




# User Manual | **UPSI-2406DPx**

UPS SYSTEM  
DIN-RAIL



## 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  |
|----------------------------|---|
| 31.03.2020<br>Revision 0-1 | Initial version   |
| 10.06.2020<br>Revision 1   | Release version   |
| 03.07.2020<br>Revision 1-1 | Chapter B2 extended,<br>Chapter B3 Environmental condition extended,<br>Chapter C1 Input data Internal input fuse changed<br>Chapter C1 Environmental conditions extended.  |
| 16.07.2020<br>Revision 1-2 | PELV indication removed   |
| 12.08.2020<br>Revision 1-3 | Chapter B3 Intended use more detailed specified<br>Chapter C1 Environmental conditions more detailed specified<br>(Indoor/Outdoor)<br>Page 2, Warning „Read User Manual“ at explanation „Legend of used symbols“ supplemented |
| 25.11.2020<br>Revision 1-4 | Model UPSI-2406DP3 integrated   |
| 13.04.2021<br>Revision 1-5 | Basic revision of individual chapters, updated backup time diagrams, B rebuilt, E14 software removed, F9 rebuilt, F12 status LED rebuilt, new image in F5, E5 images removed, F13 Shutdown diagram added                      |



## A Brief specification

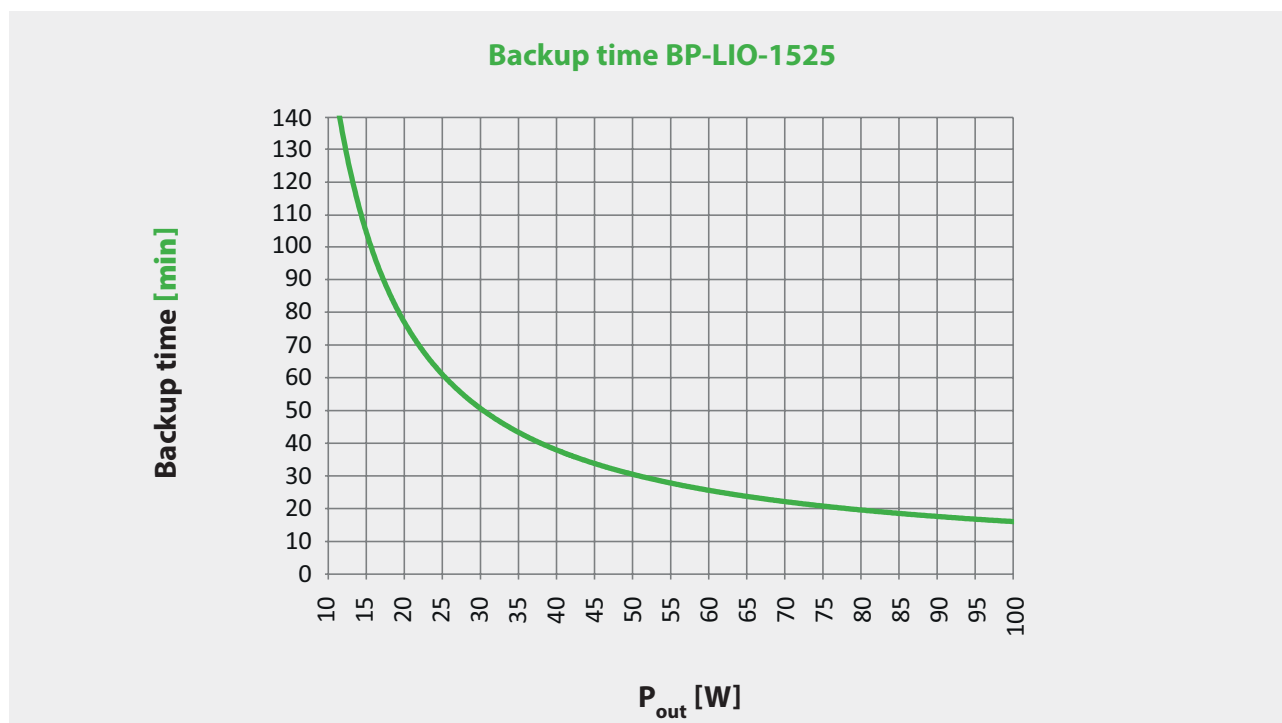
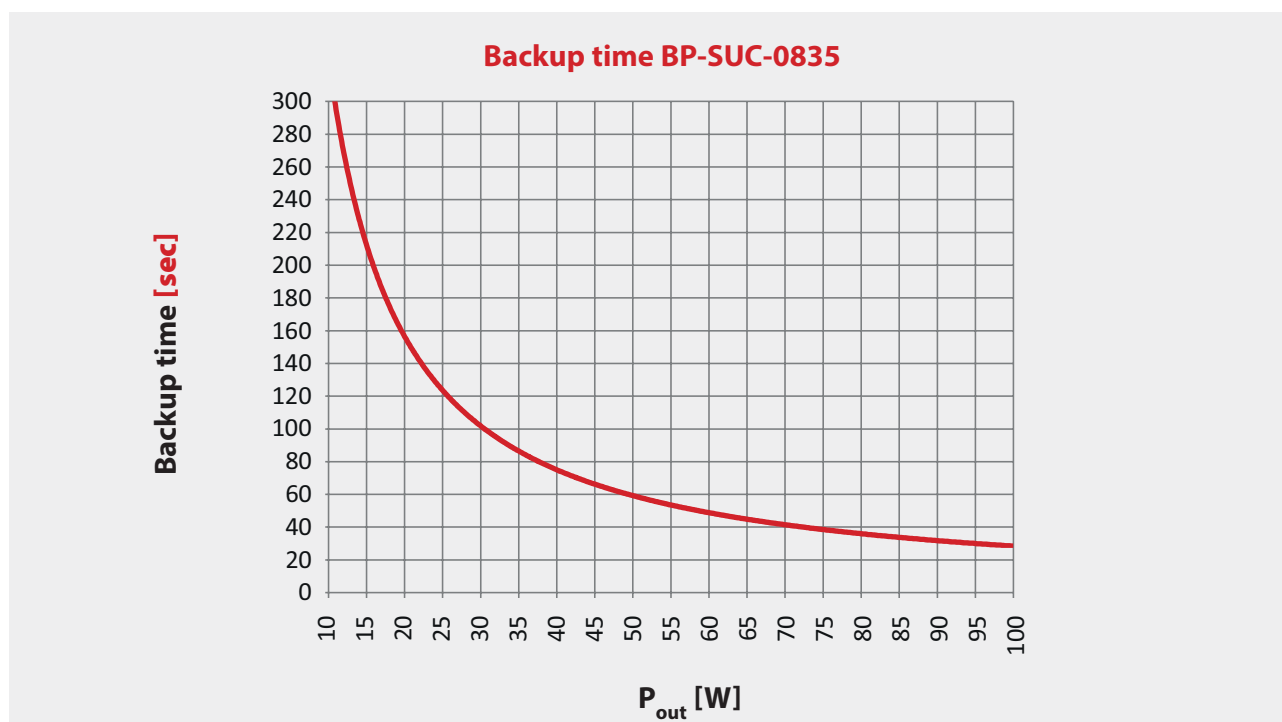
### UPSI-2406DP1 / -DP2 / -DP3

