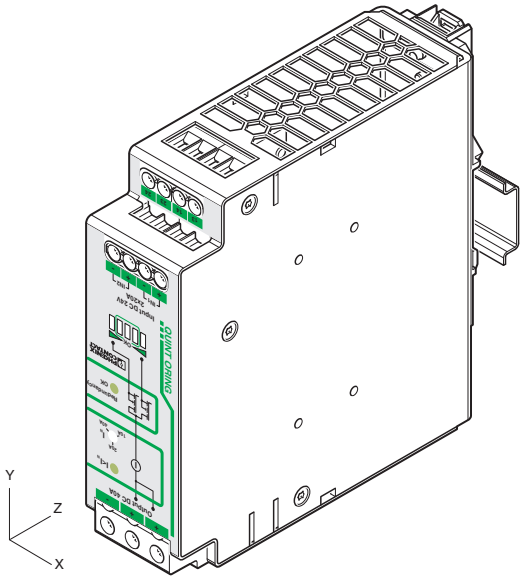


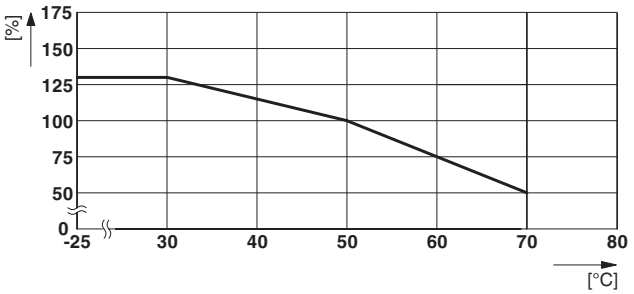
Rotated mounting position 90° X-axis



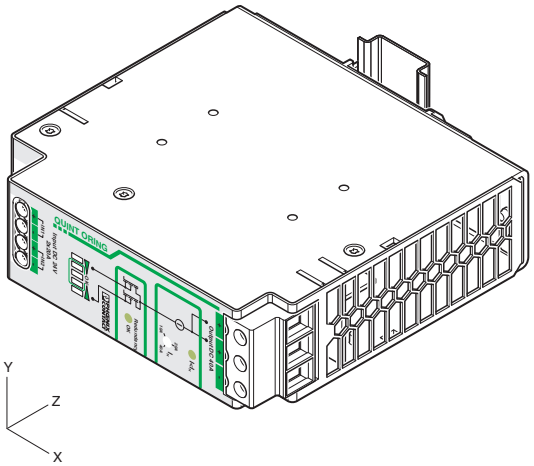


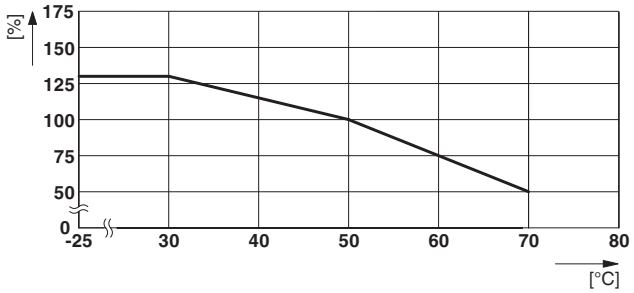
Rotated mounting position 180° X-axis



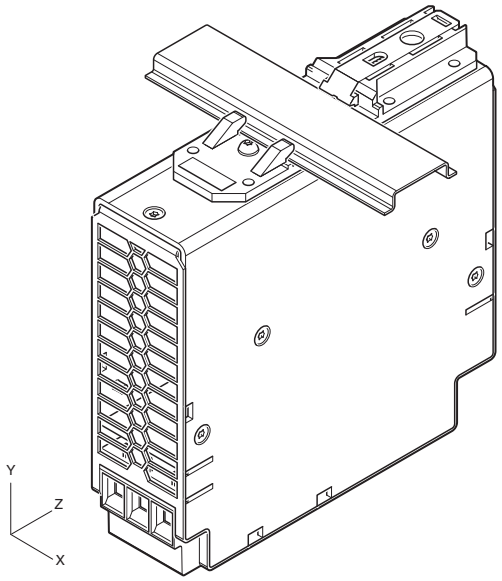


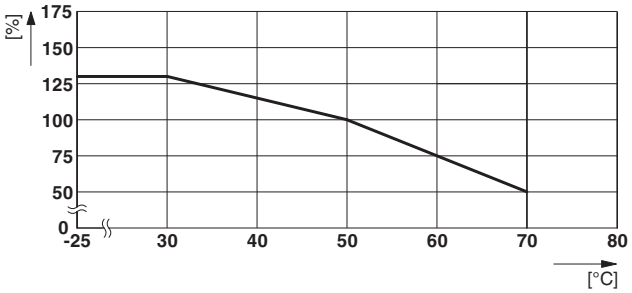
Rotated mounting position 270° X-axis





Rotated mounting position 90° Z-axis





Rotated mounting position 270° Z-axis

