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MANUAL

Uninterrupted
Power supply



Capacitive UPS
PC-0424

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1. ORDERING DATA

The following table shows the order data of the charging and control unit and the battery modules.

Table 1: Order Numbers

Charging and control unit			
Variant	**Input voltage**	**Output**	**Nominal Capacity**
PC-0424-010-0	24 Vdc	20A	1000 Ws
PC-0424-017-0	24 Vdc	20A	1700 Ws
PC-0424-050-0	24 Vdc	20A	5000 Ws
Batterymodul			
Variant	**Input voltage**	**Output current rating**	**Nominal Capacity**
PC-0424-115-0	24 Vdc	40 A	11500 Ws

NOTE:
The specified output current refers to the maximum continuous current in buffer mode. In mains operation, up to 40A is possible permanently.

2. GENERAL INFORMATION

2.1 Safety

Please read these warnings and safety instructions carefully before using the device. The device may only be installed by competent and qualified personnel. In the event of malfunctions or damage, immediately switch off the supply voltage and send the device to BLOCK Transformatoren-Elektronik GmbH for inspection. The device does not include any service components. If an internal fuse is tripped, there is most likely an internal defect in the device. The data provided are for product description purposes only and are not to be regarded as warranted properties in the legal sense.

2.2 Qualified personnel

The product associated with this documentation may only be handled by qualified personnel in compliance with the documentation related to the respective task, in particular the safety and warning instructions contained therein. Qualified personnel can guarantee on the basis of their training and experience that the use of the described product meets all safety requirements as well as the applicable regulations, regulations, standards and laws.

2.3 Intended use

This device is designed to be installed in an enclosure and is suitable for use with general electronic devices, such as industrial controls, office equipment, communication equipment or measuring instruments. Do not use this device in control systems of aircraft, trains or nuclear facilities where malfunction could result in serious injury or danger to life.

2.4 Disclaimer

The content of this publication has been checked with the greatest care for compliance with the hardware and software described. Nevertheless, there may be discrepancies between the product and the documentation. Deviations can also occur due to the constant further development of the product.
For this reason, we cannot guarantee complete compliance. If this documentation contains errors, we reserve the right to make necessary corrections without prior notice.



ATTENTION
Switch off the input voltage before installation, maintenance or modification work and protect it against unintentional reconnection.



ATTENTION
Do not make any modifications or repair attempts to the device. Do not open the device!



ATTENTION
Prevent the ingress of foreign objects, such as paper clips and metal parts.



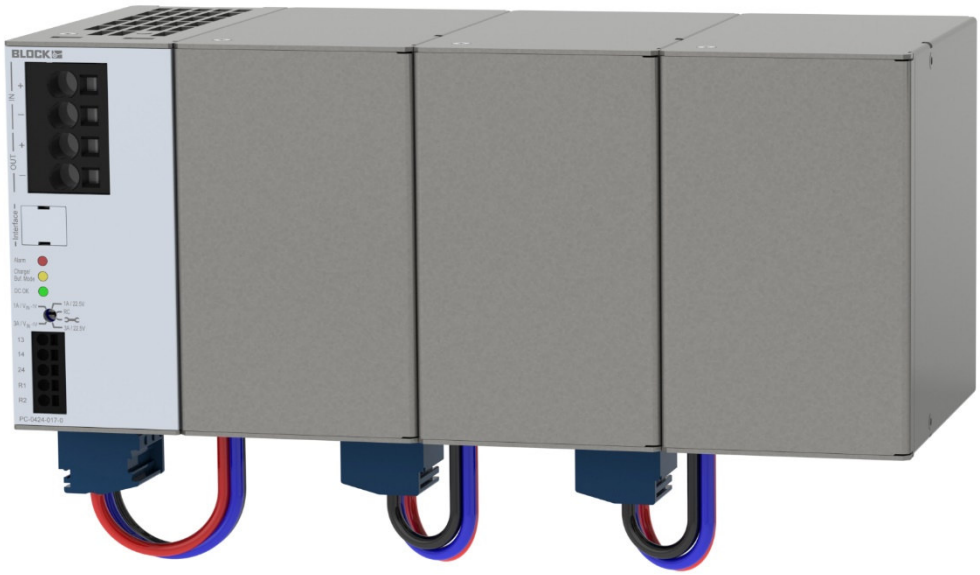
ATTENTION
Do not operate the appliance in a humid environment or in an environment where condensation or condensation.



ATTENTION
Do not touch the housing during operation or shortly after shutting down. Hot surfaces can cause injuries.

3. PRODUCT

The capacitive UPS based on ultracapacitors offer a long service life even at high ambient temperatures and thus more safety in 24 V networks. With the basic module (PC-0424-017-0), currents of up to 20 A are available without interruption in the event of a power failure. Thanks to flexible expansion options, the output current can be increased to up to 40 A by connecting up to 3 capacitance modules and the buffer time can be scaled according to requirements. All relevant data can be called up at any time via a potential-separated USB interface. In addition, the PC-0424-010-0 and PC-0424-050-0 non-expandable UPS offer an internal capacity of 1/5 kWs.



PC-0424-017-0 + 3x PC-0424-115-0



PC-0424-050-0



PC-0424-010-0

3.1 Specifications

- Maintenance-free capacitve UPS to secure the supply voltage in the event of short-term mains interruptions
- Long buffer times down tot he minute range
- Partially expandable with capacity modules
- Output current up to 40 A
- Parameterization vira rotary switch or via USB interface
- Shock- and vibration-proof USB socket
- Minimal maintenance due to longservice life oft he ultracapacitors
- Nominal input voltage 24 Vdc
- Rated output voltage 24 Vdc
- Wide temperature range
- Entkoppelter Ausgang
- Extensive signalling through different coloured LEDs
- Automatic PC shutdown via USB interface

Table 2: Technical Data PC-0424-010-00/PC-0424-017-0/PC-0424-050-0

Technische Daten Technical data	PC-0424-010-00	PC-0424-017-00
Normen Safety standards		
Sicherheit Safety	EN 61010-1, EN 61010-2-201	
EMV EMC	EN 61000-6-2 und EN 61000-6-3 EN 61000-6-2 and EN 61000-6-3	
Zulassungen Approvals		
UL	UL 61010-1, UL 61010-2-201 (E219022)	
DNVGL	(in Vorbereitung in preparation)	
Umwelt Environment		
Umgebungstemperatur Ambient temperature	-25 °C ... +70 °C *1	
Lagertemperatur Storage	-25 °C ... +85 °C	
Kühlart cooling	Selbstkühlung durch natürliche Konvektion bei vertikaler Einbaulage AN (Natural air convection cooling)	
Derating Derating	Ausgangsstrom: -2,5%/K > 55°C output current: -2,5%/K > 55°C Laderegler: -3,3%/K > 55°C bezogen auf 1A (automatische Abregelung) charge controller: -3,3%/K > 55°C based on 1A (automatic reduction) Pufferzeit: -3,3%/K > 55°C bezogen auf die max. Pufferzeiten buffer time: -3,3%/K > 55°C based on max. buffer times	
Zulässige Luftfeuchtigkeit Allowable humidity	5 ... 96 % relative Feuchte, keine Betauung zulässig 5 ... 96 % relative humidity with no dew	
Verschmutzungsgrad Pollution degree	2	
Betriebshöhe Operating altidude	4000m	
Sicherheit und Schutz Safety and protection		
Prüfspannung (Klemmen gegen Gehäuse) HV test voltage (terminals and enclosure)	500 Vdc	
Schutzart Protection index	IP 20 (nach EN 60529) IP 20 (to EN 60529)	
Schutzkleinspannung (SELV/ PELV) Safety-extra-low voltage (SELV/ PELV)	EN 61140 EN 61140	
Schutzklasse Safety class	III	
Verpolungssschutz Reverse connection protection	o	
Eingang Input		
Eingangsnennspannung Rated input voltage	24 Vdc	
Eingangsspannungsbereich Operating input voltage range	18,5 Vdc bis 30 Vdc 18,5 Vdc to 30 Vdc	
Stromaufnahme bei 24 Vdc (Leerlauf/ Ladevorgang/ max.) Input current at 24 Vdc (standby/ charging process/ max.)	0,1 A / 1 A / 22 A	0,1 A / 2 A / 22 A
Anschlüsse Eingang Terminals Input	Push-In, max. 16 mm (siehe Tab.1 / see Tab.1)²	
Ausgang Output		
Ausgangsspannung Rated output voltage	24 Vdc	
Ausgangsspannung (Normalbetrieb, Nennlast) Operating output voltage (normal operation)	typ. Uin - 0,25 Vdc (Entkopplung via MosFet) (Decoupling via MosFet)	
Ausgangsspannung (Pufferbetrieb, Nennlast) Operating output voltage (buffer operation)	typ. Pufferschwelle - 0,25 Vdc typ. buffer treshold - 0.25 Vdc (Entkopplung via MosFet) (Decoupling via MosFet)	
Ausgangsnennstrom Operating output current	20A	
Überlastverhalten im Nennbetrieb Over load behaviour in normal mode	Konstantstrom: 22A zyklische Abschaltung unter 18,5Vdc Constant current: 22A hiccup mode under 18,5Vdc	
Überlastverhalten im Pufferbetrieb Over load behaviour in buffer mode	Konstantstrom 22A für 3s Constant current 22A for 3s	
Max. Verlustleistung (Leerlauf/ Nennbetrieb) Max. power loss (idling/ nominal load)	3 W / 14 W	
Rückspeisefestigkeit Feedback voltage	max. 35 Vdc	
Anschlüsse Ausgang Terminals output	Push-In, max. 16 mm (siehe Tab.1 / see Tab.1)	
Energiespeicher Energy storage		
Art des internen Speichers Type of internal memory	Electrolytic Double Layer Capacitor (EDLC)	
Größe des internen Speichers Size of the internal memory	1000 Ws	1700 Ws
Lebensdauer Life cycle	Last abhängig: 25 °C / bis zu 14 Jahre Load dependent: 25 °C / up to 14 years	
Ladeschlussspannung pro Zelle End of charge voltage per cell	Zum Schutz der Kondensatoren wird der Ladezustand bei hohen Temperaturen automatisch reduziert To protect the capacitors, the state of charge is automatically reduced at high temperatures	
Ladestrom Charging current	1 A	2 A
Ladezeit Charge time	90s	100s
Signalisierung Signaling		
LED LED	grün / gelb / rot green / yellow / red	
Potenzialfreier Kontakt Potential free signal contact	Solid State: 2x Schließer 30 Vdc / 0,1 A Solid state: 2 x NO 30 Vdc / 0.1 A	
Anschlüsse Signalisierung Terminals Signaling	Push-In, max. 2,5 mm (siehe Tab.1 / see Tab.1)	
Sonstiges Various		
Maße B x H x T *2 Dimensions width x height x depth *2	55 x 127 x 131,5 mm	
Gewicht Weight	0,725 kg	

