QUINT4-CAP/24DC/5/4KJ

Capacity module

Data sheet
107575_en_01

1 Description

The QUINT capacity module combines an electronic switch-over unit and energy storage in the same housing. The capacity module stores the energy required to bridge mains failures in maintenance-free double-layer capacitors. Long mains buffering is possible depending on the required load current.

- Maximum energy efficiency
- High level of system availability due to high capacitor service life
- Large temperature range
- Electronic switchover unit and energy storage device in one housing
- USB interface for connection to higher-level controllers
- Maintenance-free, thanks to double-layer capacitors
- Space savings, thanks to the compact design
- Thanks to soft start, can be used with power supplies in the low power range

Technical data (short form)	
Nominal input voltage	24 V DC (SELV)
Input voltage range	22.5 V DC ... 30 V DC
Current consumption ($I_{No-Load}$ / I_{Charge} / I_{Max})	0.1 A / 0.8 A / 7 A
Activation threshold Undervoltage Overvoltage	 < 22 V DC > 30 V DC
Buffer time	3 min. (1 A) / 30 s (5 A)
Charging time (for completely discharged capacitors)	approx. 18 min.
Recharging time	approx. 12 min.
Nominal output voltage (U_N)	24 V DC
Nominal output current I_N / $I_{Stat. Boost}$	5 A / 6.25 A
Efficiency (with charged energy storage device)	> 97 %
MTBF (IEC 61709, SN 29500)	1900327 h (25 °C) 1301923 h (40 °C) 673204 h (60 °C)
Ambient temperature (operation)	-25 °C ... 60 °C (> 40 °C Derating: 1 %/K)
Dimensions W/H/D	94 mm / 130 mm / 125 mm
Weight	1.3 kg

All technical specifications are nominal and refer to a room temperature of 25 °C and 70% relative humidity at 2000 m above sea level.

2 Table of contents

3 Ordering data

Description	Type	Order No.	Pcs./Pkt.
QUINT capacity module, with maintenance-free energy storage based on double-layer capacitor, DIN rail mounting, input: 24 V DC, output: 24 V DC / 5 A / 4 kJ incl. mounted UTA 107 universal DIN rail adapter. The “POWER MANAGEMENT SUITE” software (Order No. 1252232) available in the download area can be used for configuration.	QUINT4-CAP/24DC/5/4KJ	2320539	1

Accessories	Type	Order No.	Pcs./Pkt.
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
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
Used for communication between an industrial PC and Phoenix Contact devices with USB-Mini-B connection.	MINI-SCREW-USB-DATACABLE	2908217	1
Configuration and management software	POWER MANAGEMENT SUITE	1252232	1

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

4 Technical data

Input data	
Nominal input voltage	24 V DC (SELV)
Input voltage range	22.5 V DC ... 30 V DC
Dielectric strength	max. 35 V DC (Reverse polarity protection)
Activation threshold Undervoltage Overvoltage	 < 22 V DC > 30 V DC
Voltage drop, input/output	0.5 V DC
Buffer time	3 min. (1 A) / 30 s (5 A)
Charging time ( )	approx. 18 min.
Recharging time	approx. 12 min.
Current consumption I_N (U_N, $I_{Out} = I_N$, $I_{Charge} = 0$) $I_{No\text{-}Load}$ (U_N, $I_{Out} = 0$, $I_{Charge} = 0$) I_{Charge} (U_N, $I_{Out} = 0$, I_{Charge} = max) I_{Max} (U_N, $I_{Out} = I_{Stat.Boost}$, I_{Charge} = max)	 7 A (max.) 0.1 A 0.8 A 7 A
Power consumption P_N (U_N, $I_{Out} = I_N$, $I_{Charge} = 0$) $P_{No\text{-}Load}$ (U_N, $I_{Out} = 0$, $I_{Charge} = 0$) P_{Charge} (U_N, $I_{Out} = 0$, I_{Charge} = max) P_{Max} (U_N, $I_{Out} = I_{stat.Boost}$, I_{Charge} = max)	 124 W 2.5 W 24 W 180 W
Inrush current	≤ 7 A (≤ 4 ms)
Internal input fuse	no
Switch-on time in buffer mode	1 ms

Input connection data	
Connection method	Screw connection
Conductor cross section, rigid	0.2 mm² ... 2.5 mm²
Conductor cross section, flexible	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule with plastic sleeve	0.25 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.25 mm² ... 2.5 mm²
2 conductors with same cross section, solid	0.2 mm² ... 0.75 mm²
2 conductors with same cross section, stranded	0.2 mm² ... 0.75 mm²
Two conductors with the same cross section, flexible, with TWIN ferrule with plastic sleeve	0.5 mm² ... 1.5 mm²
Conductor cross section AWG	30 ... 12
Stripping length	6.5 mm
Torque	0.5 Nm ... 0.6 Nm

Output data (mains operation)	
Nominal output voltage U_N (depending on the input voltage)	24 V DC
Nominal output current I_N / $I_{Stat. Boost}$	5 A / 6.25 A
Output power P_N (U_N, $I_{Out} = I_N$, $I_{Charge} = 0$) $P_{Stat.Boost}$ (U_N, $I_{Out} = I_{Stat.Boost}$, $I_{Charge} = 0$)	 120 W 150 W
Power dissipation No load (U_N, $I_{Out} = 0$, $I_{Charge} = 0$) Nominal load (U_N, $I_{Out} = I_N$, $I_{Charge} = 0$)	 2.5 W 4 W
Short-circuit-proof	yes (with input fuse)
No-load proof	yes
Output data (buffer mode)	
Nominal output voltage U_N (typical)	22 V DC
Nominal output current I_N / $I_{Stat. Boost}$	5 A / 6.25 A
Output power P_N (U_N, $I_{Out} = I_N$, $I_{Charge} = 0$) $P_{Stat.Boost}$ (U_N, $I_{Out} = I_{Stat.Boost}$, $I_{Charge} = 0$)	 120 W 150 W
Short-circuit-proof	yes
No-load proof	yes
Efficiency	
with charged energy storage device	> 97 %
MTBF (IEC 61709, SN 29500)	
	1900327 h (25 °C) 1301923 h (40 °C) 673204 h (60 °C)
Output connection data	
Connection method	Screw connection
Conductor cross section, rigid	0.2 mm² ... 2.5 mm²
Conductor cross section, flexible	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule with plastic sleeve	0.25 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.25 mm² ... 2.5 mm²
2 conductors with same cross section, solid	0.2 mm² ... 0.75 mm²
2 conductors with same cross section, stranded	0.2 mm² ... 0.75 mm²
Two conductors with the same cross section, flexible, with TWIN ferrule with plastic sleeve	0.5 mm² ... 1.5 mm²
Conductor cross section AWG	30 ... 12
Stripping length	6.5 mm
Torque	0.5 Nm ... 0.6 Nm

Signal state U_{In} OK	
Connection labeling	3.1, 3.2
Channel	DO (digital output)
Switch contact (floating 13/14)	Electronic relays (OptoMOS)
State (configurable)	U_{In} OK
State condition (configurable)	U_{IN} > 22.5 V DC, U_{IN} < 30 V DC
Output voltage	max. 30 V
Output can be loaded	300 mA
State - signal assignment	active - high
LED status indicator	green (U_{In} OK)
Alarm signal state	
Connection labeling	3.3
Channel	DO (digital output)
Switching output	Transistor
State (configurable)	Group alarm
State condition (configurable)	Alarm
Output voltage	24 V (U_N - 1 V (typical))
Output can be loaded	max. 20 mA
State - signal assignment	active - low
Reference potential	3.6 (SGnd, identical to 1.2, 2.2)
LED status indicator	red (Alarm)
Ready signal state	
Connection labeling	3.4
Channel	DO (digital output)
Switching output	Transistor
State (configurable)	Ready
State condition (configurable)	State of charge = 100% or buffer mode
Output voltage	24 V (U_N - 1 V (typical))
Output can be loaded	max. 20 mA
State - signal assignment	active - high
Reference potential	3.6 (SGnd, identical to 1.2, 2.2)
LED status indicator	Green (state of charge - SOC)
Remote signal state	
Connection labeling	3.5
Channel	DI (digital input)
State (configurable)	Remote
State condition	Remote
Low signal High signal	<3 kΩ to SGnd open (>470 kΩ between Remote and SGnd)
Signal - state assignment	low - active
Reference potential	3.6 (SGnd, identical to 1.2, 2.2)

