Pulsar®

CNBOP-PIB

CE 1438 17

Pulsar®

Power supply unit for fire systems used in building industry.
Declared performance: Fire safety.
Certificate of constancy of performance: 1438-CPR-0493
Certificate of admittance: 4419/2021
Conformity: EN 54-4:2001+ A1:2004 + A2:2007
EN 12101-10:2007 + AC:2007

DSOP24V

v.1.0

POWER SUPPLY SYSTEM
DSO 24V
FOR PAVIRO SYSTEM BY BOSCH

EN

Version No: 12 of 16.11.2021

Replaces version: 11 of 09.06.2021

REACH compliance

RoHS

TABLE OF CONTENTS

1. System features:

- Compliant with the requirements of the
- EN 54-4:2001+A1:2004+A2:2007
- and EN 12101-10:2007+AC:2007 standards and pt. 12.2 of the Regulation of the Minister of Interior and Administration of the Republic of Poland of 20.06.2007
- The CONFI-DSO is a program for designers that has been designed with BOSCH to support the DSO configuration
- Calibration of batteries using the installer interface
- Internal memory of the last 30 events is available via the LED display
- LED optical indication
- Output voltage readings
- Readings of the output current during battery operation
- Resistance of the battery circuit readings
- Failure codes with history
- Ethernet communication:
  - Built-in powerful web server
  - Online remote monitoring of operating parameters for a period of around 100 days: voltage, current, and the resistance in the battery circuit
  - Event log of up to 32768 power system failures
  - Automatic email notifications about power failures
  - SSL email encryption
  - Remote battery test
  - The battery operating temperature readings from the period up to 5 years
  - A real-time clock (RTC) with battery backup
  - RTC synchronization with external NTP server
- The PSG3LA LED panel for optical and acoustic indication compliant with the PN-EN54-16 standard for evaluating the DSO system operation
- The LZxxxx safety strip with overcurrent fuses, surge arresters and a dummy connector
- Single-phase or 3-phase power supply
- 230 V AC LDxxxx voltage distribution terminal
- Grounding terminals
- Full wiring of the housing adjusted individually for each configuration
- Dimensions of RACK cabinets: 24U(600x600), 36U(600x600), 42U(600x600, 600x800), 45U(600x600, 600x800), 50U (600x800)
- Protection Class: IP30Ł
- Batteries included
- Mounting bracket for batteries
- Mounting shelves for sound system equipment (controller, routers, amplifiers)
- Support for up to 2 strings of batteries
- 27,6V DC Uninterruptible Power Supply
- High efficiency (up to 90%)
- 320W-1000W power supply units of the PS24DSOxxxx series.
- Independently protected outputs for OUT1…9 amplifiers
- Three independently protected power supply outputs for ROUTER1…6 router outputs
- Fuse status control
- LED indication of fuse failure for all outputs
- Microprocessor-based automation system
- The measurement of the resistance of the battery circuit
- Automatic temperature compensation of the battery charging
- Battery test
- Two-phase battery charging
- The accelerated battery charging function
- Battery electrical continuity control
- Battery voltage control
- Battery fuse status control
- Battery charge and maintenance control
- Under-voltage protection (UVP).
- Battery overload protection.
- Battery output protection against short-circuit
- Battery discharge current control
- Output voltage control
- Acoustic indication of failure
- Adjustable indication time of the 230 V AC power failure indication
- ALARM – technical output of collective failure
- Technical input of collective failure EXTi
- Technical outputs - relay type.
- EPS – technical output of 230 V AC power failure indication
- PSU – technical output of power supply failure indication
- APS technical output of battery failure indication
- Protection types:
  - SCP short-circuit protection
  - OLP overload protection
  - OHP overheat protection
  - Surge protection
- The shelf for firefighter's microphone - optional accessory
- The DSOS24V firefighter's microphone power supply unit compliant with the PN-EN 54-4 and PN-EN12101-10 standards, and article 12.2 of the Regulation of the Minister of Interior and Administration of the Republic of Poland of 20.06.2007 - optional accessory
- The enclosure of the DSOS24V-PU firefighter's microphone - available as an option
- The AWO506 End of Line (EOL) Supervision Board - available as an option
- Forced cooling --fan panel with a thermostat, optional accessory for 24U, standard for 36U, 42U, 45U, 50U
- Warranty:
  - Power supply unit – 3 years from installation date, but not more than 3,5 years from date of manufacture
  - Batteries – 1 year from installation date.

