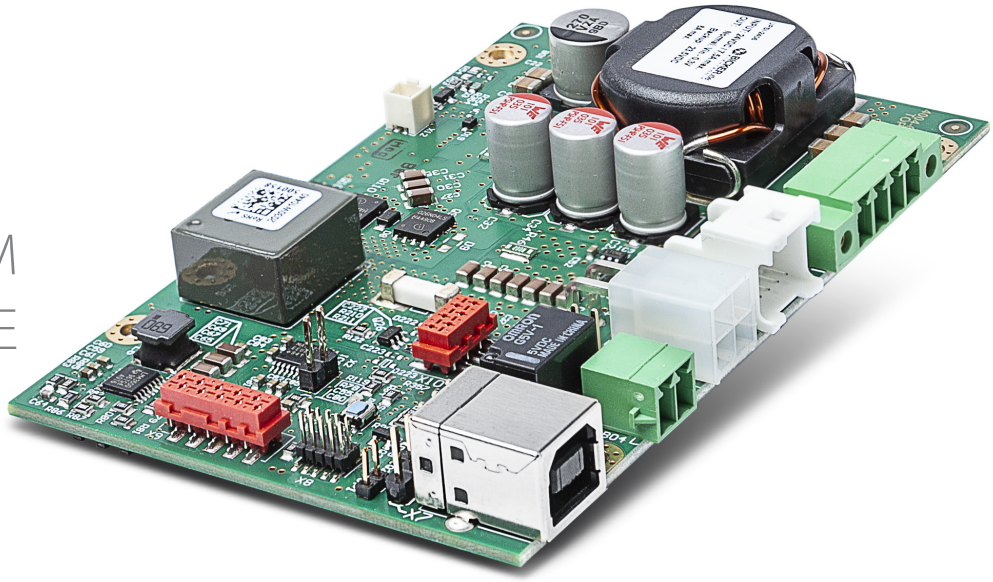
English

BICKER.de ELEKTRONIK

User Manual | UPSI-1208

UPS SYSTEM
OPEN FRAME



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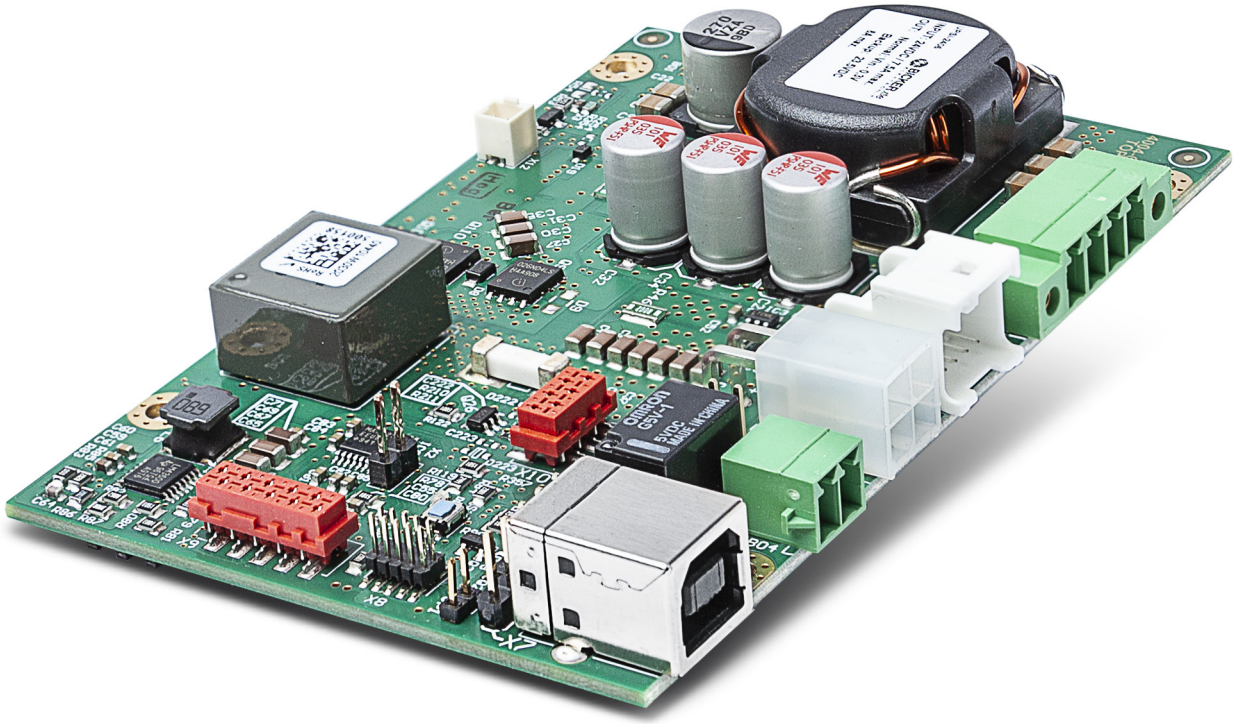
Legend of used symbols

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

Revision Directory

Date	Change
13.09.2021 Revision 0-1	Initial version
25.11.2021 Revision 1	Release version
08.02.2022 Revision 1-1	Chapter B3 included

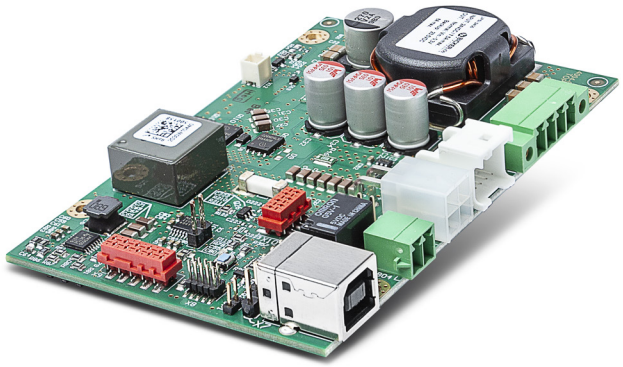


A Brief specification

UPSI-1208

12 V DC / 8 A

- **12 V DC USV (Open Frame version)**
- **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**
- **Battery start function**