Signal ground SGnd	
Connection labeling	3.6
Switching voltage	0 V
Current carrying capacity	max. 60 mA
Function	Signal ground
Reference potential	3.3 Alarm, 3.4 Ready, 3.5 Remote

Signal connection data	
Connection method	Push-in connection
Conductor cross section, rigid	0.2 mm² ... 1.5 mm²
Conductor cross section, flexible	0.2 mm² ... 1.5 mm²
Conductor cross section flexible, with ferrule with plastic sleeve	0.2 mm² ... 0.75 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 1.5 mm²
Conductor cross section AWG/kcmil	24 ... 18
Stripping length	8 mm

Data interface	
Interface designation	USB (Modbus/RTU)
Connection labeling	5.1
Number of interfaces	1
Connection method	MINI-USB Type B
Locking	Screw
Transmission physics	USB 2.0
Topology	Point-to-point
Transmission speed	9600 baud
Transmission length	max. 5 m
Access time	≤ 2 s
Chipset	Silicon Labs CP2104-F03-GM
Electrical isolation	Yes, UL approved

General data	
Storage medium	Double-layer capacitor
Insulation voltage input, output / housing	500 V
Degree of protection	IP20
Protection class	III (SELV)
Inflammability class in acc. with UL 94 (housing / terminal blocks)	V0
Overvoltage category UL 60950-1	II
Connection in parallel	no
Connection in series	no
Mounting position	horizontal DIN rail NS 35, EN 60715
Installation height	≤ 4000 m
Dimensions W / H / D (state of delivery)	94 mm / 130 mm / 125 mm
Weight	1.3 kg

Ambient conditions	
Ambient temperature (operation)	-25 °C ... 60 °C (> 40 °C Derating: 1 %/K)
Ambient temperature (start-up type tested)	-40 °C
Ambient temperature (storage/transport)	-40 °C ... 60 °C
Max. permissible relative humidity (operation)	≤ 95 %
Degree of pollution	2
Vibration (operation)	0,7g
Shock	30g, 18 ms per spatial direction (in accordance with IEC 60068-2-27)
Climatic class	3K3 (in acc. with EN 60721)

Standards	
Protective extra-low voltage	UL 61010-2-201

Approvals	
UL	cULus Listed: UL/C-UL Listed UL 508 CAN/CSA-C22.2 No. 107.1-01 UL/C-UL Recognized UL 60950-1 UL ANSI/ISA-12.12.01 Class I, Division 2, Groups A, B, C, D (Hazardous Location)
CB Scheme	UL 60950-1

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

Electromagnetic compatibility / Conformance with EMC Directive 2014/30/EU		
Noise emission in accordance with EN 61000-6-3 and EN 61000-6-4		
CE basic standard	**Minimum normative requirements**	**Higher requirements in practice (covered)**
Noise emission EN 55016	EN 61000-6-4	EN 61000-6-3

Device immunity in accordance with EN 61000-6-2		
CE basic standard	**Minimum normative requirements**	**Higher requirements in practice (covered)**
Electrostatic discharge EN 61000-4-2		
Housing contact discharge	4 kV (Test Level 2)	6 kV (Test Level 3)
Housing air discharge	8 kV (Test Level 3)	8 kV (Test Level 3)
Comments	Criterion B	Criterion B
Electromagnetic HF field EN 61000-4-3		
Frequency range	80 MHz ... 1 GHz	80 MHz ... 6 GHz
Test field strength	10 V/m	10 V/m
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)
Comments	Criterion B	Criterion B
Surge voltage load (surge) EN 61000-4-5		
Input/Output	1 kV (Test Level 2 - symmetrical) 2 kV (Test Level 3 - asymmetrical)	1 kV (Test Level 2 - symmetrical) 2 kV (Test Level 3 - asymmetrical)
Comments	Criterion B	Criterion B
Conducted interference EN 61000-4-6		
Frequency range	0.15 MHz ... 80 MHz	0.15 MHz ... 80 MHz
Voltage	10 V	10 V
Comments	Criterion A	Criterion A

Signal immunity in accordance with EN 61000-6-2		
CE basic standard	**Minimum normative requirements**	**Higher requirements in practice (covered)**
Fast transients (burst) EN 61000-4-4		
Signal	2 kV (Test Level 3 - asymmetrical)	2 kV (Test Level 3 - asymmetrical)
Comments	Criterion B	Criterion B
Surge voltage load (surge) EN 61000-4-5		
Signal	1 kV (Test Level 2 - asymmetrical)	1 kV (Test Level 2 - asymmetrical)
Comments	Criterion B	Criterion B
Conducted interference EN 61000-4-6		
Frequency range	0.15 MHz ... 80 MHz	0.15 MHz ... 80 MHz
Voltage	10 V	10 V
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.

5 Safety regulations 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.

This indicates that the device can be hot and should not be touched without taking care.

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.
- Never carry out work when voltage is present.
- Only remove equipment when it is disconnected and not in the potentially explosive area.
- Establish connection correctly and ensure protection against electric shock.
- Ensure cables are the correct size for the maximum input/output current and have fuse protection.
- Cover termination area after installation in order to avoid accidental contact with live parts (e. g., installation in control cabinet).
- Keep flames, embers or sparks away from the module.
- If the capacity module is disconnected from the power supply, there may still be a residual charge/voltage.

CAUTION: Hot surface

The housing can become hot, depending on the ambient temperature and device load.

NOTE

- Observe the national safety and accident prevention regulations.
- Assembly and electrical installation must correspond to the state of the art.
- The capacity module is a built-in device. The IP20 degree of protection of the device is intended for use in a clean and dry environment.
- The device must be installed in a control cabinet that can be locked and only opened by specialist staff.
- Observe mechanical and thermal limits.
- Horizontal mounting (terminals on top)
- Ensure sufficient convection (minimum gap above/ below: 50 mm). Housing can become hot.
- Use copper cables for operating temperatures of >75 °C.
- Refer to the corresponding tables (see Section: Technical data) for the connection parameters, such as the necessary stripping length for wiring with and without ferrule.
- Use ferrules for flexible cables.
- Protect the device against foreign bodies penetrating it, e.g., paper clips or metal parts.
- The device may only be used for its intended use.
- Improper use invalidates the device protection.
- The capacity module is maintenance free and may not be opened.
- Before transport, the capacity module must be completely discharged.
- A suitable fire and electrical enclosure must be provided in the end application.

More follows

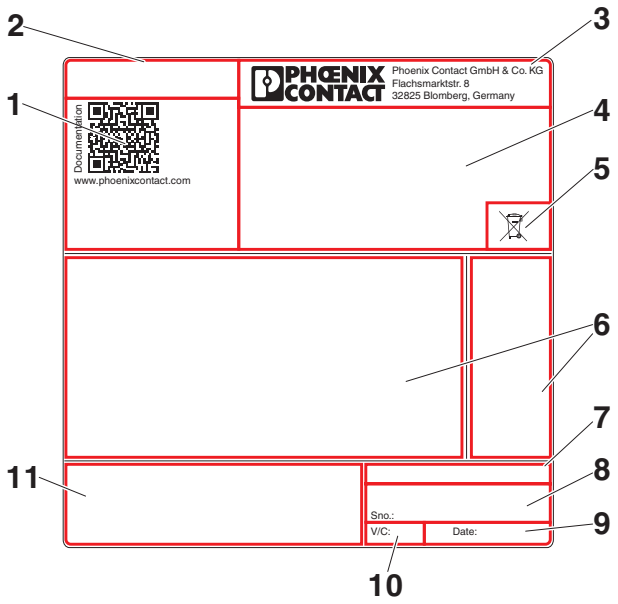
- Do not exceed max. input/output current of 8 A. Use current-limited source, e. g., QUINT POWER or suitable fuse.
- Keep these instructions in a safe place – this data sheet contains important safety notes which must be observed during installation and maintenance of the device.

6 Design

6.1 Rating plate

The rating plate for the capacity module is located on the right-hand side of the housing (viewed from the front).

