PSBEN 3012C

v.1.0

PSBEN 13,8V/3A/17Ah/EN
Buffer, switched mode power supply unit.

EN

Edition: 4 from 01.02.2013

Supersedes the: 3 from 20.11.2012edition

BLACK POWER

CONTENTS

Features:

- PN-EN50131-6 compliance, grades 1÷3 and II environmental class
- mains supply of 230VAC
- uninterrupted voltage of 13,8VDC
- fitting battery: 17Ah/12V
- high efficiency 70%
- PSU current efficiency:
  - 1,4A – for grades 1 , 2 *
  - 0,56A – for grades 3 **
  - 3A – for general use ***

  (see: chapter 2.1)
- low level of voltage ripple
- microprocessor-based automation system
- intelligent management of PSU power's output stage
- 'SERIAL' communication port with implemented MODBUS RTU protocol
- remote monitoring (option: WiFi, Ethernet, RS485, USB)
- free program - 'PowerSecurity' for monitoring the PSU operation parameters
- load current control
- output voltage control
- output fuse status control
- dynamic battery test
- battery circuit continuity control
- battery voltages control
- battery fuse status control
- battery charge and maintenance control
- deep discharge battery protection (UVP)
- battery overcharge protection
- battery output protection against short circuit and reverse polarity connection
- jumper selectable battery charging current 0,2A/0,6A/1A/1,5A
- remote battery test (additional module required)
- START button for battery activation
- STOP button for disconnecting during battery-assisted operation
- optical indication – LED panel
  - output current readings
  - output voltage readings
  - failure codes with history
- optical indication of PSU overload OVL
- acoustic indication of failure
- adjustable times indicating AC power failure
- technical inputs/outputs with galvanic isolation
- collective failure input EXT IN
- EPS technical output indicating AC power loss
- PSU technical output indicating PSU failure
- APS technical output indicating battery failure
- internal memory of PSU operating status
- protections:
  - SCP short circuit protection
  - OLP overload protection
  - OHP overheat protection
  - OVP over voltage protection
  - surge protection
  - against tampering: unwanted opening of the enclosure or detachment from the mounting surface
- convectional cooling
- warranty – 5 year from the production date

1. Functional requirements of the PSU compliant with PN-EN 50131-6.

Functional requirements	Requirements of PN-EN 50131-6			PSBEN3012C
	Grade 1	Grade 2	Grade 3	
EPS network absence	YES	YES	YES	YES
Battery low voltage	YES	YES	YES	YES
Protection against full battery discharge	-	-	YES	YES
Battery fault	-	-	YES	YES
No battery charge	-	-	YES	YES
Output low voltage	-	-	YES	YES
Output high voltage	-	-	YES	YES
PSU fault	-	-	YES	YES
Surge protection	-	-	YES	YES
Short circuit protection	YES	YES	YES	YES
Overload protection	YES	YES	YES	YES
Output fuse activation	-	-	-	YES
Battery fuse fault	-	-	-	YES
EPS technical output	YES	YES	YES	YES
APS technical output	YES	YES	YES	YES
PSU technical output	YES	YES	YES	YES
Collective failure input	-	-	-	YES
Remote battery test	-	-	-	YES
Tamper resistance – enclosure opening	YES	YES	YES	YES
Tamper resistance – detachment from the mounting surface	-	-	YES	YES

2. Technical description.

2.1. General description.

The buffer power supply has been designed in accordance with the requirements of the PN-EN 50131-6 standard, grade 1÷3 and II environmental class. It is intended for an uninterrupted supply to alarm system devices requiring stabilized voltage of 12V/DC (+/-15%).

Depending on a required protection level of the alarm system in the installation place, the PSU efficiency and the battery charging current ought to be measured as follows:

* Grade 1, 2 - standby time 12h

Output voltage 1,4A + 1,5A battery charge

** Grade 3 - standby time 30h if the faults of the main power source are reported to the Alarm Receiving Centre - ARC (in accordance with 9.2 – PN-EN 50131-1).

Output voltage 0,56A + 1,5A battery charge

- standby time 60h if the faults of the main power source are reported to the Alarm Receiving Centre - ARC (in accordance with 9.2 – PN-EN 50131-1).

Output voltage 0,28A + 1,5A battery charge

*** General use – if the PSU is not mounted within an installation which is PN-EN-50131 compliant, the acceptable current efficiency amounts to:

1. Output voltage 3A + 0,2A battery charge
2. Output voltage 2,6A + 0,6A battery charge
3. Output voltage 2,2A + 1A battery charge
4. Output voltage 1,7A + 1,5A battery charge

Total current of the receivers + battery: 3,2A max.

In case of power decay, a battery back-up is activated immediately. The PSU is housed in a metal enclosure (colour: RAL 9005 - black) which can accommodate a 17Ah/12V battery. It features micro switches that indicate unwanted door opening (faceplate) and detaching from the mounting surface.

2.2. Block diagram.

The PSU has been manufactured based on a high-duty system of DC/DC converter. It features a microprocessor-based operation control, responsible for full diagnostics of the PSU and battery parameters.

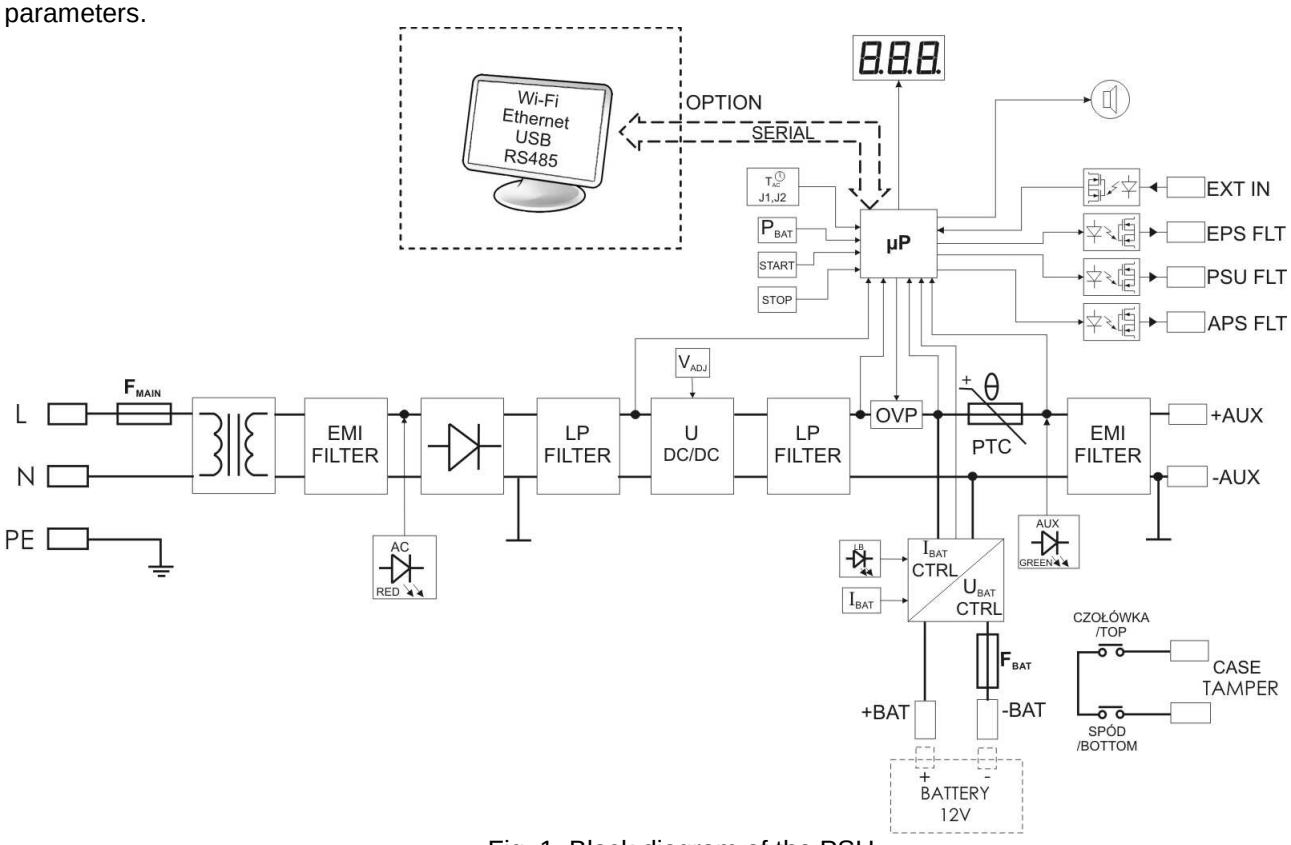
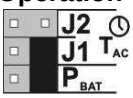


Fig. 1. Block diagram of the PSU.