Technical Data	
Input voltage	12 V DC (11.5…16 V)
Input current	9.2 A max.
Output voltage	Normal mode: V_{IN} – 0.6 V DC max. (depending on load) Battery mode: 12 V DC
Output current	8 A nominal
Capacitive load	3000 µF (at start)
Charging method	CC / CV / CP
Protection	Input: Reverse Polarity protection Output: Overcurrent protection, short circuit protection
Interface	USB, RS232, HID UPS
Possible battery technology	LiFePO4, Supercaps (EDLC)
Ambient temperature	Operating: -20…+70 °C Storage / Transport: -30…+70 °C
Operating altitude	≤4000 m
Max. permitted humidity	≤95 % (at +25 °C, no dew)
Dimensions W / H / D	105 x 17 x 70.5 mm (including connectors and highest components)
Weight	0.09 kg

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-1208 (hereinafter also called UPS) is a DC/DC UPS system with numerous digital features and high performance. The UPS can be operated with different energy storage devices (hereinafter also called battery(s)), which are different in technology, capacity and chemistry. Only energy storage devices made by Bicker Elektronik are to be used, due to the charging settings are made according the recognization of the used battery type. 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 12 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 connected 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 12 V DC 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 UPS is used with LiFePO4 battery 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 was developed for use as a built-in device in an end product with a housing and for professional use in applicatons 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. The person placing the product on the market or the user has to ensure that the end product complies with the required standards and EMC directives.
The housing of the end product has to protect against electrical, water and fire hazards so that a indoor and outdoor use is possible. The required safety distances between the individual sub-devices and components have to be observed.

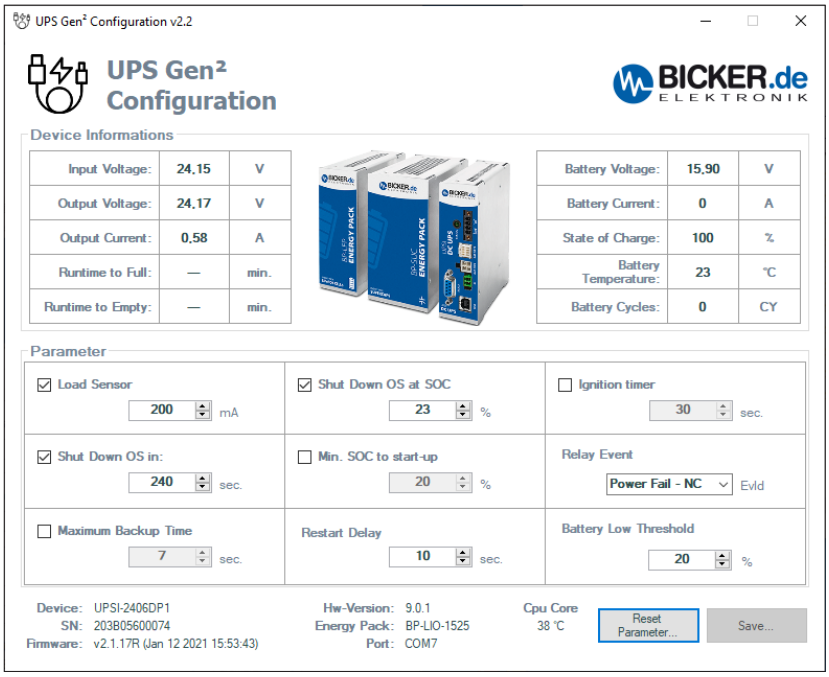
B3 UPS Gen² Configuration Software

UPS Gen² Configuration Software is required for setting parameters and programming new firmware for all UPSI Gen² devices under Microsoft® Windows. The software tool also shows the operating status of the UPS and its energy storage devices and can be connected to the device via USB:

The model has the native UPS device group integrated via USB / HID-UPS (HID Power Class). Most operating systems (OS) recognize the UPSI models via Plug & Play without additional driver and can be used with the operating system's own energy settings.

The UPS Gen² software tool offers additional setting options such as time-bound shutdown and other important features.

The Software can be downloaded here
The User Manual for the Software can be downloaded here



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.
14. The device is to be used as a built-in device or sub-device in an end product.

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 end product has to comply with the necessary approvals and standards that are required for the respective field of application.

D Technical Data

D1 General Technical Data

INPUT DATA – UPSI-1208 Unless otherwise stated, all specifications apply to 25 °C ambient temperature, 12 V DC input voltage and nominal output current (I_N).	
Input voltage	12 V DC
Input voltage range	11.5 V DC…16 V DC
Electric strength max.	18 V DC
Fixed connect threshold Undervoltage Voltage drop Input/Output	 11.5 V DC 0.6 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_{DYN} (U_N, $I_{OUT} = I_{DYN.BOOST}$, $I_{CHARGE} = 0$) $I_{NO-LOAD}$ (U_N, $I_{OUT} = 0$, $I_{CHARGE} = 0$) I_{CHARGE} (U_N, $I_{OUT} = 0$, I_{CHARGE} = max)	 8.2 A 9.2 A 9.7 A <200 mA 3.9 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_{DYN} (U_N, $I_{OUT} = I_{DYN.BOOST}$, $I_{CHARGE} = 0$) P_{CHARGE} (U_N, $I_{OUT} = 0$, I_{CHARGE} = max)	 98.5 W 110.5 W 116.5 W 47 W
Internal input fuse	Yes (15 A)
Switch-on time	<5 s
Switch-on time battery start (BS)	<5 s

OUTPUT DATA – UPSI-1208 (NORMAL MODE) Unless otherwise stated, all specifications apply to 25 °C ambient temperature, 12 V DC input voltage and nominal output current (I_N).	
Output voltage	12 V DC
Output voltage range	$U_{OUT} = U_{IN}$ – 0.6 V DC max. (depending on load)
Capacitive load	3000 µF (at start)
Output current I_N $I_{STAT.BOOST}$ $I_{DYN.BOOST}$ I_{SFB}	 8 A 8.4 A 8.5…9.5 A for max. 3 s 30 A (5 ms)
Output power P_N (U_N, $I_{OUT} = I_N$, $I_{CHARGE} = 0$) $P_{STAT.BOOST}$ (U_N, $I_{OUT} = I_{STAT.BOOST}$, $I_{CHARGE} = 0$) $P_{DYN.BOOST}$ (U_N, $I_{OUT} = I_{DYN.BOOST}$, $I_{CHARGE} = 0$)	 92 W 96 W 97…109 W for max. 3 s
Short-circuit proof	Yes
No-load proof	Yes
Overcurrent shutdown	8.5…9.5 A for max. 3 s; 9.6…10.8 A for max. 100 ms; >10.8 A for max. 5 ms