2. Technical description.

2.1. General description of the power supply system of the DSO.

The DSOP24V power supply system is designed for uninterrupted supply of Voice Alarm Systems requiring stabilized voltage of 24 V DC (-15%, +20%). The system can be equipped with a 320 – 1000 W power supply unit with independently protected outputs for 5 or 9 audio amplifiers (each with 1000 W power), 6 routers, and 1 controller.

The power supply is designed to supply 24 V DC power to the controller and routers while the power supply is powered directly from a 230 V AC mains supply. In the case of mains power loss, all devices immediately switch to a 24 V DC battery backup. The entire DSO system with batteries is configured to provide the alarm and supervision within the time required by the regulations when using backup power.

The DSO power supply system is housed in a RACK 19" enclosure with a space for additional equipment and appropriate battery packs. The power supply unit uses maintenance free Sealed Lead-Acid (SLA) batteries (AGM or gel batteries, included)

The system allows connection of 1 or 2 strings (circuits) of batteries, each with up to 230Ah, which allows for a total capacity of 460Ah.

Power supply from the power grid can be supplied to the cabinet in the form of 1-phase or 3-phase connection, which depends on the total power consumed by the DSOdevices.

The power supply unit is equipped with a system for measuring the resistance of batteries. Battery monitoring is performed independently for each installed battery string.

The power supply is equipped with an additional Ethernet module with a 10Base-T/100Base-TX interface to connect to the Internet. Such a configuration enables the remote monitoring of the Voice Alarm System over the Internet from anywhere. The Ethernet module has a built-in powerful web server that allows remote monitoring of the current status of the power supply in the browser of any PC computer. In addition, an email alert allows sending information about the system status in case of certain events.

The CONFI-DSO program is designed for the proper and fast configuration of the DSO cabinet; based on the implemented design parameters, the program selects a complete power supply system taking into account the required backup time.

2.2. Electrical scheme.

Figure 1 shows an exemplary wiring diagram inside a DSO cabinet for a 3-phase 230 V / 400 V AC connection.