*1 UL Note: Minimum temperature rating of the cable to be connected to the feld wiring terminals:
>75 °C (ambient temperature <55 °C)
>90 °C (ambient temperature <75 °C).

*2 Tiefe T ab Oberkante Tragschiene.
*2 Depth from upper edge of DIN rail.

All information is subject to technical changes

Technische Daten
Technical data

	PC-0424-050-0
Normen Safety standards	
Sicherheit Safety	EN 61010-1, EN 61010-2-201
EMV EMC	EN 61000-6-2 und EN 61000-6-3 EN 61000-6-2 and EN 61000-6-3
Zulassungen Approvals	
UL	UL 61010-1, UL 61010-2-201 (E 219022)
DNVGL	(in Vorbereitung in preparation)
Umwelt Environment	
Umgebungstemperatur Ambient temperature	-25 °C ... +70 °C
Lagertemperatur Storage	-25 °C ... +85 °C
Kühlart cooling	Selbstkühlung durch natürliche Konvektion bei vertikaler Einbauanlage AN (Natural air convection cooling)
Derating Derating	Ausgangsstrom: -2,5%/K > 55°C output current: -2,5%/K > 55°C Laderegler: -3,3%/K > 55°C bezogen auf 3A (automatische Abregelung) charge controller: -3,3%/K > 55°C based on 3A (automatic reduction) Pufferzeit: -3,3%/K > 55°C bezogen auf die max. Pufferzeiten bei 2,8V Zellenspannung buffer time: -3,3%/K > 55°C based on max. buffer times with 2.8V cell voltage
Zulässige Luftfeuchtigkeit Allowable humidity	5 ... 96 % relative Feuchte, keine Betauung zulässig 5 ... 96 % relative humidity with no dew
Verschmutzungsgrad Pollution degree	2
Betriebshöhe Operating altidude	4000m
Sicherheit und Schutz Safety and protection	
Prüfspannung (Klemmen gegen Gehäuse) HV test voltage (terminals and enclosure)	500 Vdc
Schutzart Protection index	IP 20 (nach EN 60529) IP 20 (to EN 60529)
Schutzkleinspannung (SELV/ PELV) Safety-extra-low voltage (SELV/ PELV)	EN 61140 EN 61140
Schutzklasse Safety class	III
Verpolungssschutz Reverse connection protection	o
Eingang Input	
Eingangsnennspannung Rated input voltage	24 Vdc
Eingangsspannungsbereich Operating input voltage range	18,5 Vdc bis 29 Vdc 18,5 Vdc to 29 Vdc
Stromaufnahme bei 24 Vdc (Leerlauf/ Ladevorgang/ max.) Input current at 24 Vdc (standby/charging process/max.)	0,1 A / 4 A / 24 A
Anschlüsse Eingang Terminals Input	Push-In, max. 16 mm (siehe Tab.1 / see Tab.1)²
Ausgang Output	
Ausgangsspannung Rated output voltage	24 Vdc
Ausgangsspannung (Normalbetrieb, Nennlast) Operating output voltage (normal operation)	typ. Uin - 0,25 Vdc (Entkopplung via MosFet) (Decoupling via MosFet)
Ausgangsspannung (Pufferbetrieb, Nennlast) Operating output voltage (buffer operation)	typ. Pufferschwelle - 0,25 Vdc typ. buffer treshold - 0.25 Vdc (Entkopplung via MosFet) (Decoupling via MosFet)
Ausgangsnennstrom Operating output current	20 A
Überlastverhalten im Nennbetrieb Over load behaviour in normal mode	33A/ 50ms, 28A/ 5s danach zyklische Abschaltung 33A/ 50ms, 28A/ 5s afterwards hiccup mode
Überlastverhalten im Pufferbetrieb Over load behaviour in buffer mode	Konstantstrom 22A für 3s Constant current 22A for 3s
Fernabschaltung für NOT AUS des Pufferbetriebs Remote power off (buffer operation)	o
Max. Verlustleistung (Leerlauf/ Nennbetrieb) Max. power loss (idling/ nominal load)	3 W / 14 W
Rückspeisefestigkeit Feedback voltage	max. 35 Vdc
Anschlüsse Ausgang Terminals output	Push-In, max. 16 mm (siehe Tab.1 / see Tab.1)²
Energiespeicher Energy storage	
Art des internen Speichers Type of internal memory	Electrolythic Double Layer Capacitor (EDLC)
Größe des internen Speichers Size of the internal memory	5000 Ws
Lebensdauer Life cycle	25 °C / 2,6 V: 14 Jahre 25 °C / 2.6 V: 14 years
Ladeschlussspannung pro Zelle End of charge voltage per cell	2,0 ... 2,8 Vdc einstellbar nur per Software (Werkseinstellung: 2,6 Vdc) 2.0 ... 2.8 Vdc adjustable only via software (Default: 2.6 Vdc)
Ladestrom Charging current	0,5 ... 3 Adc einstellbar 0.5 ... 3 Adc adjustable
Ladezeit Charge time	@2,6 V / 0,5 A: 700 s @2,6 V / 3 A: 116 s
Signalisierung Signaling	
LED LED	grün / gelb / rot green / yellow / red
Potenzialfreier Kontakt (kon gurierbar) Potential free signal contact (con gurable)	Solid State: 2x Schließer 30 Vdc / 0,1 A Solid state: 2 x NO 30 Vdc / 0.1 A
Schnittstelle Interface	USB 2.0 / potentialgetrennt USB 2.0 electrically isolated
Anschlüsse Signalisierung Terminals Signaling	Push-In, max. 2,5 mm (siehe Tab.1 / see Tab.1)²
Sonstiges Various	
Maße B x H x T* Dimensions width x height x depth*	91 x 127 x 131,5 mm
Gewicht Weight	1 Kg

3.2 Block diagram

The following block diagrams show wiring examples.
In order to ensure good communication with the capacitive UPS, interface, control and signal cables < 3 meters must be chosen.
In addition, care must be taken not to lay the control cable parallel to power lines, otherwise communication disruptions are to be expected.

