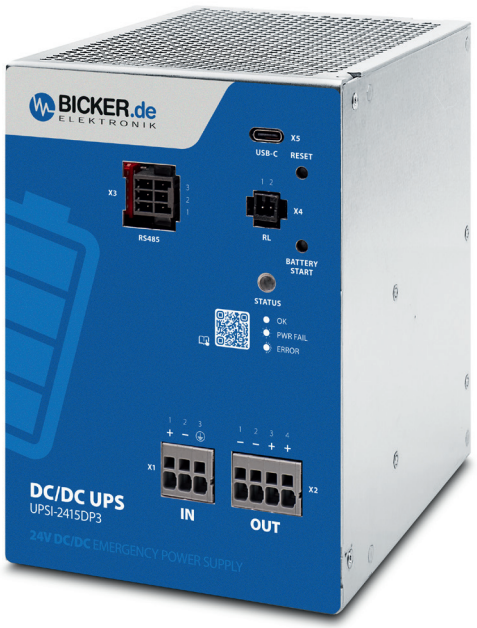
English

User Manual | UPSI-2415DPx



UPS SYSTEM
DIN-RAIL

Bicker Elektronik GmbH
Ludwig-Auer-Straße 23 | 86609 Donauwörth · Germany

Legend of used symbols

Symbol	Description
	Attention! Important hazard warning.
	Do not dispose of in the domestic waste.
	Warning of electrical voltage.

Revision Directory

Date	Change
01.04.2025 Revision 0-1	Initial version
29.07.2025 Revision 1-0	Release version
28.09.2026 Revision 1-1	Value Backup mode in chapter A „Brief specification“ adapted, Mistake corrected (table page 34)

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Declaration of nomination

UPSI - 2415 - DPx

- *Basic name for USV*
- *24V, 15A*
- *DP2 – Supercaps*
- *DP3 – LiFePO4*

NAME	TYPE OF BATTERY	USB	RS-485
UPSI-2415DP2	Supercaps	X	X
UPSI-2415DP3	LiFePO4	X	X

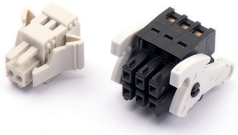
A Brief specification

UPSI-2415DP2 / -DP3

24 V DC / 15 A

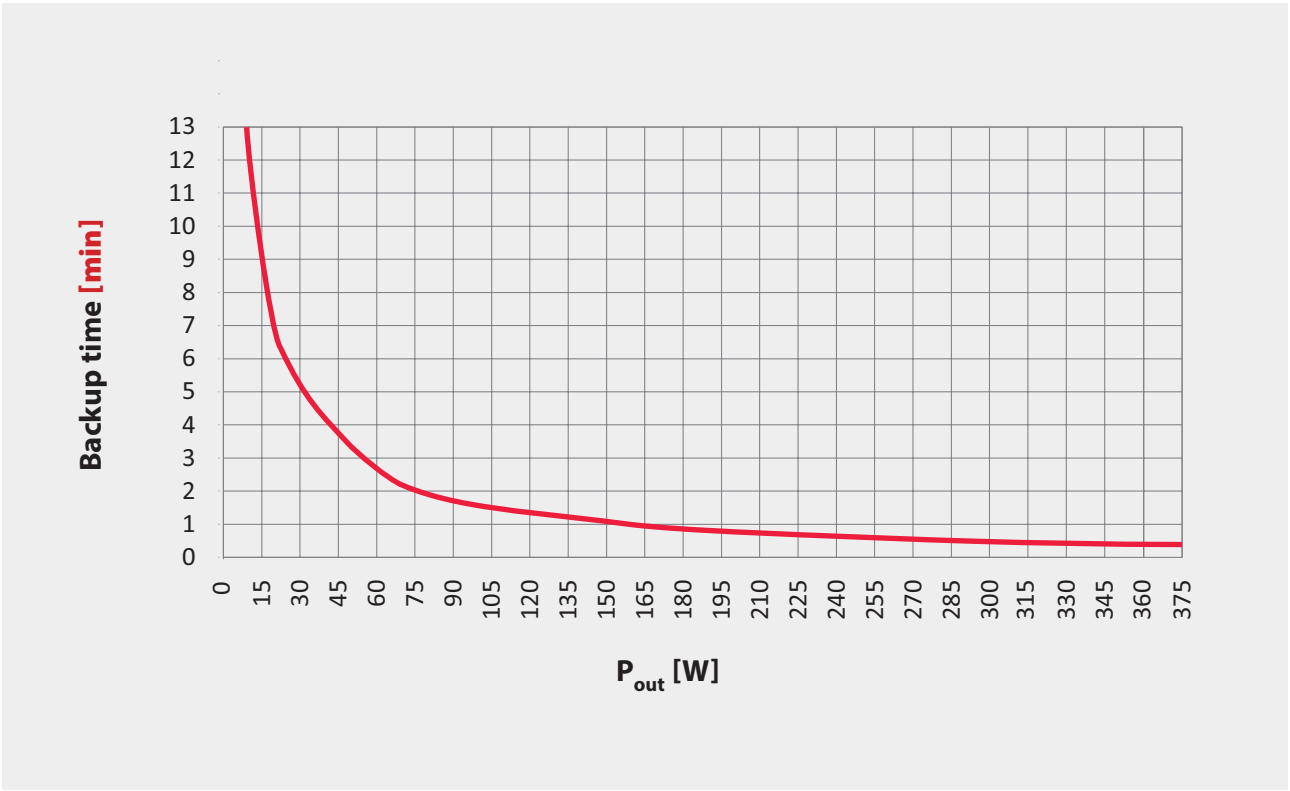
- Powerful 24 V DC UPS (DIN rail version)
- Integrated maintenance-free Supercaps (DP2) OR LiFePO4 battery (DP3)
- Up to 500 000 cycles (DP2) | up to 6 000 cycles (DP3)
- Capacity DP2: 13.5 kJ | DP3: 64 Wh
- Intelligent input current detection
- Regulated output voltage in backup mode
- Minimum load detection
- Power-fail timer function
- Relay dry contact on power fail
- Reboot function
- Fuel gauge
- Shutdown via external signal
- UPSI-2415DP3 with additional Battery start function
- Optimized charging process for significantly shorter charging times for energy storage devices
- Improved robustness of the electronics and intrinsically safe redundancy in the event of a failure
- Low-emission, efficient design – meets the emission requirements according to EN-61000-6-3
- DP3 version: Intrinsically safe high-performance battery pack with IEC 62133 safety certification

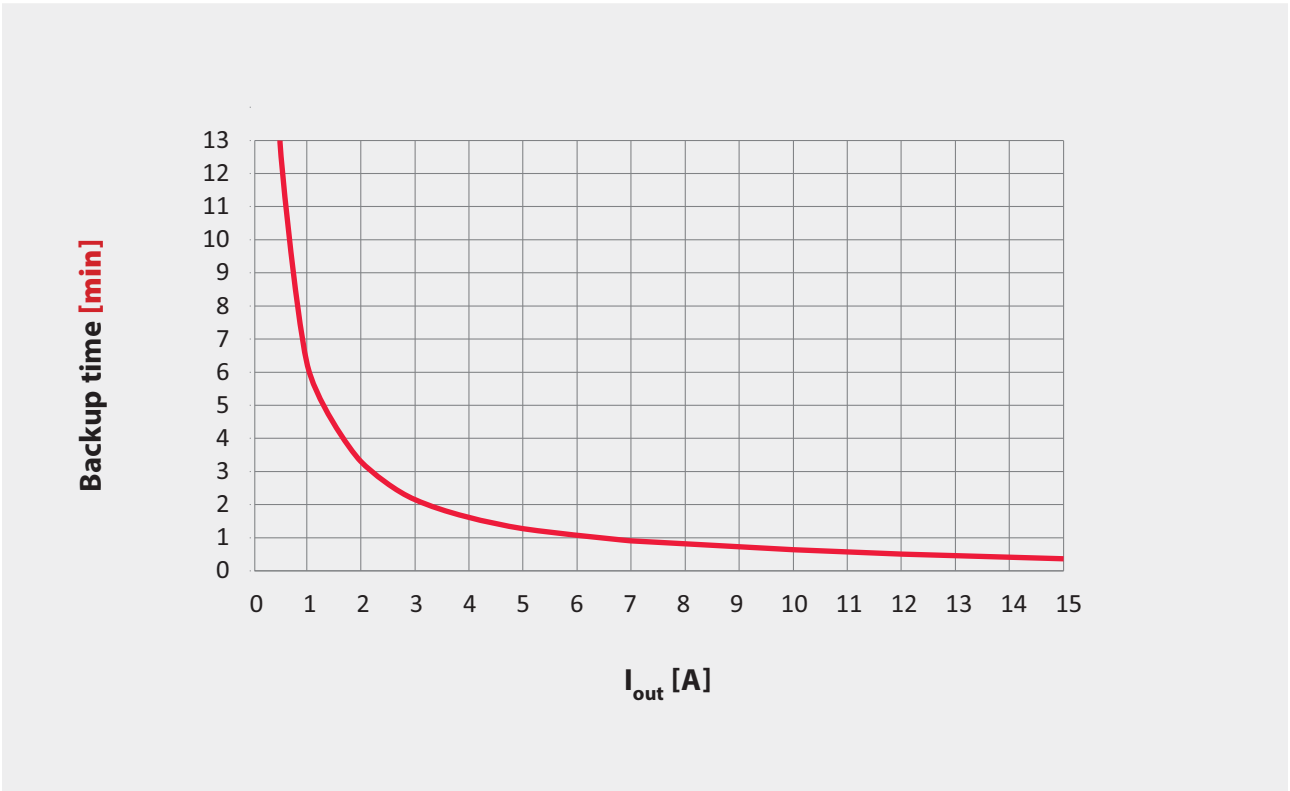




Technical Data	
Input voltage	24 V DC (23…30 V)
Input current	17.5 A max.
Output voltage	Normal mode: V_{IN} – 0.6 V DC max. (depending on load) Backup mode: 24.5 V DC
Output current	15 A max.
Capacitive load	10 000 µF (at start / 0 A output load)
Charging method	CC / CV / CP
Protection	Overcurrent protection at output, Short circuit protection at output
Interface	USB, HID-UPS, RS-485
Battery technology	DP2: EDLC 13.5 kJ (9.0 kJ useful) / 3.75 Wh (2.5 Wh useful) DP3: LiFePO4 2.5 Ah / 64 Wh
Ambient temperature	Operating — Storage / Transport DP2: -20…+65 °C — DP2: -30…+70 °C DP3: -20…+50 °C — DP3: -30…+55 °C, recommended state of charge 80% The given derating curve for the UPSI-2415DP3 must be observed.
Operating altitude	≤4000 m
Max. permitted humidity	≤95 % (at +25 °C, no dew)
Dimensions W / H / D	111 x 157 x 150 mm (without front connectors and DIN-Rail mounting bracket)
Weight	1.71 kg (DP2), 1.43 kg (DP3)