24 VDC / 4 A

- ✓ **24 V DC UPS (DIN-Rail version)**
- ✓ **Integrated Li-Ion batteries (DP1) OR Supercaps (DP2) OR LiFePO4 battery (DP3)**
- ✓ **Up to 500 cycles (DP1) | up to 500 000 cycles (DP2) | up to 6000 cycles (DP3)**
- ✓ **Capacity DP1: 37 Wh | DP2: 5.73 kJ | DP3: 33 Wh**
- ✓ **Intelligent input current detection**
- ✓ **Regulated output voltage in battery mode**
- ✓ **Minimum load detection**
- ✓ **Power-fail timer function**
- ✓ **Relay dry contact on power fail**
- ✓ **Reboot function**
- ✓ **Fuel gauge**
- ✓ **Shutdown via external signal**

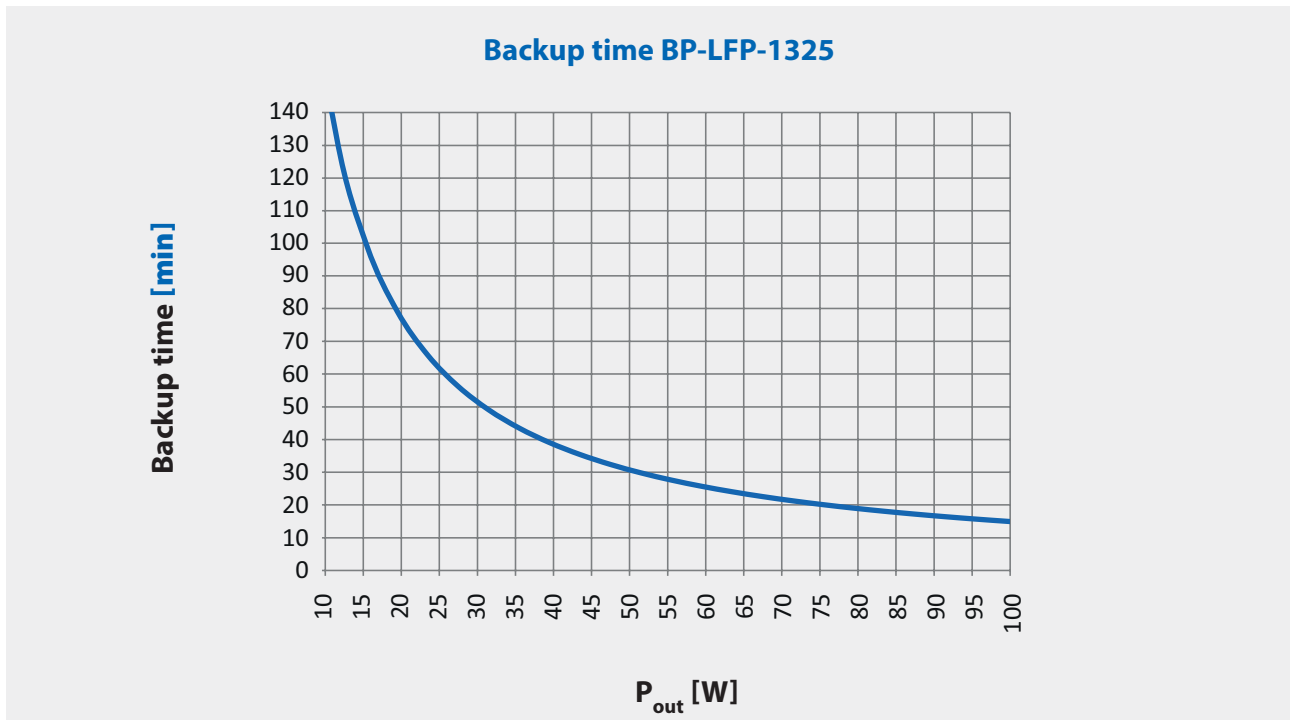


| Technical Data          |   |
|-------------------------|---|
| Input voltage           | 24 VDC (22.5 ... 30 V)  |
| Input current           | 4.9 A max.  |
| Output voltage          | Normal mode: $V_{IN} - 0.5$ VDC max. (depending on load)<br>Battery mode: 23.5 VDC  |
| Output current          | 4 A nominal   |
| Capacitive load         | 3000 $\mu$ F (at start)   |
| Charging method         | CC/CV/CP  |
| Protection              | Reverse polarity protection at input, Overcurrent protection at output, Short circuit protection at output  |
| Interface               | USB, RS232, HID UPS   |
| Battery technology      | DP1: Li-Ion 2.5 Ah / 37 Wh<br>DP2: EDLC 5.73 kJ (3.88 kJ useful) / 1.59 Wh (1.08 Wh useful)<br>DP3: LiFePO4 2.5 Ah / 33 Wh  |
| Ambient temperature     | Operating                      Storage/Transport<br>DP1: 0...+50°C      DP1: -20...+50°C<br>DP2: -20...+65°C      DP2: -30...+65°C<br>DP3: -20...+55°C      DP3: -30...+55°C, recommended state of charge 80% |
| Operating altitude      | ≤4000 m   |
| Max. permitted humidity | ≤95 % (at +25°C, no dew)  |
| Dimensions W/ H / D     | 63 x 120 x 100 mm ±0.5 mm<br>(without front connectors and DIN-Rail mounting bracket)   |
| Weight                  | 0.6 kg (DP1 and DP2), 0.8 kg (DP3)  |

**Backup time\* UPSI-2406DP1****Backup time\* UPSI-2406DP2**

\*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-2406DP3**



*\*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*

|          |   |           |
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## 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-2406DP1, UPSI-2406DP2 and UPSI-2406DP3 (hereinafter also called UPS) are DC/DC UPS systems with numerous digital features and high performance. The UPS combines the UPSI-2406 with an integrated energy storage: The UPSI-2406DP1 uses an energy storage with Lithium-ion technology, the UPSI-2406DP2 uses an energy storage with supercap (also EDLCs) technology and the UPSI-2406DP3 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 24VDC 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.

In the event of a voltage drop or a voltage fluctuation of the input voltage (below undervoltage limit), the UPS is switched to battery 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 battery mode is always regulated to 23.5VDC and does not decrease as the voltage of the energy storage device drops. If the UPS operates in battery mode, the status LED is slowly flashing (1 Hz flashing). When the UPSI-2406DP3 (with LiFePO4 battery) is used and it is discharged completely in battery 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 device is designed to be installed into a suitable enclosure which protects against electrical, water and fire hazards and can then be used indoors and outdoors. It is primarily 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.