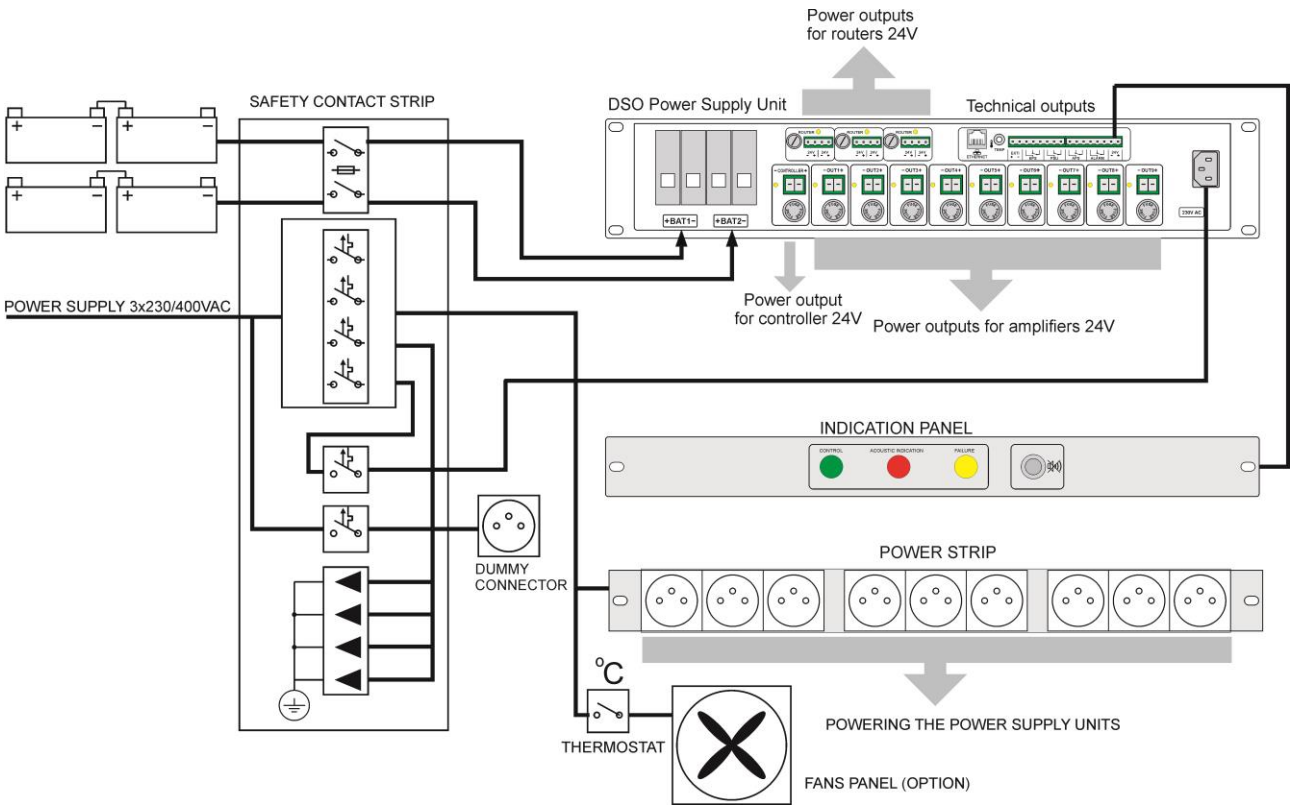


Fig.1. Block diagram of the DSO power supply system.

3. The design of the Voice Alarm System.

The design and all components of the DSO are based on the RACK 19" cabinet (Protection Class: IP30), containing all components of the system. Depending on the system and the number of devices, the height of the cabinet is adjusted individually. The available dimensions are: 24U(600x600), 36U(600x600), 42U(600x600, 600x800), 45U (600x600, 600x800), 50U (600x800).

For easier installation of equipment, the interior space is fitted with individual mounting shelves for each unit. If a call station (firefighter's microphone) is to be mounted in the rack, a dedicated pull out shelf will be added to facilitate the use of the microphone.

The equipment installed inside the cabinet can be accessed via the glass front doors, removable side walls, and rear doors. In addition, the use of two types of locks, separate for the front and rear doors, restricts unauthorized access. The cabinet can be mounted on a metal base with a height of 100 mm or wheels allowing it to move freely.

The DSO power supply system includes full wiring (of appropriate length and cross-section of wires) which can be adjusted individually for each configuration.