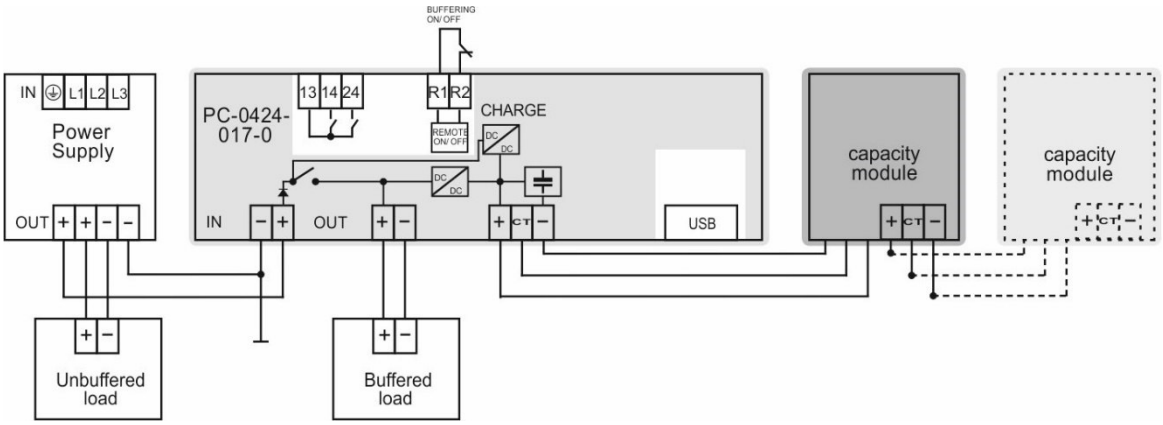


Figure 1: Wiring block diagram (PC-0424-017-0 + PC-0424-115-0)

To get the maximum power, it is possible to connect up to 3 capacity modules in parallel. This allows the buffer time and output current to be increased (see Chapter 5.1).

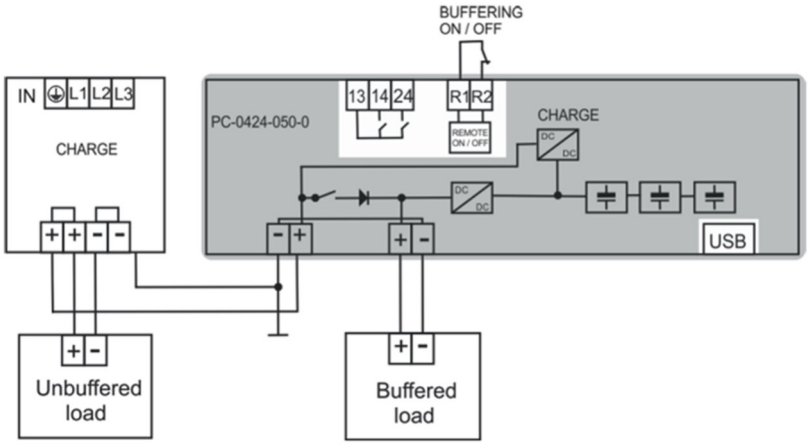


Figure 2: Wiring block diagram (PC-0424-050-0)

3.3 Dimensioning

The dimensions of the capacitive UPS and the capacitance modules can be seen in Figure 3 and Figure 4.

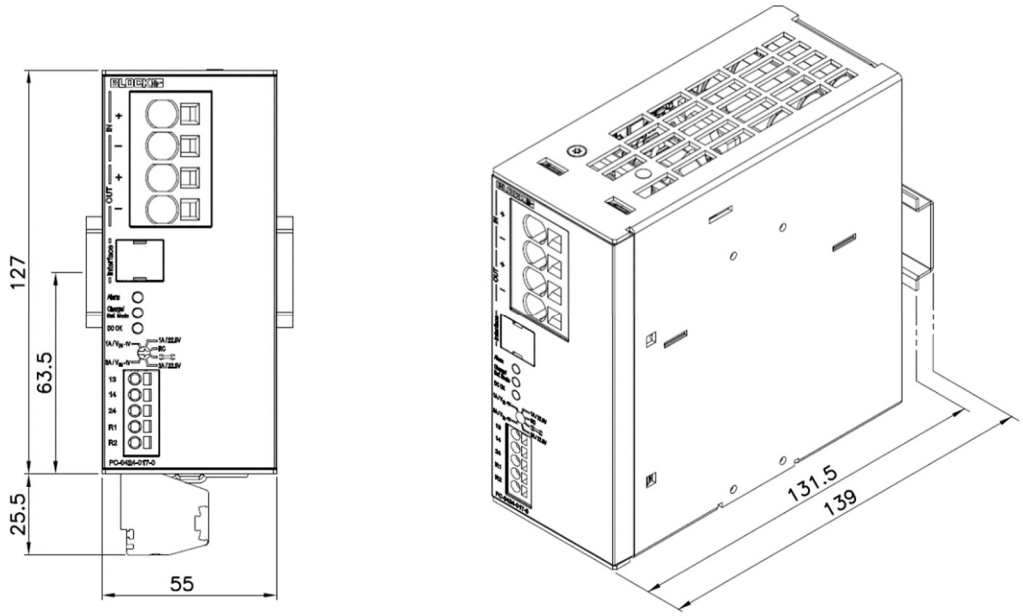


Figure 3: Dimension (PC-0424-010-00/PC-0424-017-0)

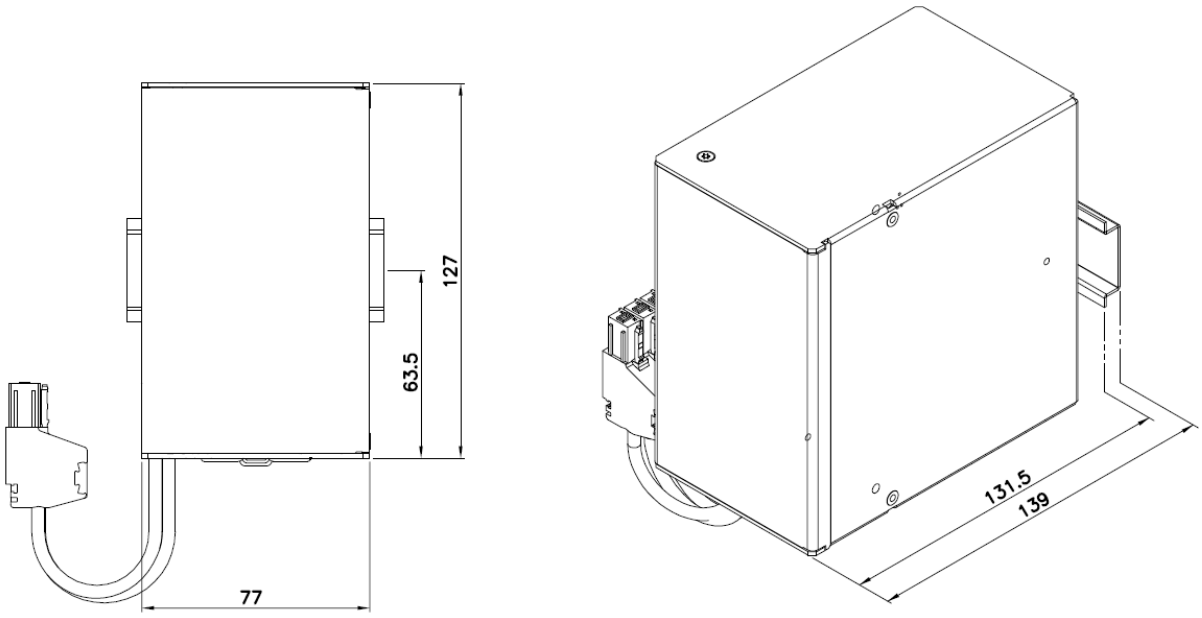


Figure 4: Capacity Module Dimension (PC-0424-115-0)