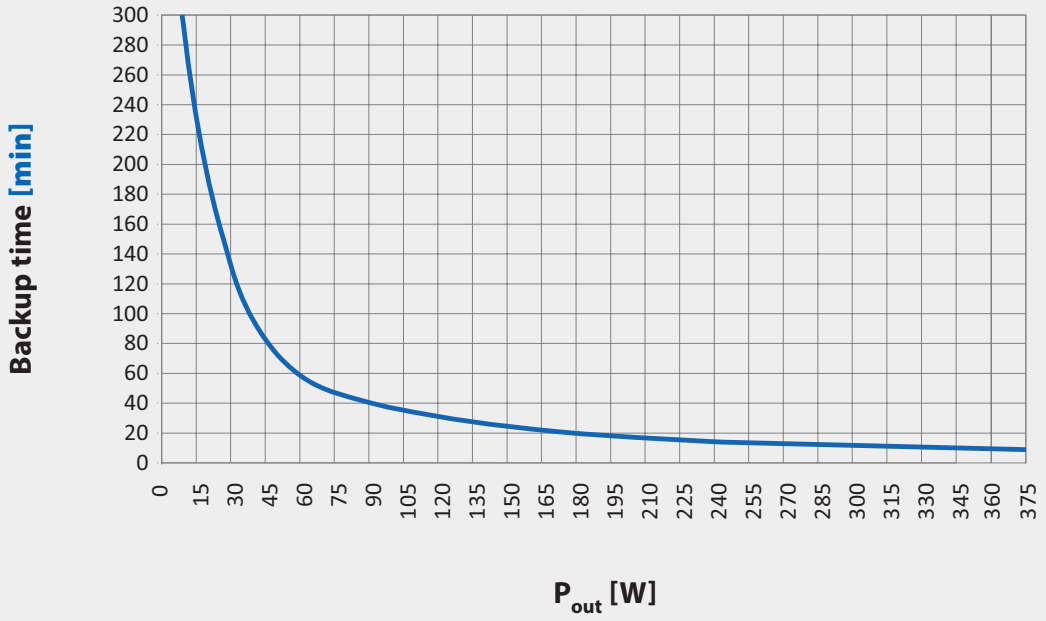
Backup time* UPSI-2415DP2 – Battery type: Supercaps



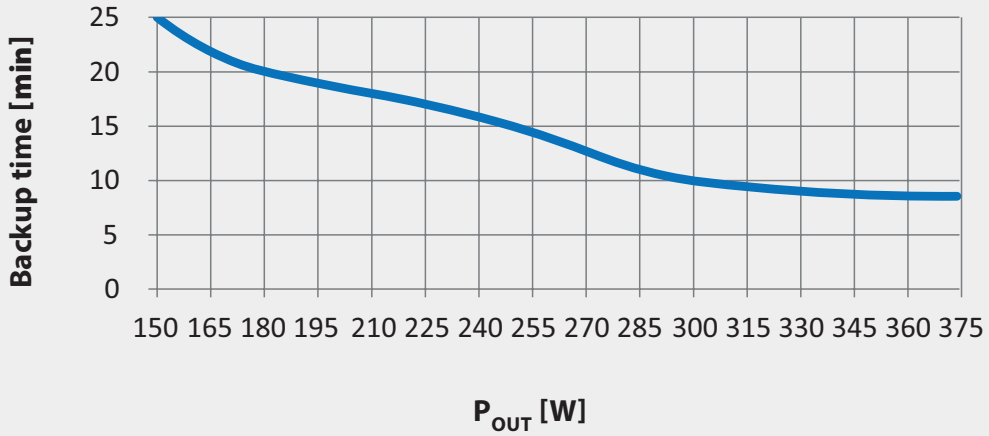


**Backup time depends on battery capacitance, load and temperature. At very high or low temperatures a reduction of backup time occurs. Unless otherwise specified, the values apply to measurements at +25 °C*

Backup time* UPSI-2415DP3 – Battery type: LiFePO4

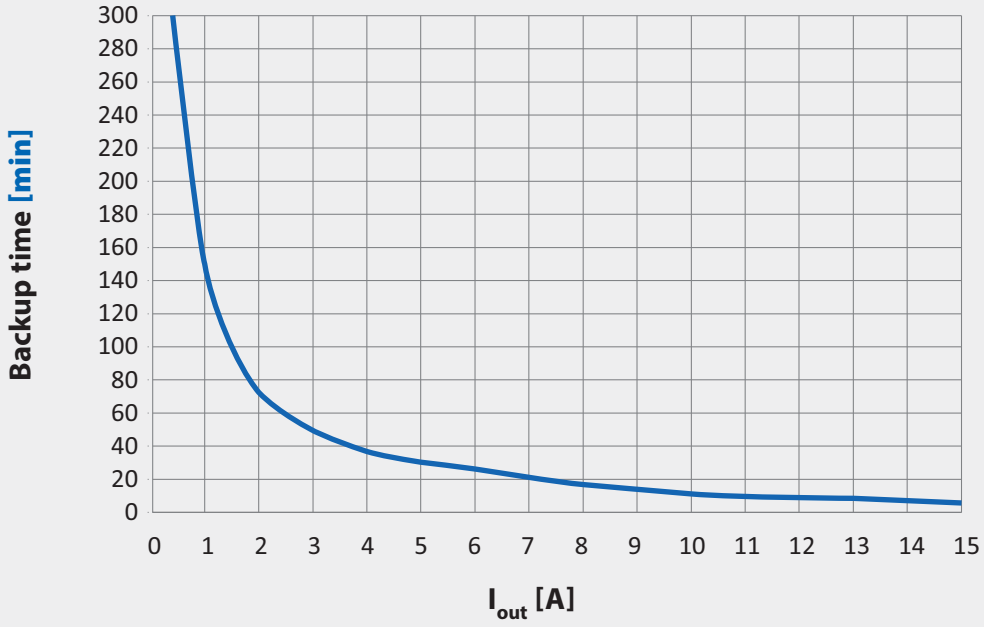


Backup time* UPSI-2415DP3 – DETAIL

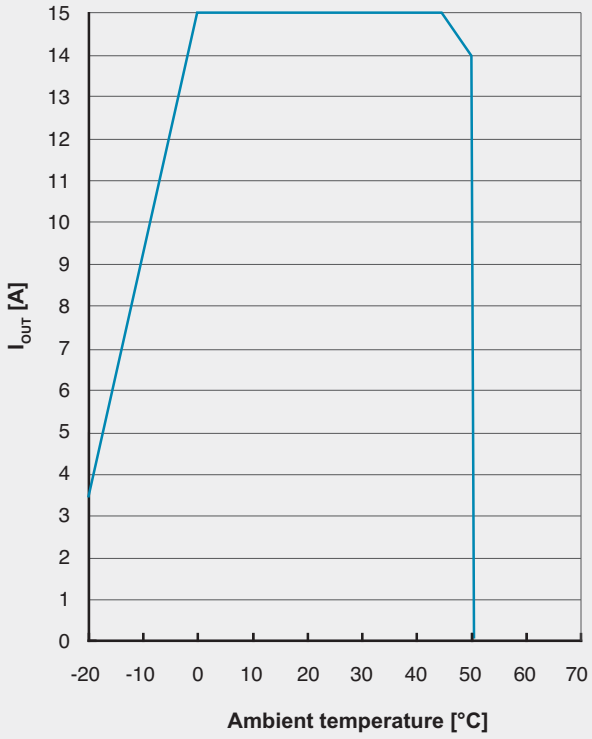


**Backup time depends on battery capacitance, load and temperature. At very high or low temperatures a reduction of backup time occurs. Unless otherwise specified, the values apply to measurements at +25 °C*

Backup time* UPSI-2415DP3 – Batterietyp: LiFePO4



Derating* UPSI-2415DP3



-20…0 °C: At sub-zero temperatures, the charging time increases according to the physical properties of the cells (increased internal resistance).

B Introduction and description

Read carefully before initial operation !

This manual shall help the user to get familiar with the product and its components and features. It shall provide information as accurately and completely as possible.

The manual as well as all documents has to be read and followed strictly before installation. Otherwise in certain situations warranty and guarantee can be cancelled partly or completely. Any liability on the part of Bicker Elektronik is excluded for possible existing errors as well as non-compliance with the instructions for use and installation.

B1 Description of the product and its functions

The UPSI-2415DP2 and UPSI-2415DP3 (hereinafter also called UPS) are DC/DC UPS systems with numerous digital features and high performance. Die high-performance UPS contains an energy storage unit integrated into the chassis: The UPSI-2415DP2 uses an energy storage with supercap (also EDLCs) technology. The UPSI-2415DP3 uses an energy storage with LiFePO4 technology. The primary use of the UPS is to secure the supply during power failures and/or voltage fluctuations. The application which should be protected is connected to the output of the UPS.

The UPS requires a rated dimensioned power supply of 24 V DC at the input. After the input voltage is applied, the UPS works in normal mode automatically. The input voltage is passed through to the output and the integrated energy storage device is charged simultaneously. The charging current depends dynamically on the load current at the UPS output. The green status LED lights up continuously when the UPS is in this state. The higher the load current is set at the output, the more the charging current of the battery pack is automatically reduced in order to keep the performance of the upstream power supply within an acceptable range.

In the event of a voltage drop or a voltage fluctuation of the input voltage (below undervoltage limit), the UPS is switched to backup mode (also backup mode). In this state, the application at the UPS output is supplied via the energy storage device. The backup time (also buffer time) depends on the used energy storage, the value of the output current and the software settings of the UPS. An important feature is that the output voltage in backup mode is always regulated to 24.5 V DC and does not decrease as the voltage of the energy storage device drops. If the UPS operates in backup mode, the status LED is slowly flashing (1 Hz flashing). When the UPSI-2415DP3 (with LiFePO4 battery) is used and it is discharged completely in backup mode, the recharging has to happen as soon as possible.