Figure 1 Rating plate information

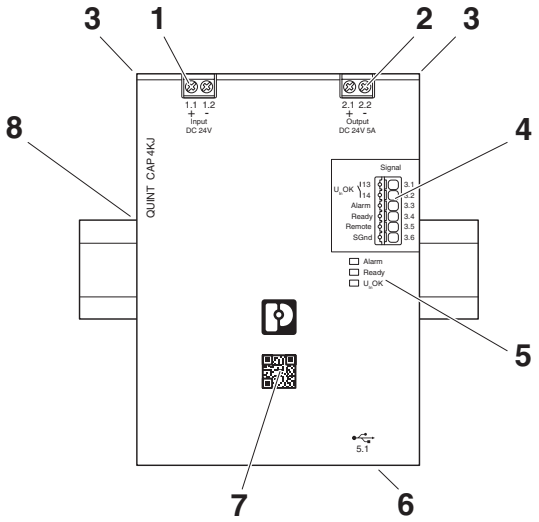


Key

No.	Designation
1	QR code as web link to the device documentation
2	Device designation and order number
3	Identification of the provider
4	Device connection data
5	Note on disposal
6	Device approvals
7	Production site of the Phoenix Contact Group
8	Bar code and serial number for device identification
9	Date of manufacture
10	Device version
11	Warning notice and note on device documentation accompanying the product

6.2 Function elements

Figure 2 Position of the function elements



Key

No.	Designation	Connection labeling
1	Connection terminal blocks for DC input (Input + / -)	1.1, 1.2
2	Connection terminal blocks for DC output (Output + / -)	2.1, 2.2
3	Accommodation for cable binders	
4	Signaling connection terminal blocks	3.1 ... 3.6
5	Status and diagnostics indicators	
6	USB interface MINI type B (bottom of device)	5.1
7	QR code web link	
8	Universal DIN rail adapter (rear of housing)	

6.3 Device dimensions and keep-out areas

Figure 3 Keep-out areas

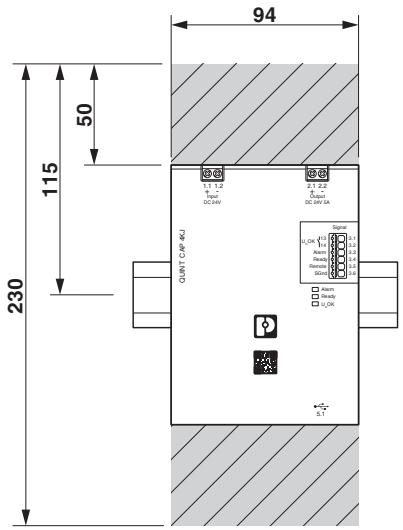
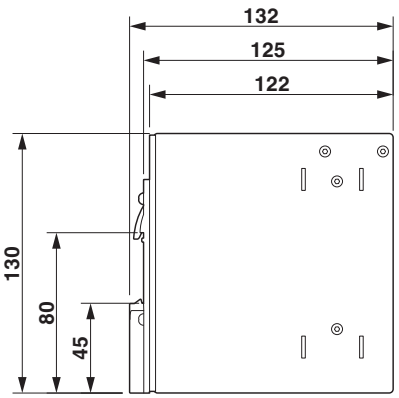
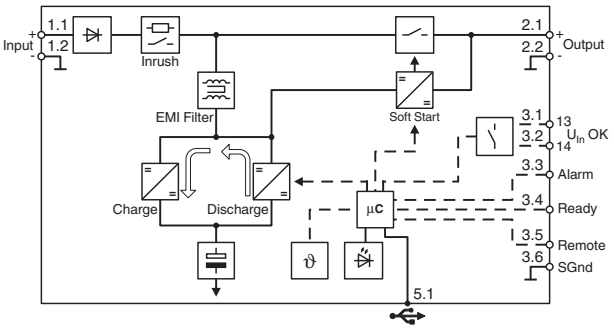


Figure 4 Device dimensions



6.4 Block diagram

Figure 5 Block diagram



Key

Symbol	Meaning
	Reverse polarity protection
	Inrush current limitation
	Switch
	EMI filter
	Electrolytic capacitor
	DC/DC converter
µC	Microprocessor
	Temperature sensor
	LED

7 Mounting and removing

The device must be installed in a control cabinet that can be locked and only opened by specialist staff.

7.1 Convection

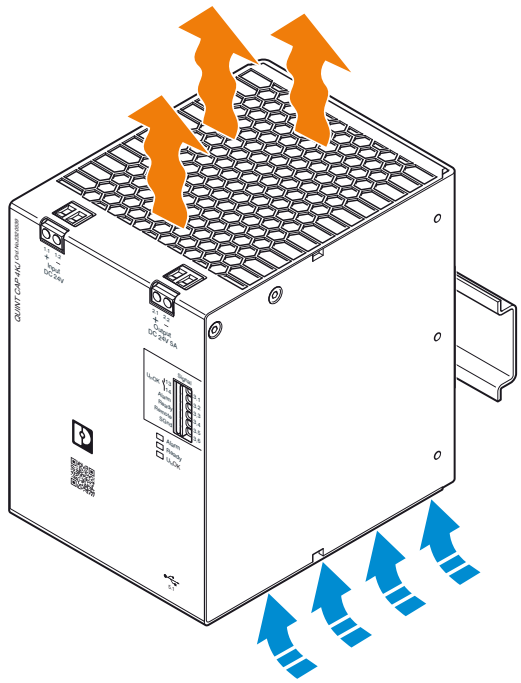
CAUTION: Hot surface

The housing can become hot, depending on the ambient temperature and device load.

NOTE: enable convection

In order to ensure sufficient convection, we recommend a minimum vertical distance of 50 mm to the other devices.

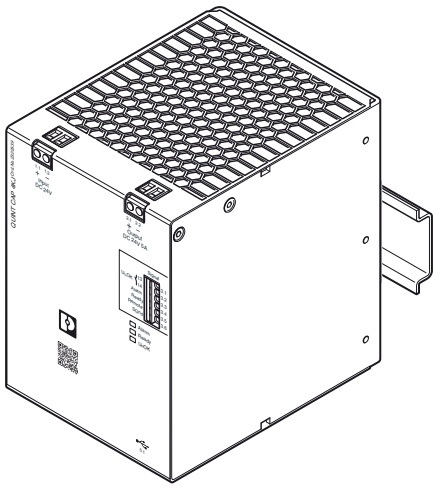
Figure 6 Convection



7.2 Normal mounting position

The device can be snapped onto all DIN rails according to EN 60715 and should only be mounted in the normal mounting position.

Figure 7 Normal mounting position

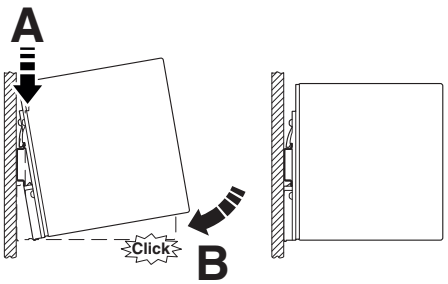


7.3 Mounting the capacity module

Proceed as follows to mount the device:

1. In the normal mounting position the device 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 device down until the universal DIN rail adapter audibly latches into place (B).
3. Check that the device is securely attached to the DIN rail.

Figure 8 Snapping onto the DIN rail



7.4 Removing the capacity module

WARNING:Never carry out work when voltage is present!

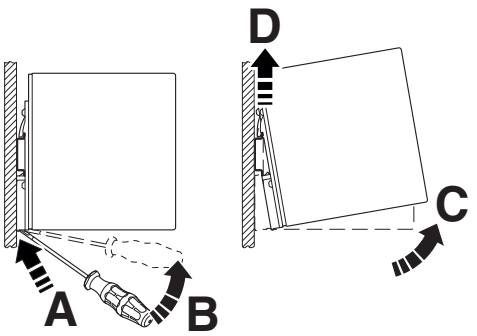
Switch off the supply voltage and ensure it cannot be switched on again!

Disconnect the connecting cables before you remove the device.

Proceed as follows to remove the device:

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 device forward (C) so that the lock slides back into the starting position.
4. Then separate the device from the DIN rail (D).

Figure 9 Removing from the DIN rail



7.5 Wall mounting

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

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

The maximum tightening torque of the Torx screw (Torx® T10) is 0.9 Nm.

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

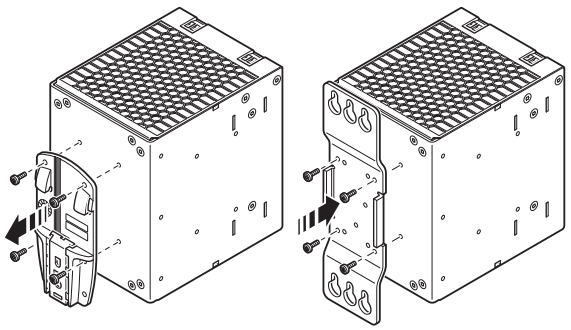
7.5.1 Mounting the UWA 182/52 universal wall adapter

The UWA 182/52 universal wall adapter (Order No. 2938235) is attached to the device by means of the Torx screws of 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. Remove the universal DIN rail adapter from the rear of the device.
3. Position the universal wall adapter in such a way that the keyholes or oval tapers face up. The mounting surface for the device is the raised section of the universal wall adapter.
4. Insert the Torx screws into the appropriate hole pattern on the universal wall adapter so that the necessary mounting holes of the device can be accessed.
5. Screw the universal wall adapter onto the device.