## 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.
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.



### **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.

## D Technical Data

### D1 General Technical Data

| <b>INPUT DATA – UPSI-2406DP1 / UPSI-2406DP2 / UPSI-2406DP3</b>   |                                  |
|--|----------------------------------|
| 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 VDC                           |
| Input voltage range  | 22.5 VDC...30 VDC                |
| Electric strength max.   | 35 VDC                           |
| <b>Fixed connect threshold</b>   |                                  |
| Undervoltage   | 22.5 VDC                         |
| Voltage drop Input/Output  | 0.5 VDC max. (depending on load) |
| <b>Current consumption</b>   |                                  |
| $I_N$ ( $U_N$ , $I_{OUT} = I_N$ , $I_{CHARGE} = 0$ )   | 4.1 A                            |
| $I_{MAX}$ ( $U_N$ , $I_{OUT} = I_{STAT.BOOST}$ , $I_{CHARGE} = \max$ )   | 4.9 A                            |
| $I_{NO-LOAD}$ ( $U_N$ , $I_{OUT} = 0$ , $I_{CHARGE} = 0$ )   | <100 mA                          |
| $I_{CHARGE}$ ( $U_N$ , $I_{OUT} = 0$ , $I_{CHARGE} = \max$ )   | 1.8 A                            |
| <b>Power consumption</b>   |                                  |
| $P_N$ ( $U_N$ , $I_{OUT} = I_N$ , $I_{CHARGE} = 0$ )   | 98 W                             |
| $P_{MAX}$ ( $U_N$ , $I_{OUT} = I_{STAT.BOOST}$ , $I_{CHARGE} = \max$ )   | 117.5 W                          |
| $P_{CHARGE}$ ( $U_N$ , $I_{OUT} = 0$ , $I_{CHARGE} = \max$ )   | 43 W                             |
| Internal input fuse  | Yes (15 A)                       |
| Switch-on time   | < 5 sec                          |
| Switch-on time battery start (BS)  | n. a.                            |

**OUTPUT DATA – UPSI-2406DP1 / UPSI-2406DP2 / UPSI-2406DP3 (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 VDC  |
| Output voltage range   | $U_{OUT} = U_{IN} - 0.5 \text{ VDC max. (depending on load)}$                   |
| Capacitive load  | 3000 $\mu\text{F}$ (at start)   |
| <b>Output current</b>  |   |
| $I_N$  | 4 A   |
| $I_{STAT.BOOST}$   | 4.1 A   |
| $I_{DYN.BOOST}$  | n. a.   |
| $I_{SFB}$  | 30 A (5 ms)   |
| <b>Output power</b>  |   |
| $P_N (U_N, I_{OUT} = I_N, I_{CHARGE} = 0)$                       | 94 W  |
| $P_{STAT.BOOST} (U_N, I_{OUT} = I_{STAT.BOOST}, I_{CHARGE} = 0)$ | 96.5 W  |
| $P_{DYN.BOOST} (U_N, I_{OUT} = I_{DYN.BOOST}, I_{CHARGE} = 0)$   | n. a.   |
| Short-circuit proof  | Yes   |
| No-load proof  | Yes   |
| Overcurrent shutdown   | 4.2...4.5 A for max. 3 s; 4.6...10.8 A for max. 100 ms<br>>10.8 A for max. 5 ms |

**OUTPUT DATA – UPSI-2406DP1 / UPSI-2406DP2 / UPSI-2406DP3 (BATTERY 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   | 23.5 VDC  |
| Output voltage range   | n.a.  |
| <b>Output current</b>  |   |
| $I_N$  | 4 A   |
| $I_{STAT.BOOST}$   | 4.1 A   |
| $I_{DYN.BOOST}$  | n. a.   |
| $I_{SFB}$  | 30 A (5 ms)   |
| <b>Output power</b>  |   |
| $P_N (U_N, I_{OUT} = I_N, I_{CHARGE} = 0)$                       | 94 W  |
| $P_{STAT.BOOST} (U_N, I_{OUT} = I_{STAT.BOOST}, I_{CHARGE} = 0)$ | 96.5 W  |
| $P_{DYN.BOOST} (U_N, I_{OUT} = I_{DYN.BOOST}, I_{CHARGE} = 0)$   | n. a.   |
| Short-circuit proof  | Yes   |
| No-load proof  | Yes   |
| Overcurrent shutdown   | 4.2...4.5 A for max. 3 s; 4.6...10.8 A for max. 100 ms<br>>10.8 A for max. 5 ms |

### CONNECTION DATA INPUT / OUTPUT

|                                      |  |
|--------------------------------------|--|
| Connection method                    | Screwable plug connector                                       |
| Conductor cross-section solid        | 0.129 mm <sup>2</sup> ... 1.31 mm <sup>2</sup> (26 ... 16 AWG) |
| Conductor cross-section flexible     | 0.129 mm <sup>2</sup> ... 1.31 mm <sup>2</sup> (26 ... 16 AWG) |
| Conductor cross-section with ferrule | 0.129 mm <sup>2</sup> ... 1.31 mm <sup>2</sup> (26 ... 16 AWG) |
| Stripping length                     | 6 mm ... 7 mm  |
| Tightening torque                    | 0.3 Nm ... 0.4 Nm  |

### ENERGY STORAGE UPSI-2406DP1 (BP-LIO-1525)

|                                     |                |
|-------------------------------------|----------------|
| Charging method                     | CC / CV / CP   |
| Nominal voltage $U_N$               | 14.8 V         |
| End-of-charge voltage               | 15.9 V         |
| Charging current                    | 1 C max.       |
| Undervoltage protection             | 10.8 V         |
| Battery technology                  | Lithium-Ion    |
| Nominal capacity                    | 2.5 Ah (37 Wh) |
| Charging time ( $I_{charge\_max}$ ) | 80 min         |
| Buffer time ( $I_N$ )               | 15 min         |

### ENERGY STORAGE UPSI-2406DP2 (BP-SUC-0835)

|                                     |   |
|-------------------------------------|---|
| Charging method                     | CC / CV / CP  |
| Nominal voltage $U_N$               | 8.3 V   |
| End-of-charge voltage               | 8.3 V   |
| Charging current                    | 16 A max.   |
| Undervoltage protection             | 4.5 V   |
| Battery technology                  | EDLC  |
| Nominal capacity                    | 5.73 kJ (3.88 kJ useful) / 1.59 Wh (1.08 Wh useful) |
| Charging time ( $I_{charge\_max}$ ) | 2 min   |
| Buffer time ( $I_N$ )               | 30 sec  |

**ENERGY STORAGE UPSI-2406DP3 (BP-LFP-1325)**

|  |                |
|--|----------------|
| Charging method                            | CC / CV / CP   |
| Nominal voltage $U_N$                      | 12.8 V         |
| End-of-charge voltage                      | 13.8 V         |
| Charging current                           | 4.5 A max.     |
| Undervoltage protection                    | 8.8 V          |
| Battery technology                         | LiFePO4        |
| Nominal capacity                           | 2.5 Ah / 33 Wh |
| Charging time ( $I_{\text{charge\_max}}$ ) | 38 min         |
| Buffer time ( $I_N$ )                      | 17 min         |

