



PSBS 5024C

v.1.1

PSBS 27,6V/5A/2x17Ah/OC

**Buffer, switch mode power supply unit
with automatic operation control.**

EN*

Edition: 4 from 05.05.2014

Supersedes edition: 3 from 16.09.2013

BLUE POWER



PSU features:

- uninterruptible power supply DC 27,6V/5A
- alternative outputs AUX1, AUX2, AUX3, 3x1,25A current limit
- battery housing: 2x17Ah/12V
- supply voltage AC 230V
- high efficiency 81%
- low voltage ripple
- battery charging and maintenance control
- deep discharge battery protection (UVP)
- battery charging current 0,5A/1A/2A/3A, jumper selectable
- START button to start the battery
- battery output protection against short-circuit and reverse connection
- LED indication
- EPS technical output of 230V power failure – OC type
- PSU technical output indicating PSU failure – OC type
- LoB technical output indicating low battery voltage – OC type
- Optional installation of the MPSBS relay module changing technical outputs of the OC type to relay type
- adjustable times of 230V AC failure indication
- Protection type:
 - SCP short-circuit protection
 - Overheat protection OHP
 - surge protection
 - overload protection OLP
 - overvoltage protection OVP
 - Tamper protection: enclosure opening and detachment from the wall
- warranty - 5 years from the production date

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1. Technical description.

1.1 General description.

A buffer PSU is designed for uninterrupted supply of devices requiring stabilized voltage of **24V DC (+/- 15%)**. The PSU supplies voltage of **U=27,6V DC** and total current capacity of:

- 1. Output current 5A + 0,5A battery charging
- 2. Output current 4,5A + 1A battery charging
- 3. Output current 3,5A + 2A battery charging
- 4. Output current 2,5A + 3A battery charging

Total current + battery is max. 5,5A

In case of mains power loss, the unit will instantly switch to battery operation. The PSU is enclosed in a metal casing (color RAL 9003) with battery housing for two 17Ah/12V batteries. The enclosure is fitted with a micro switch indicating door opening (front cover) and the detachment from the wall.

OPTIONAL POWER SUPPLY CONFIGURATIONS:

(visualization available at www.pulsar.pl)

1. **Buffer power supply PSBS 27,6V/relay module MPSBS/2x17Ah**
 - PSBS 5024C + MPSBS + 2x17Ah
2. **Buffer power supply PSBS 27,6V/8x0,5A/2x17Ah**
 - PSBS 5024C + LB8 8x0,5A (AWZ578, AWZ580) + 2x17Ah
3. **Buffer power supply PSBS 27,6V/4x1A/2x17Ah**
 - PSBS 5024C + LB4 4x1A (AWZ575, AWZ576) + 2x17Ah
4. **Buffer power supply PSBS 27,6V/2x24V/2x2,5A/2x17Ah**
 - PSBS 5024C + 2xRN25024 (27,6V/24V) + 2x17Ah
5. **Buffer power supply PSBS 27,6V/24V/4x1A/2x17Ah**
 - PSBS 5024C + RN25024 (27,6V/24V) + LB4 4x1A (AWZ575, AWZ576) + 2x17Ah
6. **Buffer power supply PSBS 27,6V/5V÷18V/2A÷1,3A/2x17Ah**
 - PSBS 5024C + DCDC20 (5V÷18V/2A÷1,3A) + 2x17Ah

