QUINT4-DIODE/12-24DC/2X20/1X40

Redundancy module



Data sheet
107059_en_00

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1 Description

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

Redundancy

- Redundant wiring up to the load
- Decoupling power supply units switched in parallel

Robust

- ATEX/IECEx approval with protective coating
- Device protection by protective circuit
- Metal housing

System availability

- Long service life
- Decoupling with two diodes

Technical data (short form)	
Input voltage range	10 V DC ... 30 V DC
Voltage drop, input/output	0.5 V
Output voltage	U_{In} - 0.5 V
Nominal output current (I_N) Static Boost ($I_{Stat.Boost}$) Dynamic Boost ($I_{Dyn.Boost}$) Selective Fuse Breaking (I_{SFB})	40 A (Increasing power) 45 A 60 A (5 s) 120 A (15 ms)
Maximum power dissipation	10 W (I_{OUT} = 20 A)
Efficiency	> 97 %
MTBF (IEC 61709, SN 29500)	40000000 h (40 °C)
Ambient temperature (operation)	-40 °C ... 70 °C > 60 °C Derating: 2,5 %/K
Dimensions W/H/D	50 mm / 130 mm / 125 mm
Weight	0.75 kg

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.
DIN rail diode module 12-24 V DC/2x20 A or 1x40 A. Uniform redundancy up to the consumer.	QUINT4-DIODE/12-24DC/ 2X20/1X40	2907719	1

Accessories	Type	Item no.	Pcs./Pkt.
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



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/output data	
Nominal input/output voltage	12 V DC ... 24 V DC
DC input / output voltage range	10 V DC ... 30 V DC
Voltage drop, input/output	0.5 V
Nominal current	2x 20 A (-40 °C ... 60 °C) 1x 40 A (-40 °C ... 60 °C)
Maximum current	2x 30 A (-40 °C ... 40 °C) 1x 60 A (-40 °C ... 40 °C)
Transient surge protection	Varistor
Reverse polarity protection	yes , < 60 V
Output current	40 A (Increasing power) 20 A (Redundancy)
Derating	60 °C ... 70 °C (2.5%/K)
Power loss nominal load max.	10 W (I_{OUT} = 20 A)
Efficiency	> 97 %
Connection in series	No
General data	
Insulation voltage input, output / housing	1000 V
MTBF	40000000 h (40 °C)
Mounting position	horizontal DIN rail NS 35, EN 60715
Housing material	Aluminum / stainless steel
Dimensions W/H/D	50 mm / 130 mm / 125 mm
Weight	0.75 kg
Security	
Degree of protection	IP20
Protection class	III
Protective extra-low voltage	IEC 62368-1 (SELV) und EN 60204-1 (PELV)
Input 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/kcmil	10 ... 6
Stripping length	10 mm
Screw thread	M4
Tightening torque	1.2 Nm ... 1.5 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/kcmil	10
Stripping length	10 mm
Screw thread	M4
Tightening torque	1.2 Nm ... 1.5 Nm

Ambient conditions	
Ambient temperature (operation)	-40 °C ... 70 °C (> 60 °C Derating: 2,5 %/K)
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Max. permissible relative humidity (operation)	≤ 95 % (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 in acc. with EN 50178	2
Climatic class	3K22 (in accordance with EN 60721-3-3)

Approvals	
ATEX	Ⓔx II 3 G Ex ec IIC T4 Gc DEKRA 20ATEX0041 X
IECEx	Ex ec IIC T4 Gc IECEx DEK 20.0022X
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 (Hazardous Location)
Shipbuilding	DNV

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		
Electrostatic discharge	EN 61000-4-2	
Electromagnetic HF field	EN 61000-4-3	
Fast transients (burst)	EN 61000-4-4	
Surge current loads (surge)	EN 61000-4-5	
	Input	2 kV (level 3 - asymmetrical: conductor to ground) 1 kV (Level 2 - symmetrical: Conductor to conductor)
	Output	2 kV (level 3 - asymmetrical: conductor to ground) 1 kV (Level 2 - symmetrical: Conductor to conductor)
	Comments	Criterion B
Conducted interference	EN 61000-4-6	

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

5 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.