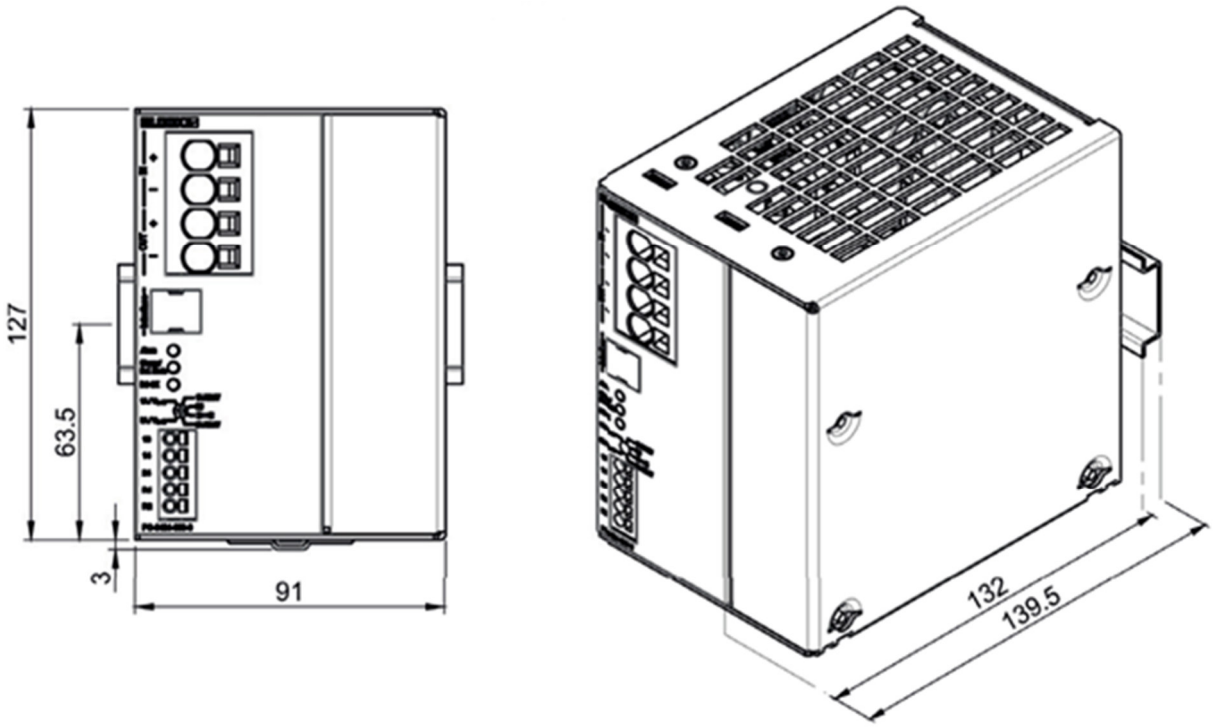


Figure 4: Capacitive UPS Dimension (PC-0424-050-0)

3.4 Assembly

The capacitive UPS and the capacitance module can be mounted on the DIN rail without tools.
To do this, the front of the device is first turned slightly upwards and placed on the DIN rail. It should be noted that the device is pushed down to the stop. When the device sits on the DIN rail, the underside is pressed against the mounting rail until it is locked in the DIN rail (followed by a "click" sound). To check, shake the device again lightly to ensure proper locking.
A standard tool, such as a flat-head screwdriver, is required for disassembly. By pressing down the fastener, the device can be detached from the DIN rail by lifting the underside of the device.

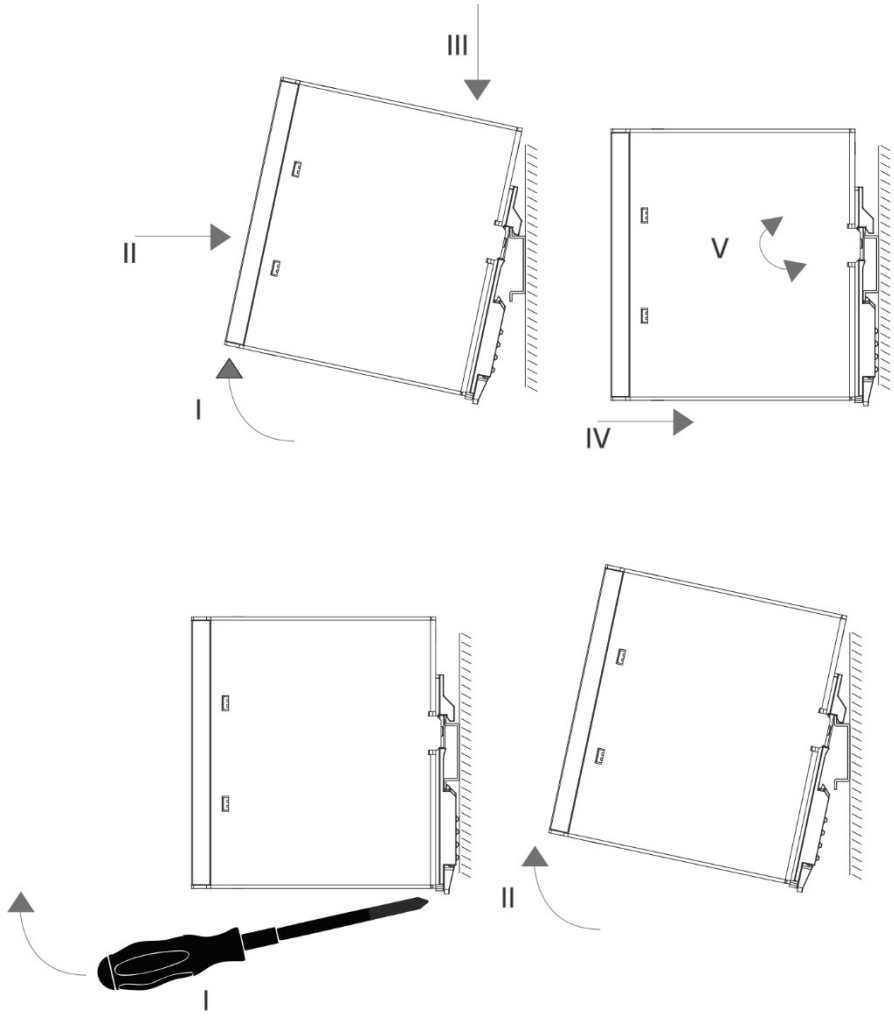
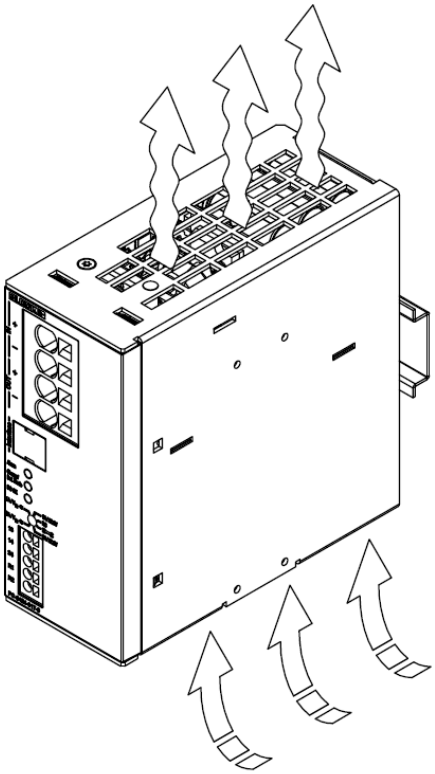
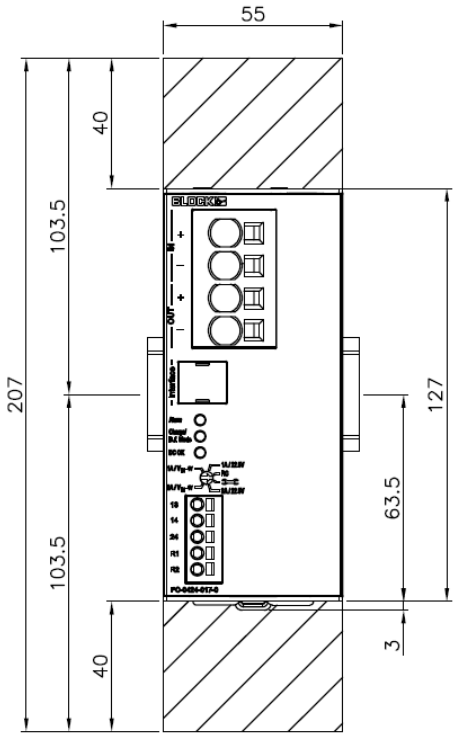


Abbildung 6: Montage

ATTENTION:
Mounting of the capacitive UPS and capacitance modules horizontally or overhead is **not** permitted

To ensure cooling by natural convection, the distances to neighboring devices must be observed.





ATTENTION:
A different assembly is not permitted.

ATTENTION:
Do not touch the housing during operation or shortly after shutting down. Hot surfaces can cause injuries.