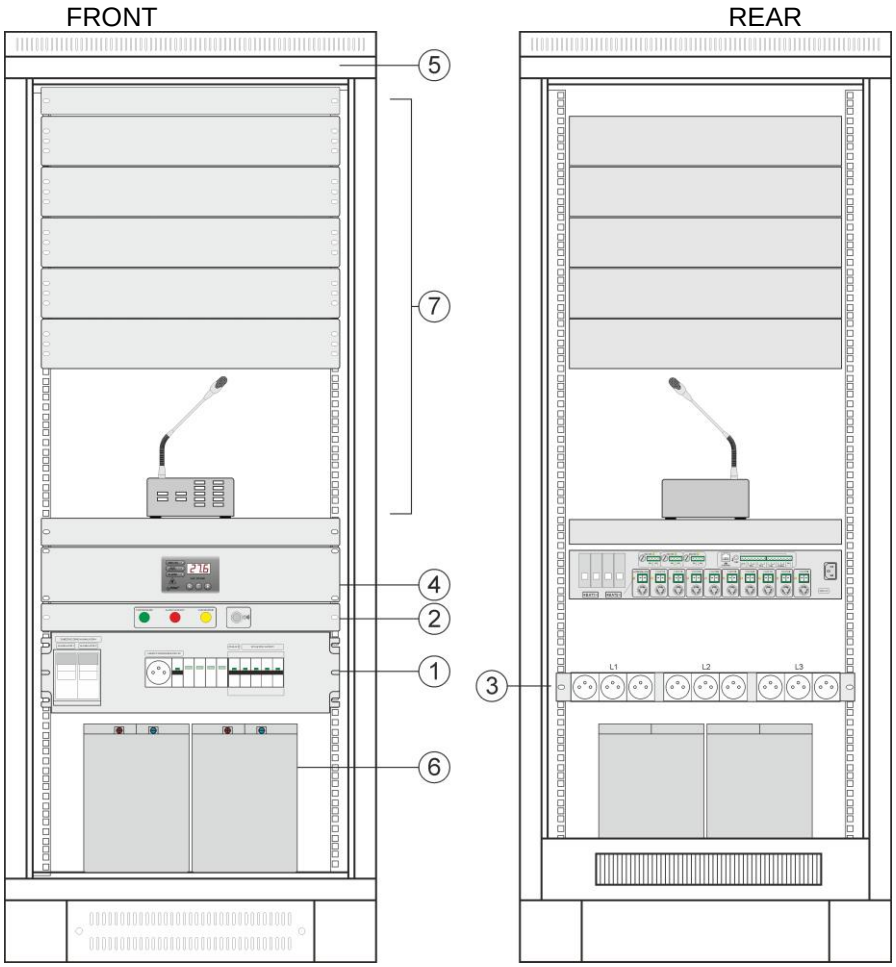


Fig. 2. Sample configuration of a DSO cabinet.

Table 1. Components of the RACK cabinet.

Component No.	Description
1	The LZxxxx safety strip.
2	The PSG3LA LED panel for optical and acoustic indication.
3	230 V AC LDxxxx voltage distribution terminal.
4	The PS24DSOxxxx power supply unit.
5	The compartment for the RAWP600RZ fan panel with a thermostat.
6	Batteries
7	The compartment for DSO equipment: the controller, routers, amplifiers, and firefighter's microphone.

Table 2. Technical parameters of RACK cabinets.

Mounting dimensions	**W=19" H=24U**	**W=19" H=36U**	**W=19" H=42U**	**W=19" H=45U**	**W=19" H=50U**
External dimensions	600x600x1303 [mm]	600x600x1837 [mm]	600x600x2103 lub 600x800x2103 [mm]	600x600x2236 lub 600x800x2236 [mm]	600x800x2459 [mm]
Weight	66kg	76kg	- 89kg (600x600mm) - 104kg (600x800mm)	- 91kg (600x600mm) - 106kg (600x800mm)	152kg
Static load	1000kg				
Protection class	IP30				
Notes:	- The set includes a base with a height of 100mm or a set of wheels - Glass front door - Two types of locks, separately for the front and rear doors				

4. Components of the DSO cabinet.

The equipment of each DSO cabinet includes the elements necessary for the proper operation of the system. These components, depending on their intended use, protect the electrical system against overvoltage or short circuit, supply power to the receivers, and ensure proper signaling or cooling of the installed equipment in the RACK cabinet.

If the device comes in several models, they are selected automatically by the CONFI-DSO program supporting the DSO configuration.

4.1. The LZxxxx safety strip.

Safety strip is fitted with circuit breakers, surge arresters, and a dummy connector.

The main overcurrent circuit breaker disconnects the 230 V / 400 V mains from all system devices. In addition, the power supply circuit is fitted with an overcurrent circuit breaker allowing its disconnection, e.g. for maintenance purposes, without disconnecting other devices of the DSO. In addition to the main switch, it is fitted with “type 3” surge arresters compliant with the EN 61643-11 standard.

The dummy connector includes overcurrent circuit breaker which can be switched on regardless of the status of the main switch.

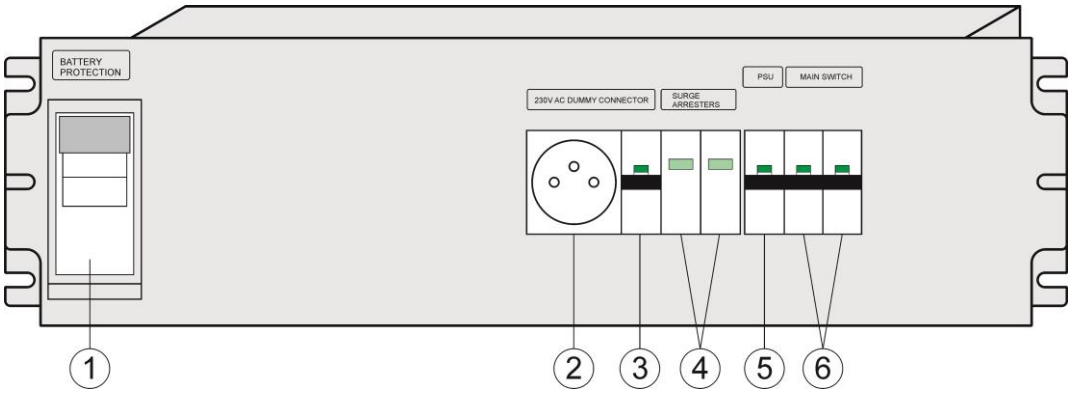


Fig.3. The LZ1F1B safety strip.