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 installations notes and check the device 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).

The heatsink of the redundancy module 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 redundancy module is a built-in device 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.
- Install the 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 and protected.
- 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 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 redundancy module may only be used for its intended purpose.
- The redundancy module does not require maintenance. Repairs may only be carried out by the manufacturer. Opening the housing invalidates the warranty.

6 High-voltage test (HIPOT)

The protection class III redundancy module is subject to the Low Voltage Directive and is factory tested. During the HIPOT test (high-voltage test), the insulation between the input and output circuit and the housing is tested for the prescribed electric strength values, for example. The test voltage is applied between the interconnected input and output terminals against the housing of the redundancy module or the DIN rail. The operating voltage used in normal operation is considerably lower than the test voltage used.

High-voltage tests up to 0.85 kV DC can be performed as described.

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 ensure permanent safe isolation from the housing, 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 of the redundancy module, a high-voltage test is performed as part of the dielectric test in accordance with the specifications of EN 60079-7. The high-voltage test is performed with a test voltage of at least 0.85 kV DC or higher. 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 redundancy module as an individual component. As per EN 60204-1 (Safety of machinery - Electrical equipment of machines), the redundancy module can be disconnected during the high-voltage test and only installed once the high-voltage test has been completed.

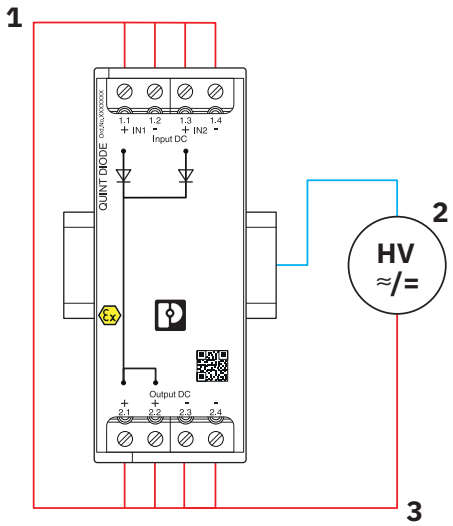
6.3.1 Performing high-voltage testing

If high-voltage testing of the control cabinet or the redundancy module as an individual component is planned during final inspection and testing, the following features must be observed.

– The redundancy module 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 redundancy module due to excessive test voltages.

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



Key

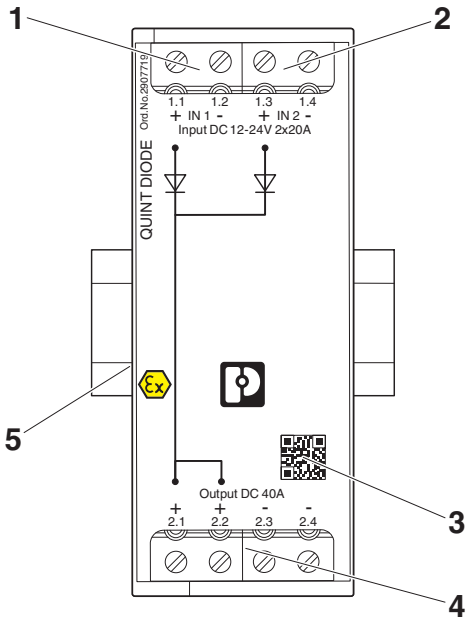
No.	Designation	Color coding	Potential levels
1	DC input circuit	Red	Potential 1
2	High-voltage tester	--	--
3	DC output circuit	Red	Potential 1

7 Structure of the redundancy module

The convection-cooled active redundancy module can be snapped onto all DIN rails in accordance with EN 60715.