3.5 Connections and signalling

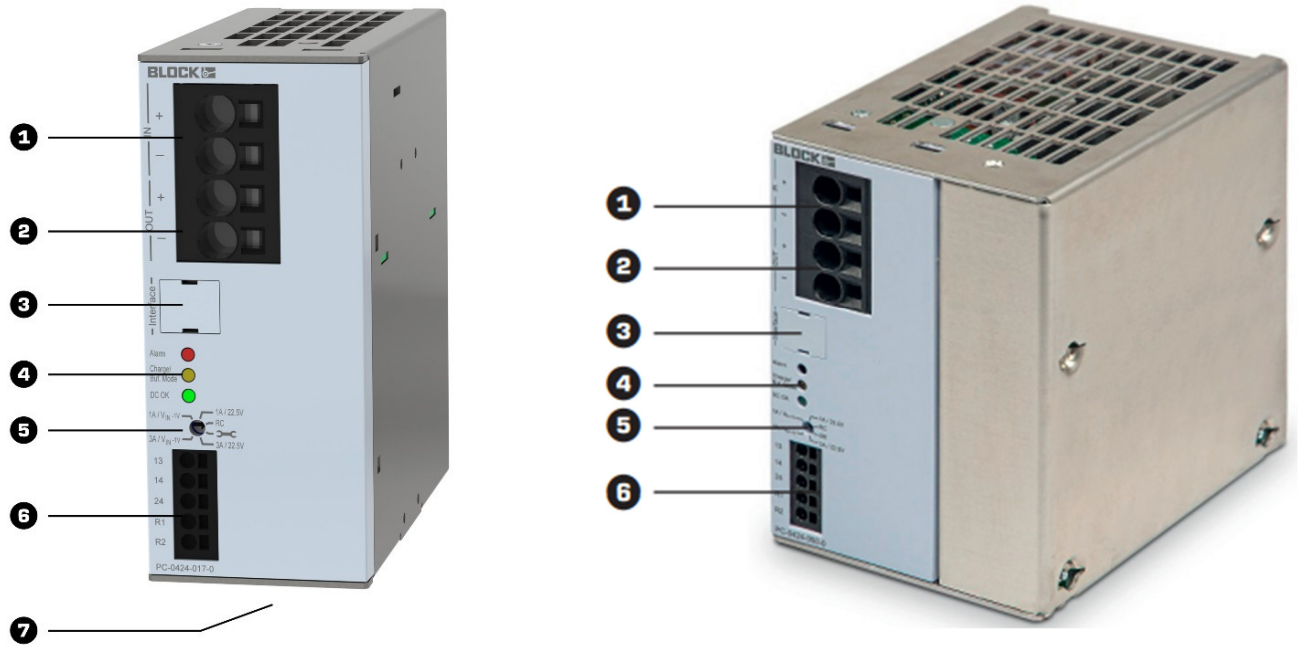


Table 4: Connections and signalling

Nr.	Function	Note	
1	Power supply input terminals	0,75 - 16 mm²	
2	Power supply output terminals	0,75 - 16 mm²	
3	PC interface	USB interface Conncector	
4	Indicators	LED red: Alarm LED yellow: Charge /Buf. Mode LED green: DC OK	
5	Rotary switch for buffer time setting	1 A and 3 A at 22,5 V 1 A and 3 A at V_{in} = -1V Maintenance (🔧) Individual (RC)	1 A and 3 A at 22,5 V 1 A and 3 A at V_{in} = -1V Output switched off (Off) Individual (RC)
6	Signal an signaling contacts	13: Potential-free collective input for signal outputs 14/24 14: Freely configurable / Default setting: UPS in buffermode 24: Freely configurable / Default setting: Capacitor voltage < 85 % R1/R2: Remote shutdown in the Buffering 0,2 - 2,5 mm²	
7	Connection of external capacity modules (Nur PC-0424-017-0)	Only released modules (PC-0424-115-0)	

4. Commissioning

At the time of delivery, the capacitive UPS and the capacity modules are discharged, which is why they are not yet operational. Buffer operation is only available from a charge of 85%. After commissioning, the capacity modules are addressed automatically, if available. Automatic addressing only begins at a charging voltage of 15 V.

NOTE:
Before replacing the capacity modules, the UPS must always be put into maintenance mode. See 5.1.

4.1 Operating states / signaling

The capacitive UPS can signal current operating states, warnings and faults. Three indicator lights (LED) and two potential-free contacts are available for function monitoring.

When delivered, the signal outputs are configured as follows:

Table 5: Configured Signal Outputs

Condition	Signal output	Function
Buffering	13/14	Low impedance
Load<85 %	13/24	Low impedance

The capacitive UPS are able to detect several events that can be individually linked to the two signal outputs via the UPS-Control configuration and management software. The logic (inverted/non-inverted or low-impedance/high-impedance) can also be changed if necessary.

Table 6: Detectable States

Nr.	Description	Explanation
1	Buffering	
2	Input voltage error	Input voltage > 30 V Input voltage < set Buffer threshold
3	No buffer operation possible	
4	Output is off	
5	Charge very low <15 %	
6	Load <85 %	
7	Fuse-Mode	
8	Hiccup-Mode	
9	End-of-life memory reached	

The operating status of the capacitive UPS can also be viewed via the LED status indicators. The light signals have the following meaning.

Table 7: Signaling via LED status indicators

Operating status	**LED green**	**LED yellow**	**LED red**
	DC OK	**Charge/Buf. Mode**	**Alarm**
UPS works in normal operation Charge is > 85% charged and OK	On	Off	Off (flashes (1Hz) in case of lifetime warning)
UPS works in normal operation Loading memory (Charge < 85% of rated capacity)	On	On	Off (flashes (1Hz) in case of lifetime warning)
UPS works in normal operation (Remote shutdown R1/R2 active or maintenance mode)	On	Off	On
Input voltage too small or too large, output switched off	flashes (1 Hz)	Off	Off (flashes (1Hz) in case of lifetime warning)
UPS works in buffer mode, output voltage OK	On	flashes (1 Hz)	Off
UPS works in buffer mode, device shortly before shutdown, output voltage OK	On	flashes (4 Hz)	Off
UPS works in buffer mode, but is in the current limit, so output voltage not OK	On	flashes (1 Hz)	flashes (1Hz)
UPS has ended buffer operation due to: - Low residual charge - User Setting -Timing -Overload - Remote shutdown - Input voltage <10V - Input voltage when switched on <10Vdc	Off	Off	Off
UPS is in Hiccup mode	Off	Off	flashes (1 Hz)
UPS is in fuse mode	Off	Off	flashes (4 Hz)
UPS in lockdown state: -Maintenance - Output switched off - Charge controller switched off	Off	Off	On
Switch-on phase / constant current	Off	Off	On

In the UPS-Control management software, two additional modes can be selected for the switch-on behavior in the event of a short circuit or overload.

Hiccup-Mode

The output cannot be ramped up within 5 seconds due to a short circuit or continuous overload.
There are 3 start-up attempts with a waiting time of 20 seconds each. If there has been no restart so far, the waiting time will henceforth be extended to 60 seconds.

Fuse-Mode

The output cannot be ramped up within 5 seconds due to a short circuit or continuous overload.
The output remains switched off until it is switched on again via the UPS control.
To exit Fuse Mode, the "Reset Fuse Mode" button must be pressed. This appears in the UPS Control software (overload behavior) as soon as the fuse mode is activated.
If there has been no restart after resetting the fuse mode, a new attempt can only be started after a waiting time of 20 seconds.



NOTE:
For more information on UPS parameterization, please refer to the UPS Control Software User Manual.



NOTE:
In the factory setting, the statuses oft he LED displays are also signalled via the signal outputs at the same time. If the signal outputs are individually assigned, signal states that deviate from the LED display are possible. Make sure that only sensible combinations are signalled.

4.2 Loading and querying capacity modules

The PC-0424-017-0 capacitive UPS performs different checks of the capacity modules depending on the operating condition. If irregularities are detected, appropriate warnings or disruptions are generated.

Charging status

In normal operation, the capacity module is charged cyclically. During charging, the state of charge and the operating hours of the capacity modules are checked.

If the capacity modules are charged <85%, the status "Capacity module is loading" is signaled. The yellow LED is lit and the signal output "Charge <85%" is activated (only in the state of delivery).

Classroom test

The presence test is used to detect a connected and functional capacity module and is carried out every 60 seconds in normal operation. During the detection phase, the charging process is briefly interrupted.

The detection and communication of the connected capacity modules only takes place from a charging voltage of 15 V. At lower voltage, there is no communication to the capacitance modules.

Charging voltage/charging current

The charging behavior of the capacity modules is freely configurable. The charging voltage and current of the capacity modules can be adjusted via the UPS-Control software.

At the time of delivery, the charging current of the capacity modules is set to 3 A.

0,5 A – 3 A einstellbar

The charging voltage for the capacitive UPS depends on the end-of-charge voltage to be configured per cell. When delivered, this is set to 2.6 V.

2.0 V – 2.8 V adjustable

The maximum end-of-charge voltage of the capacitive UPS is 33.6V.
The maximum end-of-charge voltage of connected capacitance modules reaches 25.2 V.

Capacitance modules that are fully discharged do not allow communication, but they will still be charged via the capacitive UPS once connected.



NOTE:
Increasing the cell voltage increases the maximum buffer time, but reduces the service life of the installed capacitors.

4.3 Buffering

In the event of a failure of the mains voltage, buffer operation is switched to without interruption. The energy required to maintain the DC 24 V supply voltage is taken from the memory of the capacitive UPS and the connected capacitance modules.

Buffer operation is signaled by the slow flashing of the yellow LED (approx. 1 Hz).

The capacitive UPS supports both the maintenance of the supply voltage for a configurable time and the controlled shutdown and restart of an industrial PC (IPC). (See chapter Buffer Operation in IPC Mode.)