OUTPUT DATA – UPSI-1208 (BATTERY MODE) Unless otherwise stated, all specifications apply to 25 °C ambient temperature, 12 V DC input voltage and nominal output current (I_N).	
Output voltage	12 V DC
Output voltage range	n.a.
Output current I_N $I_{STAT.BOOST}$ $I_{DYN.BOOST}$ I_{SFB}	 8 A 8.4 A 8.5…9.5 A for max. 3 s 30 A (5 ms)
Output power P_N (U_N, $I_{OUT} = I_N$, $I_{CHARGE} = 0$) $P_{STAT.BOOST}$ (U_N, $I_{OUT} = I_{STAT.BOOST}$, $I_{CHARGE} = 0$) $P_{DYN.BOOST}$ (U_N, $I_{OUT} = I_{DYN.BOOST}$, $I_{CHARGE} = 0$)	 95 W 100 W 101…112 W for max. 3 s
Short-circuit proof	Yes
No-load proof	Yes
Overcurrent shutdown	8.5…9.5 A for max. 3 s; 9.6…10.8 A for max. 100 ms; >10.8 A for max. 5 ms
Load current for battery start (BS)	8 A max. (tested with BP-LFP-1025, State of charge SOC ≥10 %)
Switching time normal mode ≫ battery mode	<600 µs

BATTERY CHARGE UNIT	
Charging method	CC / CV / CP
End-of-charge voltage	Depending on energy storage, app. 11 V max.
Charging current	Depending on energy storage, 4.5…5.0 A, 16 A max.
Battery technology	LiFePO4 / EDLC (Supercaps)
RELEASED ENERGY STORAGES	
BP-LFP-1025	LiFePO4 / 10 VDC / 2.5 Ah / 25 Wh
BP-SUC-1033	EDLC / 10.4 VDC / 4.9 kJ (3.3 kJ useful) / 1.36 Wh (0.92 Wh useful)
BP-SUC-10066	EDLC / 10.4 VDC / 9.0 kJ (6.6 kJ useful) / 2.5 Wh (1.83 Wh useful)
CONNECTION DATA INPUT / OUTPUT (X1)	
Connection method	Screwable plug connector
Conductor cross-section solid	0.129 mm^2…1.31 mm^2 (26…16 AWG)
Conductor cross-section flexible	0.129 mm^2…1.31 mm^2 (26…16 AWG)
Conductor cross-section with ferrule	0.129 mm^2…1.31 mm^2 (26…16 AWG)
Stripping length	6 mm…7 mm
Tightening torque	0.3 Nm…0.4 Nm
CONNECTION DATA – RELAY (X5)	
Connection labeling	RL
Switch contact (potential free)	Relay
Status (configurable)	Power Fail Alarm
Switching voltage	24 VDC / 125 VAC
Current carrying capacity	1A (DC) / 0.5 A (AC)
State - signal assignment	NO (Normally Open) / NC (Normally Closed) – configurable via Software (see UPS Gen² software manual)
Connection method	Lockable plug connector
Conductor cross-section solid	0.205 mm^2…1.3 mm^2 (24…16 AWG)
Conductor cross-section flexible	0.205 mm^2…1.3 mm^2 (24…16 AWG)
Conductor cross-section with ferrule	0.205 mm^2…1.3 mm^2 (24…16 AWG)
Stripping length	7 mm…9 mm
Switching time	1500 ms max.

DATA INTERFACE – USB (X6 OR X7)	
Interface designation	USB
Numbers of interfaces	1
Connection method	USB type B (female) or pin header, pitch 2.54 mm
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 (X9)	
Interface designation	RS232
Numbers of interfaces	1
Connection method	MicroMatch
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 V DC … +6 V DC
Electrical isolation	No

GENERAL DATA	
Flammability class according to UL 94	V0
Weight	0.09 kg
UPS connection in parallel	No
UPS connection in series	No
Protection type	Non
Protection class	III (without PE)
Mounting type	Built-in device
Housing version	Open Frame
Dimension W / H / D	105 mm / 17 mm / 70.5 mm (including connectors and highest components)

ENVIRONMENTAL CONDITIONS	
Ambient temperature (operation)	-20… +70 °C
Ambient temperature (start up without load)	-30 °C
Ambient temperature (storage / transport)	-30… +70 °C
Max. permitted humidity	≤95 % (at +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 / Outdoor use	Yes / Yes (end product has to be certified)