Figure 10 Mounting the UWA 182/52 universal wall adapter



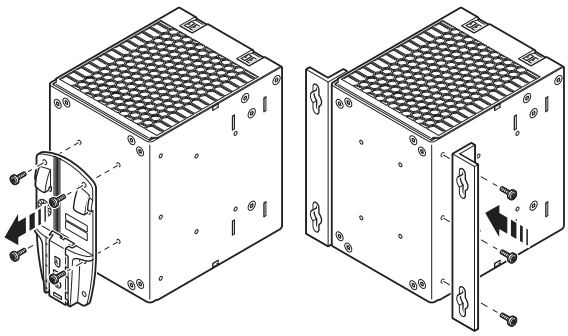
7.5.2 Mounting the UWA 130 2-piece universal wall adapter

The UWA 130 universal wall adapter (Order No. 2901664) is attached to the device using the Torx screws provided.

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 device.
3. Position the two-piece universal wall adapter on the right and left side of the housing.
4. Insert the Torx screws into the appropriate hole pattern on the universal wall adapter so that the necessary mounting holes of the device can be accessed.
5. Screw the two-piece universal wall adapter onto the device.

Figure 11 Mounting the UWA 130 universal wall adapter

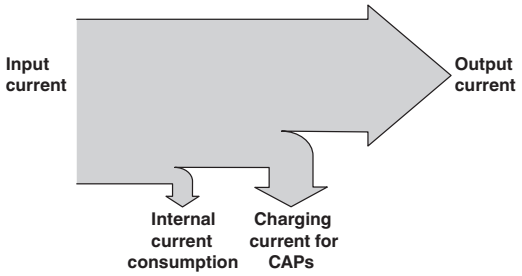


8 Device connection

8.1 Electrical installation design

When designing the electrical installation of the capacity module, take the technical data on charging current, self-consumption and loads to be supplied into consideration.

Figure 12 Electrical installation layout



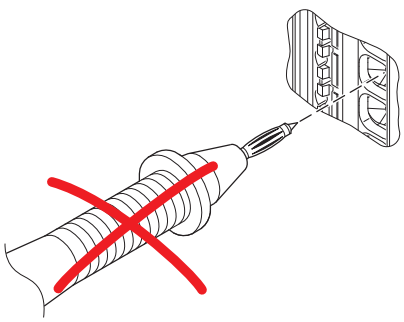
8.2 Connection parameters

For the connection parameters, including the required stripping length for wiring with and without ferrule, refer to the Section: Technical data.

9 Device connection terminal blocks

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

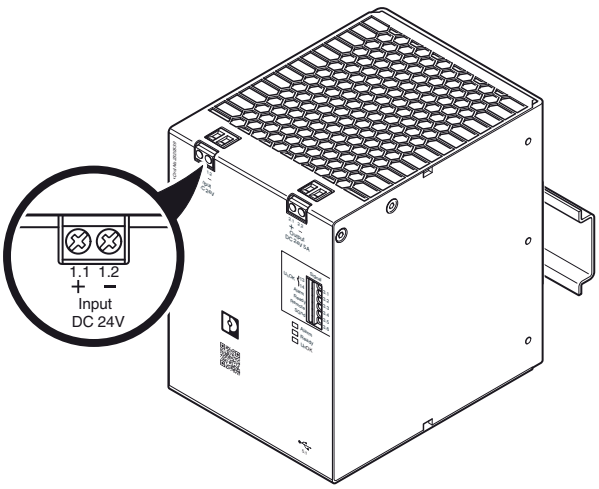
Do not plug test pins into the Push-in connection terminal blocks. The maximum pluggable depth of the Push-in connection terminal blocks is limited. In addition, when the test pin is plugged in, the unlocking button (pusher) is covered to such an extent that unlocking is not possible or only possible 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.



9.1 DC input connection terminal blocks

The supply voltage is connected via the Input + / - connection terminal blocks.

Figure 13 Input voltage connection terminal blocks: Input +/- (1.1, 1.2)



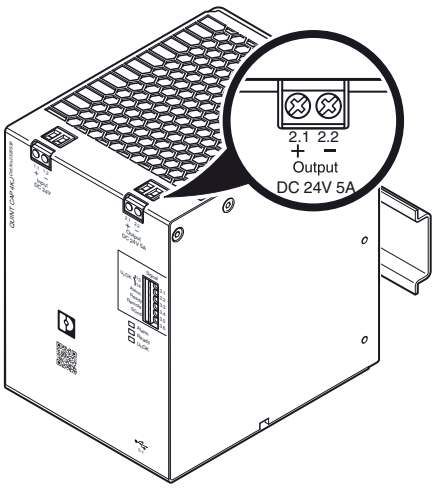
9.1.1 Protection of the primary side

Do not exceed max. input/output current of 8 A. Use current-limited source, e. g., QUINT POWER or suitable fuse.

9.2 DC output connection terminal blocks

The output voltage is connected via the "Output" connection terminal blocks.

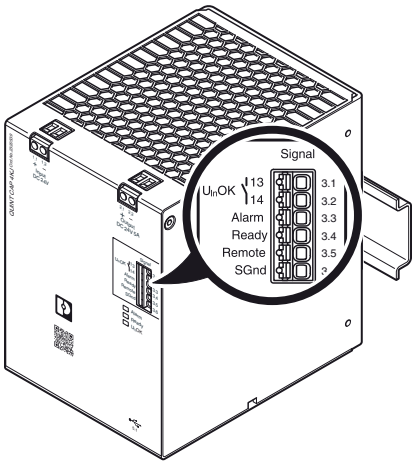
Figure 14 Output voltage connection terminal blocks: Output +/- (2.1, 2.2)



9.3 Connection terminal block signaling

The signals are connected via the Push-in connection terminal blocks for signaling.

Figure 15 Connection terminal block signaling (3.1 ... 3.6)



9.4 Securing the connection wiring

NOTE: Mechanical damage to the connection wiring caused by friction

In the event of extreme ambient conditions, e.g. strong vibrations, friction can be generated between the connection wiring and cable tie. 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 ties are attached.

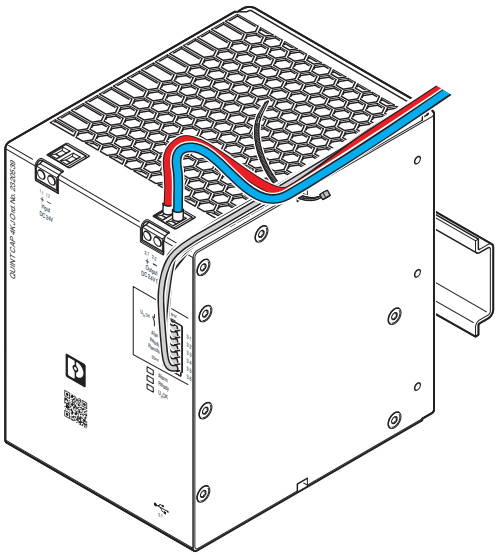
NOTE:

When wiring or disconnecting the connections, observe the bend radii specified by the manufacturer.

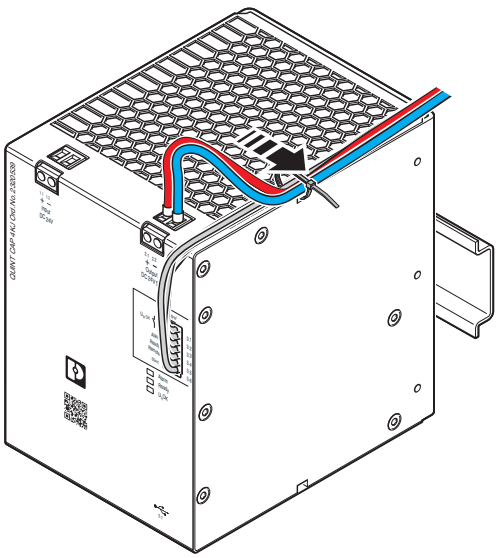
Two receptacles for the bundled attachment of the connection wiring are integrated in the left and right housing panel. Use cable ties to secure the connection wiring (optional WT-HF 3,6X140 - Order No. 3240744).