When the input voltage returns, the UPS is automatically switched back to normal mode and charging of the energy storage device is continued.

The UPS can also be used for user-initiated shutdowns of the supply voltage or cycles. Application examples are the replacement of larger batteries in vehicles in which the electronics should continue to be supplied, the opening and closing of safety valves after a malfunction or the shutdown of a system.

B2 Intended use

This UPS is designed to be installed into a suitable enclosure (e.g. an appropriately certified control cabinet) which protects against electrical, water and fire hazards and can then be used indoors and outdoors. It is primary built for being mounted on a DIN Rail and is intended for professional use in applications such as industrial control, communication and measurement technology. It must not be used in devices or equipment where a malfunction will cause serious injury or endanger human life.

B3 Software

Two different software solutions are available for the UPS Gen^2 devices, which should be selected depending on the operating mode or desired functions.

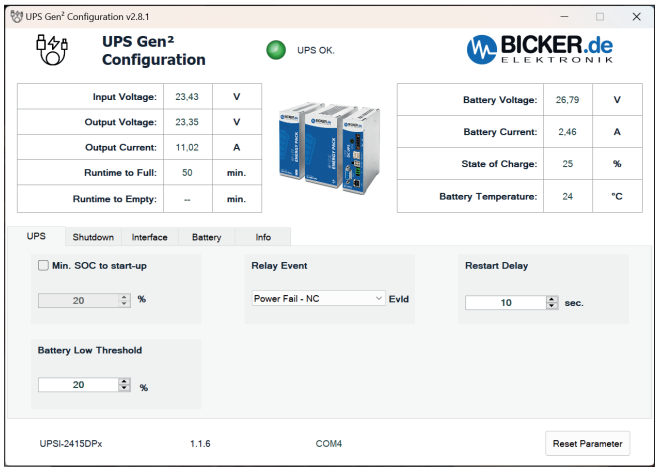
The models have the native UPS device group “HID Power Class” integrated via USB. Most operating systems recognize the UPS via Plug & Play as HID UPS or HID battery without additional drivers and can be operated with the operating system’s own energy settings, which means self-sufficient operation without additional software. In this scenario, only the UPS Gen^2 Configuration Software is required to configure the internal UPS parameters.

If more functions are required, such as running a script before shutdown, the “UPScom - UPS Management Software“ is the right choice. Unlike the “UPS Gen^2 Configuration Software“, this is permanently installed and started on the system.

UPS Gen2 Configuration Software

The UPS Gen^2 Configuration Software is used for setting parameters and programming new firmware for all UPSI Gen^2 devices under Microsoft® Windows. The software tool also shows the operating status of the UPS and its energy storage and can be connected to the device via USB.

The UPS Gen2 software tool provides additional setting options in HID power mode, such as time-bound shutdown and other important functions.



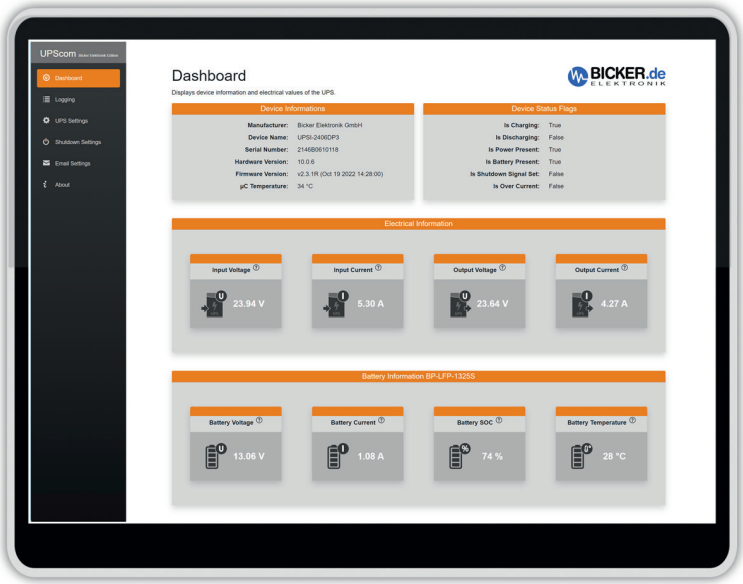
DOWNLOAD
UPS Gen2 Configuration Software

DOWNLOAD
User Manual

UPScom - UPS Management Software

During a power fail, the “UPScom” software enables controlled shutdown and switch off of connected equipment to prevent data loss or corruption. The responsive WEB UI is called up in a web browser to set and preprogram all parameters of the DC UPS system as well as for real-time monitoring with a display of the charge status.

Adjustable parameters include load sensor (mA), shutdown delay, maximum backup time, minimum load capacity before system start, email notifications and running scripts or programs before the system shuts down.



DOWNLOAD
UPScom for Windows® – All CPU

DOWNLOAD
UPScom for Linux – All CPU

DOWNLOAD
Installation Manual Windows®

DOWNLOAD
Installation Manual Linux

C Safety instructions



WARNING!

Disregarding of following issues can result in electric shock, fire, serious injury or death.

1. Care must be taken to ensure proper and professional wiring.
2. The device pack must not be exposed to fire and temperatures outside the specification.
3. The device must not be immersed in water or exposed to splash water.
4. The device must not be operated in a humid environment or in an environment where dew and condensation are to be expected. Prolonged exposure to direct sunlight should be avoided.
5. The device must not be opened, short-circuited, reversed, overheated or otherwise soldered / welded.
6. Changes or attempts to repair the device are to be omitted.
7. Effects of foreign objects on the device must be avoided (e.g. metal parts).
8. Do not put obviously damaged devices into operation (e.g. dents, burn marks, rough contamination).
9. Keep ventilation openings clear.
10. Device must not be dropped.
11. All parts of the device and accessories must not be eaten or swallowed.
12. A current limited source is to be used. The required current values for the UPS are described in this manual.
13. The UPS is supplied with voltage from both the input source and the energy storage. The latter is still energized even after the input source has been disconnected.
14. The device must be kept out of the reach of children.
15. UPSI-2415DP3: Excessive discharge of the battery will result in permanent damage or failure of the UPS. Deeply discharged battery modules must no longer be charged or operated. Deep discharge can occur, for example, if a battery module has been stored for a very long time and has previously been discharged to the final discharge limit.
16. All energy storage devices can still be a source of danger even when they are apparently discharged, as they deliver very high short-circuit currents.
17. The derating curves for the device specified in the manual must be observed.



ATTENTION!

1. Improper use and opening of the device will void the warranty.
2. The device may only be used as intended.
3. The national accident prevention and safety regulations must be observed.
4. The assembly of the device and the electrical installation have to be state of the art.
5. The electrical, thermal and mechanical limit values have to be observed.
6. The UPS wiring specifications - as described in this manual - have to be followed.
7. The UPS (or its energy storage) must be charged before use.



If a cell leaks, the fluid must not come into contact with the skin or enter the eyes or mouth.

Measures in case of inhalation
Vapors or mists escaping from a damaged cell can cause respiratory irritation. When inhaling the contents of an open cell, remove the source of contamination or remove the affected person to fresh air. Seek medical help.

Measures in case of eye contact
Contact with the contents of an opened cell can cause severe burns or eye irritation. If eye contact occurs with the contents of an opened cell, immediately rinse the contaminated eye(s) with a lukewarm, slightly flowing stream of water for at least 30 minutes. Keep eyelids open. Neutral saline may be used as soon as available. If necessary, further rinse the eyes during transport to the emergency supply station. Take care that contaminated water is not flushed to the naked eye or face. Immediately transfer the affected person to an emergency care center.

Measures in case of skin contact
Contact with the contents of an opened cell can cause burns. If skin contact occurs with the contents of an open cell, remove contaminated clothing, shoes and leather parts. Rinse immediately with lukewarm, low-flow water for at least 30 minutes. Seek medical attention if irritation symp-toms or pain persist. Thoroughly wash or dispose of clothing, shoes and leather goods before reuse.

Measures if swallowed
Contact with the contents of an opened cell can cause severe chemical burns to the mouth, esophagus and gastrointestinal tract. If you swallow the contents of an open cell, DO NOT de-liver anything by mouth if the subject becomes unconscious, unconscious, or has seizures. Rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. In case of spontaneous vomiting, place the affected person in a forward bent position to reduce the risk of suffocati-on. Rinse mouth again with water. Immediately transfer the affected person to an emergency care center.

D Technical Data

D1 General Technical Data

INPUT DATA – UPSI-2415DP2 / UPSI-2415DP3 Unless otherwise stated, all specifications apply to 25 °C ambient temperature, 24 V DC input voltage and nominal output current (I_N).	
Input voltage	24 V DC
Input voltage range	23 V DC…30 V DC
Electric strength max.	35 V DC
Fixed connect threshold Undervoltage Voltage drop Input/Output	 21.7 V DC (hysteresis 22.7 V DC) 0.7 V DC max. (depending on load)
Current consumption I_N (U_N, $I_{OUT} = I_N$, $I_{CHARGE} = 0$) I_{MAX} (U_N, $I_{OUT} = I_{STAT.BOOST}$, I_{CHARGE} = max) $I_{NO-LOAD}$ (U_N, $I_{OUT} = 0$, $I_{CHARGE} = 0$) I_{CHARGE} (U_N, $I_{OUT} = 0$, I_{CHARGE} = max)	 15.1 A 17.5 A <100 mA 6.8 A
Power consumption P_N (U_N, $I_{OUT} = I_N$, $I_{CHARGE} = 0$) P_{MAX} (U_N, $I_{OUT} = I_{STAT.BOOST}$, I_{CHARGE} = max) P_{CHARGE} (U_N, $I_{OUT} = 0$, I_{CHARGE} = max)	 360 W 420 W 164 W
Internal input fuse	20 A
Switch-on time	<10 s
Switch-on time battery start (BS) – DP3 only	<5 s