7.1 Function elements

Figure 2 Operating and indication elements



Key

No.	Designation
1	Connection terminal blocks for Input DC +/- (channel 1)
2	Connection terminal blocks for Input DC +/- (channel 2)
3	QR code web link
4	Output DC +/- connection terminal blocks
5	Universal DIN rail adapter (rear of housing)

7.2 Device dimensions

Figure 3 Device dimensions (dimensions in mm)

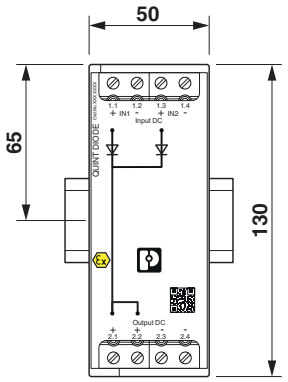
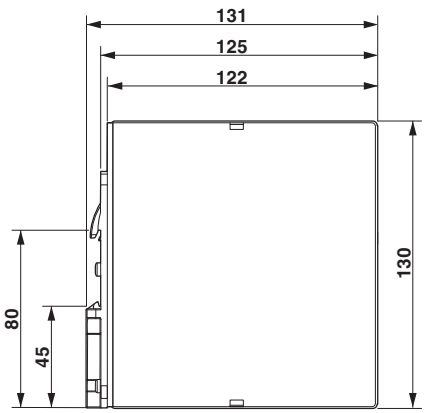


Figure 4 Device dimensions (dimensions in mm)

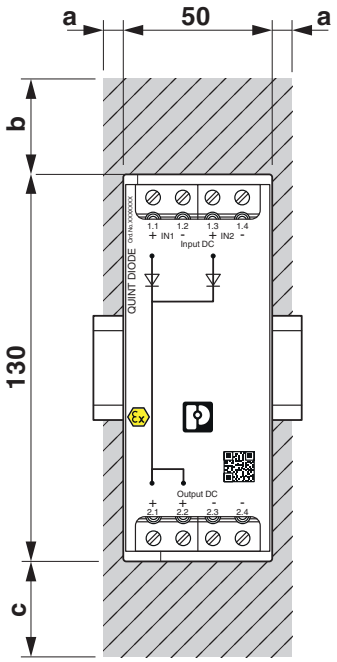


7.3 Keep-out areas

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

If adjacent components are active and the nominal output power ≥ 50%, there must be lateral spacing of 15 mm.

Figure 5 Device dimensions and minimum keep-out areas (in mm)



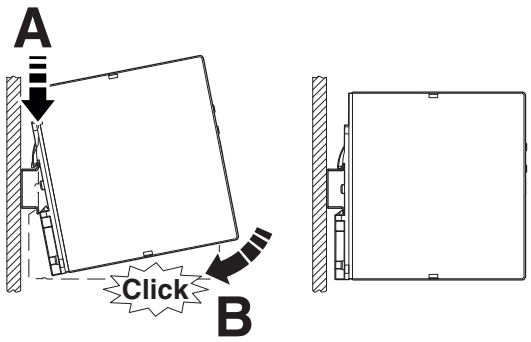
8 Mounting/removing the redundancy module

8.1 Mounting the redundancy module

Proceed as follows to mount the redundancy module:

1. In the normal mounting position the redundancy module 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 redundancy module down until the universal DIN rail adapter audibly snaps into place (B).
3. Make sure that the redundancy module is securely mounted on the DIN rail.

Figure 6 Snapping the redundancy module onto the DIN rail

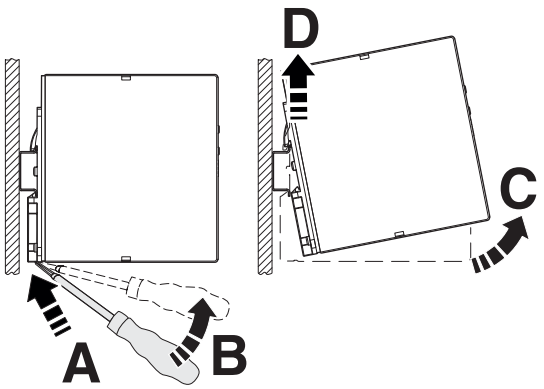


8.2 Uninstall the redundancy module

Proceed as follows to remove the redundancy module:

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 redundancy module forward (C) so that the lock slides back into the starting position.
4. Then lift the redundancy module from the DIN rail.

Figure 7 Removing the redundancy module from the DIN rail



8.3 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 redundancy module 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 redundancy module and the universal wall adapter or the actual mounting surface, an extremely high level of mechanical stability is ensured.