1.2 Block diagram (Fig.1).

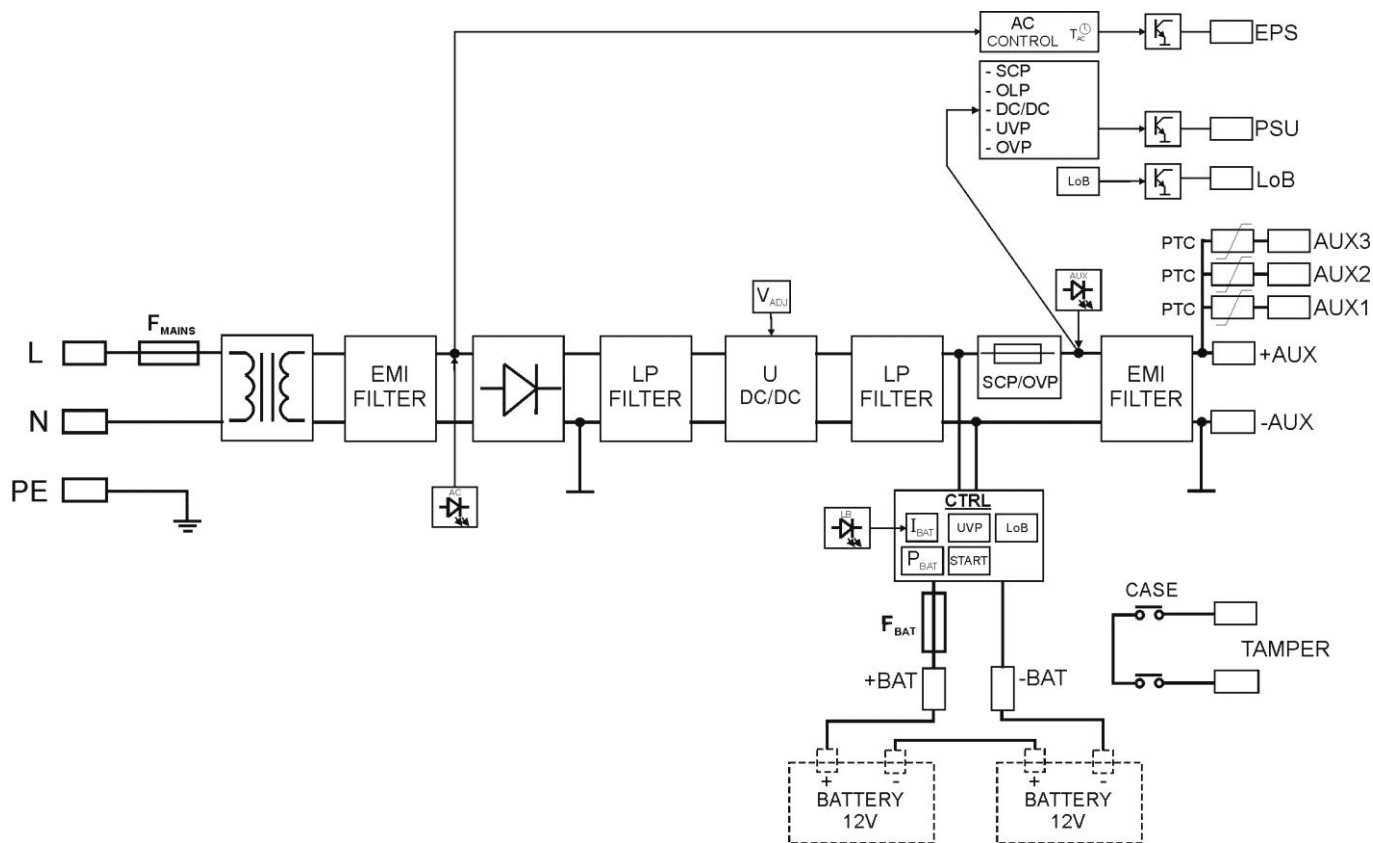


Fig.1. Block diagram of the PSU.

1.3 Description of components and power supply terminals (Table 1, Fig.2).

Table 1. Components of the Power supply PCB (Printed Circuit Board) (see Fig. 2).