2.3 Description of PSU's components and connectors.

Table 1. Elements of the PSU pcb (see Fig. 2).

Element no.	Description
[1]	**PANEL** – optical indication connector
[2]	**P_{BAT}; pin** - adjustment of battery protection function UVP • **P_{BAT}** = ▬ battery protection (disconnection) off • **P_{BAT}** = ▪▪ battery protection (disconnection) on **T_{AC}; pins J1, J2** - adjustable time lag of AC power failure indication • J1= ▪▪, J2= ▪▪ time lag T= 5s • J1= ▪▪, J2= ▬ time lag T= 140s • J1= ▬, J2= ▪▪ time lag T= 17m • J1= ▬, J2= ▬ time lag T= 2h 20m Caption: ▬ jumper on, ▪▪ jumper off **Operation without a battery**  **-** In this mode, the automation mode enables adjustments of the PSU output voltage without failure indication concerning battery operation.
[3]	**I_{BAT}** – pin - battery charging current selection J1= ▬, J2= ▪▪ J3= ▪▪ I_{BAT} =0,2 A J1= ▪▪, J2= ▬ J3= ▪▪ I_{BAT} =0,6 A J1= ▪▪, J2= ▪▪ J3= ▬ I_{BAT} =1,0 A J1= ▪▪, J2= ▪▪, J3= ▪▪ I_{BAT} =1,5 A Caption: ▬ jumper on, ▪▪ jumper off
[4]	**START** – button (launching the PSU from a battery) **STOP** – button (disconnection of the PSU during battery-assisted operation)
[5]	•)) – pin; activation of the acoustic indication ▬ - indication on ▪▪ - indication off Caption: ▬ jumper on, ▪▪ jumper off
[6]	**V_{ADJ}** – potentiometer, DC voltage adjustment
[7]	**BUZER** – acoustic indicator
[8]	**F_{BAT}** – fuse in the battery circuit
[9]	**Connectors:** **~AC~** – AC power input **+BAT** – DC power battery output **+AUX** – DC power output (+AUX= +U, -AUX=GND) **EPS FLT** – technical output of AC network absence indication open = AC power failure close = AC power - O.K. **PSU FLT** – technical output of PSU failure open = failure close = PSU working correctly - O.K. **APS FLT** – technical output of battery failure open = battery failure close = battery O.K. **EXT IN** – output of collective failure
[10]	**V_{EXT} pin** – polarisation of EXT IN circuit
[11]	**Communication connector**
[12]	**LEDs – optical indication:** **AC** – presence of the AC power **AUX** – DC output voltage **OVL** – PSU overload **PSU** – PSU failure **APS** – battery failure **EXT** – EXT IN output's status **LB** – battery charge
[13]	**OVP** – optical indication for activating the over voltage system

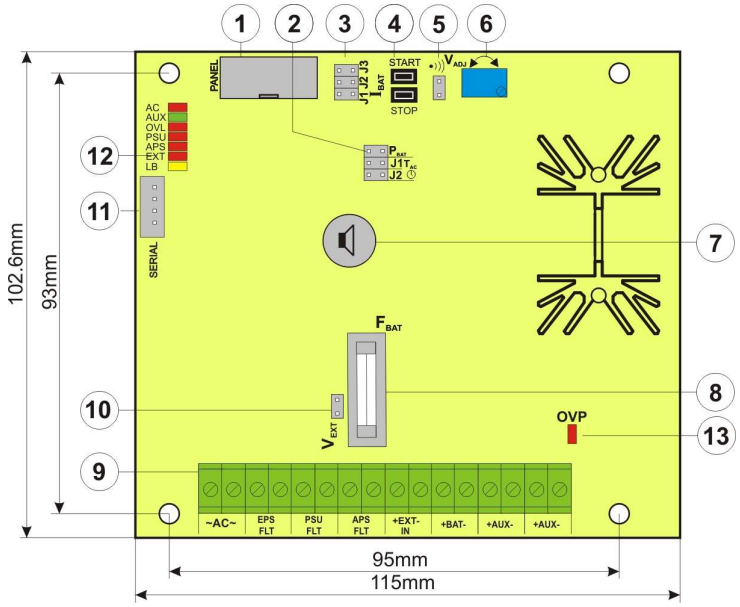


Fig. 2. The view of the PSU's pcb.

Table 2. PSU elements (see fig. 3).

Element no.	Description
[1]	Insolation transformer
[2]	PSU board (tab.1, fig.2)
[3]	**TAMPER;** micro-switch (contacts) of tamper resistance **(NC)**
[4]	**F_{MAIN}** fuse in the supply circuit (230 V AC)
[5]	**L-N** 230V/AC power connector, PE connector
[6]	Battery connectors: positive: +BAT = red, negative: - BAT = black
[7]	Grip of tamper resistance

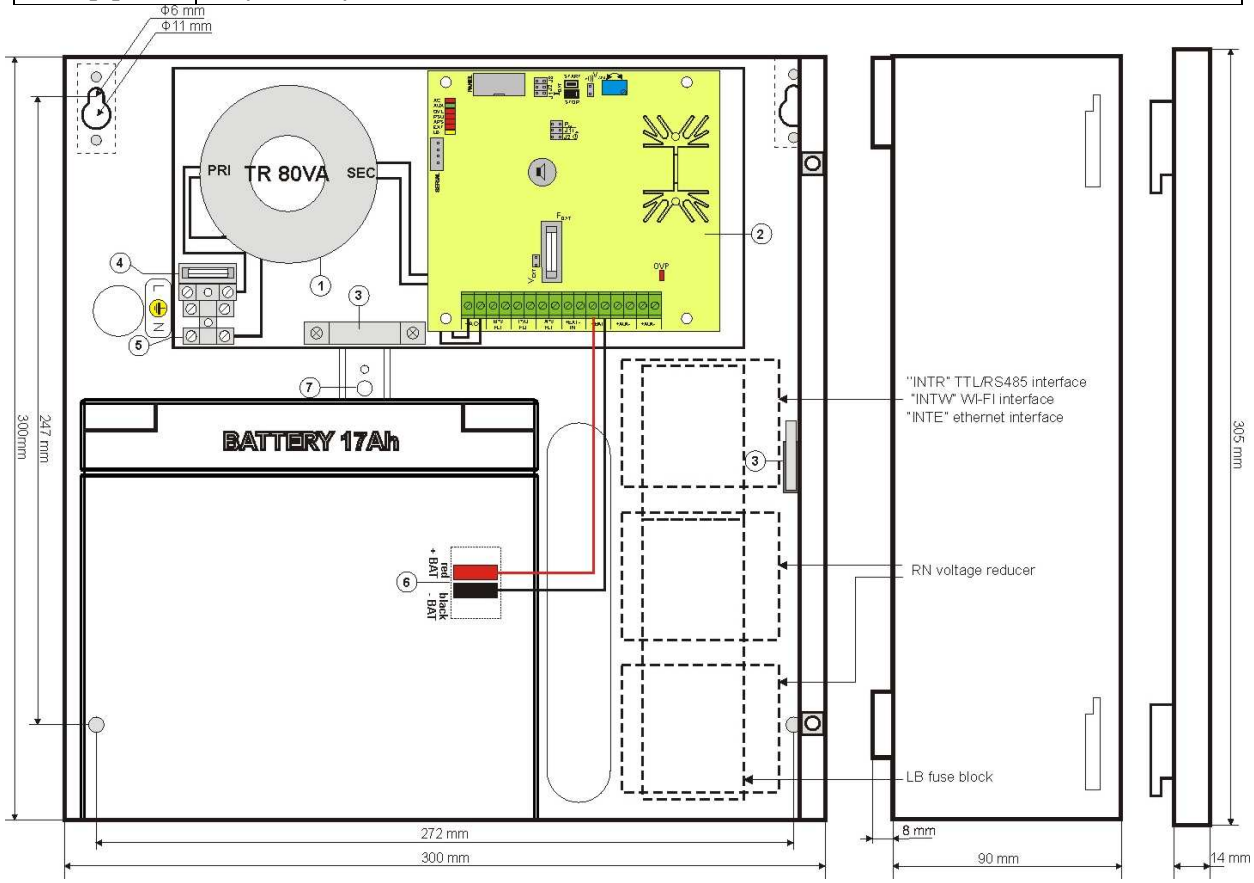


Fig.3. The view of the PSU.