### CONNECTION DATA – RELAY

|                                      |   |
|--------------------------------------|---|
| Connection labeling                  | RL  |
| Switch contact (potential free)      | Relay   |
| Status (configurable)                | Power Fail Alarm  |
| Switching voltage                    | 24 VDC / 125 VAC  |
| Current carrying capacity            | 1 A (DC) / 0.5 A (AC)   |
| State - signal assignment            | NO (Normally Open) / NC (Normally Closed) – configurable via Software |
| Connection method                    | Lockable connector  |
| Conductor cross-section solid        | 0.205 mm <sup>2</sup> ... 1.3 mm <sup>2</sup> (24 ... 16 AWG)         |
| Conductor cross-section flexible     | 0.205 mm <sup>2</sup> ... 1.3 mm <sup>2</sup> (24 ... 16 AWG)         |
| Conductor cross-section with ferrule | 0.205 mm <sup>2</sup> ... 1.3 mm <sup>2</sup> (24 ... 16 AWG)         |
| Stripping length                     | 7 mm ... 9 mm   |

### DATA INTERFACE – USB

|                       |                     |
|-----------------------|---------------------|
| Interface designation | USB                 |
| Numbers of interfaces | 1                   |
| Connection method     | USB type B (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 – RS232  |                       |
|-------------------------|-----------------------|
| Interface designation   | RS232                 |
| Numbers of interfaces   | 1                     |
| Connection method       | DSUB 9-Pin (female)   |
| Locking                 | No                    |
| Transmission physics    | RS232 light (TX / RX) |
| Topology                | Point-to-point        |
| Symbol rate (baud rate) | 38400                 |
| Type of cable           | 1:1                   |
| Transmission length     | ≤10 m                 |
| Access time             | < 1 s                 |
| Voltage level           | -6 VDC ... +6 VDC     |
| Electrical isolation    | No                    |

| GENERAL DATA  |                                |
|---|--------------------------------|
| Flammability class according to UL 94 (housing / terminal blocks) | V0                             |
| Weight  | DP1 / DP2: 0.6 kg, DP3: 0.8 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  | 63 mm / 120 mm / 100 mm ±0.5 mm<br>(without front connectors and DIN-Rail mounting bracket) |



## ENVIRONMENTAL CONDITIONS

|   |  |
|---|--|
| Ambient temperature (operation)             | DP1: 0...+50°C / DP2: -20... +65°C / DP3: -20... +55°C |
| Ambient temperature (start up without load) | DP2: -30°C / DP3: -20°C                                |
| Ambient temperature (storage / transport)   | DP1: -20...+50°C / DP2: -30...+65°C / DP3: -30...+55°C |
| Max. permitted humidity                     | ≤95 % (at +25°C, no dew)                               |
| Operating altitude                          | ≤4000 m  |
| Climate class                               | 3k3 (EN 60721)   |
| Degree of pollution                         | 2  |
| <b>Overvoltage category</b>                 |  |
| EN 61010-1                                  | I  |
| EN 61010-2-201                              | I  |
| Indoor / Outdoor use                        | Yes / Yes (in housing)                                 |

## STANDARDS

|                          |                                       |
|--------------------------|---------------------------------------|
| Safety extra-low voltage | IEC 61010-1 (SELV)<br>IEC 61010-2-201 |
|--------------------------|---------------------------------------|

## APPROVALS (valid only for UPSI-2406DP1 and UPSI-2406DP2)

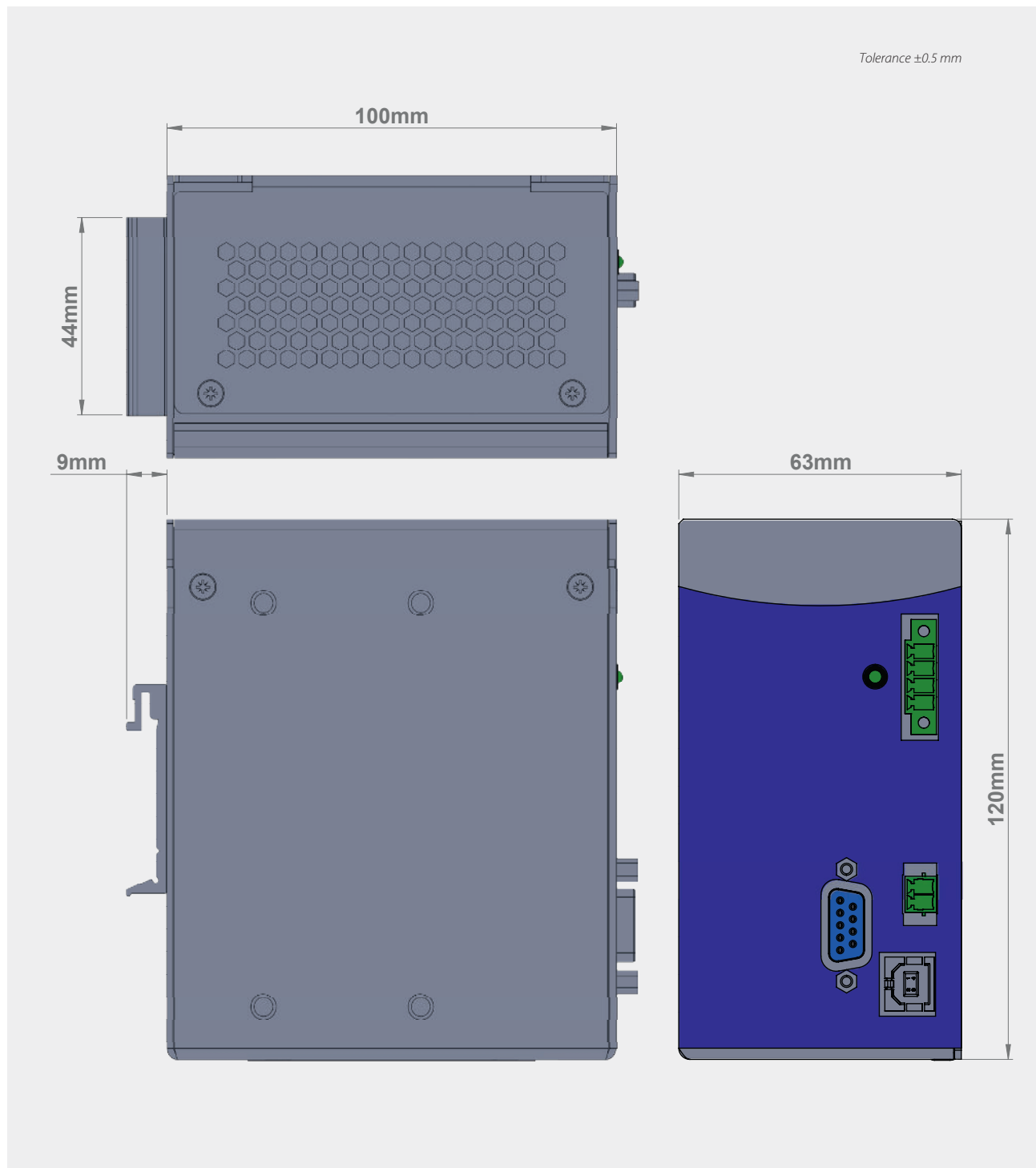
|           |   |
|-----------|---|
| UL        | ETL, UL61010-1<br>ETL, UL61010-2-201          |
| CSA       | CSA C22.2 61010-1-12<br>CSA C22.2 61010-2-201 |
| CB Scheme | IEC 61010-1<br>IEC 61010-2-201                |