For the software shutdown of an IPC, the installation of the Windows software "UPS-Control" is required. If the capacitive UPS is connected to the IPC, the cyclically transmitted data from the UPS triggers the shutdown after an adjustable time.

Switching threshold for buffer operation

If the input voltage drops below the switching threshold, the energy from the capacitive UPS and the capacitance modules is provided without interruption. The activation threshold can be individually adjusted using the rotary switch or the free UPS-Control configuration software

22.5 V – 28 V adjustable

Buffer operation with adjustable buffer time

The module is preconfigured for a minimum buffer time of 2 seconds and a maximum buffer time of one hour ex works. In this configuration, the entire usable energy of the capacitive storage system is used to maintain the DC 24 V supply voltage. The buffer time can be set via the UPS-Control software.

Buffer operation in IPC mode

In IPC mode, the UPS module works according to a chronological sequence that serves the controlled shutdown and reliable restart of an IPC. Changeable times can only be adjusted via the UPS-Control configuration software.

The chronological sequence of "delay time", "shutdown time" and "waiting time" is defined in each case. Due to the possibility of switching off the output despite mains return during battery operation, an IPC can be reliably restarted after shutdown.

Delay

If the mains voltage returns during the set delay time in buffer mode, the output of the charging and control unit is not switched off.
The signal output 13/14 or 13/24 (can be configured via the configuration software) remains in the inactive state, so no signal is generated for a shutdown of the IPC.

If the input network does not return until after the set delay time has elapsed, the output voltage and signal output are switched according to the flow diagram.

1 – 1,000 seconds adjustable

Disconnecting time

After the delay time has elapsed, the signal output 13/14 is activated. This signal output remains in the activated state for the entire set time. Thus, the IPC receives the request to shut down. During the entire set time, the IPC will continue to be powered by the capacitive UPS.

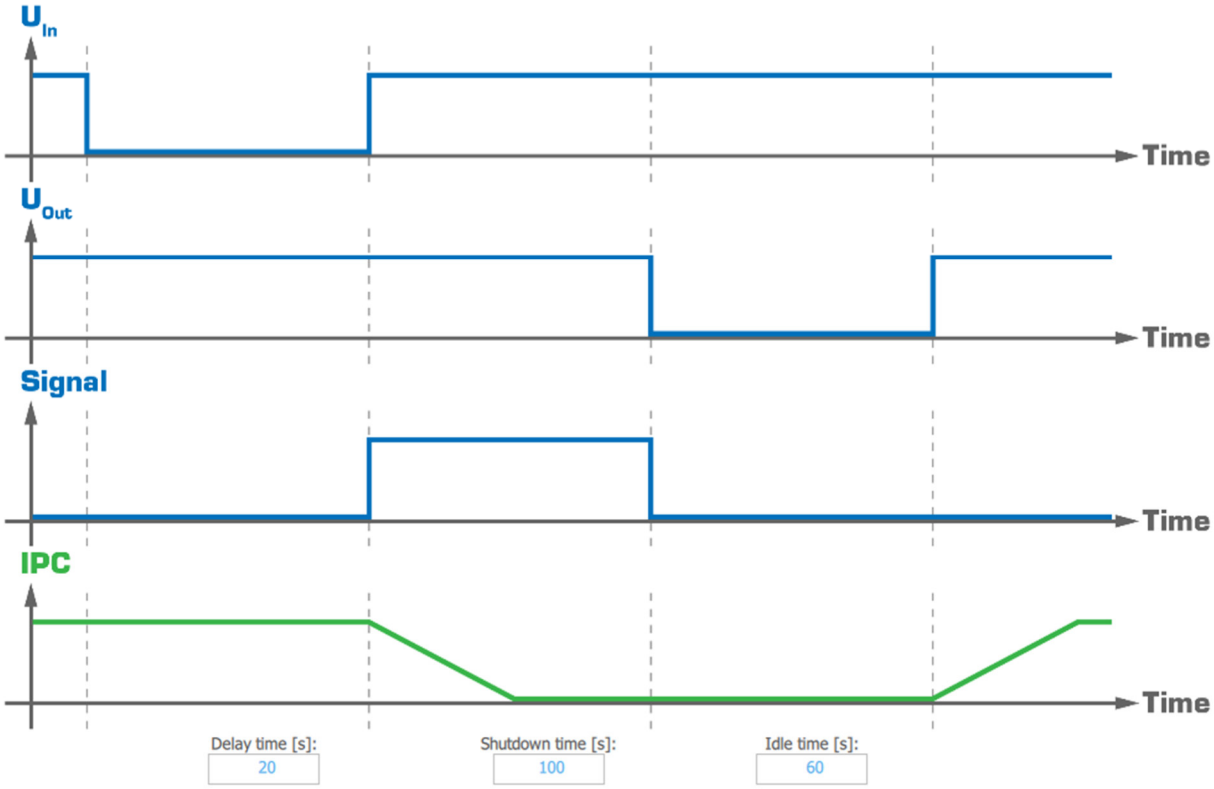
1 – 600 seconds adjustable

Latency

After the shutdown time has elapsed, the output voltage is switched off if the input voltage is available again between the end of the delay time and the beginning of the shutdown time. This gives the IPC the necessary positive flank for a restart after the waiting period has expired.

If the input voltage is not available again after the shutdown time has expired, the capacitive UPS including the output is permanently switched off. After the module has been switched off, an automatic restart takes place only by returning the input voltage with the DC 24 V switching on at the output.

1 – 60 seconds adjustable



Power Boost

Should an overload occur, the capacitive UPS with the Power Boost makes it possible to supply temporarily increased loads.

Tabelle 8: Power Boost

	PC-0424-017-0 + PC-0424-115-0	**PC-0424-050-0**
Plugged	100 A / 50 ms 60 A / 5 s 50 A / 8 s	100 A / 50 ms 25 A / 8 s
Buffering	22 A / 44 A für 3 s	22 A / 5s

The Power Boost in mains mode must be supported by the upstream power supply.

Remote shutdown in buffer mode

If the connected load at the output of the capacitive UPS is no longer to be supplied during buffer operation, e.g. in "EMERGENCY STOP" mode, the buffer operation can be disabled. For this purpose, the connection between the two contacts R1/R2 of the "remote" input must be interrupted.
If this connection is not available during normal operation, the module signals the fault "no buffer operation possible". The red LED lights up continuously. This interference can be linked to a signal output via the UPS-Control software, so that the contact is opened.

Shutdown on discharge

Under load, the buffering is maintained until the capacity modules reach the shutdown threshold. The yellow LED indicates that the capacitance modules are about to discharge or the capacitive UPS is about to be shut down.

4.4 Buffer times

The possible buffer time of the capacitive UPS can be extended with up to 3 capacitance modules. The specified buffer times stand for new capacity modules with a cell voltage of 2.8 V after full charge.

Charging and buffering time PC-0424-010-00

Maximum charging time up to 85% at 1A	Pufferzeit bei 20A	Pufferzeit bei 18A	Pufferzeit bei 15 A	Pufferzeit bei 10 A	Pufferzeit bei 5 A	Pufferzeit bei 1A
Max. 1 Min. 30 Sec.	2,51 Sec.	2,55 Sec.	2,74 Sec.	4,65 Sec.	10,9 Sec.	61,6 Sec.

Charging and buffering times PC-0424-017-0

End-of-charge voltage per cell	Charging time up to 85% at 1A	Charging time up to 85% at 2A	Charging time up to 85% at 3A	Buffer time at 20 A	Buffer time at 15 A	Buffer time at 10 A	Buffer time at 5 A	Buffer time at 1 A
2,8 V	Max. 2 Min. 30Sec.	Max. 1Min 40Sec.	Max. 1Min 15Sec.	3,07 Sec.	4,51 Sec.	7,44 Sec.	16,10 Sec.	80,11 Sec.
2,7 V				2,72 Sec.	4,22 Sec.	6,87 Sec.	14,66 Sec.	73,92 Sec.
2,6 V				2,51 Sec.	3,75 Sec.	6,19 Sec.	13,5 Sec.	65,92 Sec.
2,4 V				1,76 Sec.	2,88 Sec.	4,68 Sec.	10,71 Sec.	53,52 Sec.
2,2 V				1,29 Sec.	2,10 Sec.	3,62 Sec.	8,12 Sec.	42,64 Sec.
2 V				0,79 Sec.	1,33 Sec.	2,55 Sec.	5,96 Sec.	31,86 Sec.