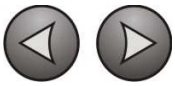
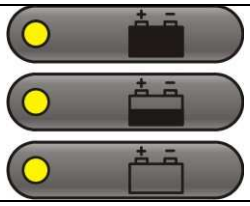
3. Operating status indication.

3.1. Control panel.

The PSU is equipped with a panel with buttons and an LED display which enables reading the basic parameters of the device. The buttons are for selecting and approving a certain parameter that is to be displayed.

Fig. 4. Control panel.

Table 3. A description of the buttons and LEDs of the LED panel.

	- parameter selection
	- selection approval
	- red LED – indicates presence of the AC voltage
	- red LED – indicates overload of the PSU
	- red LED – indicates failure of the PSU
	- red LED – indicates battery failure
	- green LED – indicates power at the AUX output of the PSU
	- three yellow LEDs – indicate battery charging level

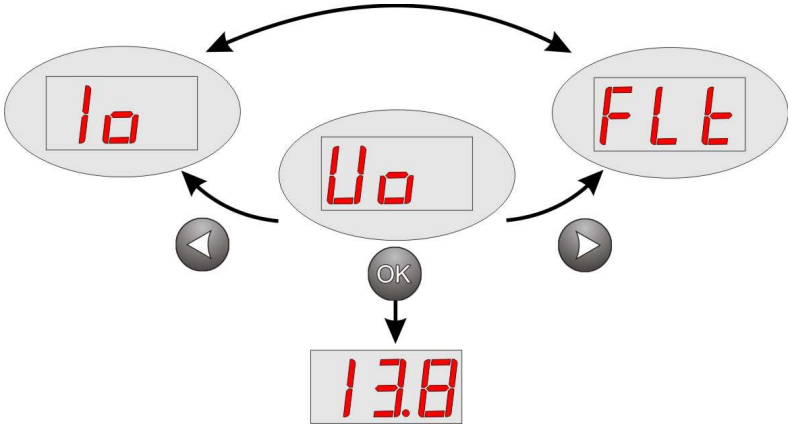


Fig. 5. Menu of the display.

- **FLt** - PSU fault memo (30 last events)
- **Io** - AUX output current measurement [A]
- **Uo** - AUX output voltage measurement [V]

Resolution for voltage measurement amounts to 0.1V, for current measurement: 0.1A. Displayed voltage and current rates are only approximate. For higher accuracy, a multimeter shall be used.

3.2 Overview of current failures.

If any incorrect electrical parameters occur, the PSU will signal the failure by illuminating an appropriate LED on the panel or by activating an acoustic indication (provided it has not been switched off). After pressing the 'OK' button, the panel display will show a code of the fault that trigger the failure. If more than one failure occurs simultaneously, another pressing the 'OK' button will display the next failure code.

In chapter 9 all possible failure codes that can appear during the PSU's operation have been shown. Each code is accompanied by an appropriate LED indication on the panel, acoustic indication and switching of a dedicated technical output.

3.3 Overview of failure memo.

The device remembers 30 last failures in non-volatile memory which enables a subsequent overview.

Entering the failure memo overview mode:
With the "<", ">" buttons choose the **FLt** position and approve by pressing "OK". The number of the failure will be displayed, then its code. Pressing "OK" again will display the next failure in the memory.

3.4 Setting the communication parameters of the PSU.

Communication in the RS485 bus requires setting appropriate communication parameters in all power supply units and assigning appropriate addresses.

All power supplies have a preset address 1.

3.4.1 Setting the parameters of the serial port.

- press the '<,>' right and left-most buttons simultaneously on the LED panel

- press 'OK.' after appearing of 'Adr'

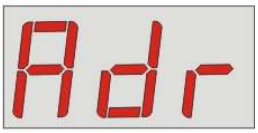
- with '>' or '<' set the address from 1 to 247.

- confirm the address with the 'OK' button

3.4.2 Setting the communication address.

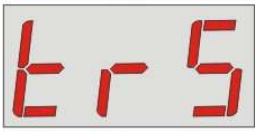
- press simultaneously the right and left-most buttons on the LED panel

- the abbr ‘Adr’ will appear on the display



- press the ‘>’ right arrow button

- the abbr ‘trS’ will appear on the display



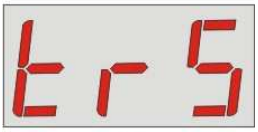
- press ‘OK’

- now, on the display there will appear either ‘9.6’ or ‘19.2’ – values informing of the transmission’s speed

- with ‘>’ or ‘<’ set the transmission’s speed to 19200, which is displayed as ‘19.2’

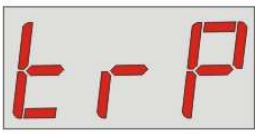
- approve the setting with the ‘OK’ button

- the abbr ‘trS’ will be displayed again

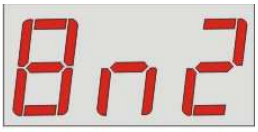


- press the ‘>’ right arrow button

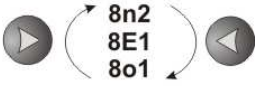
- press ‘OK’ after appearing of ‘trP’ on the display



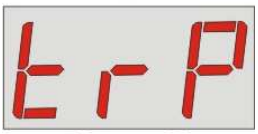
- now, one of the following abbreviations will be displayed: ‘8n2’, ‘8E1’ or ‘8o1’



- with ‘>’ or ‘<’ set the ‘8E1’ parameter



- approve your choice with the ‘OK’ button



- finish the configuration procedure by pressing simultaneously the ’<,>’ buttons

3.5 Acoustic indication.

Emergency situations are acoustically indicated. The frequency and the number of signals depend on an event type (see chapter 9). The acoustic indication is off after removing an appropriate jumper (fig. 2, [5]).

Table 4. Acoustic indication.

No.	Description	Event
1	1 signal per 10s, battery-assisted operation	No 230V AC supply
2	1 signal per 10s, mains operation	Battery fault, undercharged battery
3	2 signals per 10s, battery-assisted operation	Low level of battery charge
4	Fast signals, battery-assisted operation	The PSU will be disconnected due to the battery discharge
5	Continuous indication	PSU failure [see chapter 9]
6	1 signal	Breaking the battery test
7	2 signals	Activation of the battery test

3.6 Technical outputs.

The PSU feature indication outputs, with galvanic isolation, which change state if any of the following event occur:

- **EPS FLT – output indicating AC power loss**.

  The output indicates AC power loss. Under normal status – with the 230V AC supply, the output is close. In case of a power failure the PSU will switch the output into the open state after a period of time determined by the $\mathbf{T_{AC}}$ (J1, J2) jumpers.

  J1= ▪▪, J2= ▪▪ time lag T= 5s
  J1= ▪▪, J2= ▬ time lag T= 140s
  J1= ▬, J2= ▪▪ time lag T= 17m
  J1= ▬, J2= ▬ time lag T= 2h 20m
  Caption: ▬ jumper on, ▪▪ jumper off

- **APS FLT - output indicating battery failure.**

  The output indicates a failure in the battery circuit. Under normal status (during correct operation) the output is close. In case of a failure the PSU will switch the output into the open state. Any failures can be triggered by the following events:
  - a faulty or undercharged battery
  - battery voltage below 11,5V during battery-assisted operation
  - battery fuse fault
  - no continuity in the battery circuit

- **PSU FLT - output indicating PSU failure**.