Element nr	Description
①	<p>P_{BAT} Jumper – configuration of discharged battery disconnection system (UVP)</p> <ul style="list-style-type: none"> • P_{BAT} = discharged battery disconnection system OFF • P_{BAT} = discharged battery disconnection system ON <p>T_{AC} Jumper- setting the delay time for AC power failure indication</p> <ul style="list-style-type: none"> • T_{AC} = delay time T= 10s • T_{AC} = delay time T= 60s <p>Description: jumper on, jumper off</p>
②	START button (running the PSU from the battery)
③	V_{ADJ} potentiometer, DC 24 ÷ 29V voltage adjustment
④	F_{BAT} fuse in the battery circuit, F6,3A / 250V
⑤	<p>Terminals:</p> <p>~AC~ – AC power input</p> <p>EPS – technical output of AC power failure indication hi-Z state = AC power failure 0V state = AC power - O.K.</p> <p>PSU – technical output of PSU failure indication hi-Z state = failure 0V state = PSU status O.K.</p> <p>LoB – technical output of low battery voltage indication hi-Z state = battery voltage U_{BAT} <23V 0V state = battery O.K.</p> <p>+BAT- – terminals for battery connection</p> <p>+AUX- –DC power output, (+AUX= +U, -AUX=GND)</p> <p>Description: hi-Z – high impedance, 0V – connection to the ground GND</p>
⑥	<p>LEDs – optical indication:</p> <p>AC – AC power</p> <p>AUX, AUX1, AUX2, AUX3 – DC output voltage</p>
⑦	Optional, external optical indication output terminal
⑧	<p>I_{BAT} Jumper; - battery charging current configuration</p> <ul style="list-style-type: none"> • J1= J2= J3= I_{bat}=0,5A • J1= J2= J3= I_{bat}=1A • J1= J2= J3= I_{bat}=2A • J1= J2= J3= I_{bat}=3A <p>Description: jumper on, jumper off</p>
⑨	LB – LED battery charging indication
⑩	OVP – overvoltage protection optical indication

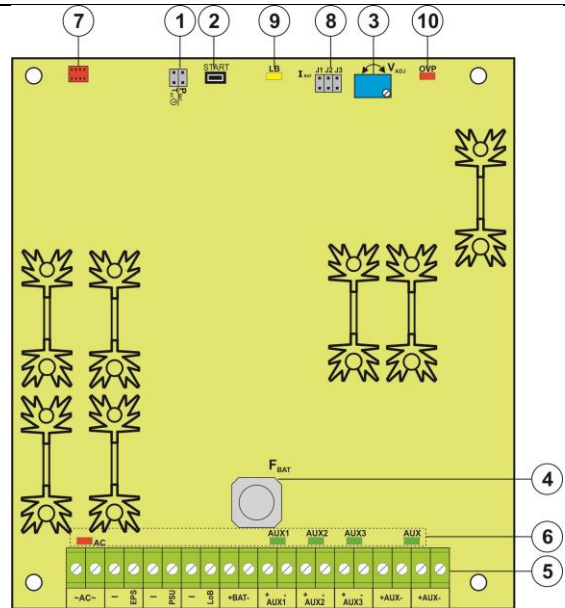



Fig. 2. The view of the Power supply PCB.

Table 2. Components of the PSU (See Fig. 3).

Component no.	Description
1	Isolation transformer
2	Printed Circuit Board (see Table 1, Fig. 2)
3	TAMPER ; micro switch of tamper protection (NC)
4	F_{MAINS} fuse in the power supply circuit 230V, T6,3A / 250V
5	L-N power supply connector, 230V AC,  PE protective connector
6	Battery connectors: positive: +BAT = red, negative: - BAT = black