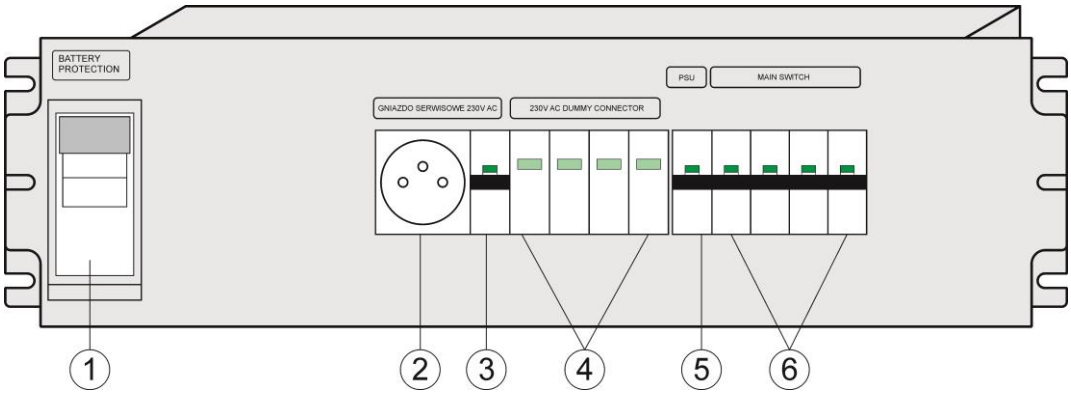


Fig.4. The LZ3F1B safety strip.

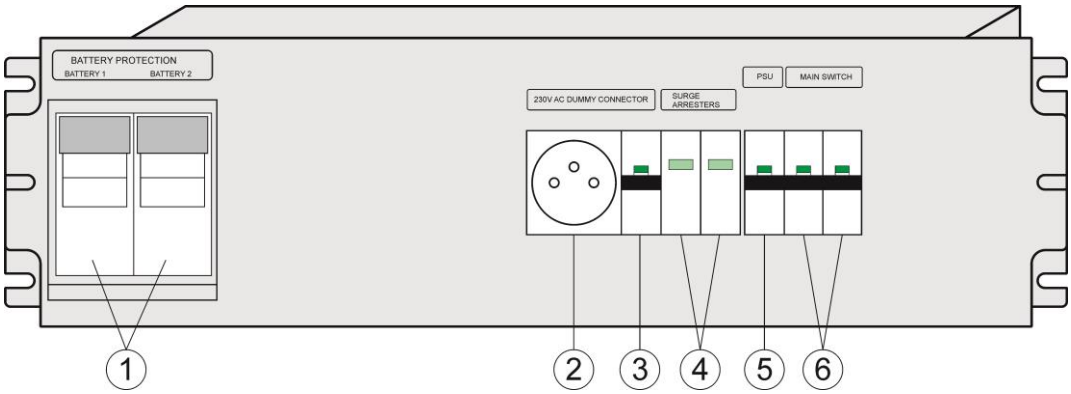


Fig.5. The LZ1F2B safety strip.