  The output indicates the PSU failure. Under normal status (during correct operation) the output is close. In case of a failure the PSU will switch the output into the open state. Any failures can be triggered by the following events:
  - low output voltage Uaux<11,8V
  - high output voltage Uaux>14,7V
  - high battery voltage Uaku>14V (during battery test)
  - polymer fuse PTC activation
  - exceeding the PSU nominal current
  - failure in the battery charging circuit
  - activation of the over voltage protection OVP

The technical outputs have been implemented with galvanic isolation between the PSU's systems and the attached devices.

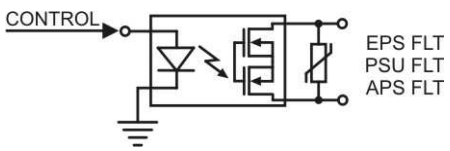


Fig. 6. Electrical diagram of the technical outputs.

- **TAMPER - output that indicates tampering with the PSU enclosure**: output with volt-free (potential-free) contacts indicating the door status and PSU detachment from the mounting surface. NC contacts: the PSU is locked and fixed to the dedicated surface.

3.7 Input of collective failure: EXT IN.

The EXT IN (external input) technical input indicating a collective failure is intended for additional, external devices that generate the failure signal. If voltage appears at the EXT IN input, it will cause generating a PSU failure, storing the information about the event in the internal memo and sending the signal about the failure to the PSU FLT output.

The EXT IN technical input has been implemented with galvanic isolation between the PSU's systems and the devices attached.

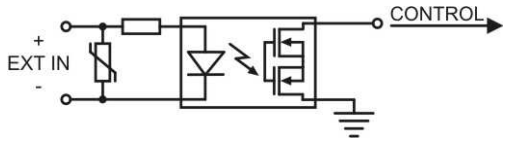


Fig. 7. Electrical diagram of the EXT IN input.

The electrical diagram below shows the way of connecting external devices to the EXT IN input. Outputs such as: OC (open collector), relay type or tamper may be used as a source of the signal.

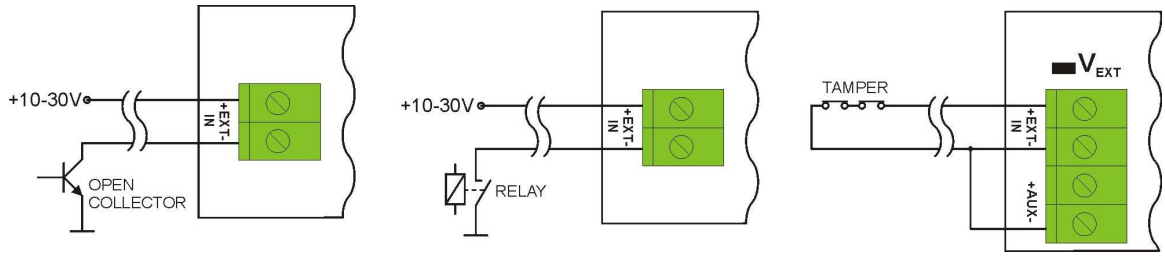


Fig. 8. Examples of connections.

In the option with tamper switches, the V_{EXT} jumper must be on. It polarises the EXT IN input circuit therefore is required in such configuration.

The EXT IN input has been adjusted to cooperate with fuse modules that generate a failure signal in case of a fuse fault in any of output sections (e.g. AWZ535, AWZ536). To guarantee a correct cooperation between the module and the EXT IN input, the V_{EXT} jumper must be on and the connections are to be made accordingly to the diagram below.

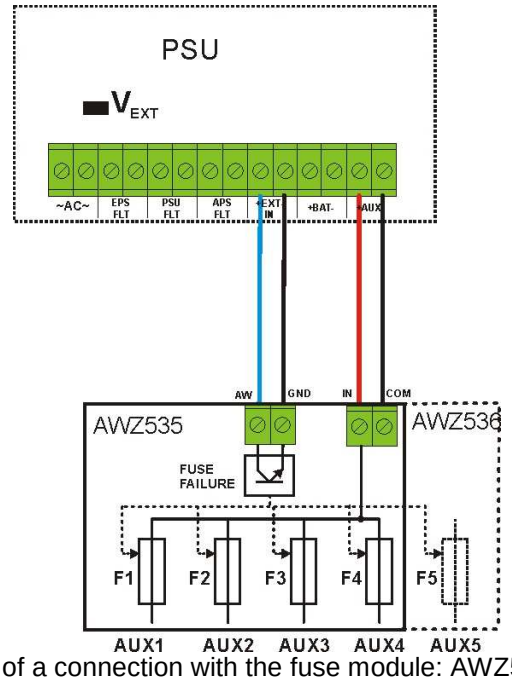


Fig. 9. Example of a connection with the fuse module: AWZ535 or AWZ536.

4. Battery-assisted operation.

4.1. Running the PSU from the battery.

The PSU has been equipped with two buttons on the pcb board which enable running or disconnecting the PSU during battery-assisted operation.

- **Running the PSU from the battery**: press the **START** button on the main board and hold for 1s.
- **Disconnecting the PSU from the battery**: press the **STOP** button on the main board and hold for 5s.

4.2. Deep discharge battery protection UVP.

The PSU is equipped with the disconnection system and the discharged battery indication. If the voltage at the battery terminals drops below10V±0.2V during battery-assisted operation, the PSU will be disconnected within approx. 15s. **The protection mode is off when the P_{BAT} jumper is removed.**

Caution.
Deactivating of the UVP function is not recommended since a deep discharge of the battery limits its capability of storing energy, lowers its capacity and shortens its durability.

4.3 Dynamic battery test.

The PSU runs a battery test every 10 minutes. It is done by a momentary switching into a battery-assisted operation. A failure is indicated when voltage drops below 12V. The battery test facility can be switched off.

Deactivating/activating the test: during mains-powered PSU operation press the STOP button on the main board and hold it for 3 seconds. The device will confirm the activation/deactivation in the following ways: (Tab.4, [6], [7]).

- **testing off – the tOF sign appears on the display**
- **testing on – the tON sign appears on the display**

Deactivating/activating the test is stored in the memory even after unplugging the device from mains. The battery failure indication at the APS FLT output is automatically switched off. The battery protection system against deep discharged remains on, though.

4.4. Standby time.

The standby time during batter-assisted operation depends on: battery capacity, battery charge level and load current. In order to keep the standby time, the current drawn from the PSU during battery-assisted operation should be limited. Characteristics for a 17Ah/12V SLA:

Grade 1, 2 - standby time 12h
Output current 1,4A + 1,5A battery charge

Grade 3 - standby time 30h if the faults of the main power source are reported to the Alarm Receiving Centre - ARC (in accordance with 9.2 – PN-EN 50131-1).
Output current 0,56A + 1,5A battery charge

- standby time 60h if the faults of the main power source are reported to the Alarm Receiving Centre - ARC (in accordance with 9.2 – PN-EN 50131-1).
Output current 0,28A + 1,5A battery charge

4.5. Battery charging time.

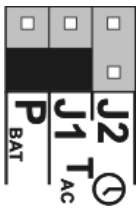
The PSU has a battery circuit charged with direct current. The current selection is done via I_{BAT} jumpers. The table below shows how long it takes to charge a (fully discharged) battery up to min. 80% of its nominal capacity.

Table 5. Battery charging time.

17Ah battery charging time up to capacity of 0,8*C	Charging current [A]	Configuration of I_{BAT} jumper
10h12m	1,5	J1=, J2=, J3=
15h18m	1	J1=, J2=, J3=
25h30m	0,6	J1=, J2=, J3=
-	0,2	J1=, J2=, J3=

4.6 Operation without a battery.

In case of an expected PSU operation without an attached battery, make a necessary configuration of jumpers:



In this mode the automation system allows adjustments of PSU's output voltage without indicating a failure connected with working of the battery.