OUTPUT DATA – UPSI-2415DP2 / UPSI-2415DP3 (NORMAL MODE) Unless otherwise stated, all specifications apply to 25° C ambient temperature, 24 V DC input voltage and nominal output current (I_N).	
Output voltage	24 V DC
Output voltage range	$U_{OUT} = U_{IN}$ – 0.7 V DC max. (depending on load)
Capacitive load	10 000 µF (at start / 0 A output load)
Output current I_N $I_{STAT.BOOST}$ I_{SFB}	 15 A 15.2 A 90 A (5 ms)
Output power P_N (U_N, $I_{OUT} = I_N$, $I_{CHARGE} = 0$) $P_{STAT.BOOST}$ (U_N, $I_{OUT} = I_{STAT.BOOST}$, $I_{CHARGE} = 0$)	 360 W 365 W
Short-circuit proof	Yes (reversible short circuit protection)
No-load proof	Yes
Overcurrent shutdown	15.2…16.8 A for max. 100 ms >16.8 A for max. 5 ms
Internal output fuse	15 A

OUTPUT DATA – UPSI-2415DP2 / UPSI-2415DP3 (BACKUP MODE) Unless otherwise stated, all specifications apply to 25 °C ambient temperature, 24 V DC input voltage and nominal output current (I_N).	
Output voltage	24.5 V DC
Output voltage range	±2 %
Output current I_N $I_{STAT.BOOST}$ I_{SFB}	 15 A 15.2 A 90 A (5 ms)
Output power P_N (U_N, $I_{OUT} = I_N$, $I_{CHARGE} = 0$) $P_{STAT.BOOST}$ (U_N, $I_{OUT} = I_{STAT.BOOST}$, $I_{CHARGE} = 0$)	 367.5 W 372.4 W
Short-circuit proof	Yes
No-load proof	Yes
Overcurrent shutdown	15.2…16.8 A for max. 100 ms >16.8 A for max. 5 ms
Switching time normal mode ≫ backup mode	<3 ms

CONNECTION DATA INPUT / OUTPUT	
Connection method	Spring clamp
Conductor cross-section solid	0.2 mm^2 … 6 mm^2 (24 … 10 AWG)
Conductor cross-section flexible	0.2 mm^2 … 6 mm^2 (24 … 10 AWG)
Conductor cross-section with ferrule	0.25 mm^2 … 2.5 mm^2
Stripping length	10 mm … 12 mm

It ist recommended to use flexible conductor cross sections.

ENERGY STORAGE UPSI-2415DP2 (BP-SUC-30090)	
Charging method	CC / CV / CP
Nominal voltage U_N	31.3 V
End-of-charge voltage	31.3 V
Charging current	5.8 A max.
Undervoltage protection	16 V
Battery technology	EDLC
Nominal capacity	13.5 kJ (9.0 kJ useful) / 3.75 Wh (2.5 Wh useful)
Charging time (I_charge_max)	~5 min (if energy storage is completely discharged)
Buffer time (I_N)	26 sec

ENERGY STORAGE UPSI-2415DP3 (BP-LFP-2725)	
Charging method	CC / CV / CP
Nominal voltage U_N	25.6 V
End-of-charge voltage	27.6 V
Charging current	≤2.32 C (5.8 A max.)
Undervoltage protection	2.4 V (cell level)
Battery technology	LiFePO4
Nominal capacity	2.5 Ah / 64 Wh
Charging time (I_charge_max)	28 min
Buffer time (I_N)	8 min 10 sec

CONNECTION DATA – RELAY	
Connection labeling	RL
Switch contact (potential free)	Relay
Status (configurable)	Power Fail Alarm
Switching voltage	24 V DC
Current carrying capacity	0.5 A (DC)
State - signal assignment	NO (Normally Open) / NC (Normally Closed) – configurable via Software (see UPS Gen^2 software manual)
Switching time	4 s max.

DATA INTERFACE – USB	
Interface designation	USB
Numbers of interfaces	1
Connection method	USB type C (female)
Locking	No
Transmission physics	USB 2.0
Topology	Point-to-point
Protocol	VCOM, HID
Transmission length	≤3 m
Access time	<1 s
Chipset	NXP
Electrical isolation	No

DATA INTERFACE – RS-485	
Interface designation	RS-485
Numbers of interfaces	1
Connection method	Lockable connector
Locking	Yes (lockable)
Transmission physics	Modbus RTU
Topology	Daisy-Chain
Symbol rate (baud rate)	38400
Conductor cross-section solid	0.08 mm^2…1.5 mm^2 (28…16 AWG)
Conductor cross-section flexible	0.08 mm^2…1.5 mm^2 (28…16 AWG)
Conductor cross-section with ferrule	0.25 mm^2…1 mm^2
Stripping length	6 mm…7 mm
Transmission length	<100 m
Access time	<1 s
Voltage level	-3.3 VDC … +3.3 VDC
Electrical isolation	No

GENERAL DATA	
Flammability class according to UL 94 (housing / terminal blocks)	V0
Weight	DP2: 1.71 kg, DP3: 1.43 kg
UPS connection in parallel	No
UPS connection in series	No

HOUSING	
Degree of protection	IP 20
Protection class	III (without PE)
Mounting type	DIN-Rail mounting (EN 60715)
Housing version	Aluminium
Dimension W / H / D	111 mm / 157 mm / 150 mm (without front connectors and DIN-Rail mounting bracket)

ENVIRONMENTAL CONDITIONS	
Ambient temperature (operation)	DP2: -20… +65 °C / DP3: -20… +50 °C
Ambient temperature (start up without load)	DP2 / DP3: -20 °C
Ambient temperature (storage / transport)	DP2: -30…+70 °C / DP3: -30…+55 °C
Max. permitted humidity	≤95 % (bei +25 °C, no dew)
Operating altitude	≤4000 m
Climate class	3k3 (EN 60721)
Degree of pollution	2
Overvoltage category EN 61010-1 EN 61010-2-201	 I I
Indoor use	Yes
Outdoor use	Possible in additional, suitable housing.

STANDARDS	
Safety extra-low voltage	IEC 61010-1 (SELV) IEC 61010-2-201

APPROVALS	
Certified according to	UL61010-1 UL61010-2-201 CSA C22.2 61010-1-12 CSA C22.2 61010-2-201
CB Scheme	IEC 61010-1 IEC 61010-2-201

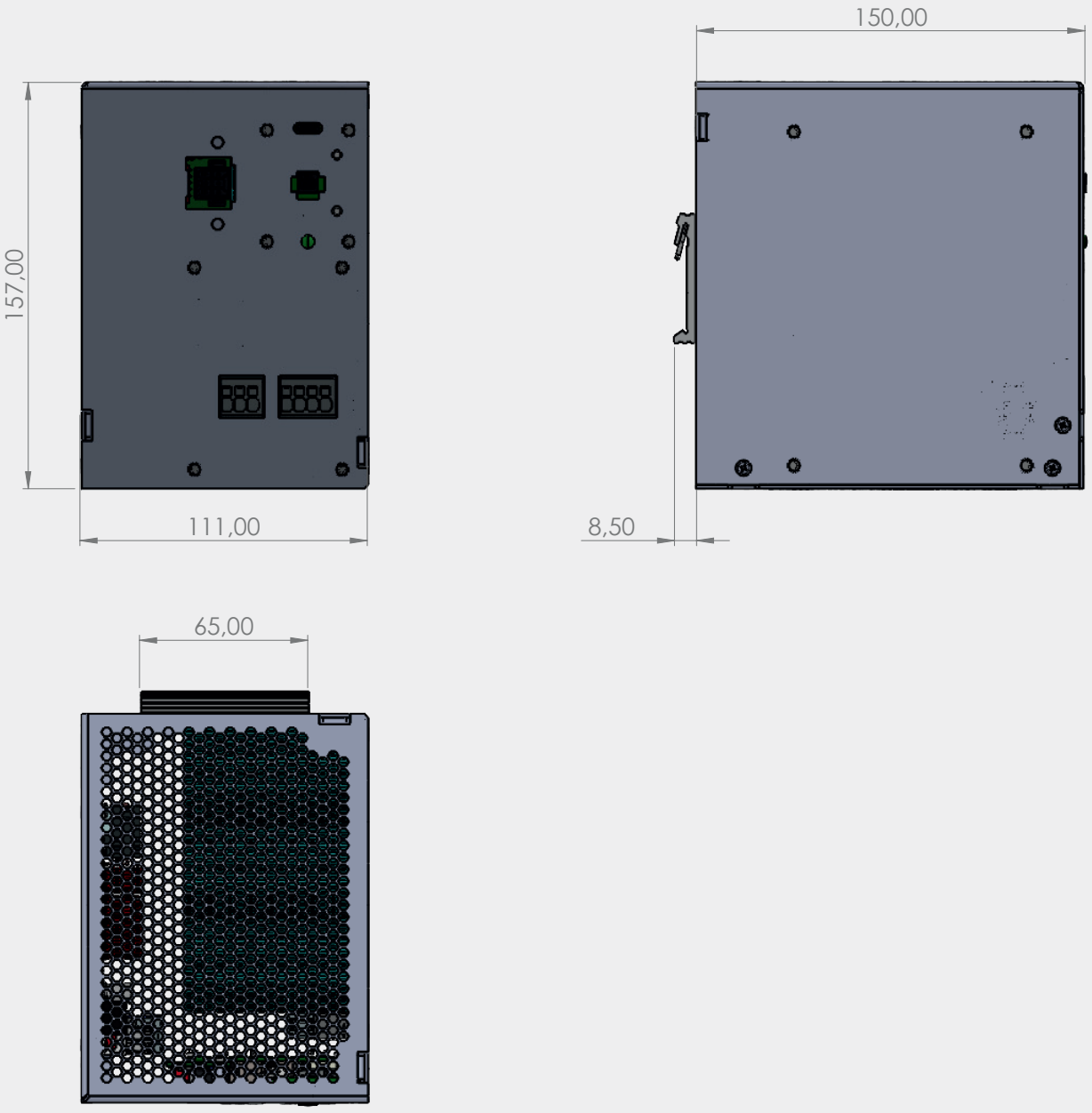
INTERFERENCE IMMUNITY ACCORDING TO EN 61000 (INDUSTRY)	
Basic standard CE	**Fulfilled requirements according to EN 61000 (CE) (Interference immunity of industrial environment)**
Electrostatic discharge EN 61000-4-2	
Contact discharge	4 kV
Air discharge	8 kV
Comment	Criterion A
Electromagnetic HF field EN 61000-4-3	
Frequency range	80 MHz … 1 GHz
Test field strength	10 V/m
Frequency range	1.4 GHz … 2 GHz
Test field strength	3 V/m
Comment	Criterion A
Fast transients (Burst) EN 61000-4-4	
Test voltage	2 kV
Comment	Criterion A
Surge voltage load (Surge) EN 61000-4-5	
Test voltage L–N	±1 kV
Test voltage L–PE, N–PE	±2 kV
Comment	Criterion A
Induced radio-frequency fields EN 61000-4-6	
Frequency range	0.15–80 MHz
Test level	10 V; 150 Ω source impedance; AM80 % / 1 kHz (sine)
Comment	Criterion A
Power frequency magnetic field immunity EN 61000-4-8	
Test level	30 A/m
Comment	Criterion A

EMISSION ACCORDING TO EN 61000-6-3 (HOUSEHOLD)	
Basic standard CE	**Fulfilled requirements according to EN 61000-6-3 (CE) (Household environment)**
Conducted emission from the power port EN 61000-6-3	
Frequency range	150 kHz–30 MHz
Comment	Conform
Electric field radiated emission EN 61000-6-3	
Frequency range	30 MHz–1 GHz
Comment	Conform

LEGEND	
Criterion A	Normal operating behaviour within the defined limits. No impact on the output voltage.
Criterion B	Temporary impairment of the operating behaviour, that is corrected by the device itself.