| INTERFERENCE IMMUNITY ACCORDING TO EN 61000 (INDUSTRY)  |  |
|---|--|
| Basic standard CE   | Fulfilled requirements according to EN 61000 (CE)<br>(Interference immunity of industrial environment) |
| <b>Electrostatic discharge</b><br><b>EN 61000-4-2</b><br>Contact discharge<br>Air discharge<br>Comment  | 4 kV<br>8 kV<br>Criterion B  |
| <b>Electromagnetic HF field</b><br><b>EN 61000-4-3</b><br>Frequency range<br>Test field strength<br><br>Frequency range<br>Test field strength<br>Comment | 80 MHz ... 1 GHz<br>10 V/m<br><br>1.4 GHz ... 2 GHz<br>3 V/m<br>Criterion A                            |
| <b>Fast transients (Burst)</b><br><b>EN 61000-4-4</b><br>Test voltage<br>Comment  | 2 kV<br>Criterion A  |
| <b>Surge voltage load (Surge)</b><br><b>EN 61000-4-5</b><br>Test voltage L–N<br>Test voltage L–PE, N–PE<br>Comment  | ±1 kV<br>±2 kV<br>Criterion A  |
| <b>Power frequency magnetic field immunity</b><br><b>EN 61000-4-8</b><br>Test level<br>Comment  | 30 A/m<br>Criterion A  |

| <b>EMISSION ACCORDING TO EN 55016-2-3 (DOMESTIC)</b>   |   |
|--|---|
| <b>Basic standard CE</b>   | <b>Fulfilled requirements according to EN 55016-2-3 (CE) (Domestic)</b> |
| <b>Conducted emission from the power port</b><br><b>EN 55016-2-3</b><br>Frequency range<br>Comment | 150 kHz–30 MHz<br>Conform   |
| <b>Electric field radiated emission</b><br><b>EN 55016-2-3</b><br>Frequency range<br>Comment       | 30 MHz–1 GHz<br>Conform   |

| <b>LEGEND</b> |   |
|---------------|---|
| Criterion A   | Normal operating behavior within the defined limits.                                    |
| Criterion B   | Temporary impairment of the operating behavior, that is corrected by the device itself. |

## D2 Drawing UPSI-2406DP1 / UPSI-2406DP2 / UPSI-2406DP3



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

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

E-Mail: [support@bicker.de](mailto:support@bicker.de) · Tel.: +49 (0) 906 70595-0

## F General Data

### F1 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!

### F2 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:

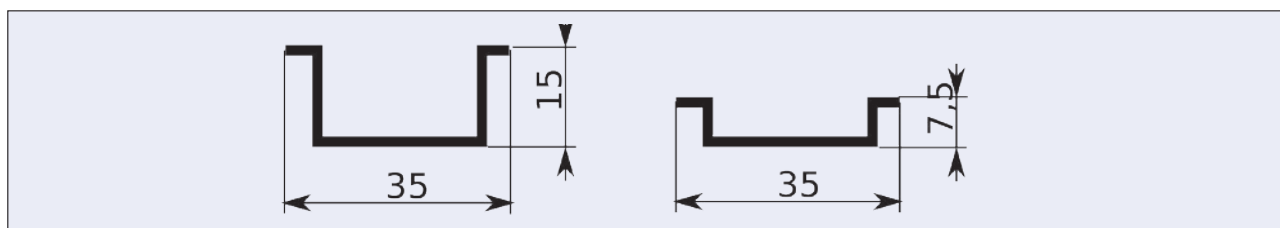
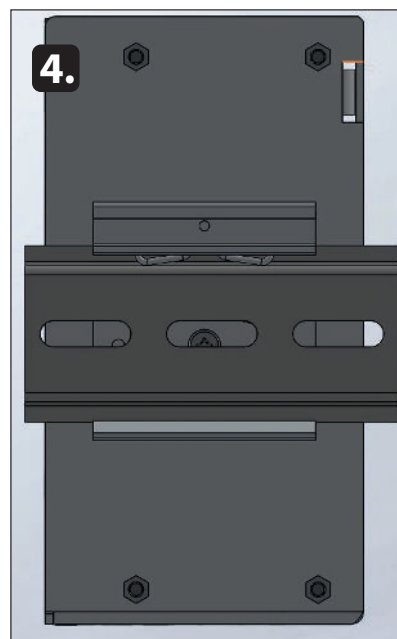
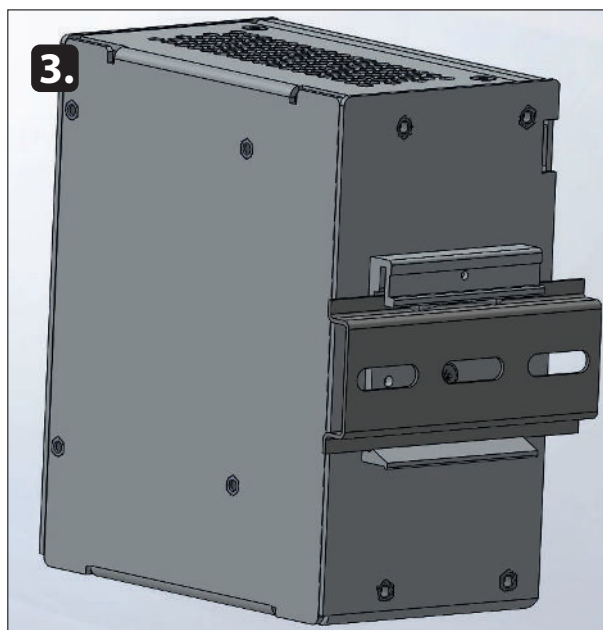
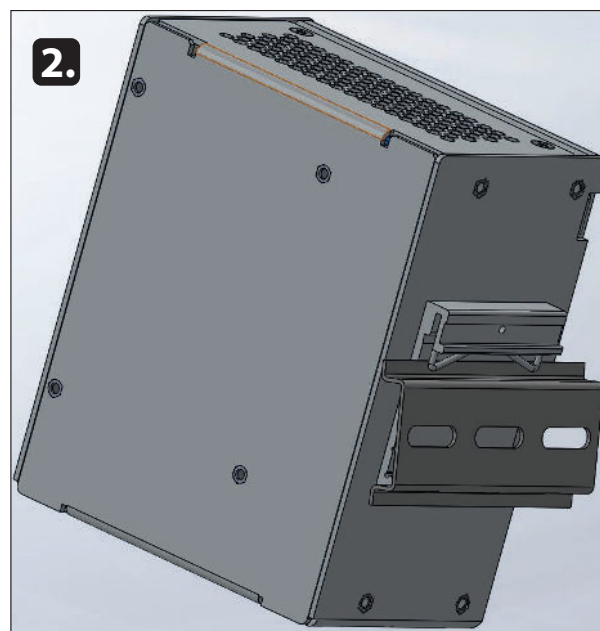
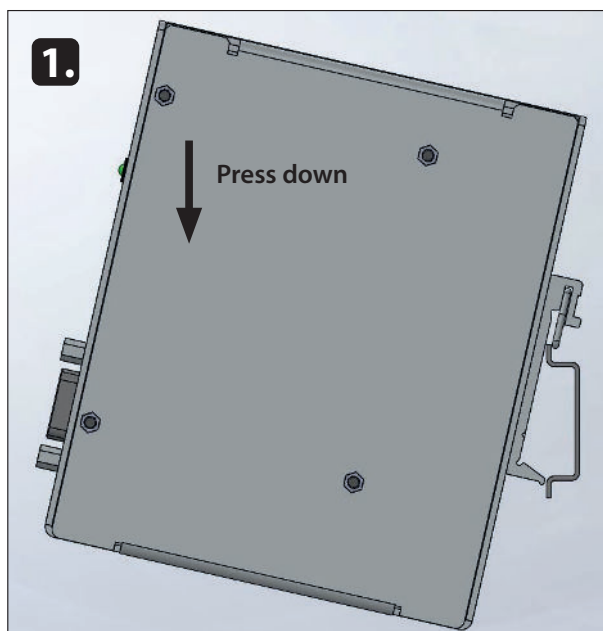
Left / right: 20 mm