Secure the connection wiring as follows:

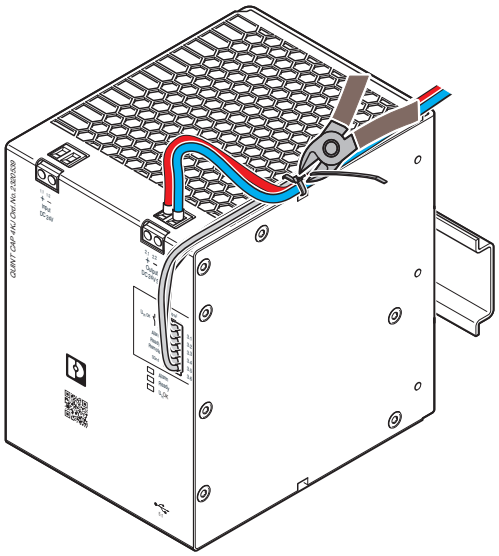
– Wire the device with sufficient connection reserves (input terminal blocks and output terminal blocks).
– Bundle and lay out the connection wiring such that the ventilation slots on the top of the housing are covered as little as possible
– Thread the cable tie through the opening provided on the top of the housing



– Tighten the cable tie
– When doing so, ensure that the connection wiring is attached safely and securely without damaging the connection wiring



– Shorten the excess length of the cable ties.

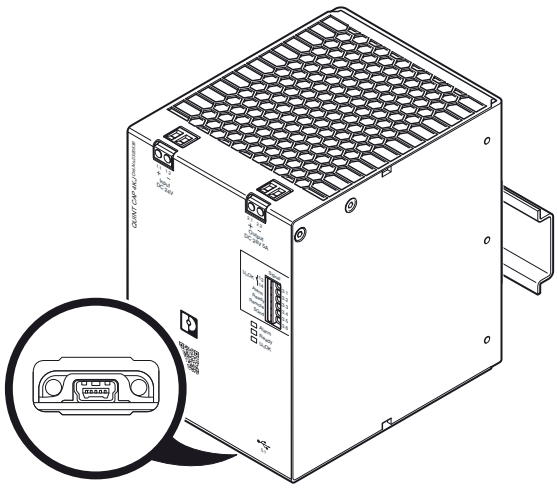


10 Communication interface

10.1 Communication via the USB interface

The capacity module is equipped with a USB Mini type B interface for data transmission.

Figure 16 Service USB interface Mini type B (device bottom) (5.1)



You can set individual parameters and perform a controlled shutdown of the PC via the USB interface. To do so, connect the capacity module to the PC using the USB connection cable.

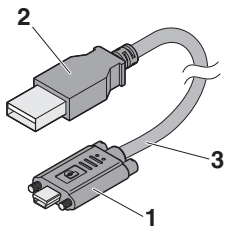
In this case of point-to-point coupling (Modbus/RTU protocol), the connected PC will continue to operate after a mains failure. Buffer mode guarantees availability until all of the data from the PC buffer has been saved. The PC subsequently performs a controlled shutdown. The PC is restarted when the mains voltage is restored.

The optional USB connection cable (MINI-SCREW-USB-DATACABLE, Order No. 2908217) is required for controlled shutdown in PC mode.

10.1.1 MINI-SCREW-USB-DATACABLE

The device is connected to the USB interface on the PC via the USB Mini type B interface with data cable MINI-SCREW-USB-DATACABLE (order number 2908217).

Figure 17 MINI-SCREW-USB-DATACABLE

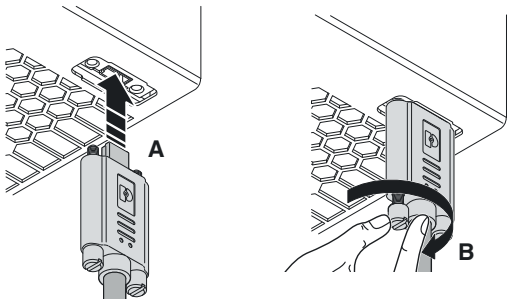


No.	Designation
1	Mini type B USB connector with screw connection
2	USB plug type A
3	Cable length: 3 m

NOTE: Damage

Tighten the screws with your fingers. If you use a tool instead, do not exceed a maximum torque of 0.2 Nm.

Figure 18 Connecting USB data cables



10.2 Modbus/RTU

The Modbus protocol is a communication protocol based on a client/server or controller/device architecture. Modbus/RTU is a point-to-point connection via USB interface.

To communicate with the capacity module, you must connect the device to the PC via the USB interface. Use the MINI-SCREW-USB-DATACABLE (Order No. 2908217) for this.

Observe the following settings for communication with a Modbus protocol:

Parameter setting for the virtual COM port via the USB interface

Order No.	Designation	Baud rate
2320539	QUINT4-CAP/24DC/5/4KJ	9600 baud

Parameter	Settings
Start bit	1
Data Bits	8
Parity	Even
Stop Bits	1

In the POWER MANAGEMENT SUITE software, these settings are already specified as default values.

Detailed information on Modbus/RTU is available in the download area in the supplementary document: Modbus/RTU communication for CAP modules.

11 Device operation

11.1 Functions in buffer mode

The capacity module provides the following functions in buffer mode:

1. Time-limit mode
2. PC mode

11.1.1 Time-limit mode (default setting)

You can activate the time-limit mode function via the POWER MANAGEMENT SUITE software.
The capacity module supplies the connected loads for the time set. After this time expires, the device switches off. Once the mains voltage returns, the device output switches on. This only happens in buffer mode.

11.1.2 PC mode

The PC mode function enables the controlled shutdown and startup of the PC connected via USB at the times set. You can set these times via the POWER MANAGEMENT SUITE software.

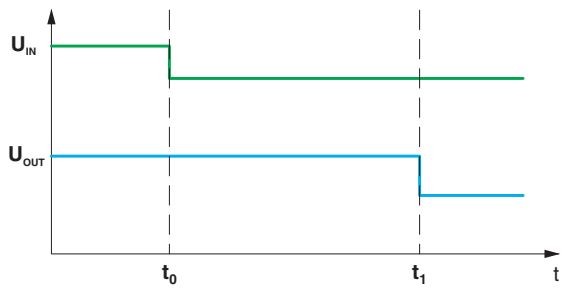
11.2 Setting the buffer time

You can set the required buffer time in the POWER MANAGEMENT SUITE software. To do this, activate the “Buffer time Custom” control field. In this setting, buffer mode is ended after the entered amount of time. If the configuration is 0 (mm:ss), all the capacity module’s available power is supplied.

Default setting: 0 (mm:ss)

Particularly with respect to cyclical applications, the recharging time is reduced when configuring the buffer time because a corresponding level of power remains in the storage capacitors (depending on the buffer time).

Figure 19

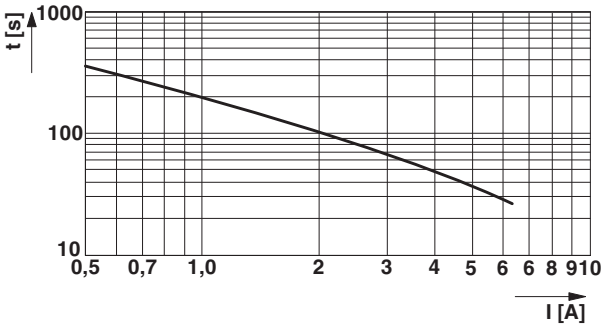


t_0: mains power failure

t_1: after the preset buffer time has expired, the output is switched off

Refer to the following diagram for possible buffer times for varying discharge currents.

Figure 20 Buffer time/discharge current diagram



11.2.1 PC mode configuration

In PC mode, you can individually configure the buffer mode’s chronological sequence using the POWER MANAGEMENT SUITE software.

Activate the "PC mode" control field to switch to the PC mode of the capacity module:

The following components are required for the PC mode function:

Data cable MINI-SCREW-USB-DATACABLE (Order No. 2908217)

POWER MANAGEMENT SUITE software (Order No. 1252232)

In the event of a mains failure, one PC can continue to work, perform a controlled shutdown, and restart automatically.

You can set the following times in the POWER MANAGEMENT SUITE software:

1: Delay time

If the mains supply is not restored during the delay time, the PC is shut down.