D2 Drawing

Unless otherwise stated,
Tolerance according to:
DIN ISO 2768 T1 - m
DIN ISO 2768 T2 - K



E General Data

E1 Assembly and installation advice

Installation and operation of this device is only allowed to be executed by a qualified electrician! The application has to be separated from any power during the mounting process. Wires have to be connected safely and must not have contact with sharp edges. Pay attention to correct polarity! Before commissioning, check all the connections for correctness!

E2 Convection and installation position

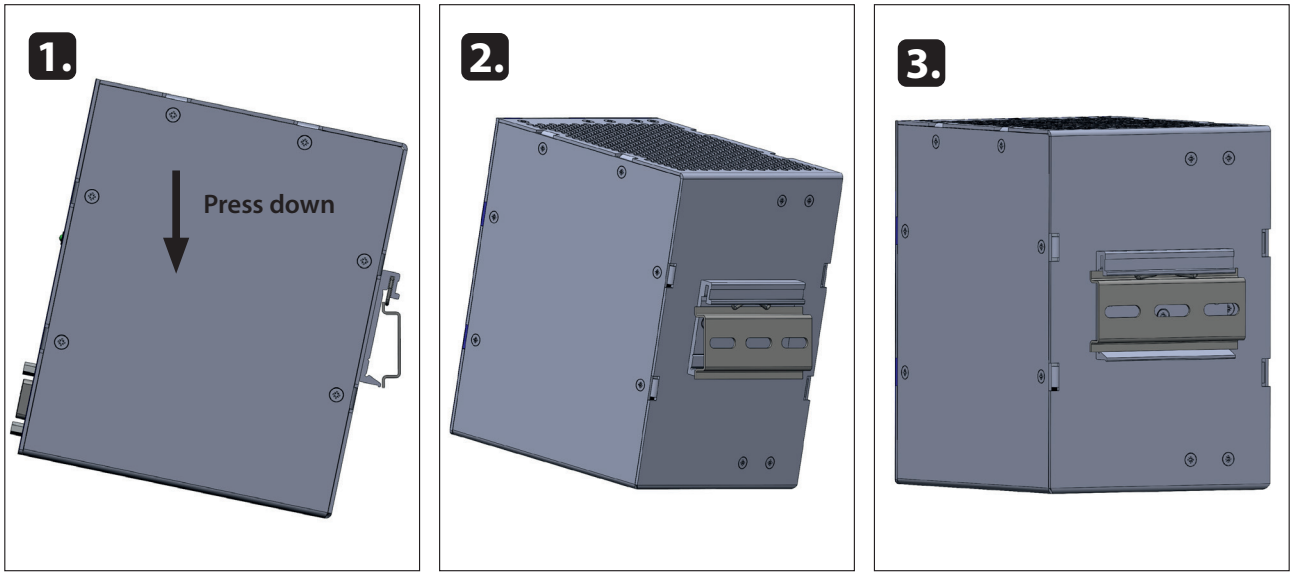
For these DIN rail versions, vertical mounting on a horizontal rail (DIN rails according to EN 60715) is recommended in order to achieve the best possible convection of the UPS. Another mounting position is possible, but operation up to the respective highest ambient temperature can not be guaranteed.
Make sure that no ventilation holes are covered by other, neighboring components and devices.

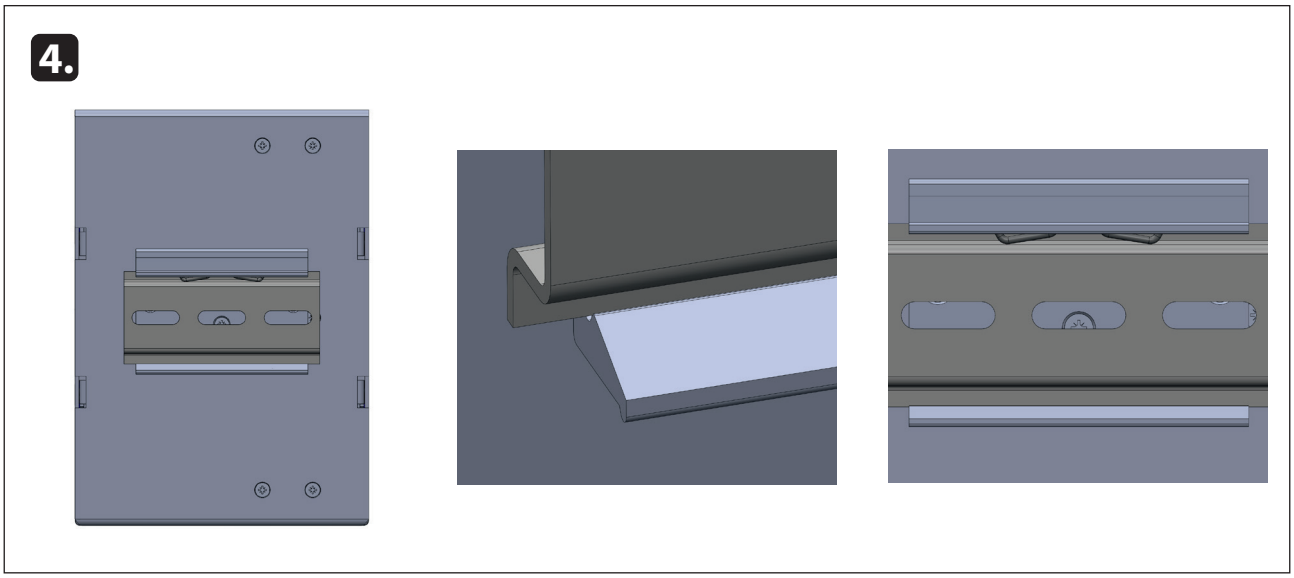
The following distances to neighboring devices are recommended:
Left / right: 20 mm
Top / bottom: 50 mm

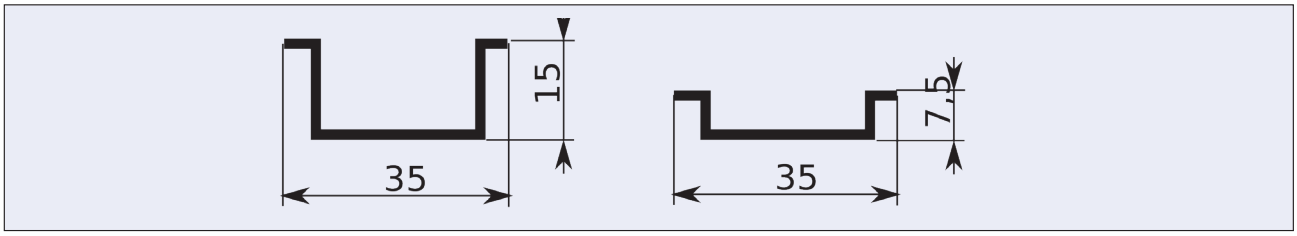


The devices comply with the IP protection class 20.

DIN-Rail mounting and DIN-Rail profile according to EN 60715







E3 Description of connectors

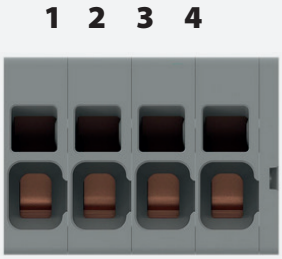
For a list of the part numbers of the plugs and counter parts, see the following chapter.

INPUT (V_{IN}, FE)



PIN	FUNCTION
1	V_{IN} +
2	V_{IN} –
3	FE (Functional earth)

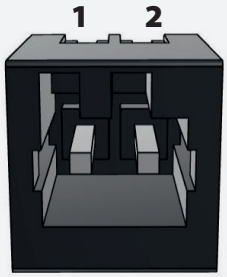
OUTPUT (V_{OUT})



PIN	FUNCTION
1	V_{OUT} –
2	V_{OUT} –
3	V_{OUT} +
4	V_{OUT} +

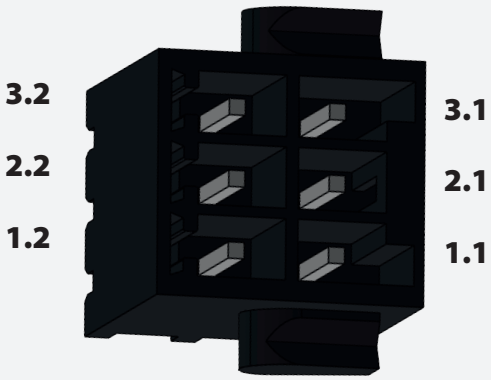
RELAY CONNECTION (RL)

The function of the relay connection is configurable via software. When closing the relay the resistor value between both contacts is approx. 0 Ω, otherwise they are „open load“.