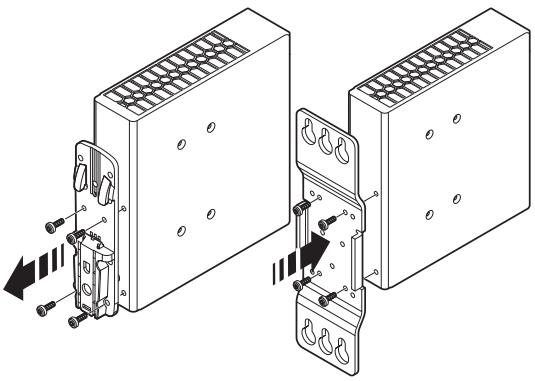
The redundancy module is attached to the UWA 182 or UWA 130 universal wall adapter by means of the Torx screws of the universal DIN rail adapter.

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

Figure 8 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.

9 Device connection terminal blocks

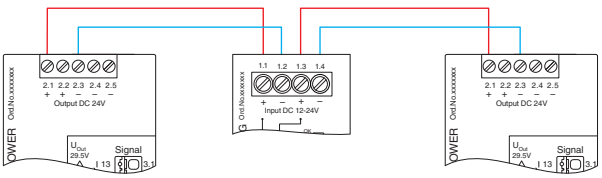
The DC input terminal blocks and DC output terminal blocks on the front of the redundancy module feature screw connection technology. The signal level is wired by means of tool-free Push-in connection technology.

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

9.1 Input

The redundancy module is operated with the DC output voltage of the upstream power supply. On the primary side, the redundancy module is connected via connection terminal blocks INPUT DC +/-.

Figure 9 Schematic diagram, wiring of the input terminal blocks



Protection of the primary side

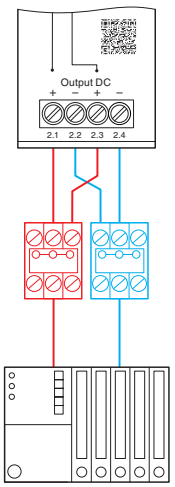
NOTE: Potential damage to the redundancy module caused by overload

If a non-current-limiting source is used to supply the load, appropriate protection must be implemented.

9.2 Output

The load to be supplied is operated with the DC output voltage of the redundancy module. On the secondary side, the redundancy module is connected via connection terminal blocks OUTPUT DC +/-.

Figure 10 Schematic diagram, wiring of the output terminals with one input at the load



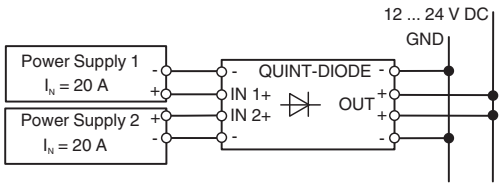
10 Function

10.1 Input

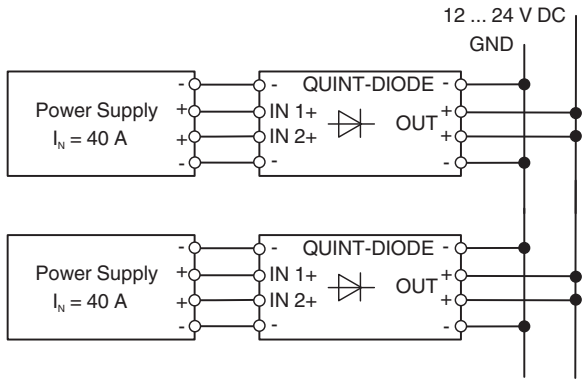
The maximum permissible current depends on the cross section of the connected cables and the ambient temperature.

Conductor cross section	Ambient temperature			
	40 °C	50 °C	60 °C	70°C
6 mm² / 10 AWG	2 x 19 A 1 x 39 A	2 x 18 A 1 x 36 A	2 x 16 A 1 x 32 A	2 x 12 A 1 x 24 A
10 mm² / 8 AWG	2 x 27 A 1 x 54 A	2 x 25 A 1 x 50 A	2 x 21 A 1 x 43 A	2 x 15 A 1 x 32 A
16 mm² / 6 AWG	2 x 30 A 1 x 60 A	2 x 27 A 1 x 55 A	2 x 24 A 1 x 48 A	2 x 18 A 1 x 36 A

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.