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

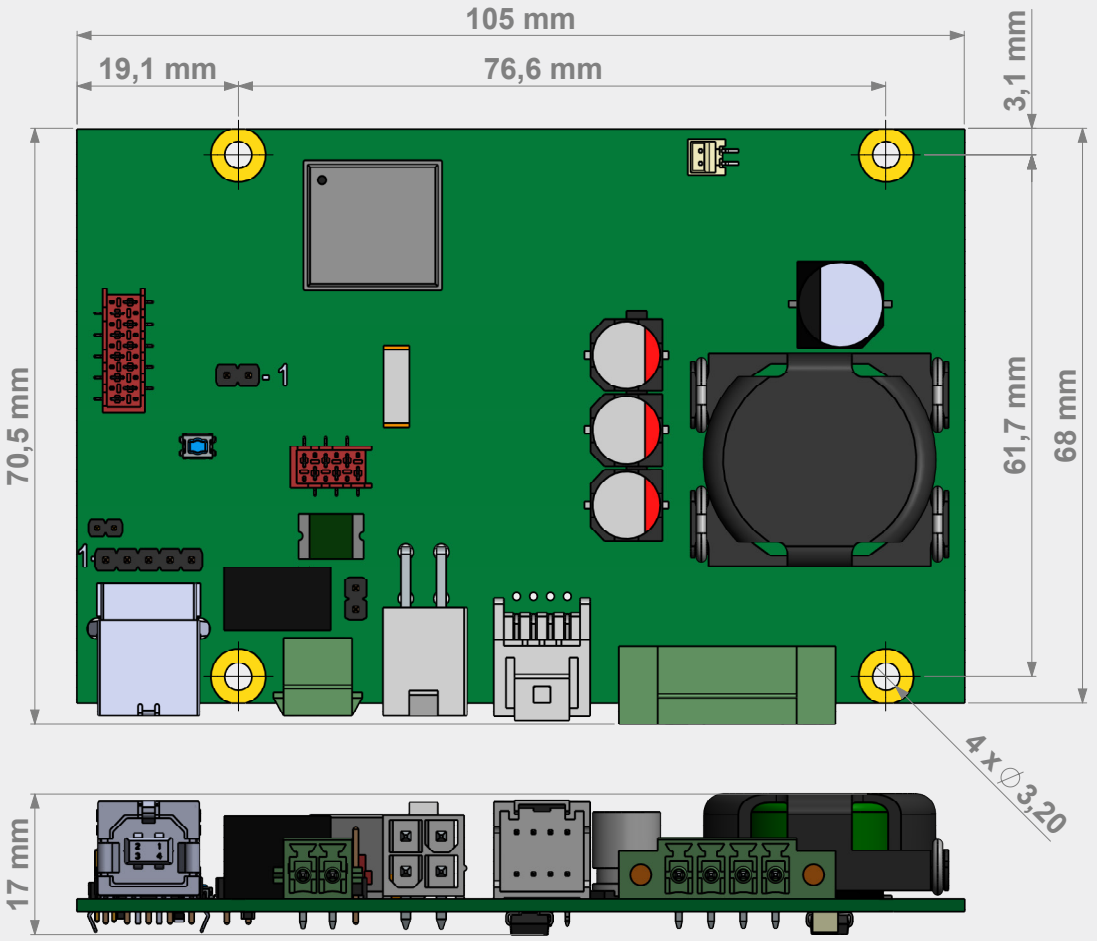
APPROVALS	
UL	n.a.
CSA	
CB Scheme	

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 Air discharge Comment	The end product has to be certified. The UPSI-1208 is designed to meet all requirements according to CE. The manual for the certified DIN rail version (UPSI-1208D) can be used as a guideline for the limit values that can be achieved by the device.
Electromagnetic HF field EN 61000-4-3 Frequency range Test field strength Frequency range Test field strength Comment	
Fast transients (Burst) EN 61000-4-4 Test voltage Comment	
Surge voltage load (Surge) EN 61000-4-5 Test voltage L–N Test voltage L–PE, N–PE Comment	
Power frequency magnetic field immunity EN 61000-4-8 Test level Comment	

EMISSION ACCORDING TO EN 55016-2-3 (DOMESTIC)	
Basic standard CE	**Fulfilled requirements according to EN 55016-2-3 (CE) (Domestic)**
Conducted emission from the power port EN 55016-2-3 Frequency range Comment	The end product has to be certified. The UPSI-1208 is designed to meet all requirements according to CE. The manual for the certified DIN rail version (UPSI-1208D) can be used as a guideline for the limit values that can be achieved by the device.
Electric field radiated emission EN 55016-2-3 Frequency range Comment	

D2 Drawing

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



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

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

F General Data

F1 Installation advice

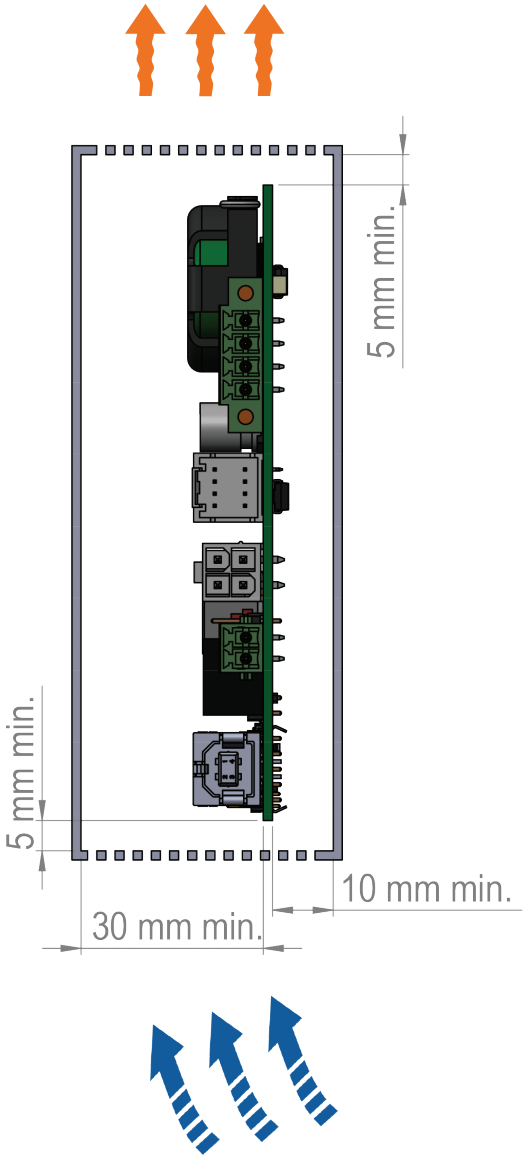
Installation and operation of this device is only allowed to be executed by a qualified electrician! The application has to be separated from any power during the mounting process. Wires have to be connected safely and must not have contact with sharp edges. Pay attention to correct polarity! Before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

F2 Convection and installation position

When installing in the overall system, it has to be ensured that the required distances to neighboring parts and boards are maintained. Sufficient ventilation holes or open ventilation areas should be provided during installation in order to avoid air congestion or the like. The device can optionally be installed in the system with suitable heat conducting pads (gap pad / gap filler) in order to compensate for temperature increases of the components due to closer / narrow placement to neighboring components. This is recommended on the bottom side in the area of the converter (choke L2, Power MOSFETs Q10, Q110 and Q9) and in the input area (choke L1).

The functional grounding of the UPSI-2406 and UPSI-1208 is provided from version v10.0 on both the input side as well as on the output side (V_{IN-} and V_{OUT-}). The connection takes place via the mounting hole B03 next to the input / output connector X1. The remaining three mounting holes (B01, B02 and B04) are isolated. For PCBs with version v9.0 or lower, the functional grounding is only connected on the output side (V_{OUT-}) via the mounting holes B04 (near USB socket X6) and B02 (near choke L1).

It is recommend installing the board vertically in the overall system with the input/output socket X1 pointing upwards. This installation position favors the heat dissipation of the circuit board hot spots in the area of X1 and the converter.