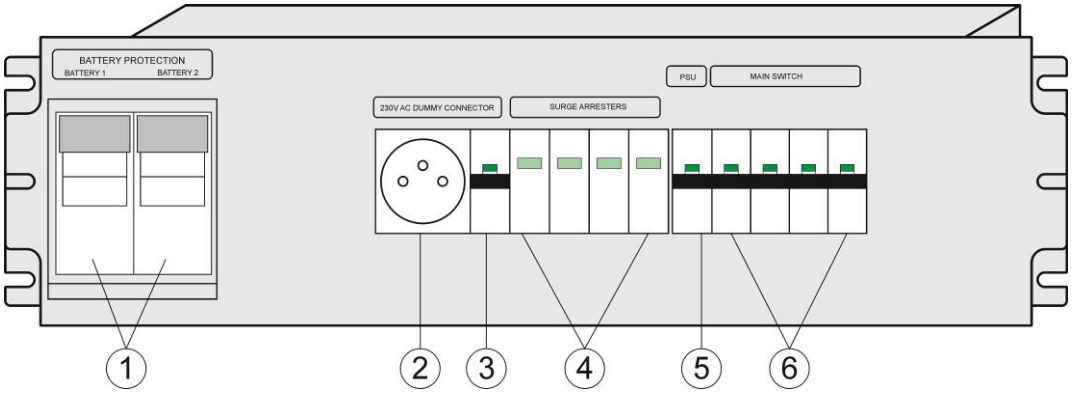


Fig.6. The LZ3F2B safety strip.

Table 3. Components of the safety strip.

Component No.	Description
1	Battery fuse inserts
2	A 230 V maintenance socket.
3	The overcurrent circuit breaker of the 230 V maintenance socket.
4	Surge arresters
5	The overcurrent circuit breaker of the power supply unit of the DSO.
6	The main overcurrent circuit breaker.

Safety contact strip is connected to the mains. The access is obtained by removing the front cover. The connection to the power system is shown below.

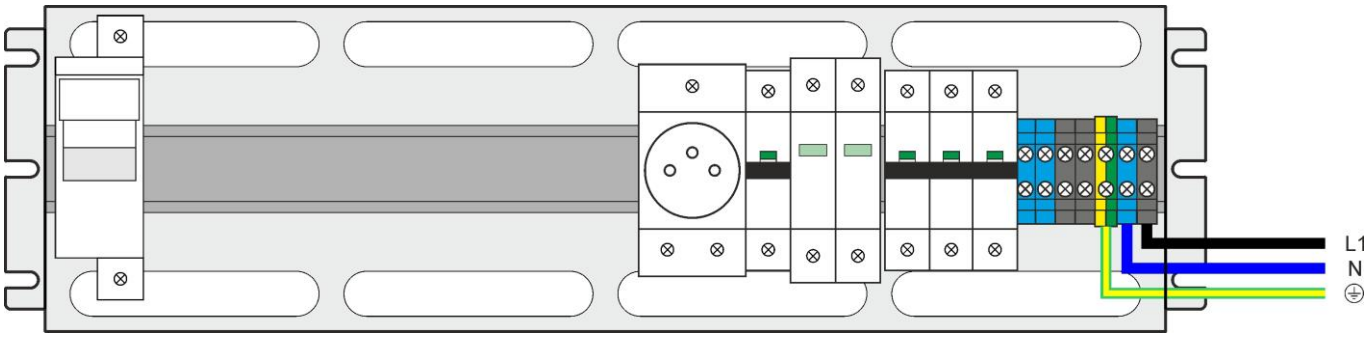


Fig.7. Connection to the power system – a single-phase 230 V AC connection.

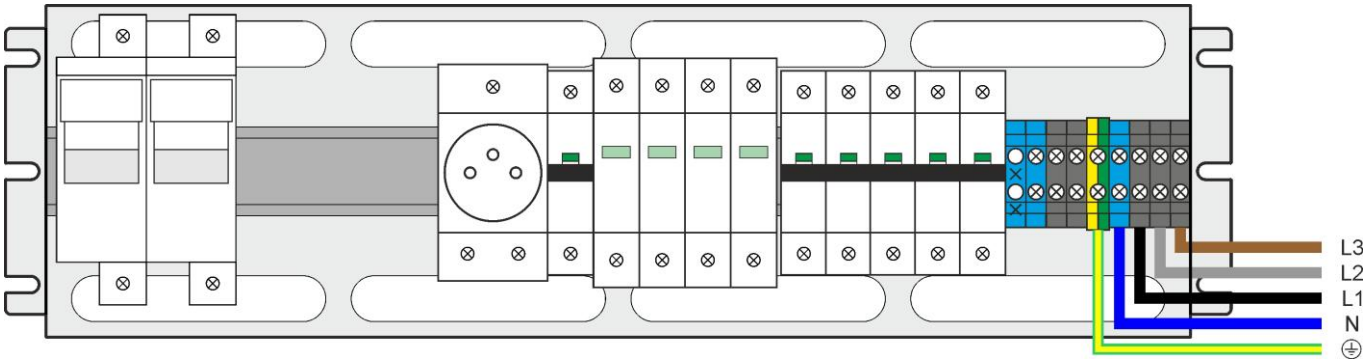


Fig.8. Connection to the power system – 3-phase 400 V AC connection.