Top / bottom: 50 mm



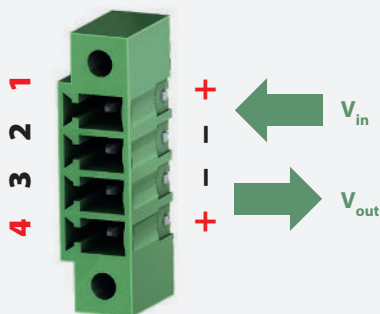
The devices comply with the IP protection class 20.

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



### F3 Description of connectors

#### INPUT & OUTPUT (IN & OUT)



| PIN | FUNCTION |
|-----|----------|
| 1   | Vin +    |
| 2   | Vin -    |
| 3   | Vout -   |
| 4   | Vout +   |

#### 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  $\Omega$ , otherwise they are „open load“.



| PIN | FUNCTION        |
|-----|-----------------|
| 1   | Relay contact 1 |
| 2   | Relay contact 2 |

#### RS-232



| PIN | FUNCTION          |
|-----|-------------------|
| 1   | +5 V (50 mA max.) |
| 2   | RXD               |
| 3   | TXD               |
| 4   | DTR               |
| 5   | GND               |
| 6   | DSR               |
| 7   | NC                |
| 8   | NC                |
| 9   | NC                |

## F4 Dimensioning the upstream power supply

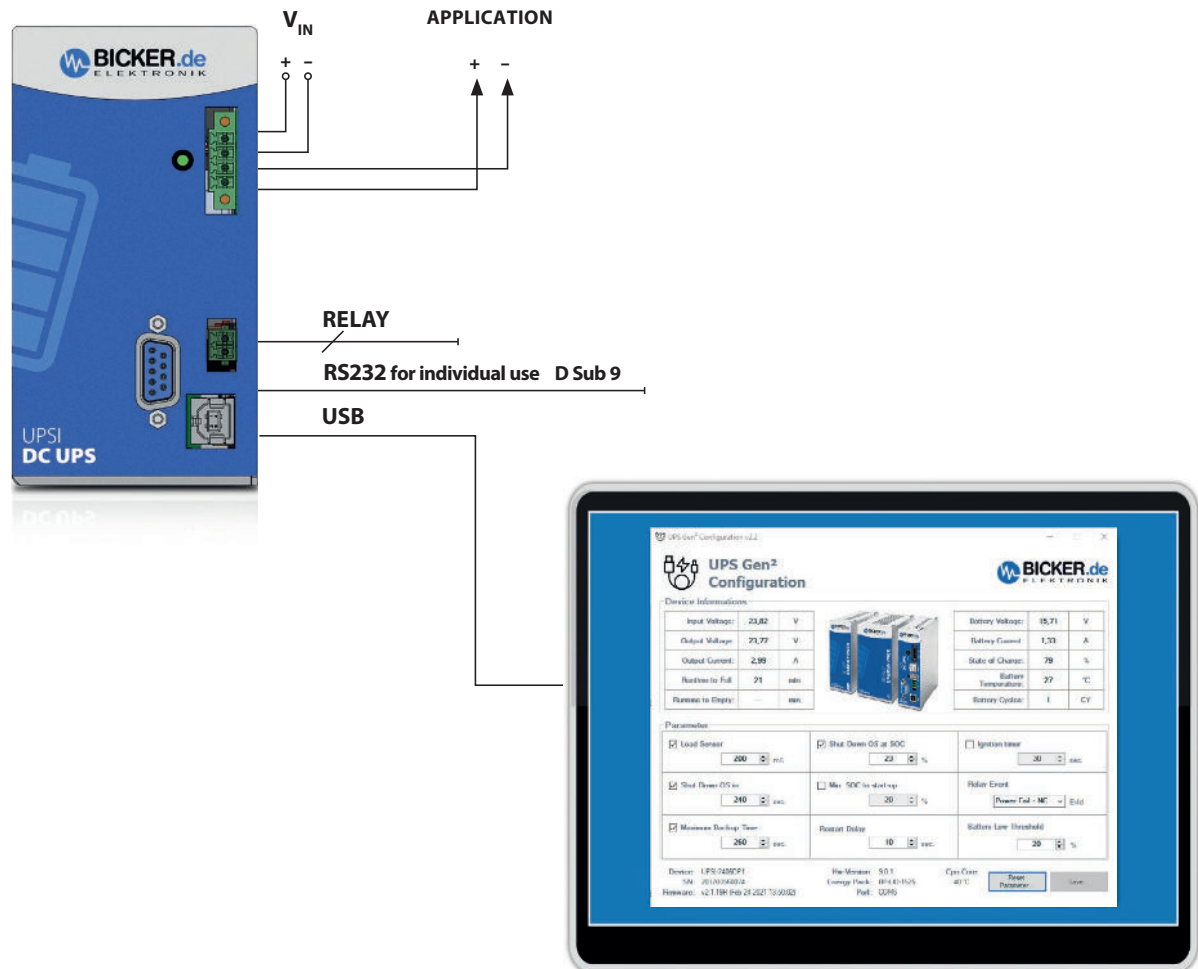
Ensure that the upstream power supply is correctly dimensioned to guarantee the charging process of the batteries and the correct functioning of the application. The input has to be supplied from a SELV or PELV power supply. In order to operate the UPS devices with complete functionality, the upstream power supply has to provide at least 24V/6A and use **no** constant current function.