CAUTION. During operation without battery assistance the PSU does not perform any parameter

5. Remote monitoring (option: Wi-Fi, Ethernet, RS485, USB).

The PSU has been adjusted to operate in a system that requires a remote control of the parameters in a monitoring centre. Transmitting data concerning PSU status is possible due to an additional, external communication module that is responsible for communication in Wi-Fi, Ethernet or RS485 standard.

A USB –TTL interface enables connection between the PSU and a computer.

In the further part of the chapter, there are presented different connection topologies which serve as examples since more communication variations are possible. For more examples, study the manuals of particular interfaces.

5.1 1 Communication in the wi-fi wireless network.

The Wi-Fi wireless communication is to be implemented on the basis of additional interfaces: WI-Fi 'INTW' and RS485-WiFi operating within 2,4GHz frequency band, accordingly to the IDEE 802.11b standard.

The WiFi 'INTW' interface stall be mounted in a selected location inside the enclosure so that the serial protrudes outwards.

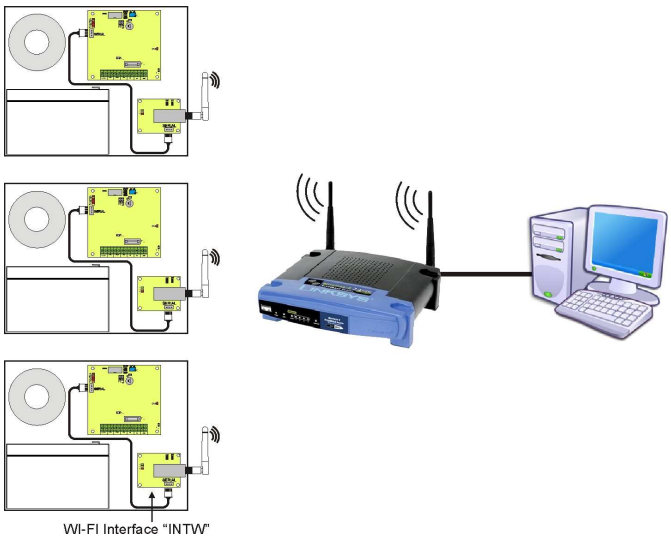


Fig.10. WI-FI communication with the use of the WI-FI "INTW" interface".

The RS485-WiFi 'INTRW' interface is a device intended for converting signals between the RS485 bus and the Wi-Fi network. To work correctly, the device requires external power supply within the range of 10÷30V DC e.g. drawn from a PSU of the PSBEN series. The device is mounted in a hermetic enclosure that protects it against adverse environmental conditions.

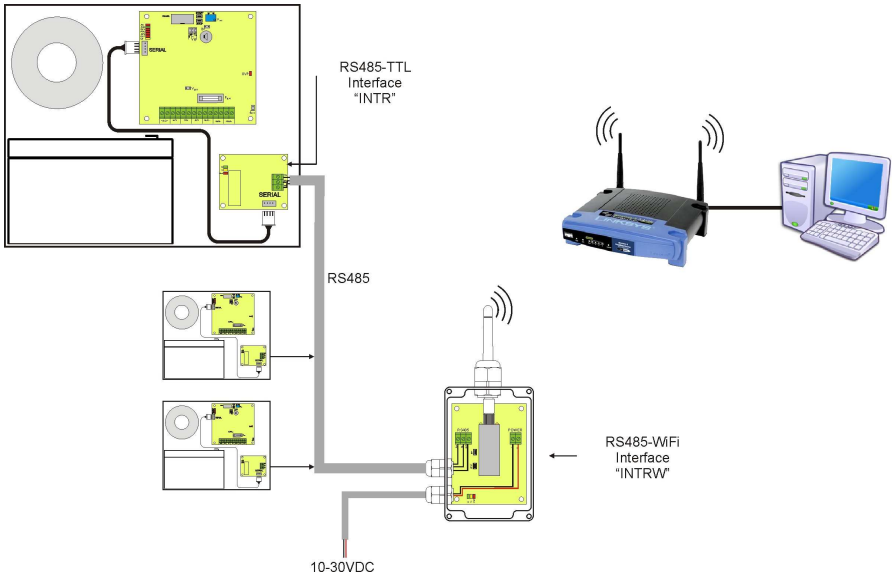


Fig. 11. WI-FI communication with the use of the RS485-WIFI 'INTRW' interface.

5.2 Communication in the ETHERNET network.

Communication in the Ethernet network is possible due to the additional interfaces: Ethernet ‘INTE’ and RS485-ETH, compliant with the IEEE802.3 standard.

The Ethernet ‘INTE’ interface feature full galvanic isolation and protection against surges. It shall be mounted inside the PSU enclosure.

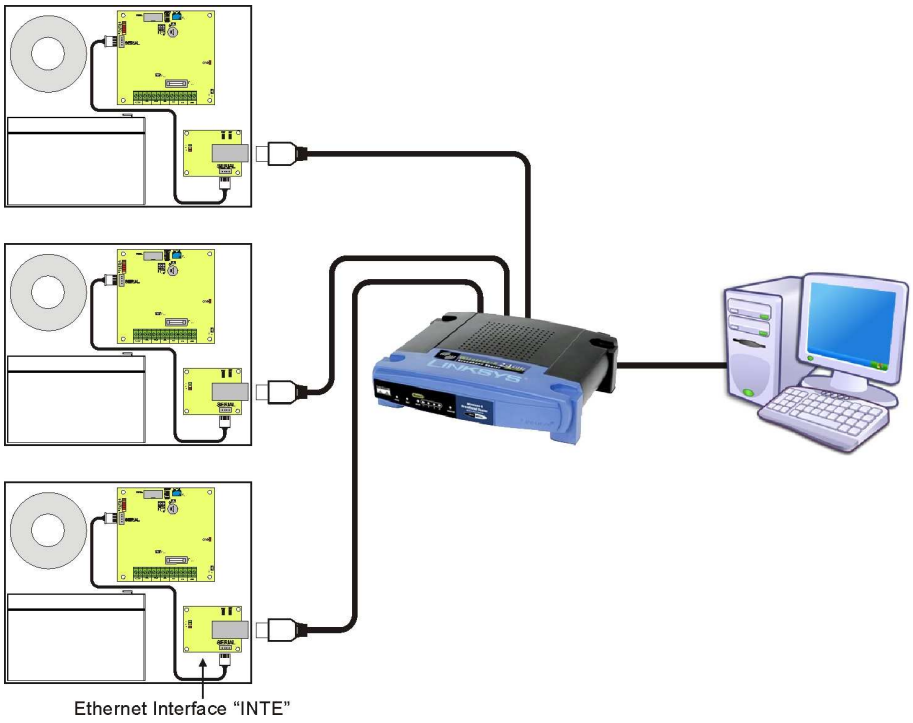


Fig. 12. Ethernet communication with the use of the ‘INTE’ interface.

The RS485-ETHERNET ‘INTRE’ interface is a device intended for converting signals between the RS485 bus and the Ethernet network. To work correctly, the device requires external power supply within the range of 10÷30V DC e.g. drawn from a PSU of the PSBEN series. The physical connection is safe due to embed galvanic isolation. The device is mounted in a hermetic enclosure that protects it against adverse environmental conditions.