Table 4. Technical parameters of safety strips.

Model	LZ1F1B	LZ1F2B	LZ3F1B	LZ3F2B
Connection to the mains	Single-phase 230 V		3-phase 3x230 V / 400 V	
The main overcurrent circuit breaker.	1 + N-pole C16 or C20 The rated short-circuit breaking capacity 6kA		3 + N-pole C16 or C20 The rated short-circuit breaking capacity 6kA	
Surge protection	L, N type 3 (D) according to the EN 61643-11 standard		L1, L2, L3, N type 3 (D) according to the EN 61643-11 standard	
The overcurrent circuit breaker of the power supply unit	1 - pole, C6			
Battery circuit protection	63 A or 100 A 22x58mm 442000 (aM)	2x63 A or 2x100 A 22x58mm 442000 (aM)	63 A or 100 A 22x58mm 442000 (aM)	2x63 A or 2x100 A 22x58mm 442000 (aM)
Recommended cable parameters	OMY 3 x 1.5 mm^2…4 mm^2, YLY 3 x 1.5 mm^2…4 mm^2		OMY 5 x 2.5 mm^2…4 mm^2 YLY 5 x 1.5 mm^2…4 mm^2	
Dimensions	Standard RACK 19” H= 3U			

4.2. 230VAC LDxxxx voltage distribution terminal.

The voltage distribution terminal is equipped with 230V connection sockets and is used to supply components of the DSO. Depending on the number of devices and the amount of power consumption, the terminal can have a 1-phase or 3-phase connection. The 3-phase version enables a more uniform load per phase of the power grid. The terminal is placed in the rear of the cabinet.

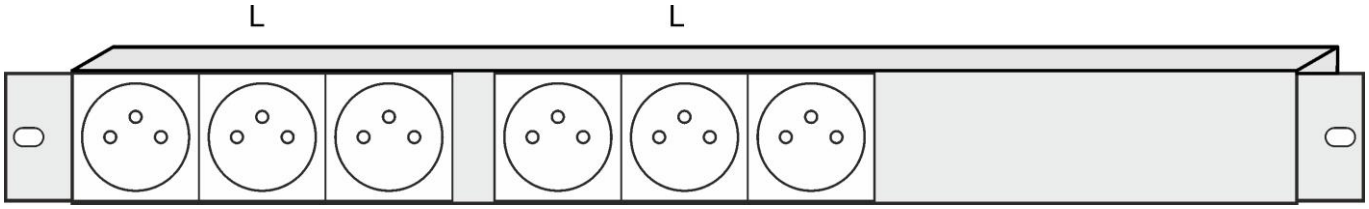


Fig. 9. A LD1F6G voltage distribution terminal.

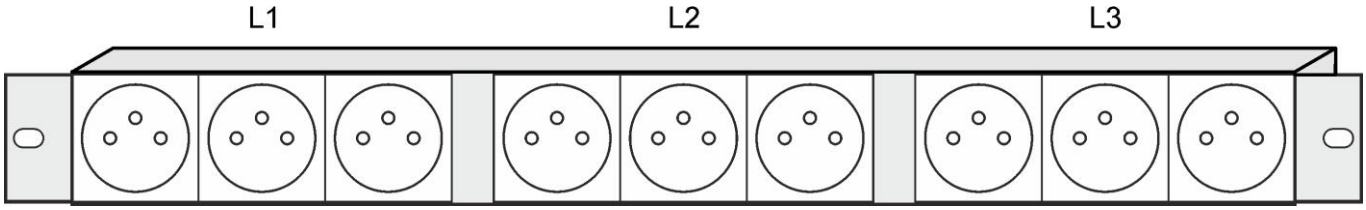


Fig. 10. The LD3F9G voltage distribution terminal.

Table 5. Technical parameters of distribution terminals.