If less load than the maximum load is required at the output, the voltage supply can be dimensioned according to the table below (column 3).

| UPSI-2406DP1 / -DP2 / -DP3 |                         |                         |
|----------------------------|-------------------------|-------------------------|
| $I_{\text{LOAD}}$ [A]      | $I_{\text{CHARGE}}$ [A] | $I_{\text{IN-MIN}}$ [A] |
| 0                          | 1.8                     | 2                       |
| 1                          | 1.6                     | 3                       |
| 2                          | 1.4                     | 3.5                     |
| 3                          | 1.3                     | 4.5                     |
| 4                          | 1                       | 6                       |



## F5 Connecting diagram



### CONNECTING ORDER

1. APPLICATION ( $V_{OUT}$ )
2. DC SOURCE ( $V_{IN}$ )
3. RELAY / USB / RS232

**Dismantling order reverse to connection!**



**$V_{IN}/V_{OUT}$  – ATTENTION!**

1. Note polarity!
2. AWG18 wire should be used (1 mm<sup>2</sup>)

## F6 Initial operation

The correct installation of the UPS has to be ensured.

**The start is accomplished by connecting the upstream power supply:** When an input voltage higher than 22.5 V is connected to the input terminals, the energy storage gets queried and transmits its data. The UPS sets the corresponding end-of-charge voltage and releases the pack via the system present signal. After that, the charging of the energy storage starts.

The applied voltage at the input of the UPS is passed through to the output, reduced by a current-dependent voltage drop ( $V_{OUT} = V_{IN} - 0.5 \text{ V}$  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 F4 „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.

## F7 Overview connector / counterpart with description / Scope of delivery

| CONNECTOR        | PART NO.                      | COUNTERPART NO.               |
|------------------|-------------------------------|-------------------------------|
| $V_{IN}/V_{OUT}$ | Würth Elektronik 691325310004 | Würth Elektronik 691364300004 |
| RL               | Würth Elektronik 691305140002 | Würth Elektronik 691304130002 |
| USB              | Würth Elektronik 61400416121  | USB type B connector          |
| RS232            | D-Sub9 Female                 | D-Sub 9 Male                  |

| SCOPE OF DELIVERY |   |
|-------------------|---|
| QUANTITY          | DESCRIPTION   |
| 1x device         | UPSI-2406DP1 or UPSI-2406DP2 or UPSI-2406DP3 - DC UPS |
| 1x                | $V_{IN} / V_{OUT}$ connector counterpart              |
| 1x                | Relay connector counterpart                           |

## F8 Charging time

Charging times depend on energy storage, input voltage and the load current.

## F9 Reverse polarity / Overload / Short circuit

Reverse polarity:

The device has active reverse polarity protection at the input if the input terminal is connected with reverse polarity while the device is still switched off (e.g. during commissioning). If the device operates in battery mode and the input terminals are connected with reverse polarity, no reverse polarity protection is given.

Overload:

If the load current at the output is too high, 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. During battery mode there is no restart attempt.

Short circuit:

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). During battery 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.

## F10 Backup time in battery mode

The nominal backup times can be found within the technical data of this user manual or the user manuals/datasheets of the used energy storages. At extreme low or high temperatures a reduction of the nominal backup times can occur.

## F11 Behaviour in case of exceeding maximum backup time

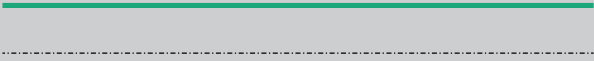








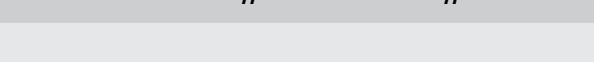

When the given buffering times are exceeded, the output is separated on the basis of the discharge voltage of the corresponding energy storage (total discharge protection).

With supercapacitors in particular, an additional switch-off threshold can take effect if the discharge current of the energy storage device is too high ( $>15\text{ A}$ ). This can occur at very high load currents at the output of the UPS. 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.

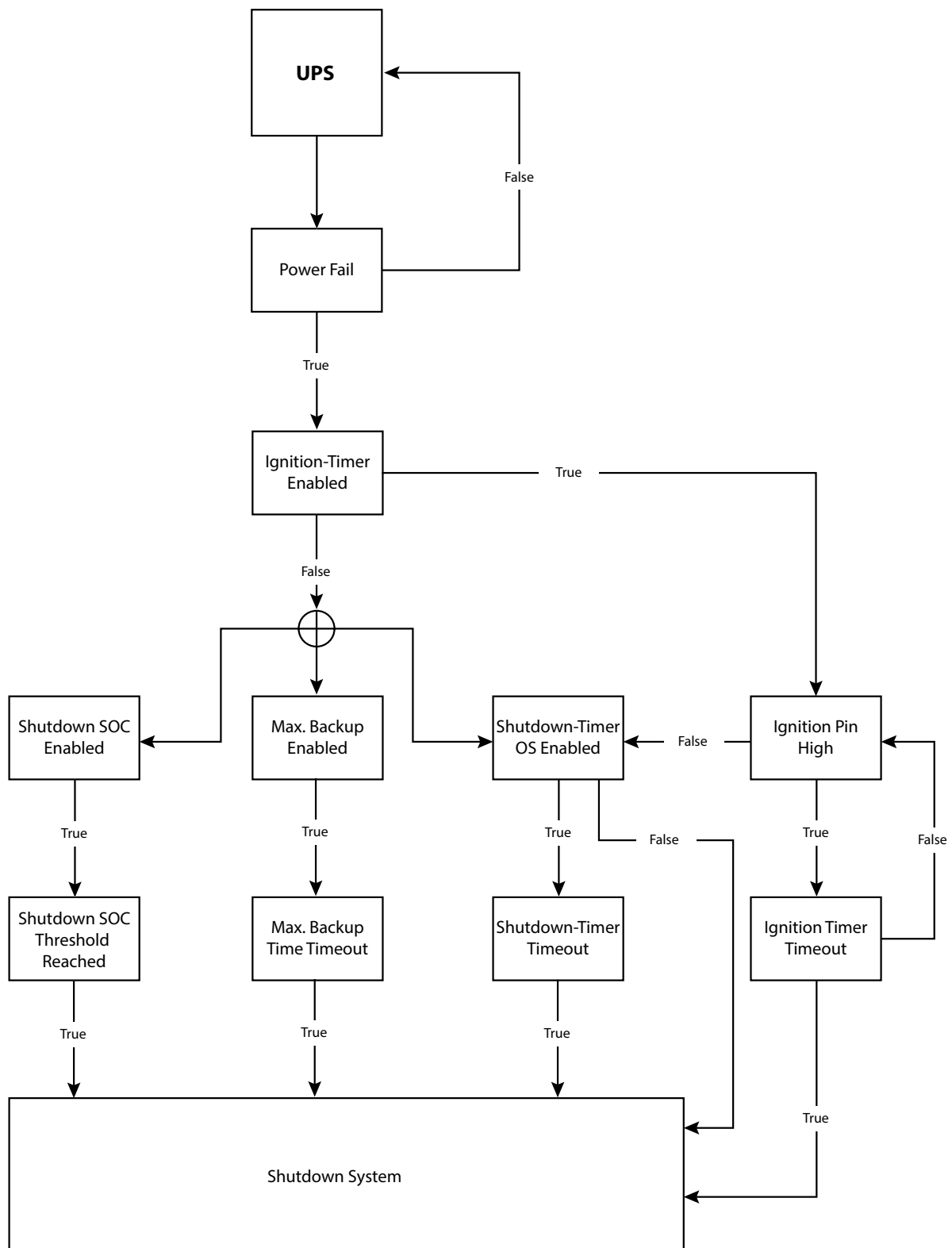
If the allowable output current during battery mode exceeds more than 70%, the converter switches off first, without separating the output immediately. In this case, the voltage at the output of the UPS can drop significantly below 23.5 V. This condition should be avoided by shutting down the system in time.