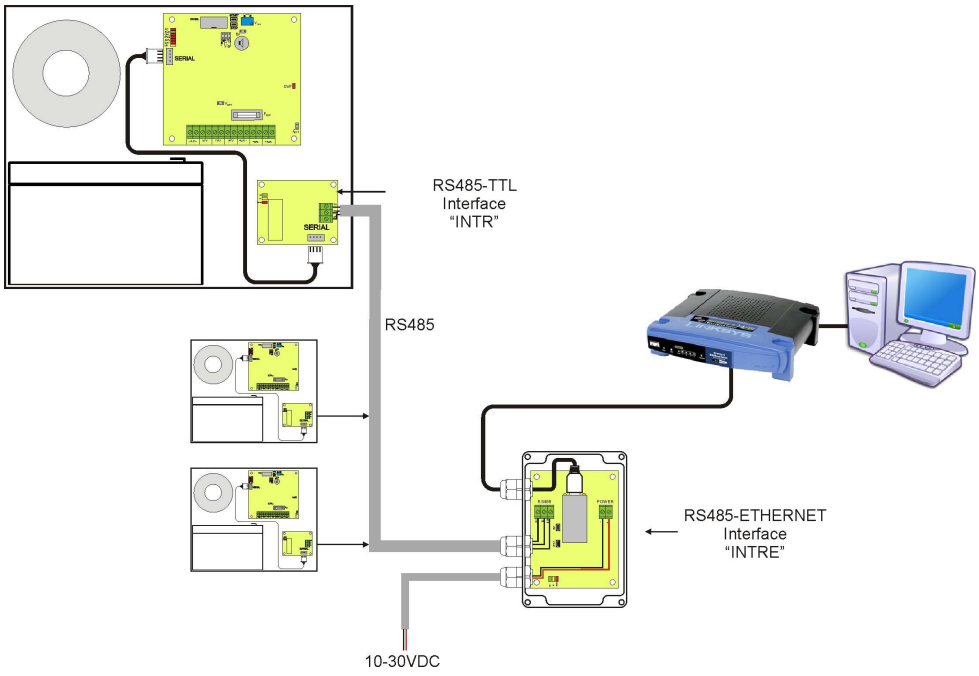


Fig. 13. Ethernet communication with the use of the RS485-Ethernet ‘INTRE’ interface.

5.3 Communication in RS485 network.

Another kind of network communication is the RS485 that uses a two-wire transmission line. To implement this kind of data exchange, the PSU needs to be equipped with the additional RS485-TTL ”INTR” interface which converts data from the PSU into the RS485 standard and the USB-RS485 ”INTUR” one that converts data from the RS485 network to a USB. These interfaces feature full galvanic isolation and protection against surges.

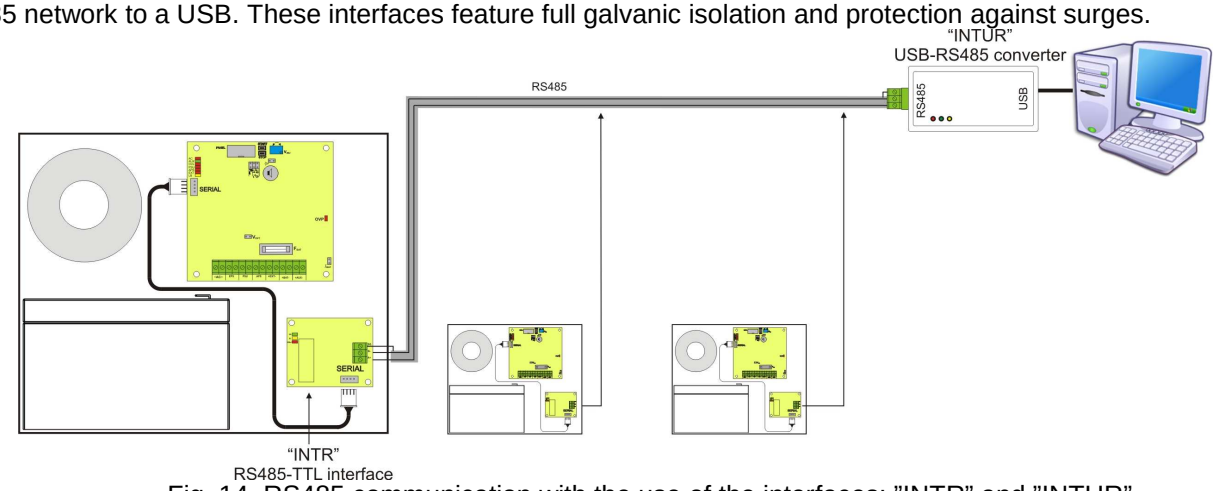


Fig. 14. RS485 communication with the use of the interfaces: ”INTR” and ”INTUR”.

5.4 USB-TTL communication.

If the PSU does not cooperate with any of previously mentioned network and the access to the parameters’ adjustment and memo readings are necessary, the USB-TTL ”INTU” needs to be used. This interface allows direct connection between the computer and the PSU and it is recognisable by the operating system as a virtual COM port.

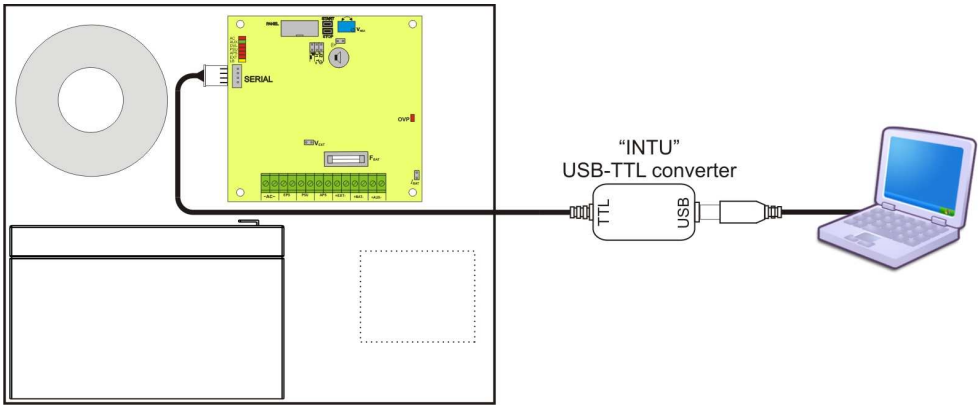


Fig. 15. KUSB-TTL communication with the use of the USB-TTL ”INTU” interface.

5.5 ”Power security” program.

”Power security” is a computer program that has been created for displaying and analysing the information sent from the PSU installation spots. Here is its front panel:

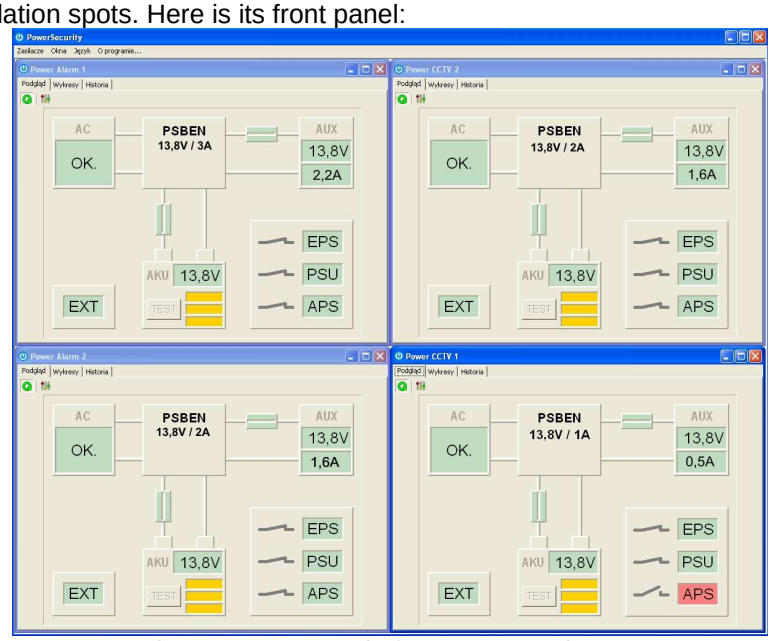


Fig. 16. Front panel of “Power security” program.

The main panel of the program has been formulated in such a way that it is possible to divide it into smaller areas, depending on the number of power supplies.

The program enables both a visualisation and an analysis of the received data. Exceeding of the acceptable parameters is indicated by highlighting in red the appropriate area or by twinkling of the indicator. Particular tabs contain a chart with an overview of the PSU parameters and failure memo along with the information about status and the electrical specifications of the technical outputs.

The "Power Security" program is available on our website: www.pulsar.pl
Its detailed description can be found in the manual of the program.

6. Technical specifications.

Electrical specifications (tab.6).
Mechanical specifications (tab.7).
Operation safety (tab.8).
Operating specifications (tab.9).
Factory settings (tab. 10).

Table 6. Electrical specifications.