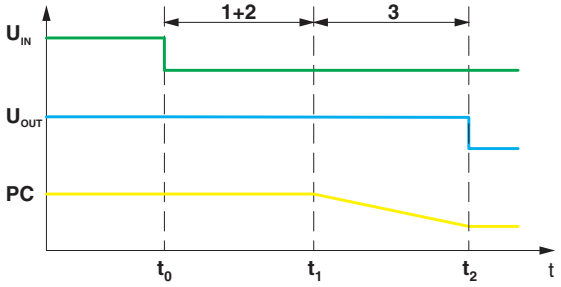
2: Program runtime

After the delay time has expired, it is possible to start a program.

3: PC shut-down

The time required for PC shutdown is set here.

Figure 21



t_0: mains power failure

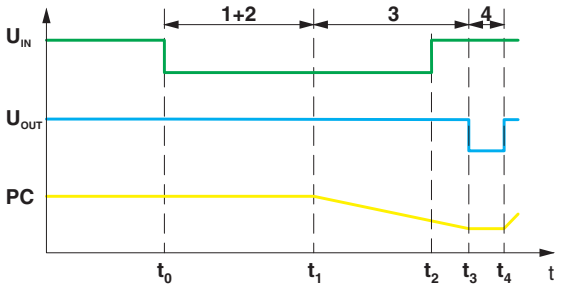
t_1: delay time and program runtime have expired, PC will be shut down

t_2: the PC has shut down, the output will be switched off

4: PC no-load time

Only if the PC is shut down and the mains supply is restored in the meantime is the output voltage interrupted for the PC standby time and the PC then started automatically.

Figure 22



t_0: mains power failure

t_1: delay time and program runtime have expired, PC will be shut down

t_2: mains restored while PC is shutting down

t_3: the PC has shut down and the output will be switched off, PC no-load time starts

t_4: the PC no-load time has expired, PC is starting back up

11.3 Remote

You can use the Remote signal terminal to:

1. Deactivate buffer mode
2. Shut down the PC immediately
3. Shut down the PC immediately in buffer mode
4. Switch on/off the output of the capacity module

To perform these steps, you must connect the Remote signal terminal to the SGnd signal terminal.

You can set the various functions in the POWER MANAGEMENT SUITE software. To do this, activate the corresponding radio buttons.

1. Remote disables buffer mode

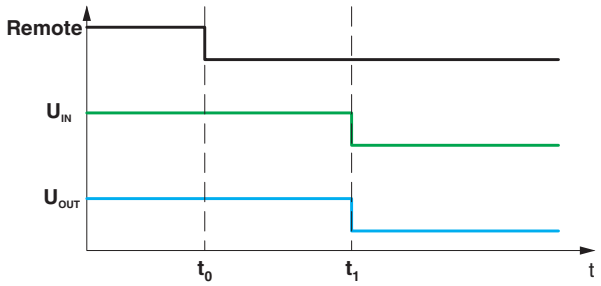
You can deactivate buffer mode using this function. This function is always active when a buffer time has been preset.

This function is the default setting in PC mode.

In mains operation, the remote signal is indicated by the flashing green LED (see section: Signaling).

In the event of mains failure, buffer mode is not started.

Figure 23

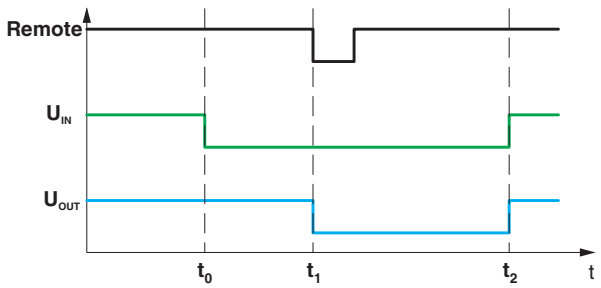


t_0: remote signal is set in mains operation

t_1: no input voltage, output will be switched off

If the remote signal is set in buffer mode, then buffer mode is exited immediately. The output of the capacity module is switched off. This procedure cannot be reversed. The capacity module is only activated once the input voltage is applied.

Figure 24



t_0: mains power failure

t_1: remote signal is set in buffer mode, the output is switched off

t_2: input voltage restored, output will be switched on

2. Remote starts undelayed PC-Shutdown

You can shut down the PC immediately via the POWER MANAGEMENT SUITE software.

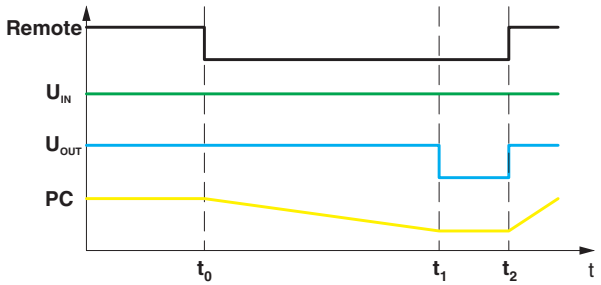
This setting only applies in PC mode.

The remote signal is indicated by the flashing green LED (see section: Signaling).

The PC shuts down, and the delay time under Item 1 is skipped (see PC mode section).

Once the PC has shut down, the capacity module output is switched off. When input voltage is present, the capacity module remains charged and the system is ready to use. When you reset the remote signal, the capacity module output is switched on again.

Figure 25



t_0: remote signal is set during mains operation, PC will be shut down

t_1: PC has shut down, output will be switched off

t_2: remote signal will be reset, output will be switched back on

Once the PC has shut down in buffer mode, the capacity module output is switched off. This procedure cannot be reversed. The capacity module is only activated once the input voltage is applied.

3. Remote starts undelayed PC-Shutdown only in buffer mode

You can shut down the PC immediately upon going into buffer mode using the POWER MANAGEMENT SUITE software.

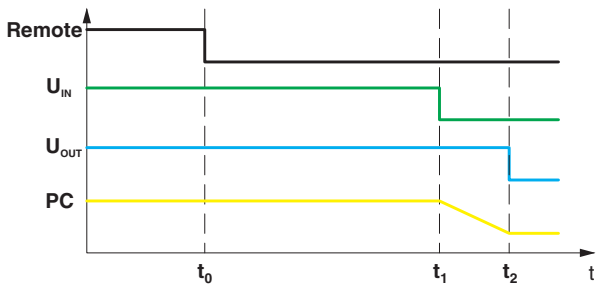
This setting only applies in PC mode.

The remote signal is indicated by the flashing green LED (see section: Signaling).

If the remote signal is set in mains operation, the PC is shut down when buffer mode is entered. The delay time under Item 1 is skipped (see “PC mode” section).

Once the PC has shut down in buffer mode, the capacity module output is switched off. This procedure cannot be reversed. The capacity module is only activated once the input voltage is applied.

Figure 26



t_0: remote signal is set in mains operation

t_1: no input voltage, PC shutdown begins immediately

t_2: the PC has shut down, the output will be switched off

4. Remote switches the output

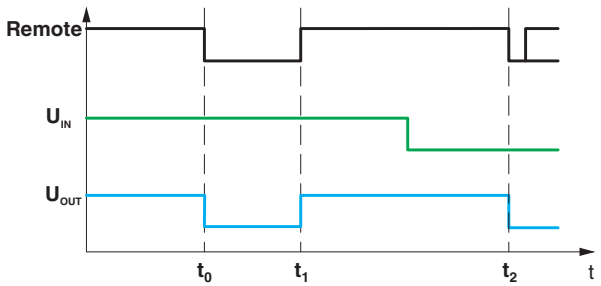
You can use this function to switch on/off the output of the capacity module.

This function is only available if a buffer time has been set.

The remote signal is indicated by the flashing green LED (see section: Signaling).

If the remote signal is set in buffer mode, then buffer mode is exited immediately. The output of the capacity module is switched off. This procedure cannot be reversed. The capacity module is only activated once the input voltage is applied.

Figure 27



t_0: remote signal is set in mains operation, output will be switched off

t_1: the remote signal will be reset, output will be switched back on

t_2: remote signal is set in buffer mode, the output is switched off

11.4 Switch-on delay

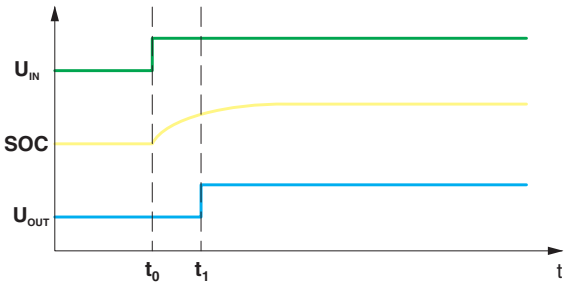
You can use this function to switch on the capacity module output based on the charging state of the storage capacitors.

The "buffer-ready threshold value" refers to the charging state of the storage capacitors and also has an effect on signaling.