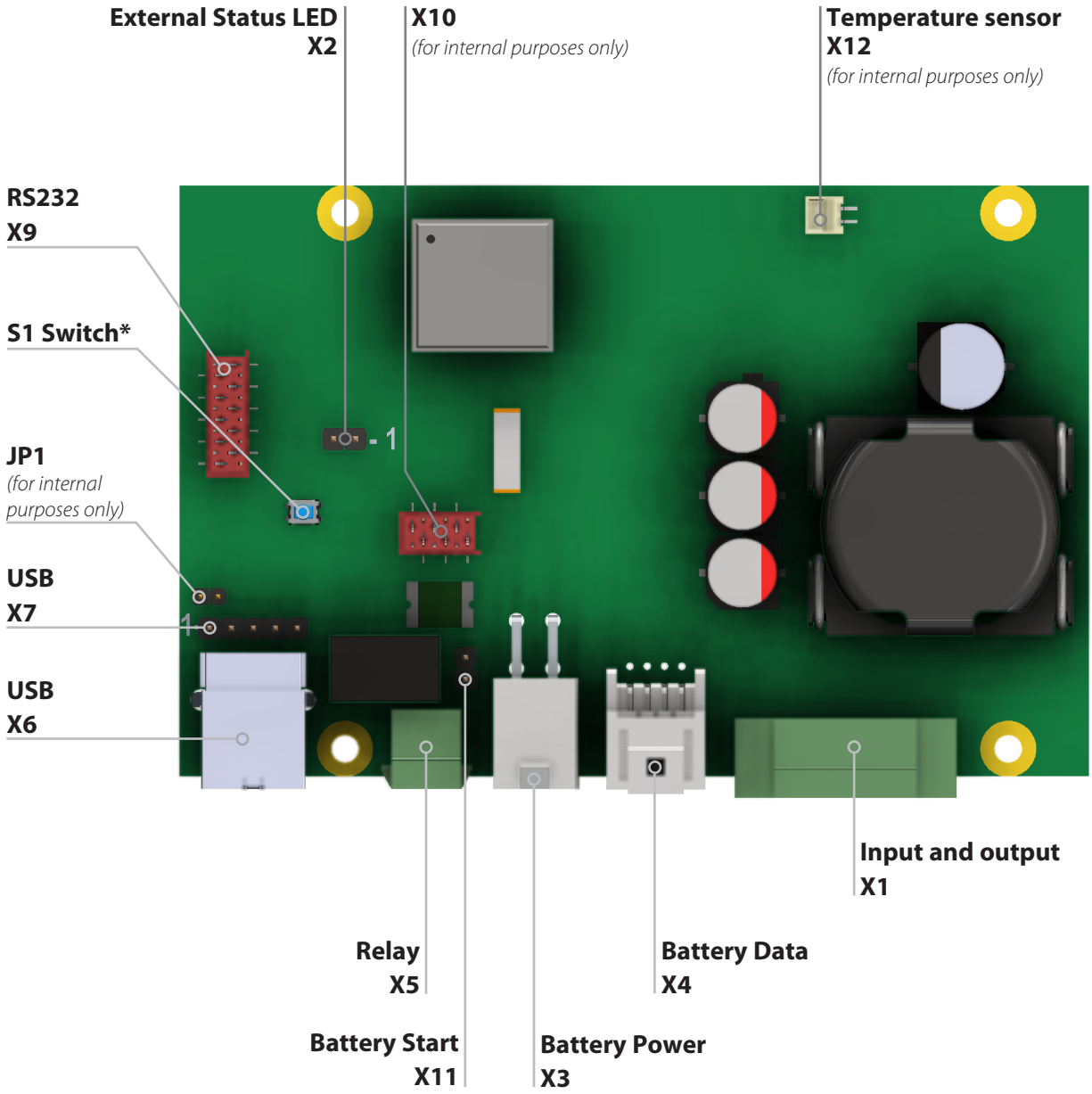


<u>The following distances to neighboring devices are recommended:</u>
Top side circuit board:
–> Neighboring component: 30 mm min.

Bottom side circuit board:
–> Neighboring component: 10 mm min.

Left/right:
–> Neighboring component: 5 mm min.

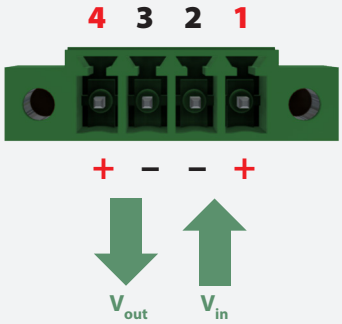
F3 Overview of connectors / interfaces



*S1 Switch: (µC reset): Pressing it will reset the microcontroller to its initial state.
Use only in the event of an error (not in normal mode).

F4 Description of connectors

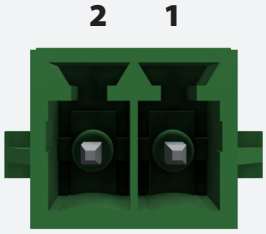
INPUT AND OUTPUT (X1)



PIN	FUNCTION
1	Vin +
2	Vin –
3	Vout –
4	Vout +

RELAY (X5)

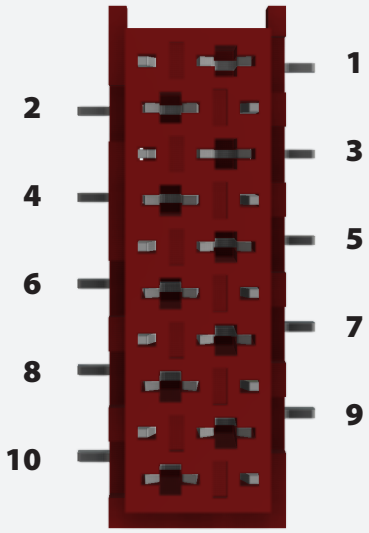
The function of the relay connection is configurable via software. When closing the relay the resistor value between both contacts is approx. 0 Ω, otherwise they are „open load“.



PIN	FUNCTION
1	Relay contact 1
2	Relay contact 2

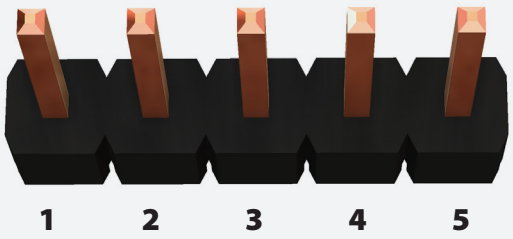
RS-232 (X9)

To enable PIN 8, PIN 1 has to be permanently switched to PIN 9 (GND).