Charging an buffering times PC-0424-017-0 + PC-0424-115-0

End-of-charge voltage per cell	Charging time up to 85% at 1A	Charging time up to 85% at 2A	Charging time up to 85% at 3A	Buffer time at 40A	Buffer time at 35A	Buffer time at 30A	Buffer time at 25A	Buffer time at 20A	Buffer time at 15A	Buffer time at 10A	Buffer time at 5A	Buffer time at 1A
2,8V	Max. 12 Min 50 Sec.	Max. 5 Min 45 Sec.	Max. 4 Min 25 Sec.	6,40 Sec.	7,56 Sec.	9,48 Sec.	12,3 Sec.	16,3 Sec.	22,7 Sec.	36,4 Sec.	74,3 Sec.	335 Sec.
2,7V				5,2 Sec.	6,2 Sec.	7,72 Sec.	10,1 Sec.	13,6 Sec.	20,0 Sec.	32,4 Sec.	67,4 Sec.	324 Sec.
2,6V				4,74 Sec.	5,15 Sec.	6,8 Sec.	8,56 Sec.	12,3 Sec.	17,5 Sec.	28,2 Sec.	60,8 Sec.	321 Sec.
2,4V				2,8 Sec.	3,31 Sec.	4,3 Sec.	5,75 Sec.	8,0 Sec.	12,9 Sec.	20,9 Sec.	45,6 Sec.	244 Sec.
2,2V				1,63 Sec.	1,86 Sec.	2,2 Sec.	3,32 Sec.	5,61 Sec.	8,17 Sec.	13,8 Sec.	32,0 Sec.	176 Sec.
2V				0,6 Sec.	0,6 Sec.	0,9 Sec.	1,66 Sec.	2,78 Sec.	4,96 Sec.	8,28 Sec.	19,6 Sec.	111 Sec.

Charging and buffering times PC-0424-017-0 + 2x PC-0424-115-0

End-of-charge voltage per cell	Charging time up to 85% at 1A	Charging time up to 85% at 2A	Charging time up to 85% at 3A	Buffer time at 40A	Buffer time at 35A	Buffer time at 30A	Buffer time at 25A	Buffer time at 20A	Buffer time at 15A	Buffer time at 10A	Buffer time at 5A	Buffer time at 1A
2,8V	Max. 24 Min 30 Sec.	Max. 8 Min 50 Sec.	Max. 5 Min 15 Sec.	13,9 Sec.	15,6 Sec.	18,5 Sec.	24,8 Sec.	33,0 Sec.	45,3 Sec.	70,7 Sec.	142 Sec.	640 Sec.
2,7V				11,6 Sec.	13,2 Sec.	16,5 Sec.	21,1 Sec.	28,5 Sec.	39,6 Sec.	64,8 Sec.	130 Sec.	602 Sec.
2,6V				9,71 Sec.	11,3 Sec.	13,9 Sec.	18,0 Sec.	24,6 Sec.	35,4 Sec.	55,5 Sec.	116 Sec.	537 Sec.
2,4V				6,46 Sec.	7,85 Sec.	9,32 Sec.	12,2 Sec.	17,1 Sec.	25,6 Sec.	40,9 Sec.	87,0 Sec.	457 Sec.
2,2V				4,08 Sec.	4,88 Sec.	5,88 Sec.	7,50 Sec.	11,4 Sec.	16,6 Sec.	28,1 Sec.	60,8 Sec.	332 Sec.
2V				1,63 Sec.	2,20 Sec.	2,60 Sec.	3,68 Sec.	6,14 Sec.	9,42 Sec.	16,4 Sec.	38,5 Sec.	204 Sec.

Charging and buffering time PC-0424-017-0 + 3x PC-0424-115-0

End-of-charge voltage per cell	Charging time up to 85% at 1A	Charging time up to 85% at 2A	Charging time up to 85% at 3A	Buffer time at 40A	Buffer time at 35A	Buffer time at 30A	Buffer time at 25A	Buffer time at 20A	Buffer time at 15A	Buffer time at 10A	Buffer time at 5A	Buffer time at 1A
2,8V	Max. 39 Min 5 Sec.	Max. 11 Min 55 Sec.	Max. 8 Min 10 Sec.	20,3 Sec.	24,0 Sec.	28,6 Sec.	35,8 Sec.	46,4 Sec.	66,6 Sec.	104 Sec.	215 Sec.	951 Sec.
2,7V				17,5 Sec.	19,8 Sec.	24,3 Sec.	31,1 Sec.	40,0 Sec.	58,0 Sec.	90,4 Sec.	190 Sec.	898 Sec.
2,6V				14,7 Sec.	16,9 Sec.	20,4 Sec.	26,5 Sec.	34,8 Sec.	50,8 Sec.	80,2 Sec.	165 Sec.	785 Sec.
2,4V				10,9 Sec.	11,3 Sec.	13,9 Sec.	18,6 Sec.	25,4 Sec.	35,6 Sec.	57,4 Sec.	122 Sec.	598 Sec.
2,2V				5,92 Sec.	6,44 Sec.	8,23 Sec.	11,0 Sec.	16,0 Sec.	23,8 Sec.	40,5 Sec.	86,0 Sec.	424 Sec.
2V				2,48 Sec.	2,98 Sec.	3,80 Sec.	6,28 Sec.	9,20 Sec.	13,2 Sec.	24,2 Sec.	54,2 Sec.	273 Sec.

Charging and buffering time PC-0424-050-0

End-of-charge voltage per cell	Charging time up to 85% at 1A	Charging time up to 85% at 2A	Charging time up to 85% at 3A	Buffer time at 20 A	Buffer time at 15 A	Buffer time at 10 A	Buffer time at 5 A	Buffer time at 1 A
2,8 V	Max. 6 Min 5 Sec.	Max. 2 Min 25 Sec.	Max. 1 Min 20 Sec.	8,30 Sec.	12,57Sec.	20,4 Sec.	43,9 Sec.	218 Sec.
2,7 V				7,11 Sec.	11,1 Sec.	18,7 Sec.	39,6 Sec.	197 Sec.
2,6 V				6,63 Sec.	9,90 Sec.	16,3 Sec.	35,9 Sec.	181 Sec.
2,4 V				5,00 Sec.	7,78 Sec.	13,0 Sec.	29,0 Sec.	147 Sec.
2,2 V				4,86 Sec.	7,66 Sec.	12,9 Sec.	28,8 Sec.	117 Sec.
2 V				3,61 Sec.	5,91 Sec.	10,0 Sec.	22,8 Sec.	91,3 Sec.

4.5 Derating

The capacitive UPS are designed for a wide temperature range. To protect the UPS, the power must be reduced from 55 °C to prevent the device from overheating.

The maximum output current is provided up to a temperature of 55 °C. In addition, the rated output current per Kelvin must be reduced by 2.5%.

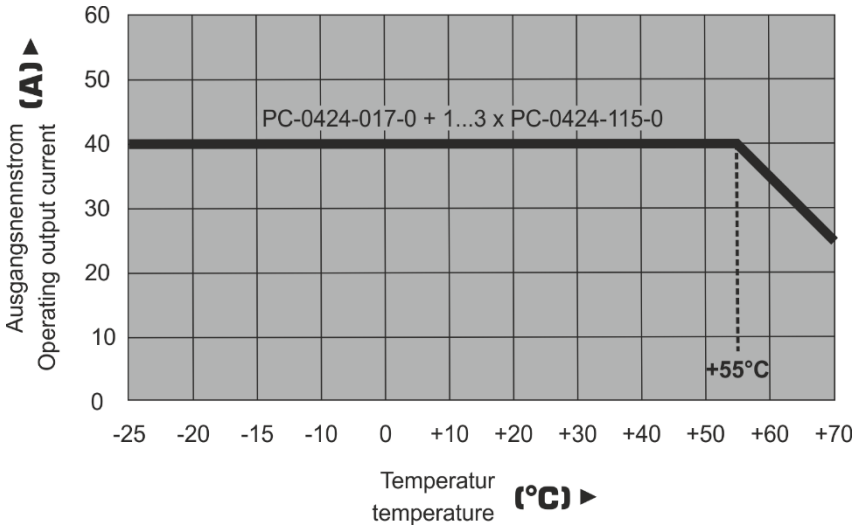


Figure 11: Temperature behavior of the rated output current (PC-0424-017-0 + PC-0424-115-0)

The maximum charging current is provided up to a temperature of 55 °C. In addition, the charging current per Kelvin is reduced by 3.3%.