## F12 Status LED

Valid from firmware version 2.2.19

| MAIN STATES   |   |  |
|---|---|--|
|    | Always on                                     | <b>Status: mains voltage</b><br>>> Mains voltage is present.   |
|    | 1 Hz flash<br>(1 s on, 1 s off)               | <b>Status: Battery mode</b><br>>> Mains voltage is not present.  |
| INTERNAL STATES   |   |  |
|    | 1 x flash (LED is off briefly), pause 2 s     | <b>Status: Battery start</b><br>>> Manual start from the battery by pressing the BS button.  |
|    | 2 x flash (LED is off briefly), pause 2 s     | <b>Status: Capacity not reached</b><br>>> 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     | <b>Status: Shutdown</b><br>>> 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     | <b>Status: Reboot</b><br>>> Output is deactivated and time until reboot runs (Reboot phase).   |
| BATTERY FAILURES  |   |  |
|  | 1 x flash (LED is off a long time), pause 2 s | <b>Status: No battery detected</b>   |
|  | 2 x flash (LED is off a long time), pause 2 s | <b>Status: Battery overvoltage</b><br>>> Charge voltage at battery is too high, battery is deactivated.  |
|  | 3 x flash (LED is off a long time), pause 2 s | <b>Status: Battery overcurrent</b><br>>> Charge current at battery is too high, battery is deactivated.  |
|  | 4 x flash (LED is off a long time), pause 2 s | <b>Status: Battery temperature failure</b><br>>> Battery temperature sensor was not detected or battery temperature is too high or low.  |
| UPS FAILURES  |   |  |
|  | Quick flashing without pause                  | <b>Status: UPS failure</b><br>>> Output current too low, UPS is deactivated.<br>>> Overcurrent at output (charge current too high), output is deactivated<br>>> Short circuit at output, output is deactivated<br>>> Internal failure, UPS is deactivated. |

## F13 Shutdown diagram



## F14 Recommendations for a long UPS service life

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.

LiFePO<sub>4</sub> batteries also age over time depending on cycles, operating temperature and the level of the end-of-charge voltage. The end-of-charge voltages 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. When using the UPSI-2406DP3 (LiFePO<sub>4</sub> battery), a larger capacity than actually required should always be used. The less deep the packs are discharged, the longer the service life lasts.

## F15 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!

## F16 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.



## F17 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.

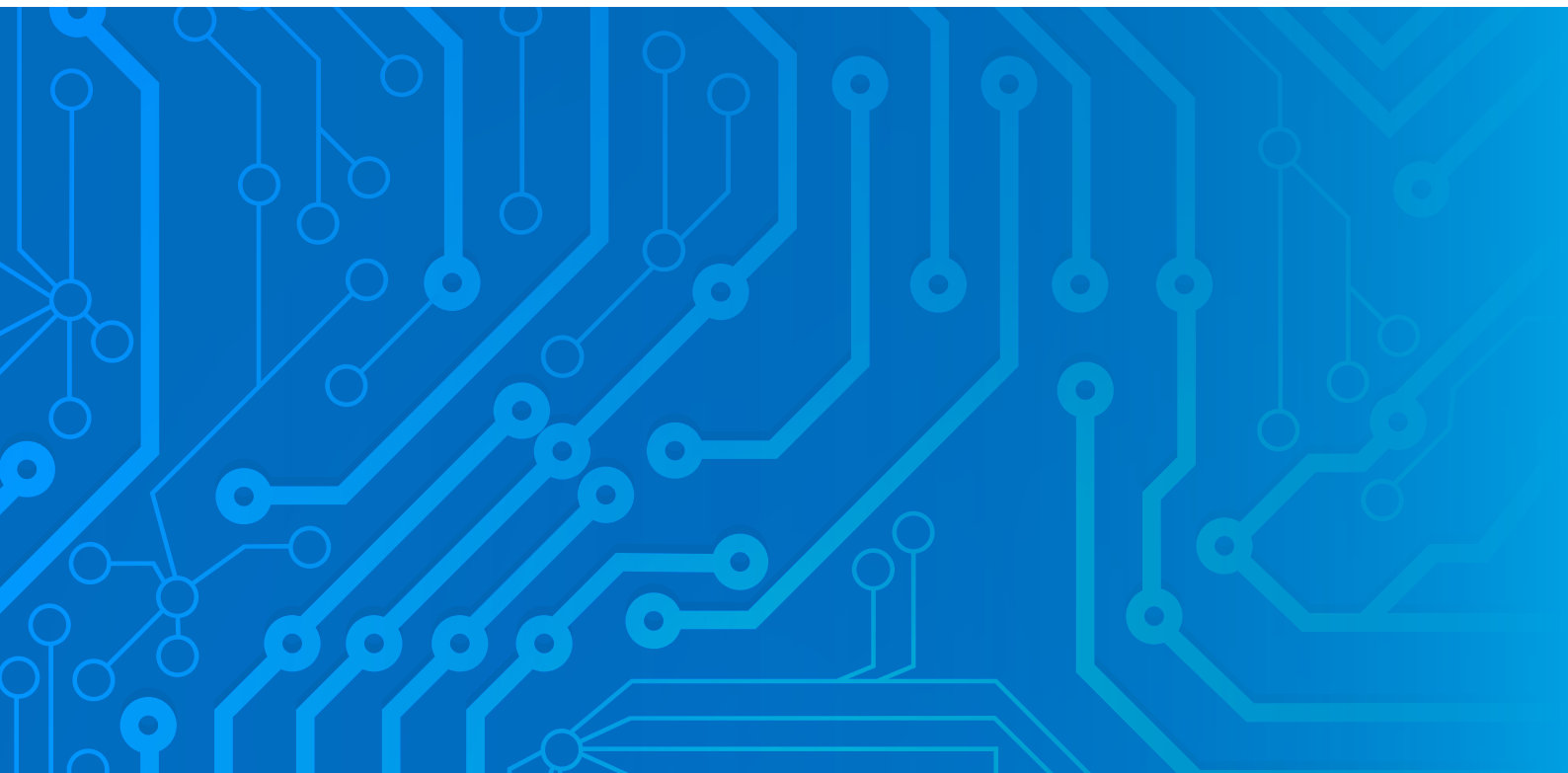
## **F18 Preventive measures and rules when operating the UPS system**

The voltage drop of the supply line has to be kept in mind! The maximum charge current can cause huge voltage drops if too long supply lines are used. If the voltage drop is too high a shortfall of the threshold values 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 22.5V.

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: 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.





Note: Subject to errors and technical modifications!  
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