PIN	FUNCTION
1	PIN 8 ENABLE
2	DTR
3	TXD
4	NC
5	RXD
6	NC
7	DSR
8	+5 V (4.9 V at 20 mA / 4.6 V at 50 mA)
9	GND
10	NC

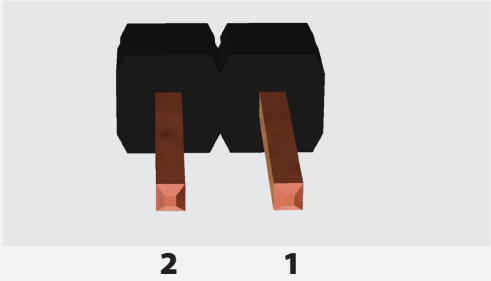
USB (X7)



PIN	FUNCTION
1	GND
2	GND (housing / shielding)
3	Data+
4	Data–
5	V+

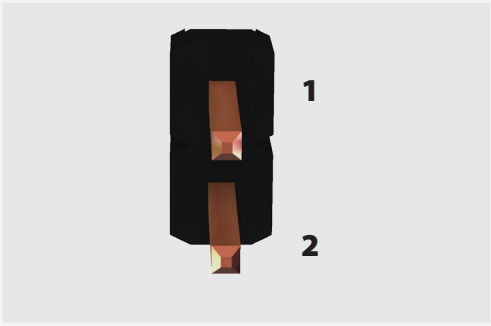
EXTERNAL STATUS LED (X2)

An external low-current LED can be connected to connection X2 (LED current 5…10 mA).



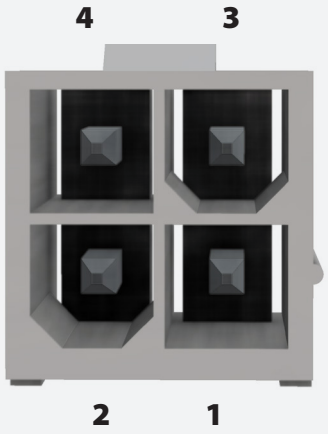
PIN	FUNCTION
1	LED anode, V+
2	LED cathode, V–

BATTERY START (X11)



PIN	FUNCTION
1	Battery start, contact 1 (to µC)
2	Battery start, contact 2 (GND)

BATTERY POWER (X3)



PIN	FUNCTION
1	Battery –
2	Battery –
3	Battery +
4	Battery +

BATTERY DATA (X4)

PIN	FUNCTION
1	Internal temperature sensor to energy storage, connector 1
2	I^2C_0-SCL
3	Internal temperature sensor to energy storage, connector 2
4	I^2C_0-SDA
5	NC
6	SP0 (Battery Enable)
7	+5 V (max. 50 mA)
8	GND

BATTERY TYPE	USED PINS
LiFePO4	2, 4, 6, 8
Supercap	1, 2, 3, 4, 6, 7, 8

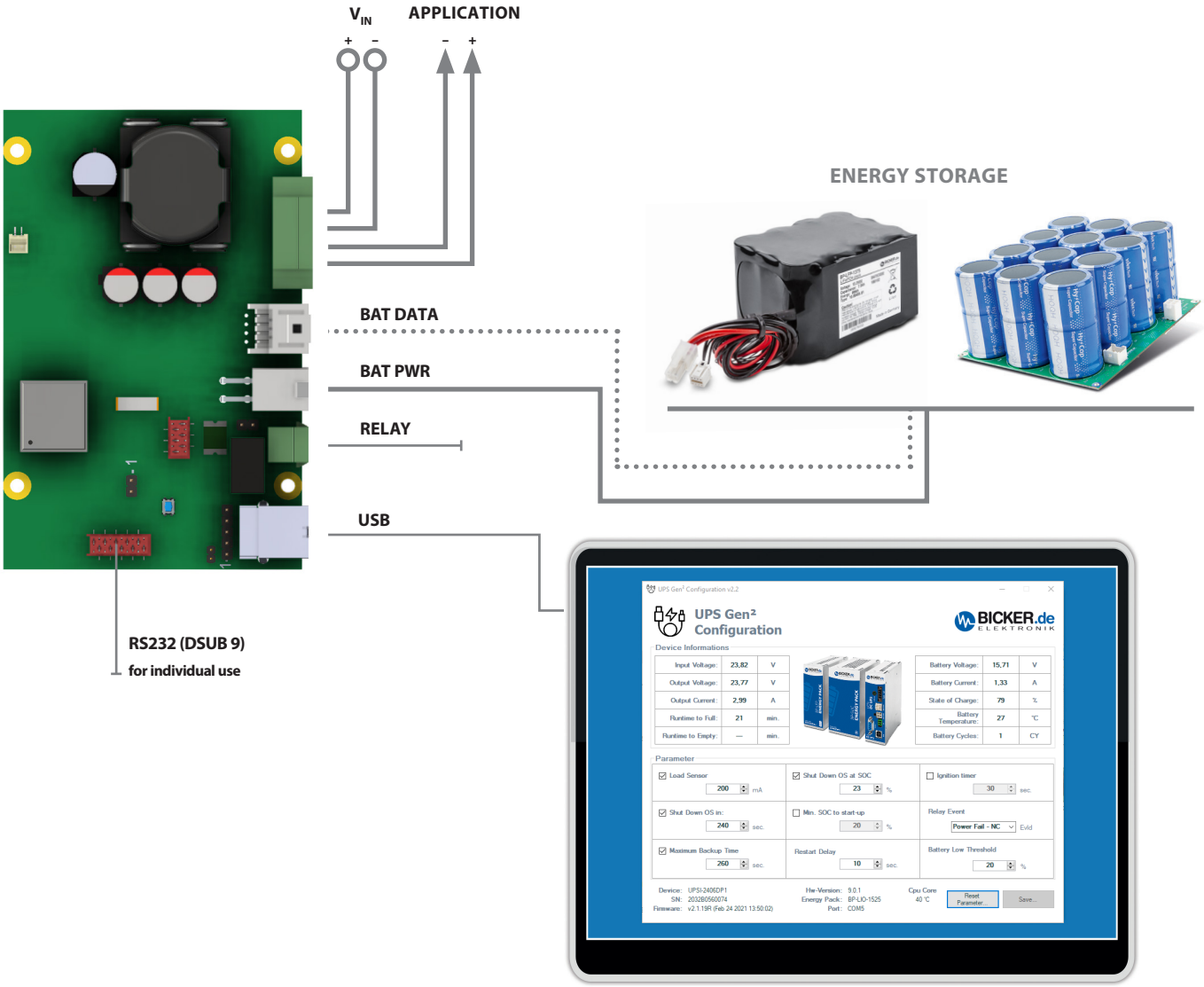
F5 Dimensioning the upstream power supply

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 UPSI-1208 with complete functionality, the upstream power supply has to provide at least 12 V / 10 A 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-1208		
I_{LOAD} [A]	I_{CHARGE} [A]	I_{IN-MIN} [A]
0	3.9	4
1	3.6	5
2	3.2	6
3	2.9	6.5
4	2.4	7
5	2.1	7.5
6	1.7	8
7	1.4	9
8	1.0	10

F6 Connecting diagram



CONNECTING ORDER

1. BATTERY POWER (X3)
2. BATTERY DATA (X4)
3. APPLICATION (V_{OUT})
4. DC SOURCE (V_{IN})
5. RELAY (X5) / USB (X6 or X7) / RS232 (X9)

Dismantling order reverse to connection!