One redundancy module per power supply is required to decouple power supplies with nominal currents from 20 A to 40 A. Inputs 1 and 2 on the redundancy module must be connected to the power supply unit using two conductors. This is necessary because the maximum current carrying capacity of 30 A per input must not be exceeded. To connect the redundancy module to the power supply unit, we recommend using two conductors of the same length and with an identical cross section.



10.2 Output

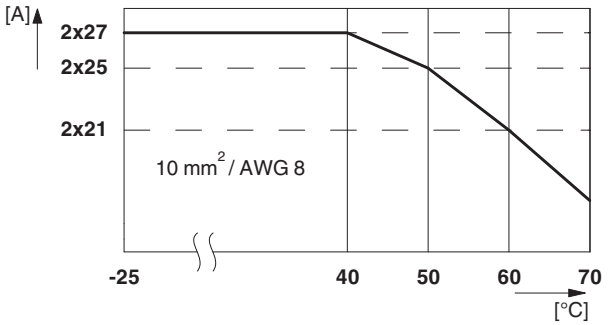
Only devices suitable for operation in the potentially explosive areas of zone 2 may be connected to the output of the redundancy module in zone 2.

Wire the load with the plus and minus terminals to the output of the redundancy module.

10.3 Temperature response

Horizontal mounting position

Figure 11 Derating diagram



In the horizontal mounting position (input terminal blocks facing upwards or downwards), the redundancy module can carry current loads up to a maximum of 2 x 27 A or 1 x 54 A at an ambient temperature up to 40 °C. Depending on the ambient temperature, the permissible current carrying capacity is reduced in the case of a conductor cross section of 10 mm².

A maximum of 2 x 21 A or 1 x 43 A can be permanently carried at an ambient temperature of 60 °C.

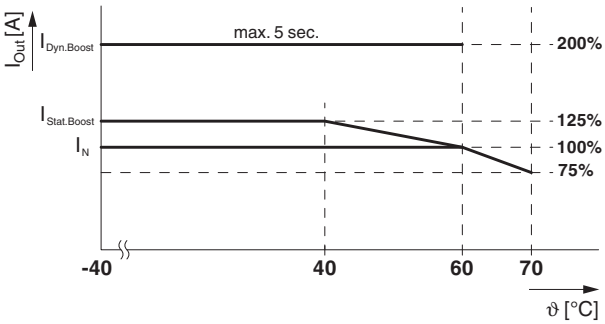
11 Derating

The redundancy module 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.

11.1 Ambient temperature

When operating the redundancy module at an ambient temperature of > 60°C, a power derating of 2.5%/K should be observed. Up to an ambient temperature of 40°C, the power of the static boost can be taken from the redundancy module for a sustained period. In the 40°C to 60°C temperature range, the redundancy module can output more than the nominal power for a sustained period.

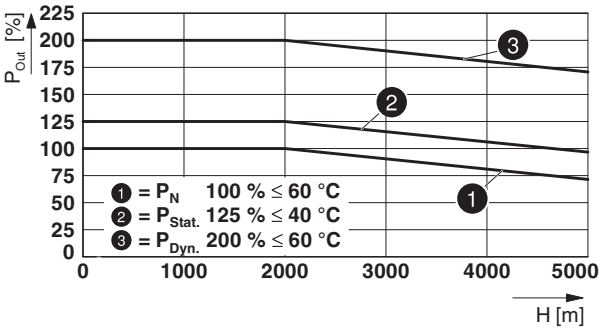
Figure 12 Output power depending on the ambient temperature



The redundancy module can be operated at an installation height of up to 5000 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.

11.2 Installation height

Figure 13 Output power depending on the installation height



11.3 Position-dependent derating

Position-dependent derating does not have to be taken into consideration.

The redundancy module can provide the full output power in all mounting positions.