PSU type	A, protection grade 1÷3, II environmental class
Mains supply	230V/AC (-15%/+10%)
Current consumption	0,39 A
Power frequency	50Hz
PSU's power	44 W
Efficiency	70%
Output voltage	11,0V÷13,8 V DC – buffer operation 10,0V÷13,8 V DC – battery-assisted operation
Output current	**- for grades 1, 2:** **Io = 1,4A + 1,5A battery charge** **- for grade 3:** **Io = 0,56A + 1,5A battery charge -** (connection with ARC required, compliant with 9.2 – PN-EN 50131-1) **Io = 0,28A + 1,5A battery charge** **- for general use:** **Io = 3A + 0,2A battery charge** **Io = 2,6A + 0,6A battery charge** **Io = 2,2A + 1A battery charge** **Io = 1,7A + 1,5A battery charge**
Output voltage setting, escalation and keeping time	5ms / 40ms / 18ms
Output voltage adjustment range	12,0 V÷ 14,5 V
Ripple voltage	30 mV p-p max.
Current consumption by the PSU systems during batter-assisted operation	I = 22 mA
Battery charging current	0,2A / 0,6A / 1A / 1,5A –I_{BAT} jumper selectable
Low battery voltage indication	Ubat < 11,5V, during battery-assisted operation
Over voltage protection OVP	U>15,5V, disconnection of the output voltage, automatic return (AUX+ disconnection)
Short circuit protection SCP	200% ÷ 250% of the PSU power - current limiting and/or fuse fault in the battery circuit (fuse-element replacement required)
Overload protection OLP	Program - equipment
Battery circuit protection SCP and reverse polarity connection	F5 A- current limiting, F_{BAT} fuse (failure requires fuse-element replacement)
Deep discharge battery protection UVP	U<10,0 V (± 2%) – disconnection (-BAT) of the battery, configuration with jumper P_{BAT}
Technical outputs: **- EPS FLT; output indicating AC power failure**	- type – electronic, max 50mA/30V DC, galvanic isolation 1500V_{RMS} - time lag, approx. 5s/140s/17m/2h 20m (+/-5%)
- APS FLT; output indicating battery failure	- type – electronic, max 50mA/30V DC, galvanic isolation 1500V_{RMS}
- PSU FLT; output indicating PSU failure	- type – electronic, max 50mA/30V DC, galvanic isolation 1500V_{RMS}
- TAMPER output indicating enclosure opening and detaching from the mounting surface	- microswitches x2, NC contacts (enclosure closed ad fixed to the mounting surface), 0,5A@50V DC (max.)

EXT IN technical input	Voltage 'on' – 10÷30V DC Voltage 'off' – 0÷2V DC Level of galvanic isolation: 1500V_{RMS}
Optical indication:	- LEDs on the PSU's pcb, - LED panel • output current readings • output voltage readings • failure codes with history
Acoustic indication:	- piezoelectric indicator ~75dB /0,3m, switchable via jumper
F_{BAT} fuse **F_{MAIN} fuse**	F 5A / 250V T 0,63A / 250V
Additional accessories (not included)	- interface USB-TTL 'INTU'; communication: USB-TTL - interface RS485 'INTR'; communication: RS485 - interface USB-RS485 'INTUR'; communication: USB-RS485 - interface Ethernet 'INTE'; communication: Ethernet - interface WiFi "INTW'; wireless communication: Wi-Fi - interface RS485-Ethernet "INTRE'; communication: RS485-Ethernet - interface RS485-WiFi "INTRW'; wireless communication: RS485-WiFi

Table 7. Mechanical specifications.

Enclosure dimensions	300 x 300 x 98 (305 x 305 x 90+8) (WxHxD) [mm] (+/- 2)
Fixing	272x 247 x Φ 6 x4 (WxH)
Fitting battery	17Ah/12V (SLA) max.
Net/gross weight	4,4/4,8kg
Enclosure	Steel plate DC01 1mm, colour RAL 9005 (black)
Closing	Cheese head screw x2 (at the front), lock assembly possible
Connectors	Supply: Φ0,63÷2,50 (AWG 22-10) Outputs : Φ0,51÷2 (AWG 24-12), battery outputs BAT: 6,3F-2,5, 30cm TAMPER output: wires, 25cm
Notes	The enclosure does not adjoin the assembly surface so that cables can be led. Convectional cooling.

Table 8. Operation safety.

Protection class PN-EN 60950-1:2007	I (first)
Protection grade PN-EN 60529: 2002 (U)	IP20
Electrical strength of insulation: - between input (network) circuit and output circuits of the PSU (I/P-O/P) - between input circuit and PE protection circuit (I/P-FG) - between output circuit and PE protection circuit (O/P-FG)	 3000 V/AC min. 1500 V/AC min. 500 V/AC min.
Insulation resistance: - between input circuit and output or protection circuit	 100 MΩ, 500V/DC

Table 9. Operating specifications.

Operating temperature	-10ºC...+40ºC
Storage temperature	-20ºC...+60ºC
Relative humidity	20%...90%, without condensation
Vibrations during operation	unacceptable
Impulse waves during operation	unacceptable
Direct insolation	unacceptable
Vibrations and impulse waves during transport	PN-83/T-42106

Table 10. PSU's factory settings.

Indication time of EPS network loss	5s
Battery charging current	1,5A
Battery presence	YES (battery present)
Battery test	YES (activated)
Deep discharge battery protection UVP	YES (battery protected)
Communication address	1
Transmission	19.2k 8E1

7. Installation.

7.1 Requirements.

The buffer PSU is to be mounted by a qualified installer, holding relevant permits and licenses (applicable and required for a given country) for 230V/AC interference and low-voltage installations. The unit should be mounted in confined spaces, in accordance with the II environmental class, with normal relative humidity (RH=90% maximum, without condensation) and temperature from -10℃ to +40℃. The PSU shall work in a vertical p osition that guarantees sufficient convectional air-flow through ventilating holes of the enclosure.

As the PSU is designed for a continuous operation and is not equipped with a power-switch, therefore an appropriate overload protection shall be guaranteed in the power supply circuit. Moreover, the user shall be informed about the method of unplugging (most frequently through separating and assigning an appropriate fuse in the fuse-box). The electrical system shall follow valid standards and regulations.

7.2 Installation procedure.

CAUTION!
Before installation, cut off the voltage in the 230V power-supply circuit.
To switch off power use an external switch in which the distance between the contacts of all poles in the disconnection state is not less than 3mm.

1. Mount the PSU in a selected location. It is crucial to bolt the tamper grip to the mounting surface. The grip is located in the central part of the enclosure (see fig. 3 [7]) and guarantees indication in case of any attempts of detaching the device from the mounting surface. Proper installation is one of the requirements of the PN-EN 50131-6 standard.

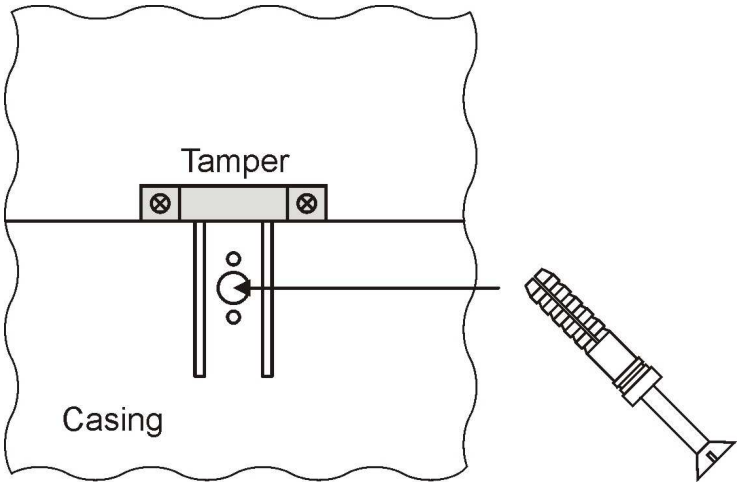


Fig. 17. Fixing a tamper grip.

2. Connect the power cables (~230Vac) to L-N terminals of the PSU. Connect the ground wire to the terminal marked by the earth symbol: PE. Use a three-core cable (with a yellow and green PE protection wire) to make the connection. Lead the cables to the appropriate terminals through the insulating bushing.