V_{IN}/V_{OUT} – ATTENTION!

1. Note polarity!
2. AWG16 wire should be used (1.5 mm²)

F7 Initial operation

The correct installation of UPS and energy storage has to be ensured. The energy storage can be unplugged and exchanged at any time in compliance with the connecting order (see chapter F6 „Connecting diagram“). There are three connections to consider: a data connection to the battery (X4), a power supply to the battery (X3) and the input / output (X1) to the UPS.

After connecting a charged energy storage, the start can take place in two ways:

1. **By connecting the supply voltage (standard):**
   If a voltage more than 11.5 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 system present. After that, the charging of the energy storage starts.

OR

2. **Starting the battery from the energy storage into battery mode (alternative):**
   By short circuiting or bridging the pin header X11 for more than 2 seconds (max. 5 s).
   See also chapter F13 „Battery start“.

Only energy storages by Bicker Elektronik may be used. These are appropriately qualified and have the necessary protective functions. In addition, the charging methods are set using internal codes and settings.

The applied voltage at the input of the UPS is passed through to the output, reduced by a current-dependent voltage drop ($V_{OUT} = V_{IN}$ - 0.6 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 F5 „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.

F8 Overview connector / Counterpart with description / Scope of delivery

CONNECTOR	PART NO.	COUNTERPART NO.
V_{IN}/V_{OUT} (X1)	Würth Elektronik 691325310004	Würth Elektronik 691364300004
Relay (X5)	Würth Elektronik 691305140002	Würth Elektronik 691304130002
USB, type B socket (X6)	Würth Elektronik 61400416121	USB Typ B Stecker
USB, 2.54 mm pin header (X7)	Würth Elektronik 61300511121	2.54 mm female header or equal
RS232, MicroMatch (X9)	Würth Elektronik 690367281076	MicroMatch pin connection (male), IDC or equal
Battery power (X3)	Würth Elektronik 64900429522	Würth Elektronik 649004113322
Battery data (X4)	Würth Elektronik 62400821722	Würth Elektronik 624008213322
External status LED (X2)	Würth Elektronik 61300211121	2.54 mm female header or equal
Battery start (X11)	Würth Elektronik 61300211121	2.54 mm female header or equal

SCOPE OF DELIVERY	
QUANTITY	**DESCRIPTION**
1x device	UPSI-1208 - DC UPS
1x	V_{IN} / V_{OUT} connector counterpart
1x	Relay connector counterpart

F9 Charging time

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

F10 Reverse polarity / Overcurrent / 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.

Overcurrent:
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.

F11 Backup time in battery mode

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

F12 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 A). This can occur at very high load currents at the output of UPSI-1208. 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.

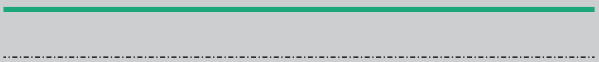
If the allowable output current during battery mode exceeds more than 70 %, the converter switches off first, without separating the output immediately. In this case, the voltage at the output of the UPSI-1208 can drop significantly below 12 V. This condition should be avoided by shutting down the system in time.

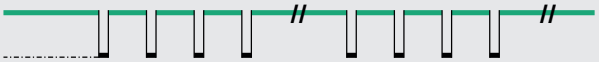
F13 Battery start

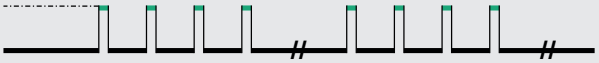
This function enables the application or the device to be started from the battery up to a load current of 8 A (nominal, tested with a BP-LFP-1025, State of charge SOC ≥10 %) without the power supply being available or connected. To do this, the pinheader X11 has to be short circuited or bridged for more than 2 seconds (max. 5 s). This is usually only useful with a LiFePO4 energy storage (BP-LFP-1025), because with supercapacitors the chemically induced self-discharge does not allow a battery start already after a few minutes.

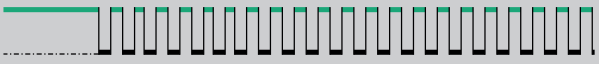
F14 Status LED

Valid from firmware version 2.1.19

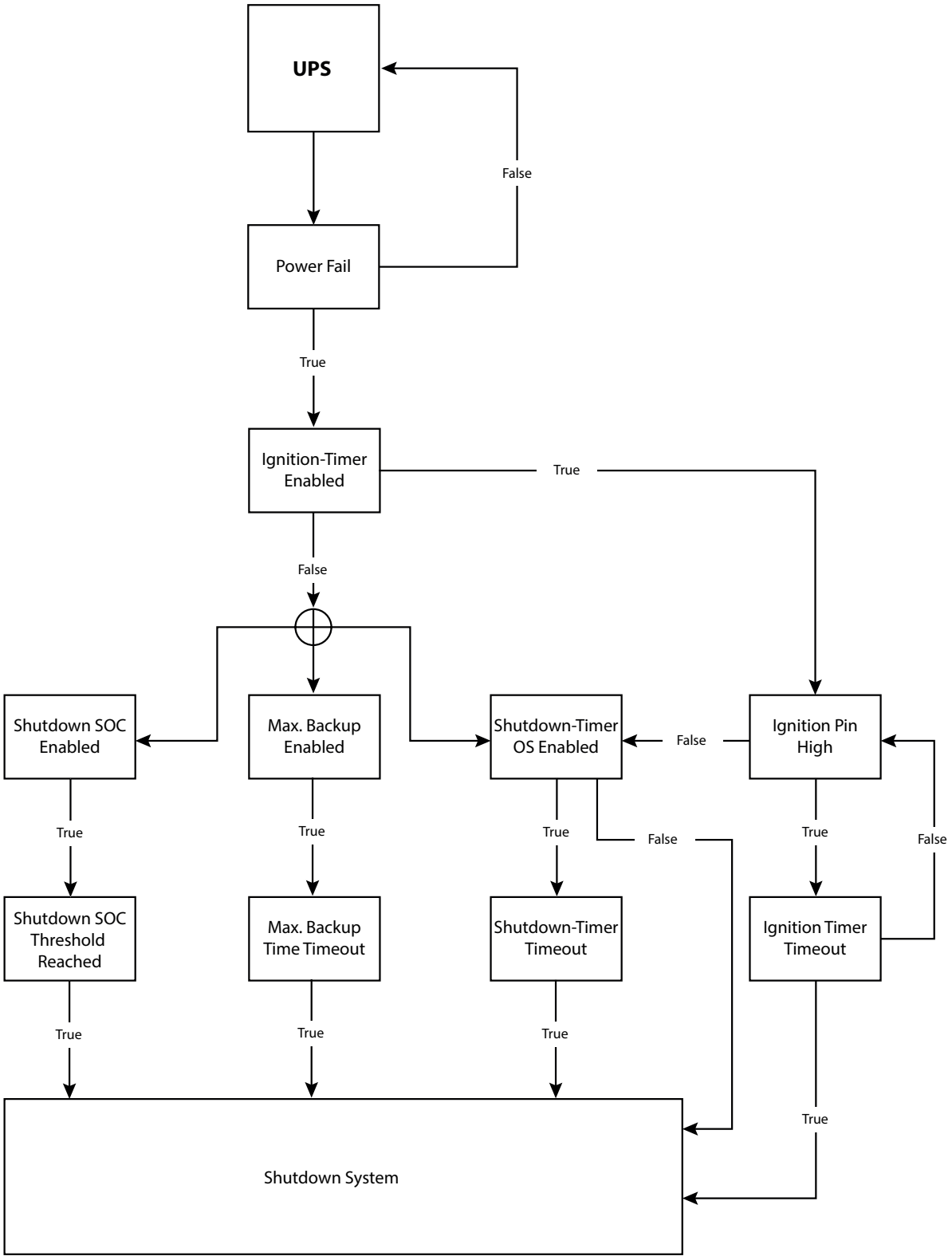
MAIN STATES		
	Always on	**Status: mains voltage** >> Mains voltage is present.
	1 Hz flash (1 s on, 1 s off)	**Status: Battery mode** >> Mains voltage is not present.