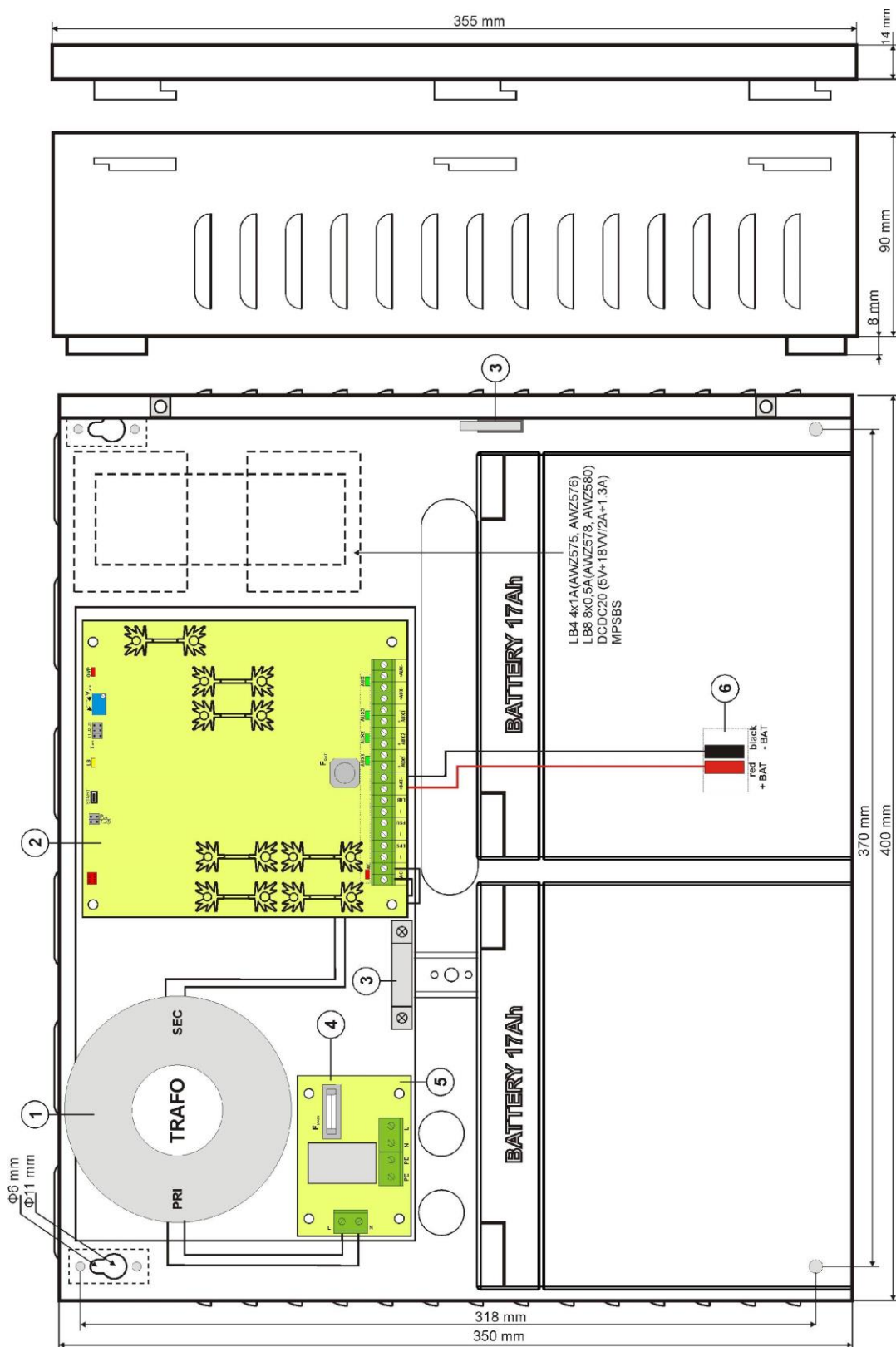


Fig.3. The view of the PSU.