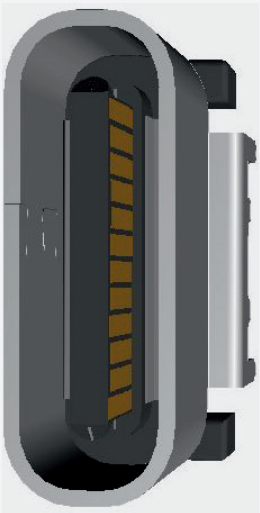
PIN	FUNCTION
1	Relay contact 1
2	Relay contact 2

RS-485



PIN	FUNCTION
1.1	D+
1.2	D+
2.1	D –
2.2	D –
3.1	GND
3.2	GND

USB-C PIN ASSIGNMENT STANDARDIZED



PIN	FUNCTION
A1	GND
A2	SSTXp1
A3	SSTXn1
A4	VBUS
A5	CC1
A6	Dp1
A7	Dn1
A8	SBU1
A9	VBUS
A10	SSRXn2
A11	SSRXp2
A12	GND

PIN	FUNCTION
B12	GND
B11	SSRXp1
B10	SSRXn1
B9	VBUS
B8	SBU2
B7	Dn2
B6	Dp2
B5	CC2
B4	VBUS
B3	SSTXn2
B2	SSTXp2
B1	GND

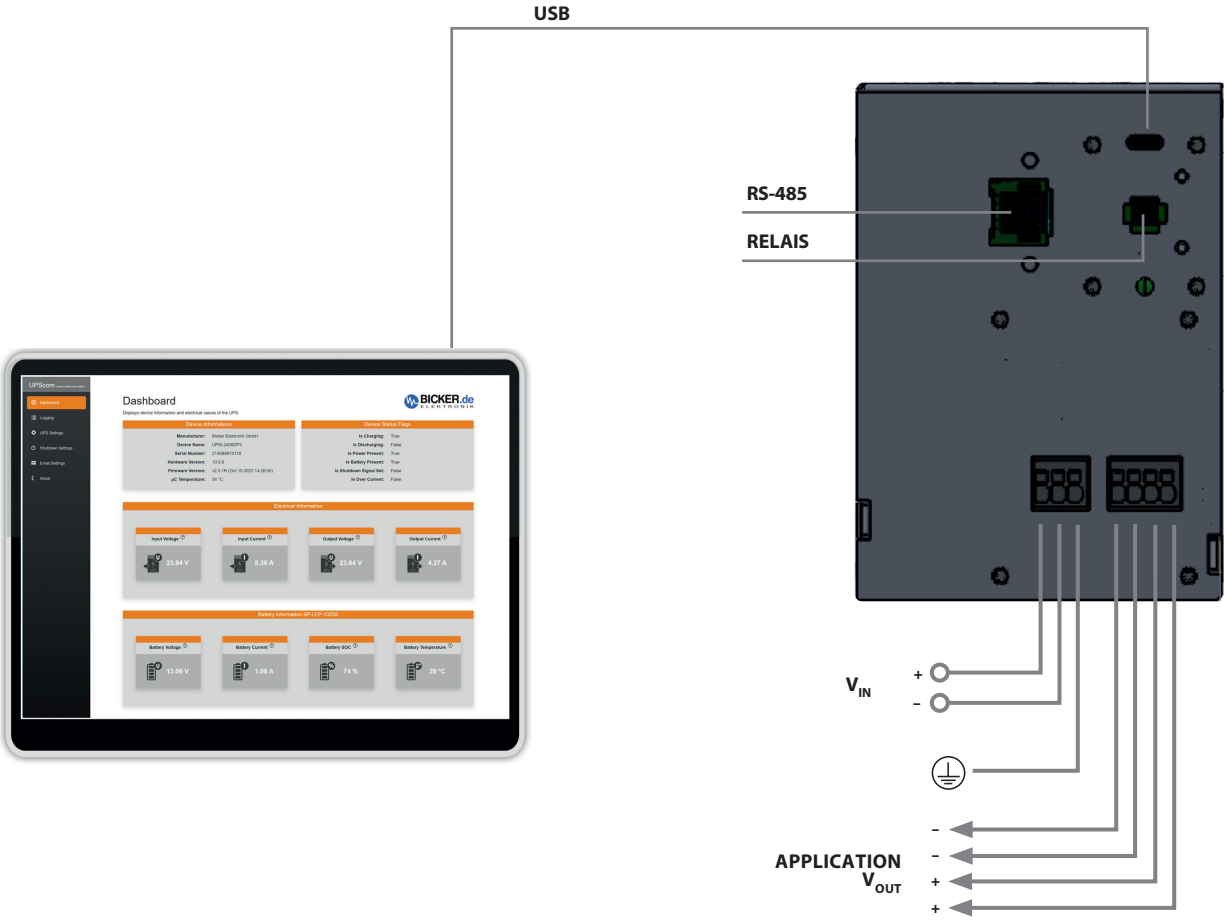
E4 Dimensioning the upstream power supply

Ensure that the upstream power supply is correctly dimensioned to guarantee the charging process of the batteries and the correct functioning of the application. The input has to be supplied from a SELV or PELV power supply. In order to operate the UPS devices with complete functionality, the upstream power supply must be able to provide at least 24 V / 20 A and constant current function should not be used. It is recommended to use a 500 W power supply. Suitable, compact power supplies are also available at Bicker Elektronik.

If less load than the maximum load is required at the output, the voltage supply can be dimensioned according to the table below.

UPSI-2415DP2 / UPSI-2415DP3	
I_{LOAD} [A]	I_{IN-MIN} [A]
0	6.8
1	7.5
3	8.8
6	10.8
9	12.8
12	14.8
15	16.8

E5 Connecting diagram



CONNECTING ORDER

1. APPLICATION (V_{OUT})
2. DC SOURCE (V_{IN})
3. RELAY / USB / RS485

Dismantling order reverse to connection!

V_{IN}/V_{OUT} – ATTENTION!

1. Note polarity!
2. At least AWG14 wires should be used (2.5 mm^2)

E6 Initial operation

The correct installation of the UPS has to be ensured. After that, the start can take place in two ways:

1. **By connecting the supply voltage (standard):**
   If a voltage more than 23 V is connected to the input terminals, the energy storage is queried and transmits its data. The UPS sets the appropriate end-of-charge voltage and releases the pack via the internal function „System Present“. After that, the charging of the energy storage starts.

OR

2. **Starting the battery from the energy storage into backup mode (alternative – only with UPSI-2415DP3):**
   By pressing the BS button for more than 2 seconds (max. 5 s). See also chapter E12 „Battery start“.

The applied voltage at the input of the UPS is passed through to the output, reduced by a current-dependent voltage drop ($V_{OUT} = V_{IN}$ - 0.7 V at maximum current). The device charges the energy storage and monitors the upstream voltage thresholds at the input (UPS function).

It must be ensured that the source supplies enough current to guarantee the charging process (see chapter E4 „Dimensioning the upstream power supply“).



Even after disconnecting the upstream source and also no voltage is measurable at the output, the UPS can be still powered by the energy storage.

E7 Overview connector / Counterpart with description / Scope of delivery

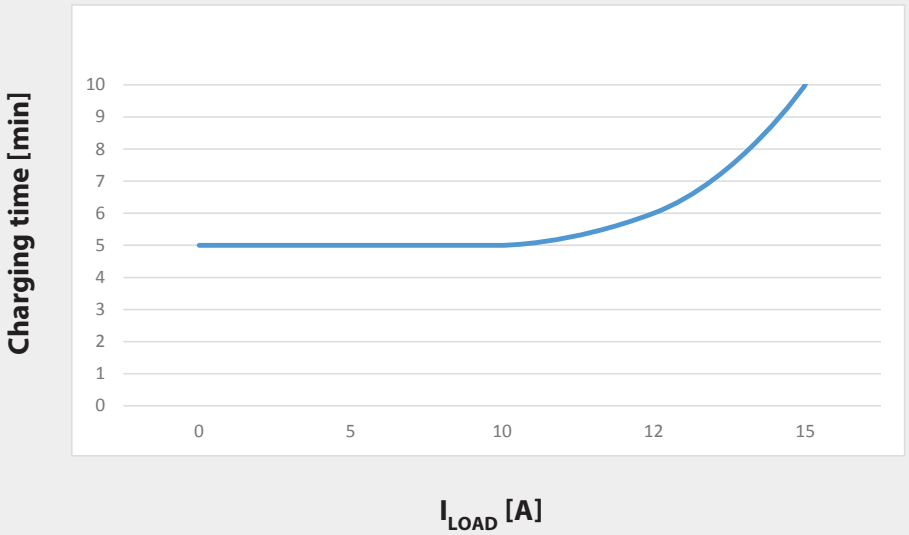
CONNECTOR	PART NO.	COUNTERPART NO.
V_{IN}	Wago 2624-3103	Direct connection of the strands (spring terminal)
V_{OUT}	Wago 2624-3104	Direct connection of the strands (spring terminal)
RL	Wago 733-332/105-604	Wago 733-102/105-604/037-000 Wago 733-102/037-000 Amtek 5TM250N-W02F02GLB-01
USB	Würth Elektronik 632722110112	USB type C connector
RS-485	Wago 713-1403/116-000	Wago 713-1103/037-000

SCOPE OF DELIVERY	
QUANTITY	**DESCRIPTION**
1x device	UPSI-2415DP2 or UPSI-2415DP3 - DC UPS
1x	RS-485 connector counterpart (Modbus)
1x	Relay connector counterpart

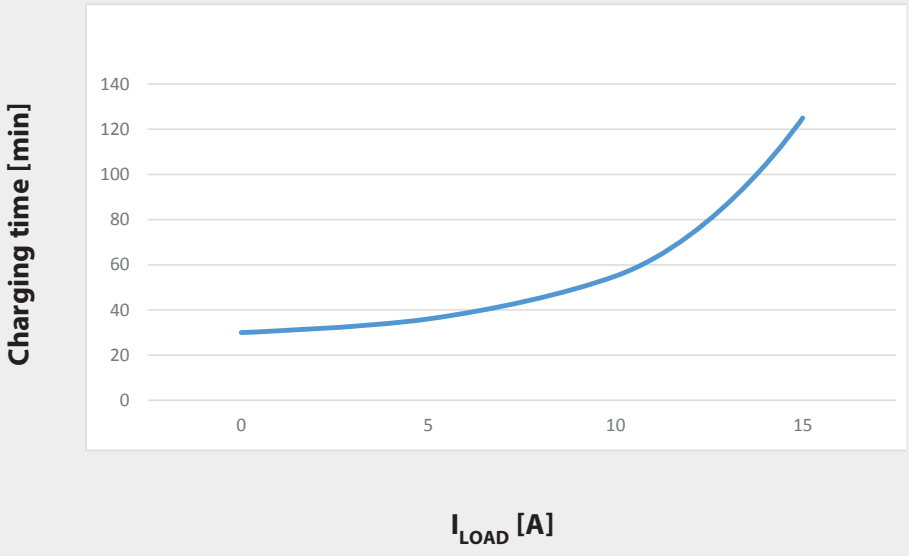
E8 Charging time

Charging times depend on energy storage, input voltage and the load current. The following diagrams show the approximate charging time of the energy storage device (up to SOC = 100%) as a function of the load current.