You can use the corresponding selection fields in the POWER MANAGEMENT SUITE software to activate and configure parameters for this function.

The switch-on delay ensures that a system does not switch on until a certain level of power is available in the storage capacitors. As a result, a mains failure can be bypassed for a specific amount of time.

Figure 28



t_0: the input voltage is present, the storage capacitors are charged

t_1: the configured support bar has been reached, the output is switched off

11.5 Bypass function (default setting)

You can activate the bypass function via the POWER MANAGEMENT SUITE software.

As soon as the critical external temperature ≥80°C is reached, the capacity module automatically blocks and signals an alarm. The red LED indicator alarm flashes permanently. The device output remains switched off until the external temperature drops to <75°C. The module remains blocked.

The blocked capacity module continues to be supplied via the grid. The load supply is maintained via the bypass function of the capacity module.

The manufacturer can analyze the device and unlock it.

You can find detailed information on the signal states in Section: Signaling. Further information on protection against overtemperature is to be found in Section: Safety functions.

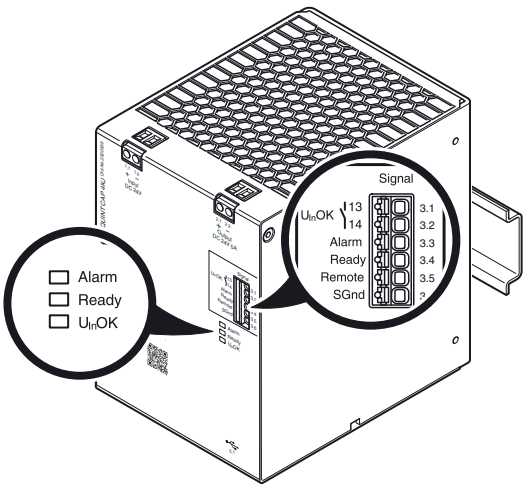
12 Signaling

Information on the software setting for signaling via the POWER MANAGEMENT SUITE is available in the Section: Software.

Various LED indicators are available for visual function monitoring of the module. Active signal outputs can be used to forward this data to a higher-level control system.

12.1 Connection terminal block signaling

Figure 29 Connection terminal block signaling (3.1 ... 3.6)



Key

Connection labeling	Designation	Function
3.1, 3.2	U_{In} OK: 13/14	Mains voltage OK
3.3	Alarm	Alarm
3.4	Ready	Buffer Ready
3.5	Remote	Start/stop buffer mode
3.6	SGnd	Signal ground

12.2 LED status indicators

On the right side of the device front, three LEDs (Alarm, Ready, U_{In} OK) signal the device status of the capacity module.

Figure 30 LED status indicators for device status

Alarm

Ready

U_{In} OK

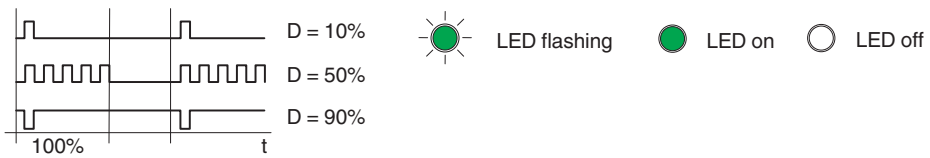
For module signaling and the corresponding states, please refer to the following tables.

12.3 Signaling in operation

Figure 31

Status LED			Switching OUTPUT			Note
U_{In} OK (green)	READY (green)	ALARM (red)	U_{In} OK	READY	ALARM	
○	○	○	open	low	low	Device off.
●	●	●	open	low	low	Initialization, LED test (~3 sec.)
●	●	○	closed	high	high	Mains operation, buffer is ready. The SOC* of the double layer capacitors is above READY threshold.
	☀ D = 50%	○	closed	low	high	Mains operation, charging in process. The SOC* of the double layer capacitors is below READY threshold.
	☀ D = 50%	●	closed	low	low	Mains operation, ALARM. The SOC* of the double layer capacitors is below READY threshold.
	●	●	closed	high	low	Mains operation, ALARM. The SOC* of the double layer capacitors is above READY threshold.
○	●	○	open	high	high	Buffer mode.
	●	●	open	high	low	Buffer mode, ALARM due to over temperature > 70°C.
	○	●	open	low	low	Buffer mode, ALARM.
	○	●	closed	low	low	Start-up, ALARM.
☀ D = 90%	●	○	closed	high	high	Mains operation, REMOTE contact shorted to SGnd, buffer is ready.
	☀ D = 50%	○	closed	low	high	Mains operation, REMOTE contact shorted to SGnd, charging in process.
☀ D = 10%	☀ D = 50%	○	closed	low	high	Mains operation, REMOTE contact shorted to SGnd or output delay on enabled, charging in process or CAP is fully charged**
	☀ D = 50%	●	closed	low	low	Mains operation, REMOTE contact shorted to SGnd or output delay on enabled, charging in process or READY, ALARM.

*SOC = State of Charge
**Delay for the flashing READY-LED maximum 10 sec.



12.4 Signaling the bypass function

Figure 32

Status LED			Switching OUTPUT			Note
U_{In} OK (green)	READY (green)	ALARM (red)	U_{In} OK	READY	ALARM	
○	○	D = 50%	open	low	low	The device is locked due to over temperature less or higher than 80 °C. No input, the device output is OFF.
●	○	D = 50%	closed	low	low	The device is locked. The temperature is less than 80 °C. The device output is ON.
D = 10%	○	D = 50%	closed	low	low	The device is locked. The temperature is less or higher than 80 °C, or BYPASS function is disabled. The device output is OFF.

12.5 Signal outputs

U_{In} OK (13/14)

If the input voltage is in the valid range, the signal output is active (closed). The signal status can be inverted via the POWER MANAGEMENT SUITE software.

A floating N/O contact (implemented with a photorelay) is available as a signal contact.

This signal is indicated visually by a green LED.

You can assign other additional information to this signal output using the POWER MANAGEMENT SUITE software.

Ready

When the storage capacitors are fully charged or the device is in buffer mode, the signal output is active (High level). The signal status can be inverted via the POWER MANAGEMENT SUITE software.

A digital transistor output is available as a signal contact.

This signal is indicated visually by a green LED.

You can assign other additional information to this signal output using the POWER MANAGEMENT SUITE software.

Alarm

When an alarm is present, the signal output is active (low level). The signal status can be inverted via the POWER MANAGEMENT SUITE software.

A digital transistor output is available as a signal contact.

This signal is indicated visually by a red LED.

Possible alarms include:

– Device overheated
– Error in the storage capacitor
– Disconnection in the event of overload in buffer mode

12.6 Signal input

Remote

You can activate and trigger various functions using the remote signal input. For further information, refer to the “Remote device operation” section.

You can invert the signal state using the POWER MANAGEMENT SUITE software.

A change made to the remote function using the POWER MANAGEMENT SUITE software is not applied until a corresponding status change of the remote signal input or device restart has been carried out.

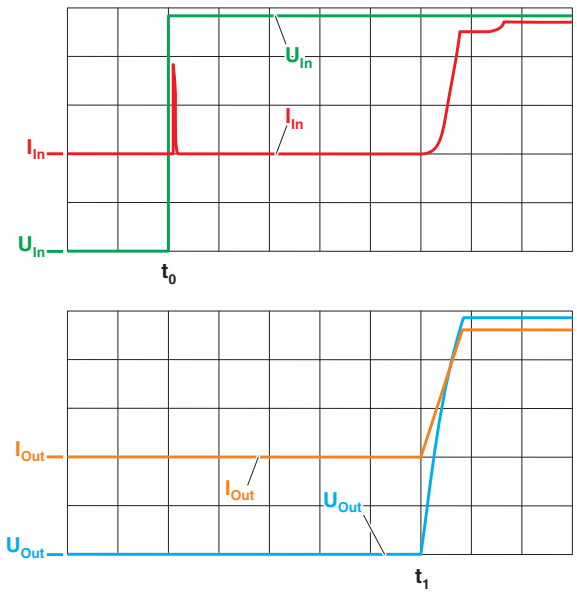
13 Switch-on and switching behavior

13.1 Switch-on behavior

The QUINT capacity module features a soft startup. The output is switched on by ramping up instead of abruptly. This makes the QUINT capacity module also suitable for use in power supplies in the low power range.

How to adjust the switch-on behavior is described in the section Switch-on delay.