1.4 Technical parameters:

- Electrical parameters (Table 3)
- Mechanical parameters (Table 4)
- Safety of use (Table 5)
- Operation parameters (Table 6)

Table 3. Electrical parameters

PSU type:	A (EPS - External Power Source)
Mains supply	230V AC / 50Hz (-15%/+10%)
Current consumption	1,1A @230V AC
PSU's power	152W
Efficiency	81%
Output voltage	22V± 27,6V DC – buffer operation 20V± 27,6V DC – battery operation
Output current	5A + 0,5A battery charging 4,5A + 1A battery charging 3,5A + 2A battery charging 2,5A + 3A battery charging
Output voltage adjustment range	24±29V DC
Ripple voltage	100mV p-p max.
PSU current consumption	20 mA
Battery charging current	0,5A / 1A / 2A / 3A – jumper selectable
Short-circuit protection SCP	Electronic - current limitation and/or activation of the F _{BAT} melting fuse in the battery circuit (failure requires fuse replacement) Automatic return
Overload protection OLP	110-150% of the PSU power, manual restart (failure requires the disconnection of the DC output)
Battery circuit protection SCP and reverse polarity connection	T6,3A- current limitation, the F _{BAT} melting fuse (failure requires fuse replacement)
Surge protection	varistors
Overvoltage protection OVP:	>31V (automatic return)
Deep discharge battery protection UVP	U<20V (± 0,5V) – disconnection of battery terminal
Tamper protection: - TAMPER output indicating enclosure opening or detachment from the wall	- micro switch x 2 NC contacts (enclosure closed and mounted to the mounting base), 0,5A@50V DC (max.)
Optical indication: front panel of the PSU - AC OK.; LED indicating the AC power status - DC OK.; LED indicating the DC supply at the PSU output - BAT OK.; LED indicating the battery voltage	- red, normal operation: permanently illuminated, failure: off - green, permanently illuminated, failure: off - green, permanently illuminated, failure: off
Technical outputs: - EPS; output indicating AC power failure - PSU; output indicating no DC power/PSU failure - LoB output indicating low battery voltage	- OC type: 50mA max. Normal operation: L state (0V), failure: hi-Z state, - delay time 10s/60s (+/-20%) – jumper selectable T _{Ac} - OC type: 50mA max. Normal operation: L state (0V), failure: hi-Z state, - OC type, 50mA max. Normal operation (UBAT >23V): L state (0V), failure (UBAT <23V): hi-Z state
Fuses: - F _{MAINS} - F _{BAT}	T 6,3A / 250V T 6,3A / 250V

Table 4. Mechanical parameters.

Enclosure dimensions	400 x 350 x 90+8 (WxHxD) [mm] (+/- 2)
Mounting	See Fig., 3
Battery housing	2x17Ah/12V (SLA) max. 350x175x85mm (WxHxD) max
Net/gross weight	7,3kg / 7,8kg
Enclosure	Steel plate, DC01 0,7mm color RAL 9003
Closing	Cylindrical screw (at the front) (lock assembly possible)
Terminals	Mains supply 230V AC: $\Phi 0,51 \pm 2$ (AWG 24-12) Outputs : $\Phi 0,41 \pm 1,63$ (AWG 26-14) BAT battery outputs: 6,3F-2,5, 30cm TAMPER output: cables, 25cm
Notes	The enclosure does not adjoin the mounting surface so that cables can be led. Convection cooling.

**Table 5. Safety of use.**

Protection class PN-EN 60950-1:2007	I (first)
Protection grade PN-EN 60529: 2002 (U)	IP20
Insulation electrical strength: - between input (network) circuit and the 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 M Ω , 500V/DC

Table 6. Operation parameters.

Environmental class	II
Operating temperature	-10°C...+40°C
Storing temperature	-20°C...+60°C
Relative humidity	20%...90%, no condensation
Vibrations during operation	unacceptable
Surges during operation	unacceptable
Direct insolation	unacceptable
Vibrations and surges during transport	According to the PN-83/T-42106 standard

2. Installation.

2.1 Requirements.

The buffer PSU should be mounted by a qualified installer, holding relevant permits and licenses (applicable and required for a given country) for 230V/AC and low-voltage installations. The unit should be mounted in confined spaces, in accordance with the 2nd environmental class, with normal relative humidity (RH=90% maximum, no condensation) and temperature range from -10°C up to +40°C. The power supply should operate in a vertical position in order to provide free and convective air flow through ventilating holes of the enclosure.