UPSI-2415DP2



UPSI-2415DP3



Note: With the DP2 version, the recharging time of the module is significantly reduced if it is recharged immediately after battery operation has ended.

E9 Reverse polarity / Overcurrent / Short circuit / Over- and Undertemperature protection

REVERSE POLARITY

The device has active reverse polarity protection at the input which protects the UPS from damage. Once the error is corrected, the UPS can be used as intended again. A 20A fuse is installed as additional redundancy in the event of a serious fault (irreversible disconnection).

OVERCURRENT

If the load current at the output is too high (more than 15.2 A), the device switches it off. For maximally allowed current values and peak current values refer to chapter D „Technical Data". The status LED indicates the error status by means of a very rapid flashing sequence. A restart attempt occurs every 10 seconds in normal mode. Usually, during backup mode there is no restart attempt.

SHORT CIRCUIT OUTPUT (V_{OUT})

In the event of a short-circuit at the output of the UPS, the output is immediately disconnected (<5 ms). The status LED indicates the error status by means of a very rapid flashing sequence. A restart attempt occurs every second in normal mode (non-latch). Usually, during backup mode there is no restart attempt. The impact of a short-circuit to the device depends on length and diameter (impedance) of the output wiring. In case of a short-circuit directly at the plugs a damage of the device can occur. In case of a serious fault, a 15A fuse is installed as additional redundancy

INPUT SHORT-CIRCUIT AND BACKFEED PROTECTION (V_{IN})

The UPS also features active input short-circuit protection. This prevents any potential backfeed into the upstream power supply. A 20A fuse is installed for redundancy in the event of a fault.

OVER AND UNTERTEMPERATURE PROTECTION

The UPS has temperature measurement and shutdown features on both the energy storage unit and the central DC/DC converter. If critical limits are exceeded, the energy storage unit or the main converter is shut down to prevent damage and dangerous conditions. Please note that in the DP3 version, the permissible charging temperature of the high-performance cells is lower than the discharging temperature. After battery operation at high ambient temperatures, the charging operation of the energy storage device can be blocked for a certain period of time until the temperature falls below permissible limits again.

ERROR TYPE	1. SECURITY LEVEL – ALWAYS REVERSIBLE	2. SECURITY LEVEL	3. SECURITY LEVEL
Short circuit output (V_{OUT})	Output shutdown by power MOSFETs	Shutdown by BMS (reversible) – DP3 version only	15A fuse (irreversible)
Short circuit input (V_{IN})	Input shutdown by power MOSFETs	20A fuse (irreversible)	additional internal 20A fuse (irreversible)
Reverse polarity input (V_{IN})	Input shutdown by power MOSFETs	20A fuse (irreversible)	additional internal 20A fuse (irreversible)
Overcurrent output (V_{OUT})	Output shutdown by power MOSFETs	Shutdown by BMS (reversible) – DP3 version only	15A fuse (irreversible)
Overtemperature	Switch-off of converter/energy storage by microcontroller (temperature measurement on energy storage and main converter)	Shutdown by BMS (reversible) – DP3 version only	
Overcharging battery pack	Integrated detection/activation of the energy storage device. Energy storage device is switched off by the microcontroller if the charging voltage is too high.	Shutdown by BMS (reversible) – DP3 version only	Thermal fuse to BMS (irreversible) – DP3 version only

BMS = Battery management system

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E10 Backup time in backup mode

The nominal backup times for different output loads can be found in the technical data of this user manual (Chapter A „Brief specification“) or the separate user manuals for the respective energy storage devices. Extremely low or high temperatures may reduce the backup times.

E11 Behaviour in case of exceeding maximum backup time

When the given buffering times are exceeded, the output is separated on the basis of the discharge voltage of the corresponding energy storage (total discharge protection).
In particular, with the LiFePO4 battery of the DP3 version, an additional switch-off threshold can take effect if the discharge current of the energy storage device is too high. This can occur with very high load currents at the UPS output, especially in the low temperature range or with a very aged battery. The lower the voltage of the energy storage device decreases, the higher the discharge current so that a constant power is ensured at the output of the UPS.

E12 Battery start (only with UPSI-2415DP3)

This function enables the application or the device to be started from the battery without the power supply being available or connected. To do this, the BS button has to be pressed through the hole in the front of the housing with a fine object (thin screwdriver or similar) for more than 2 seconds (max. 5 s). This is only useable with UPSI-2415DP3. Battery start-up can only occur when the battery is charged. The output can be deactivated by pressing the button again during battery start-up operation.

E13 Reset button

There‘s a reset button on the front of the UPS. In the unlikely event of a firmware crash, the „Reset“ button can be used to manually reboot the microcontroller. To do so, use a delicate instrument (a thin screwdriver or similar) to push it through the corresponding hole in the front of the case. This button should only be used in an emergency!

E14 Relay contact

The relay contact can be configured as normally open or normally closed using e.g. the UPS-Gen^2 software.
The relay signals whether the UPS is in battery operation or mains operation, e.g., for evaluation via an external microcontroller or PLC. The contact is potential-free. When the relay is closed, the resistance between the two pins is approximately 0 Ω; otherwise, they are „open load.“ It must not be loaded with more than 24 V DC / 0.5 A. Safety-critical circuits must not be implemented with the relay contact. The delay time for switching the contacts can be up to 3 seconds.

Please note that the relay contacts are wired as „normally closed“ in the hardware – i.e., as soon as the UPS is turned off, the relay contact is always closed.

The following states apply to the software functions:

„normally closed“: Default setting of the UPS
Mains operation ..... Relay closed (0 Ω)
Backup mode..... Relay open (open load)
UPS turned off..... Relay closed (0 Ω)

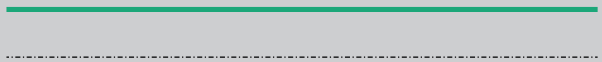
„normally open“:
Mains operation ..... Relay open (open load)
Backup mode..... Relay closed (0 Ω)
UPS turned off..... Relay closed (0 Ω)

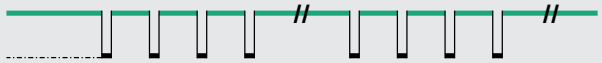
E15 Module behaviour at low temperatures – UPSI-2415DP3 only

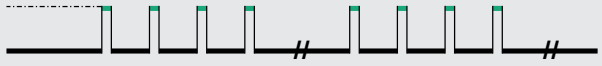
When operating the UPSI-2415DP3 in subzero temperatures, the internal resistance of the cells in the integrated battery pack increases significantly due to physical reasons. As the operating temperature drops, this leads to reduced battery performance and a reduced backup time of the UPS system. The BP-LFP-2725 is equipped with high-performance LiFePO4 cells, enabling it to be used even at sub-zero temperatures. However, in temperatures below zero, it is recommended not to operate the UPS with an output current exceeding 3.5 A. If the output current is set too high when the module is running on battery power, the BMS of the frozen battery pack will disconnect the main power path prematurely due to an excessive drop in cell voltage. The expected backup time is reduced to approximately 80 % at an ambient temperature of -20 °C compared to operation at room temperature, i.e., to approximately 34 minutes at a load current of 3.5 A at the output. Charging the battery pack at sub-zero temperatures is possible, but the charging process can take a very long time due to the significantly increased internal resistance of the cells.

E16 Status LED

A green status LED is visible on the front of the UPS. The following states can be distinguished:

MAIN STATES		
	Always on	**Status: mains voltage** >> Mains voltage is present.
	1 Hz flash (1 s on, 1 s off)	**Status: Backup mode** >> Mains voltage is not present.