The shock protection circuit shall be performed with a particular care, i.e. the yellow and green wire coat of the power cable shall stick to one side of the terminal - marked with the PE symbol on the PSU enclosure. Operation of the PSU without the properly made and fully operational shock protection circuit is UNACCEPTABLE! It can cause a device failure or an electric shock.

3. Connect the receivers' cables to the +AUX, -AUX connectors of the terminal block on the PSU board.
4. If necessary, connect the device's leads to the technical inputs and outputs:
- EPS FLT; technical output of AC power loss indication (alarm panel, controller, indicator, etc.)
- PSU FLT; technical output of the PSU failure.
- APS FLT; technical output of the battery failure.
- TAMPER; output indicating enclosure opening or detaching from the assembly surface.
- EXT IN; collective failure output

5. With the I_{BAT} jumper determine the maximum battery charging current, in accordance with the battery parameters.
6. With the **P_{BAT}** jumper determine if the discharged battery disconnection system U<10V (+/-5%) shall be on or off. **The battery protection is on when the P_{BAT} jumper is removed.**

7. Switch on the ~230V AC supply (red AC diode and green AUX diode should be lit).
8. Check the output voltage (the PSU voltage without load and without a battery should amount to 13,7V ÷ 13,9V, with a battery or during battery charging process: 11,0V÷13,8V). If the value of the voltage requires adjustment, it should be set by the V_{ADJ} potentiometer, monitoring the voltage at the AUX output of the PSU.
9. Connect the batteries in accordance with the markings: +BAT red to 'plus', -BAT black to 'minus'. The LB diode should be on during battery charging process.
10. With the STOP button, activate or deactivate a dynamic battery test. Deactivating the test turns out the PSU failure indication at the APS FLT output, but it does not affect the protection system against complete battery discharge.
11. Check the current consumption of the receivers allowing of the battery charging current no to exceed the total current efficiency of the PSU.
12. Once the tests and operation control have been completed, the enclosure can be locked.

8. Operation and use.

8.1. Over voltage protection OVP at the PSU output.

In case of voltage exceeding 15.5V±0.5V at the regulator's output, the system cuts off the power at the outputs to protect the battery and the receivers from damage. The outputs will be battery-powered. The protection system is indicated by illuminating of the OVP red LED on the pcb board, PSU FLT output status change into Hi-Z (high impedance), by sound and appropriate message on the PSU front panel.

8.2 Overload of the PSU.

The PSU has been equipped with a LED OVL (overload) indicator light on the pcb. It informs about the output overload status. If the nominal current of the PSU is exceeded, the indicator light will be lit and the microprocessor will proceed to a specially implemented procedure. If the overload threatens the PSU's power grade, the control system will decide about a disconnection of the AUX output. Restart will occur after 1 minute.

8.3 Short circuit at the PSU output.

In the case of a short circuit at the AUX or BAT output (load 200% ÷ 250% of the PSU power) or a reverse polarity connection, the F_{BAT} fuse in the battery circuit becomes permanently damaged and the restoration of the voltage at the BAT output requires replacement of the fuse.

8.4. Maintenance.

Any and all maintenance operations may be performed following the disconnection of the PSU from the power supply network. The PSU does not require performing any specific maintenance measures. However, in the case of significant dust level, clean its interior with compressed air. In the case of a fuse replacement, use a replacement of the same parameters.

9. PSU FAILURE CODES.

Failure code	LED indication					Acoustic indication	Technical oupust actvation	Fault description	Causes
	EXT	OVL	AC	PSU	APS				
F01	-	-	-	-	-	1 beep per 10s	EPS FLT	Battery-assisted operation	- No AC mains supply - Faulty main fuse F_{MAIN}
F02	-	-	ON	twinkles	-	ON	PSU FLT	PTC polyswitch activation at the AUX output	- Overloaded AUX output
F03	-	-	ON	-	twinkles	ON	APS FLT	Blown fuse of the battery F_{BAT}	- Short circuit in the battery circuit - Short circuit in the AUX output circuit - Overloaded AUX output
F04	-	ON	ON	ON	-	ON	PSU FLT	-	- Overloaded AUX output
F05	-	-	ON	-	ON	1 beep per 10s	APS FLT	Faulty battery*	- Drained battery - Undercharged battery - Unplugged battery
F06	-	-	ON	1 flash	-	ON	PSU FLT	Too high output voltage	- Output voltage >14.7V
F07	-	-	ON	2 flashes	-	ON	PSU FLT	Too high battery voltage*	- Battery voltage > 14V
F08	-	-	ON	3 flashes	-	ON	PSU FLT	Battery charging circuit failure	- Too low output voltage of the PSU, set <13V - Fault in the battery charging circuit
F09	-	-	ON	4 flashes	-	ON	PSU FLT	Too low output voltage	- Output voltage <11.8V (during buffer operation)
F10	-	-	-	-	ON	2 signals per 10s	APS FLT	Too low battery voltage	- Battery voltage drops below 11.5V (during battery-assisted operation)
F11	-	-	-	-	ON	Fast audible signals	APS FLT	PSU disconnection caused by battery discharge	- Battery voltage drops below 10V (during battery-assisted operation)
F12	ON	-	-	ON	-	ON	PSU FLT	Activation of the EXT IN collective failure input	-
F50	-	-	-	ON	-	ON	PSU FLT	Internal damage of the PSU	-
F51	-	-	-	ON	-	ON	PSU FLT	Error in setting memo	-
F60	-	-	-	-	-	-	-	No communication	Broken cord between the PSU and the display
F61-64	-	-	-	-	-	-	-	Desktop fault	-
F65	-	-	-	-	-	-	-	-	Password unblocking procedure

* failure indication only during a battery test

WEEE MARKING

According to the EU WEE Directive – It is required not to dispose of electric or electronic waste as unsorted municipal waste and to collect such WEEE separately.

CAUTION! The power supply unit is adapted for a sealed lead-acid battery (SLA). After the operation period it must not be disposed of but recycled according to the applicable law.

GENERAL WARRANTY CONDITIONS

1. Pulsar K. Bogusz Sp.j. (the manufacturer) grants a five-year warranty for the equipment, counted from the device's production date.
2. The warranty includes free-of-charge repair or replacement with an appropriate equivalent (the selection is at the manufacturer's discretion) if the malfunction is due to the manufacturer, includes manufacturing or material defects, unless such defects have been reported within the warranty period (item 1).
3. The equipment subject to warranty is to be brought to the place where it was purchased, or directly to the main office of the manufacturer.
4. The warranty applies to complete equipment, accompanied by a properly filled warranty claim with a description of the defect.
5. Should the claim be accepted, the manufacturer is obliged to provide warranty repairs, at the earliest convenience, however not later that within 14 days from the delivery to the service centre of the manufacturer.
6. The repair period mentioned in item 5 may be prolonged, if there are no technical possibilities to carry out the repairs, or if the equipment has been conditionally accepted, due to the breaking warranty terms by the claimant.
7. All the services rendered by force of the warranty are carried out at the service centre of the manufacturer, exclusively.
8. The warranty does not cover the defects of the equipment, resulting from:
- reasons beyond the manufacturer's control,
- mechanical damage,
- improper storage and transport,
- use that violates the operation manual or equipment's intended use
- fortuitous events, including lightning discharges, power failures, fire, flood, high temperatures and chemical agents,
- improper installation and configuration (in defiance with the manual),
9. The warranty is void in any of the following circumstances:
- construction changes
- repairs carried out by any unauthorized service center
- damage or removal of warranty labels
- modifications of the serial number
10. The liability of the manufacturer towards the buyer is limited to the value of the equipment, determined according to the wholesale prices suggested by the manufacturer on the day of purchase.
11. The manufacturer takes no responsibility for the defects that result from:
- the damaging, malfunctioning or inability to operate the equipment
- defects that result from using the equipment outside its stated specifications and operating parameters failing to abide by the recommendations and requirements contained in the manual, or the use of the equipment.

Pulsar K.Bogusz Sp.j.
Siedlec 150,
32-744 Łapczyca, Poland
Tel. (+48) 14-610-19-40, Fax. (+48) 14-610-19-50
e-mail: biuro@pulsar.pl, sales@pulsar.pl
http:// www.pulsar.pl, www.zasilacze.pl