The power supply load balance should be done before installation:

1. Output current 5A + 0,5A battery charging
2. Output current 4,5A + 1A battery charging
3. Output current 3,5A + 2A battery charging
4. Output current 2,5A + 3A battery charging

Total current of the receivers + battery is max. 5,5A

The power supply is designed for a continuous operation and is not equipped with a power-switch. Therefore, an appropriate overload protection in the power supply circuit should be provided. Moreover, the user should be informed how to disconnect the power supply unit from the mains supply (usually by assigning an appropriate fuse in the fuse box). The electrical system shall be made in accordance with applicable standards and regulations.

2.2 Installation procedure.

1. **Before installation, make sure that the voltage in the 230V power-supply circuit is cut off.**
2. Mount the PSU in a selected location. The tamper bracket, located in the central part of the housing (see Fig. 3 [3]), signaling the attempts to detach the PSU from the mounting surface, should be screwed to the mounting surface.

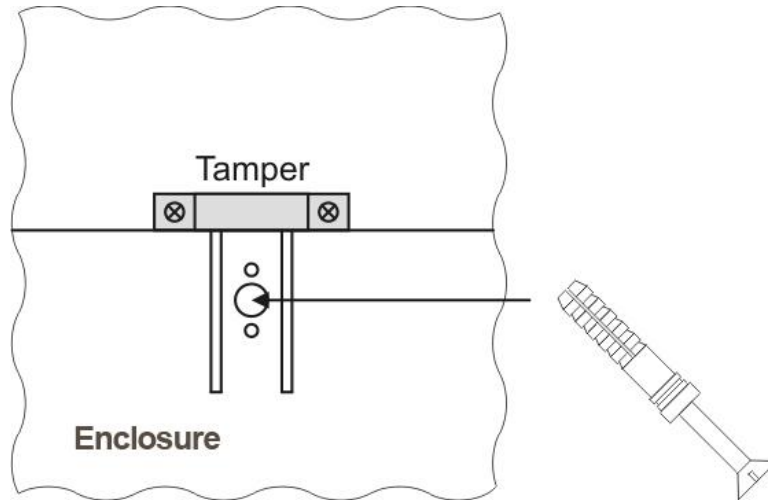


Fig. 4. Mounting the tamper bracket.

3. Connect the power cables (230V AC) to the L-N terminals of the PSU. Connect the ground wire to the terminal marked with the PE symbol (power supply module connector). Use a three-core cable (with a yellow and green PE protection wire) to make the connection. The power cables should be connected to the appropriate terminals on the connection board through the bushing.



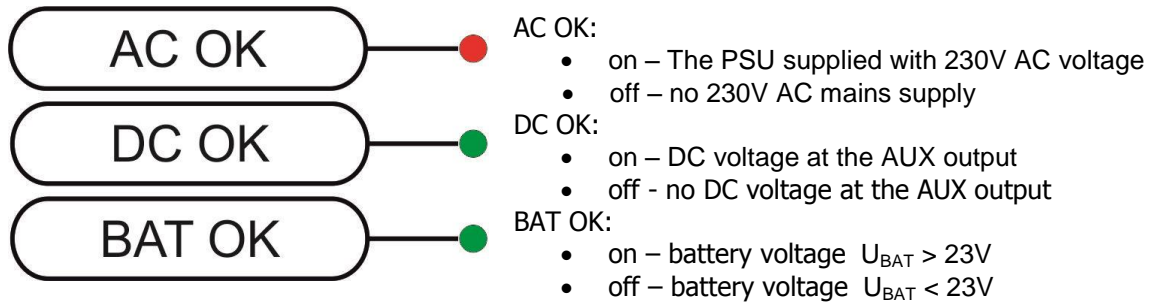
The shock protection circuit shall be done with a particular care: the yellow and green wire coat of the power cable should be connected to the terminal marked with the PE symbol. Operation of the PSU without the properly made and fully operational shock protection circuit is UNACCEPTABLE! It can cause damage to the equipment or an electric shock