Figure 33 Switch-on behavior



U_{In}: 5V/div I_{In}: 2A/div Time: 1s/div
U_{Out}: 5V/div I_{Out}: 2A/div

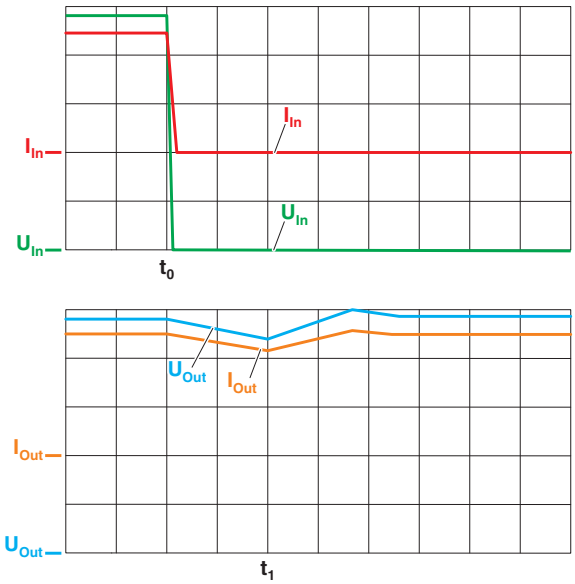
t_0: input voltage is present

t_1: the output is switched on approximately 5 seconds later

13.2 Switching behavior

The output voltage remains present without interruption when switching over from grid to buffer mode.

Figure 34 Switching behavior



U_{In}: 5V/div I_{In}: 2A/div Time: 5ms/div
U_{Out}: 5V/div I_{Out}: 2A/div

t_0: mains power failure

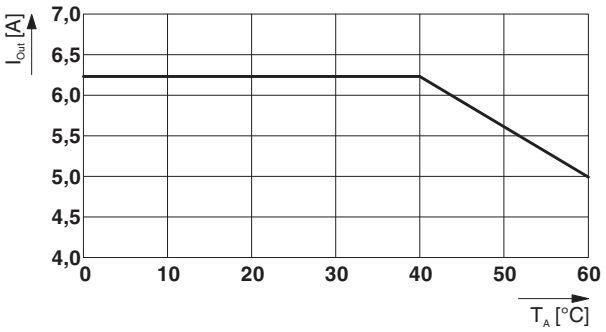
t_1: the output voltage does not drop below 20 V in the switchover phase

14 Derating

14.1 Ambient temperature

At an ambient temperature of up to +40°C, the device supplies the output current $I_{Stat. Boost}$.

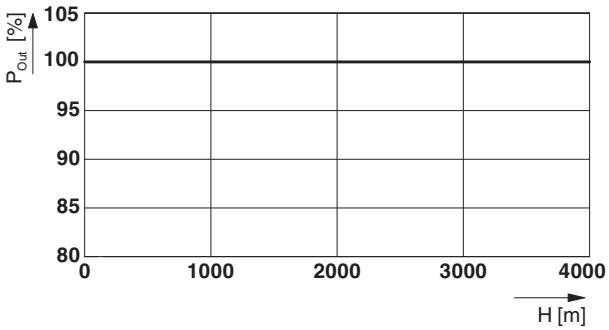
Figure 35 Temperature-dependent derating



14.2 Installation height

The device can be operated at an installation height of up to 4000 m without any limitations.

Figure 36 Altitude-dependent derating

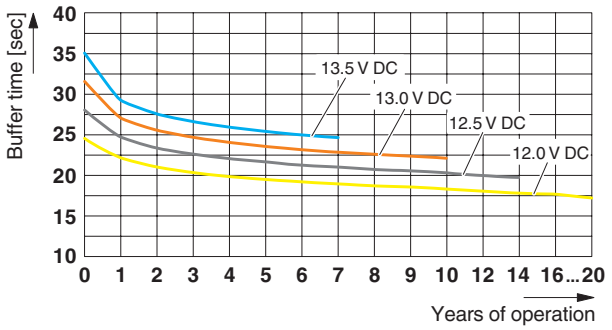


14.3 Service life

You can affect the service life of the capacity modules by configuring the charging voltage of the storage capacitors. You can parameterize this function via the corresponding selection fields in the POWER MANAGEMENT SUITE software.

Reducing the charging voltage leads to an increase in the service life and simultaneous reduction of the possible buffer time.

The specifications in the illustrated diagram are based on an operating temperature of T_A= 40°C with 5 A load.



*30 % capacitance degradation of SCAPs is considered as the end of life (EOL)

**up to a maximum humidity (rH) of 43 % rH, no impacts on the SCAPs are expected

***calculations are based on technical reference data from SCAPs manufacturer

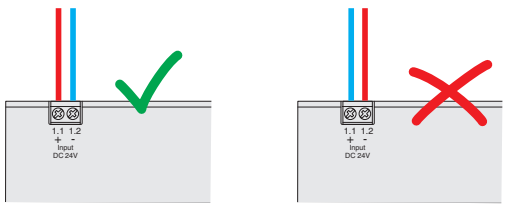
15 Safety functions

Integrated safety functions protect the capacity module against potential system errors and ensure stable, reliable system operation.

15.1 Reverse polarity protection

An integrated reverse polarity protection diode protects the device against mismatching during installation. If the positive and negative poles are connected in reverse, all visual LEDs remain off.

Figure 37 Schematic diagram, wiring of the input terminal blocks



15.2 Line protection

Protect incoming lines with suitable miniature circuit breakers or fuses.

An appropriate overcurrent protection device is necessary upstream of the capacity module if the current sources have a high short-circuit current.

Observe the technical data and the connection cross-section of the cable manufacturer.

15.3 Short-circuit protection

The capacity module is protected against internal device errors. After a short circuit in the device, the device shuts down and displays an alarm. Charging and buffer processes are disconnected automatically.

15.4 Overload protection

Numerous overload protection mechanisms are integrated into the capacity module. The device monitors the charging current. In the event of an error, the charging process is stopped. The device indicates an alarm.

15.5 Undervoltage and surge protection

The device constantly monitors the input voltage. After over- or undervoltages, the device disconnects and attempts to restart after specified interaction loops.

15.6 Protection against overtemperature

The capacity module features an additional function for internal temperature monitoring. If the external temperature exceeds a threshold value of 70°C, the module first switches the charger off. At the same time, the red alarm LED lights up and the alarm signal is active “high”.

Buffer mode is switched of at an external temperature of 75°C. The red alarm LED lights up and the alarm signal is active “high”.

If the temperature reaches a critical value of ≥ 80°C for a few seconds, the module shuts down. At the same time, the red alarm LED lights up permanently and the digital alarm signal is off.

The manufacturer can analyze the device and unlock it.

This safety function protects the module itself and prevents internal component overloads.

16 Software

The latest software version is to be found in the product download area.

POWER MANAGEMENT SUITE software (Order No. 1252232)

Configuration software UPS-CONF (Order No. 2320403)

The UPS-CONF software supports QUINT CAP modules up to production batch 05.

16.1 Software installation

You can configure the capacity module individually via the POWER MANAGEMENT SUITE software. To be able to configure the module, install the POWER MANAGEMENT SUITE PC software as follows:

1. Open the software in the download area of the item.
2. Next, extract the ZIP file.
3. Depending on the application, you can install individual modules.

You can select the following modules:

- POWER MANAGEMENT SUITE server: Communication interface between Phoenix Contact power supply systems and PC. Manages all data provided by the device.
- POWER MANAGEMENT SUITE Client: Display of data delivered by the server. Configuration and management of the system. Includes service for controlled PC shutdown.
- POWER MANAGEMENT SUITE Agent: Service for controlled PC shutdown.

4. Connect the capacity module to your PC via the USB interface and start the POWER MANAGEMENT SUITE. The software detects the connected device automatically.

Comprehensive information on the POWER MANAGEMENT SUITE as well as application examples are available in the user manual and the download area.

Further information on configuring the capacity module is available in Section: Device operation.

16.2 Software settings for signaling

16.2.1 Assignment of signal terminals

You can assign different states to the individual signal terminals using the software. The following table describes the possible combinations:

Alarm Default	U_{In} OK Default	Ready Default	Comment
1	0	0	Negation BIT
1	0	0	Alarm CAP
1	0	0	Device fail
x	0	1	Buffer mode
x	0	0	Charger
x	0	0	Status remote
x	0	0	Status buffer delayed 1
x	0	0	Status buffer delayed 2
x	0	0	Status buffer delayed 3
x	0	1	Status buffer ready
x	1	0	Input OK

Key

1 = default (factory setting)

0 = not assigned (assignment via POWER MANAGEMENT SUITE possible)

x = assignment not possible