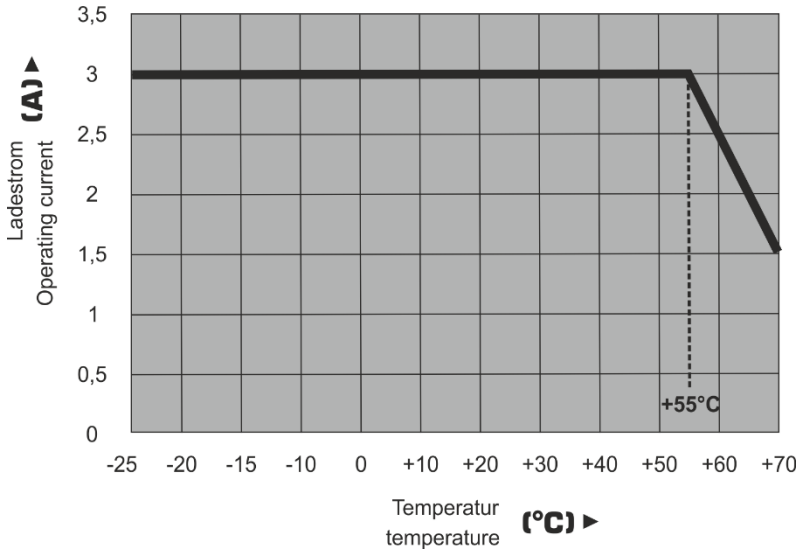


Figure 12: Temperature behavior of the charging current

The maximum buffer time is provided up to a temperature of 55 °C. In addition, the buffer time should be reduced as the output current increases.

The maximum buffer time at an output current of 1 A must be reduced by 1 % per Kelvin from a temperature of 55 °C.

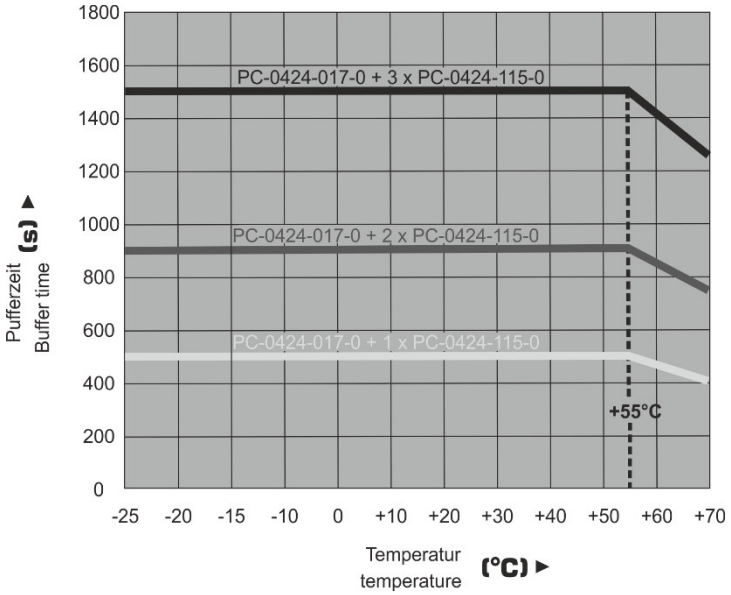


Figure 13: Temperature behavior at 1 A (PC-0424-017-0 + PC-0424-115-0)

The maximum buffer time at an output current of 20 A must be reduced by 2.1 % per Kelvin from a temperature of 55 °C.

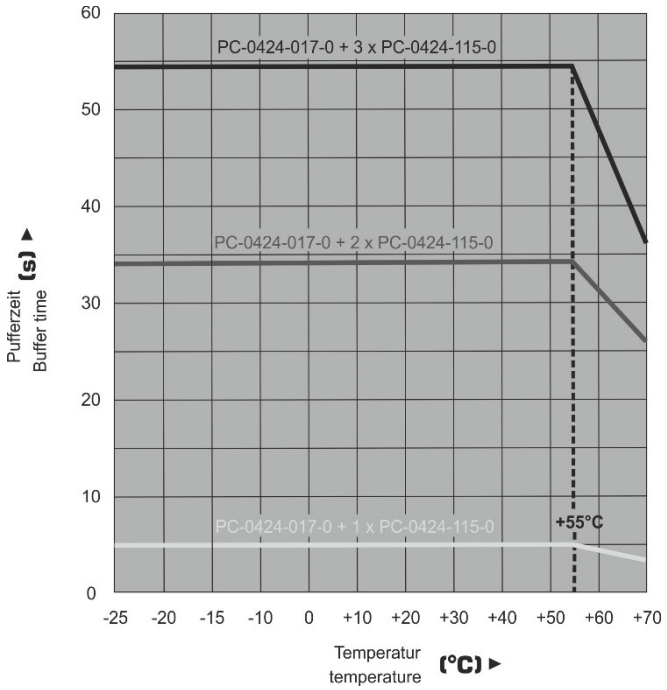


Figure 14: Temperature behavior at 20 A

The maximum buffer time at an output current of 40 A must be reduced by 3.3 % per Kelvin from a temperature of 55 °C.

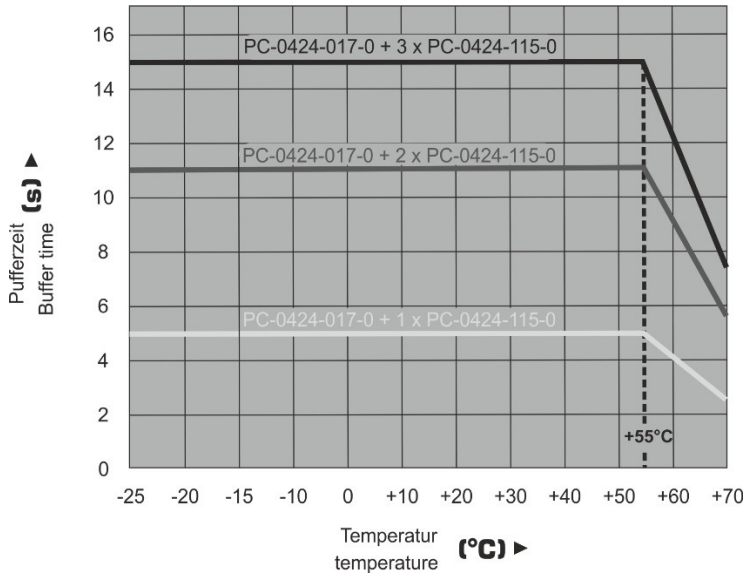


Figure 15: Temperature behavior at 40 A

5. Maintenance

5.1 Expansion of capacity modules

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NOTE:
When switching to maintenance mode, buffer standby and charging are interrupted. Actuation during ongoing buffer operation leads to the immediate termination of the same.



NOTE:
Extending the pre-installed connection lines of the capacity modules is not permitted, as it can negatively affect communication between the modules.

5.2 UPS and Capacitance Module Life

The service life depends on the temperature, the set cell voltage and the currents. The following graphs show the service life of the products, based on thermal measurements and calculated according to a theoretical calculation model (these values do not represent a guaranteed service life). The service life of the processed capacitors specified by the manufacturer is a maximum of 15 years and a maximum of 500,000 cycles for the double-layer capacitors.

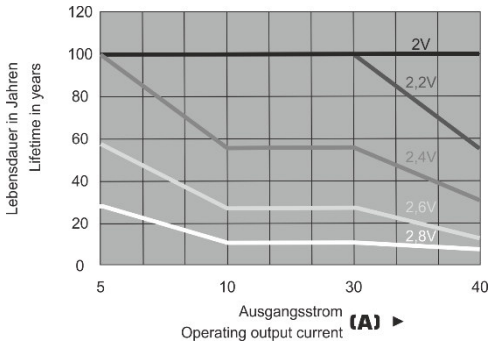


Figure 16: Lifetime at 20 °C

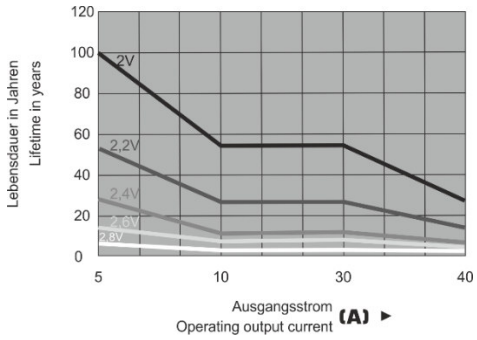


Figure 17: Lifetime at 40 °C

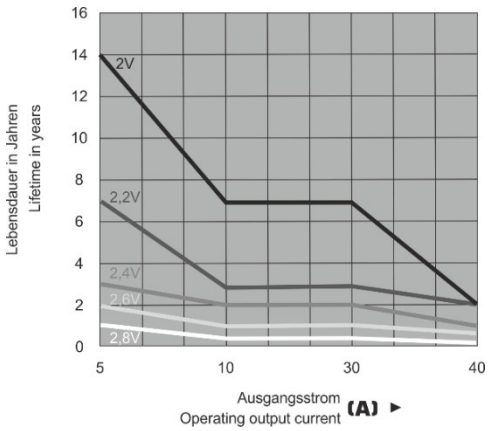


Figure 18: Lifetime at 70 °C

5.3 Storage of capacity modules

The capacitive UPS and capacity modules are delivered in an uncharged state. In this state, storage should not be carried out above 70 °C and not below -30 °C.

6. USV-Firmware

For the UPS control software see **UPS-Control-Software Manual**