4. Connect the receiver cables to the AUX, AUX1, AUX2 and AUX3 terminals at the power supply board.
5. If needed, connect the device cables to the technical outputs:
 - EPS; technical output indicating AC power failure
 - PSU; technical output indicating PSU failure.
 - LoB; technical output indicating low battery voltage
 - Optional installation of the MPSBS relay module changing technical outputs of the OC type to relay type (page 9, section. 3.3)
6. Use the I_{BAT} jumper to set the maximum battery charging current, taking into account the battery parameters.
7. Use the P_{BAT} jumper to set to turn on/off deep discharge battery protection $U < 20V$ (+/-5%). **Deep discharge battery protection is ON when the P_{BAT} jumper is OFF.**
8. Mount the battery in the battery compartment of the enclosure (Fig. 3). Connect the batteries with the PSU paying special attention to the correct polarity.
9. Switch on the 230V AC supply. The corresponding LEDs on the power supply PCB should be ON: red AC and green AUX, AUX1, AUX2 and AUX3. The yellow LB LED should light up while charging.
10. Check the output voltage (the power supply voltage without load should be $27,2V \div 27,8V$, $22V \div 27,6V$ while battery charging). If the voltage requires adjustment, use the V_{ADJ} , potentiometer while monitoring the voltage at the AUX output of the power supply.
11. Check the current consumption of the receivers, taking into account the battery charging current, so as not to exceed the total current efficiency of the PSU (section 1.1).
12. Close the cover after installing and checking the operation of the power supply.

3. Power supply operation indication.

3.1 Optical indication.

The PSU is fitted with 3 LED lights at the front panel:



Additionally, the PSU is fitted with LED lights indicating the operating status: AC, LB and AUX at the PCB of the PSU:

- **AC- red LED:** is permanently illuminated during normal operation (AC power ON). No AC power is indicated by turning off the LED.
- **LB- yellow LED:** indicates battery charging. The light intensity depends on the charging current.
- **AUX- green LED:** indicates DC power status at the PSU output. During normal operation, it is permanently illuminated. In case of short-circuit or output overload the LED is off

3.2 Technical outputs.

The PSU has three indication outputs:

- **EPS - • technical output indicating 230V AC power failure.**
The output indicates 230V AC power failure. Under normal status – with the 230V AC supply on, the output is shorted to ground GND. In case of power failure, the PSU will switch the output into hi-Z high impedance state after a time set by the T_{AC} jumper.
- **PSU – output indicating PSU failure.**
The output indicates PSU failure. Under normal status (correct operation) the output is shorted to ground GND. If there is no DC voltage at the output (eg short circuit), the output is switched into hi-Z high impedance state.
PSU failure can be caused by the following events:
 - Short circuit at the output
 - Output overload
 - DC/DC voltage converter failure
 - Under voltage protection activation
- **LoB – output indicating low battery voltage.**
The output indicates low battery voltage. Under normal status ($U_{BAT} > 23V$) the output is shorted to ground GND, when the battery voltage drops too low ($U_{BAT} < 23V$) the output is switched into hi-Z high impedance state.

The power supply technical outputs are open collector (OC) type, as shown schematically below.

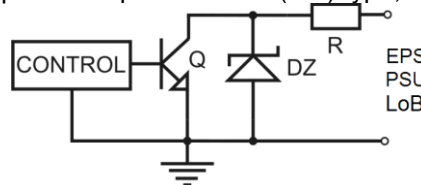


Fig. 5. Electrical diagram of the OC technical outputs.

3.3 Relay technical outputs.

If the OC type outputs are not sufficient to control the unit, it is possible to use the MPSBS relay module changing technical outputs of the OC type to relay type.