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.

F15 Shutdown diagram



F16 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.

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 are optimized so that they are at an optimium between service life and performance.

To extend the lifetime of the system, the UPS and energy storage should not be placed near sources of heat and should be placed within good air-circulation. When using LiFePO4 batteries, a larger capacity than actually required should always be used. The less deep the packs are discharged, the longer the service life lasts.

F17 Maintenance

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

F18 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.

F19 Disclaimer

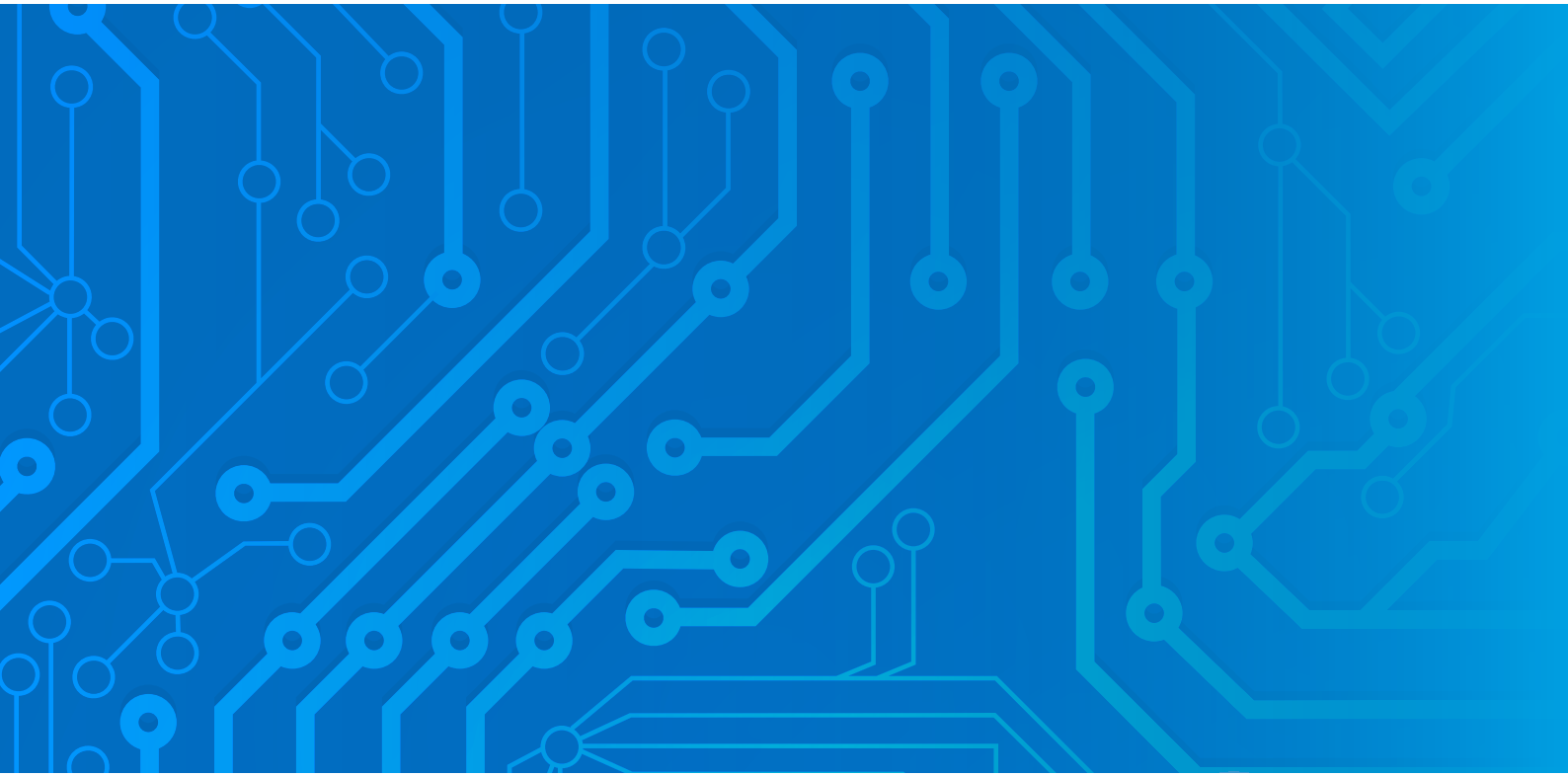
We, the Bicker Elektronik GmbH, have checked the contents of this document for compliance with the hardware and software described. Nevertheless, deviations can not be ruled out, so we assume no liability for the complete agreement. The information in this publication is checked regularly, necessary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

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

F20 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 11.5 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: 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.



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