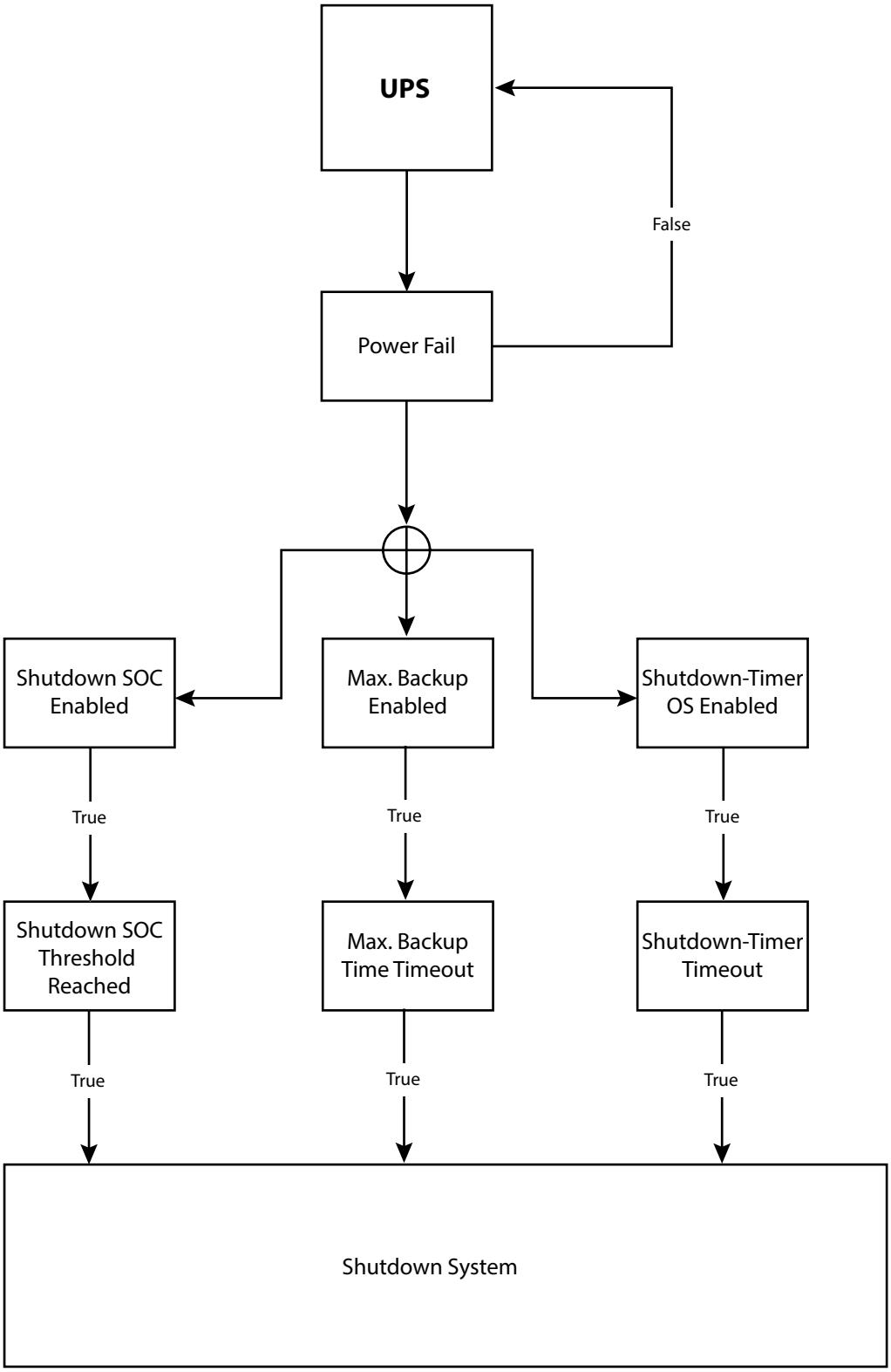
INTERNAL STATES		
	1 x flash (LED is off briefly), pause 2 s	**Status: Battery start*** >> Manual start from the battery by pressing the BS button.
	2 x flash (LED is off briefly), pause 2 s	**Status: Capacity not reached** >> Capacity is required. Output is only activated when the battery is charged to set SOC.
	3 x flash (LED is off briefly), pause 2 s	**Status: Shutdown** >> UPS has received a shutdown signal and is waiting until the set load sensor value has fallen below.
	4 x flash (LED is off briefly), pause 2 s	**Status: Reboot** >> Output is deactivated and time until reboot runs (Reboot phase).

BATTERY FAILURES		
	1 x flash (LED is off a long time), pause 2 s	**Status: No battery detected**
	2 x flash (LED is off a long time), pause 2 s	**Status: Battery overvoltage** >> Charge voltage at battery is too high, battery is deactivated.
	3 x flash (LED is off a long time), pause 2 s	**Status: Battery overcurrent** >> Charge current at battery is too high, battery is deactivated.
	4 x flash (LED is off a long time), pause 2 s	**Status: Battery temperature failure** >> Battery temperature sensor was not detected or battery temperature is too high or low.

UPS FAILURES		
	Quick flashing without pause	**Status: UPS failure** >> Output current too low, UPS is deactivated. >> Overcurrent at output (charge current too high), output is deactivated >> Short circuit at output, output is deactivated >> Internal failure, UPS is deactivated.

** Only usable with UPSI-2415DP3*

E17 Shutdown diagram



E18 Recommendations for a long UPS service life

DP2 version: Over time, the capacity of the Supercaps decreases and the ESR (equivalent series resistance) increases. However, EOL is often defined as a reduction in capacity to 70 % and a doubling of the ESR. An important aspect for the aging of the Supercaps is the end-of-charge voltage and the operating temperature.

DP3 version:LiFePO4 batteries also age over time depending on cycles, operating temperature and the level of the end-of-charge voltage.

The end-of-charge voltages of the UPS are optimized so that they are at an optimum between service life and performance.

To extend the lifetime of the system, the device should not be placed near sources of heat and should be placed within good air-circulation. Continuous operation at very high ambient temperatures has a particularly negative impact on the lifetime of the UPS due to physical reasons. Especially when using the UPSI-2415DP3 (LiFePO4 battery), a larger capacity than actually required should always be used. The less deep the packs are discharged, the longer the service life lasts.

E19 Maintenance

The UPS contains no serviceable parts. In case of a malfunction the upstream power source has to be disconnected and cables have to be removed. Use a dry cloth for cleaning!

E20 Disposal

Electric and electronic devices must not be disposed with domestic waste! Please consider to each country's own regulation about recycling and disposal of used batteries at the end of their lifetime or resending to any recycling organization.



E21 Disclaimer

We, the Bicker Elektronik GmbH, have checked the contents of this document for compliance with the hardware and software described. Nevertheless, deviations can not be ruled out, so we assume no liability for the complete agreement. The information in this publication is checked regularly, necessary corrections are included in the updated versions.

Suggestions for improvement as well as tips and criticism are always welcome.

E22 Preventive measures and rules when operating the UPS system

The voltage drop of the supply line has to be kept in mind! The very high input current of the UPS (load current + charging current) leads to high voltage drops if the cable cross-sections are too long and/or too thin. If the voltage drop is too high a shortfall of the threshold values for the backup mode is possible and a not intended Power Fail could be caused. With maximum load the voltage at the input of the device must not undercut 23 V. Even after the upstream supply has been disconnected, the device continues to run for some time after the shortfall of the load sensor (setting of a threshold value for current via software: currents below this value will be classified as „system off" (no load)).

A short direct at the output of the device can cause damage or destruction of the UPS. In the event of a fault, electrolytes can escape in liquid and gaseous form.

E23 Transport information

Transport regulations for devices with energy storage
Devices containing LiFePO4 batteries and supercapacitors are subject to special transport restrictions in accordance with applicable dangerous goods regulations.

Road Transport
The following UN classifications apply to road transport:
- **LiFePO4 batteries:** UN3480/UN3481 (depending on installation / packaging condition)
- **Supercapacitors:** UN3499 with special provision 361

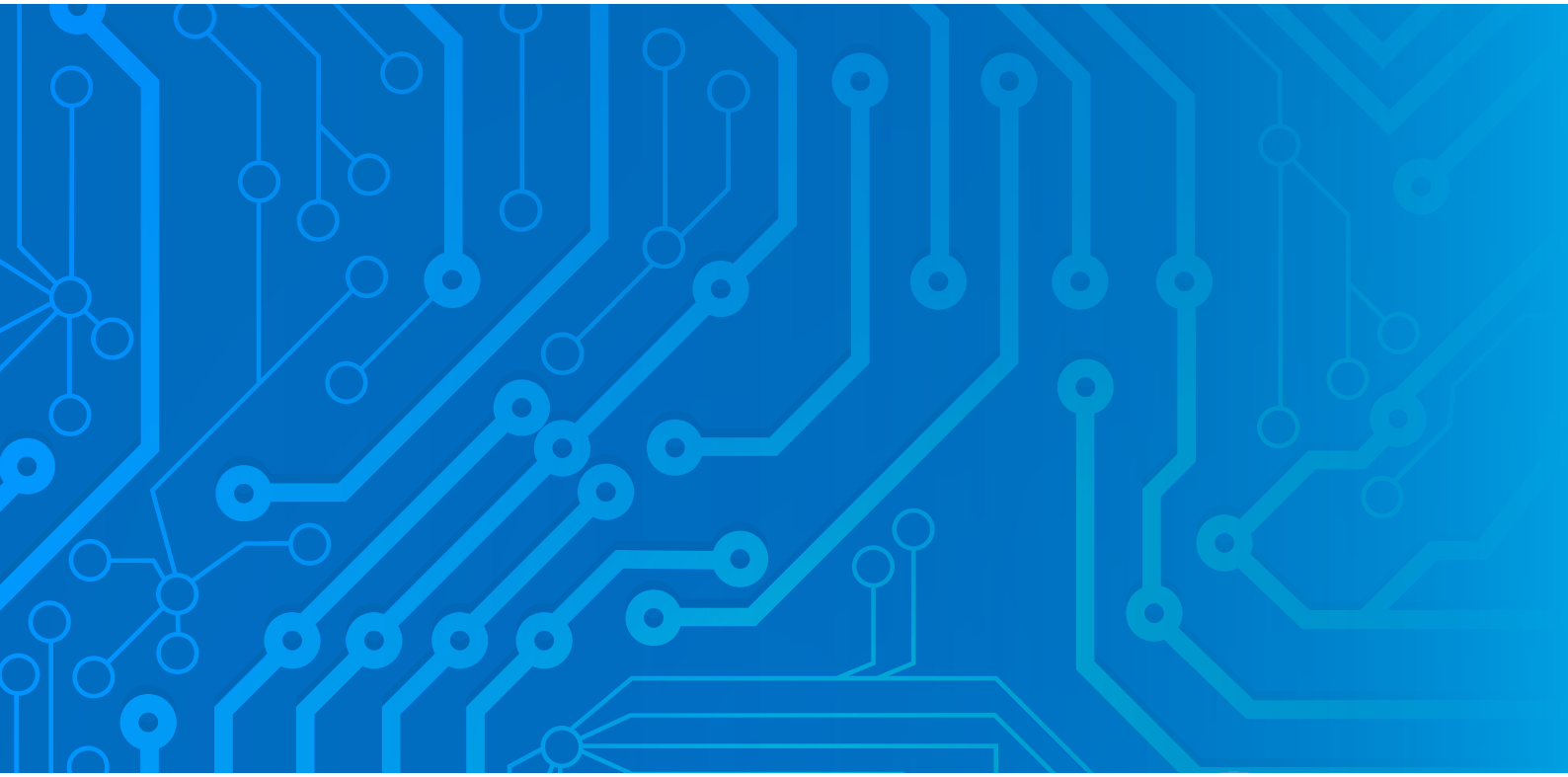
Further information on dangerous goods regulations for road transport can be found at:
www.bmv.de - Dangerous Goods by Road

Sea and Air Freight
For transport by sea and air, please contact the relevant authorities for information on the relecant regulations:
- **Sea freight:** www.bmv.de - Dangerous Goods Maritime Shipping
- **Air freight:** IATA Dangerous Goods Regulations

Note: Compliance with current regulations must be checked before each transport and the relevant documentation have to be provided.

F Name / Address / Support E-Mail / Phone number of the manufacturer

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Note: Subject to errors and technical modifications!
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