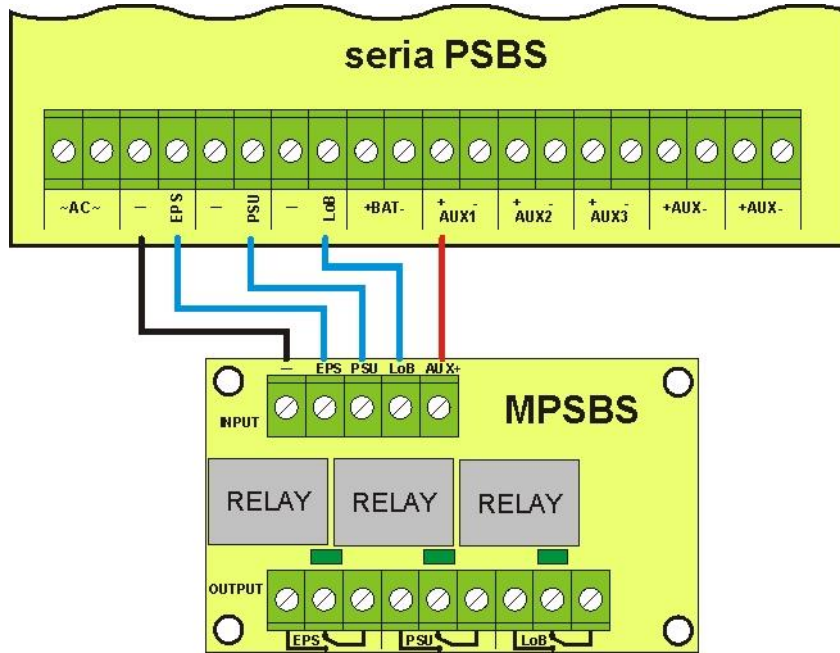


Fig. 6. The diagram of connecting the MPSBS module.

4. Service and operation.

4.1 Overload or short-circuit of the power supply output (SCP activation).

The output circuit is fitted with an electronic current protection. In case of exceeding the permissible output current I_{max} , the power supply output will be disconnected, which will be signaled by turning off the AUX, AUX1, AUX2 and AUX3 LEDs. The voltage will automatically return after disconnecting the receivers from the output.

Additionally, the AUX1, AUX2 and AUX3 outputs of the PSU are individually protected against short-circuit by polymer PTC fuses. If the output load current exceeds 1,25A, automatic disconnection of the output voltage, indicated by switching off the green AUX1, AUX2 or AUX3 LED, takes place. To restore the voltage at the output, disconnect the load from the power supply output for approximately 1 minute.

In case of a short-circuit at the AUX, BAT output or reverse battery connection, the F_{BAT} fuse in the battery circuit becomes permanently damaged. The voltage restoration at the BAT output requires fuse replacement.

4.2 Running the PSU from the battery.

The power supply is equipped with the button on the PCB allowing to run the PSU from the battery, when needed. To do that, press and hold the **START** button on the unit board for 1 second.

4.3 Deep discharge battery protection UVP.

The power supply is equipped with deep discharge battery protection (UVP). If the voltage at the battery terminals drops below $20V \pm 0.5V$ during battery-assisted operation, the batteries will be disconnected. **The battery protection is on when the P_{BAT} jumper is off.**



Caution.

It is not recommended to disable UVP since deep discharge of the batteries reduces their ability to store energy, their capacity and lifetime.

4.4 Maintenance.

All maintenance procedures can be performed after disconnecting the power supply from the power network. The PSU does not require any specific maintenance; however, its interior should be cleaned with compressed air if used in dusty conditions. In case of fuse replacement, use only compatible replacement parts.



WEEE LABEL

Waste electrical and electronic equipment must not be disposed of with normal household waste. According to the European Union WEEE Directive, waste electrical and electronic equipment should be disposed of separately from normal household waste.

The power supply unit is adapted for cooperation with the sealed lead-acid batteries (SLA). After the operation period they must not be thrown but recycled according to the applicable law.

GENERAL WARRANTY CONDITIONS

1. Pulsar K. Bogusz Sp.j. (the manufacturer) grants a five-years 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 than 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
Phone (+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