Model	LD1F6G	LD3F9G
The number of outlets	6	9
Protection	C16 or C20	3xC16 or 3xC20
Dimensions	Standard RACK 19” H= 1U	

4.3. The PSG3LA panel for optical and acoustic indication.

The optional panel for optical and acoustic indication compliant with the PN-EN54-16 standard indicates the status of the entire DSO system. It is equipped with three LEDs, a sounder, and a reset button of acoustic indication.

The panel can indicate three different operating states

CONTROL – Normal state, indicating the presence of mains power.
ACOUSTIC INDICATION – Fire alarm status, acoustic indication ON
FAILURE – Fire alarm status, acoustic indication ON

The indication panel is fitted with two alarm signal inputs:

- ACOUSTIC INDICATION
- FAILURE

Inputs should be connected to the control panel or other signaling device. For proper signalization, the terminals must be normally (without failure) opened; in the case of failure, they must be closed. A voice alarm signal or failure indication triggers the appropriate optical and acoustic indication. The button on the front panel allows muting the acoustic signal, while the optical signal remains unchanged. Once the failure is cleared, the optical and acoustic indication will automatically be stopped and the green indicator will light up to indicate that the system is operating properly.

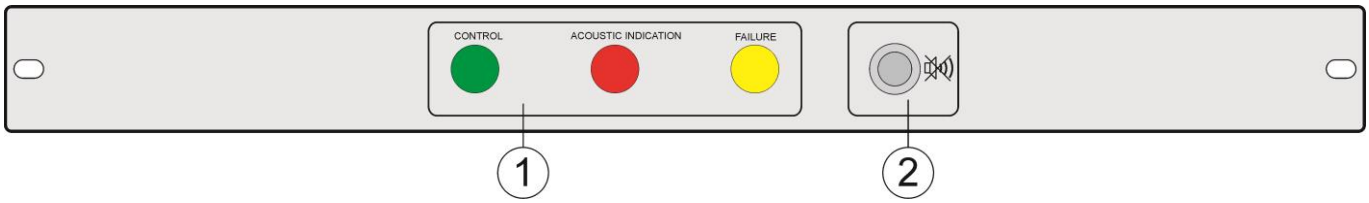


Fig.11. The indication panel - front view.

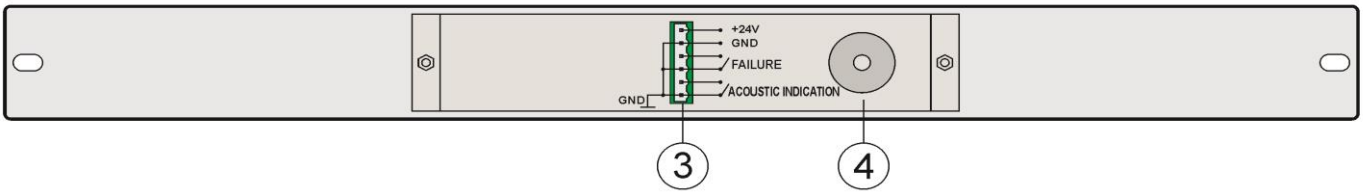


Fig.12. The indication panel - rear view.

Table 6. Components of the PSG3LA panel for optical and acoustic indication.

Component No.	Description
1	LED lights for optical indication.
2	Acoustic indication reset button
3	Connector: ACOUSTIC INDICATION; normal operation – terminals are opened Indication – terminals are closed FAILURE; normal operation – terminals are opened Indication – terminals are closed + 24V / GND power supply terminals
4	Acoustic indicator.

Table 7. Technical parameters of the indication panel.

Supply voltage:	10÷30 V DC
Current consumption	30mA
Optical indication	LED lights: Green – „CONTROL” Red – „ACOUSTIC INDICATION” Yellow – „FAILURE”
Acoustic indication:	- Piezoelectric indicator ~60dB /1m
Technical outputs: **- „ACOUSTIC INDICATION”** **- „FAILURE”**	 Normal operation (no failure) - terminals are opened Alarm - terminals closed Normal operation (no failure) - terminals are opened Failure indication – electrical contacts are closed
Terminals	Φ0,51÷2mm (AWG 24-12)
Dimensions	Standard RACK 19” H= 1U

Example of connection of the optical-acoustic indication panel to the DSO controller is presented below. The CONTROL OUT connector has an OC (open collector) output that can be configured for failure and voice alarm indication.

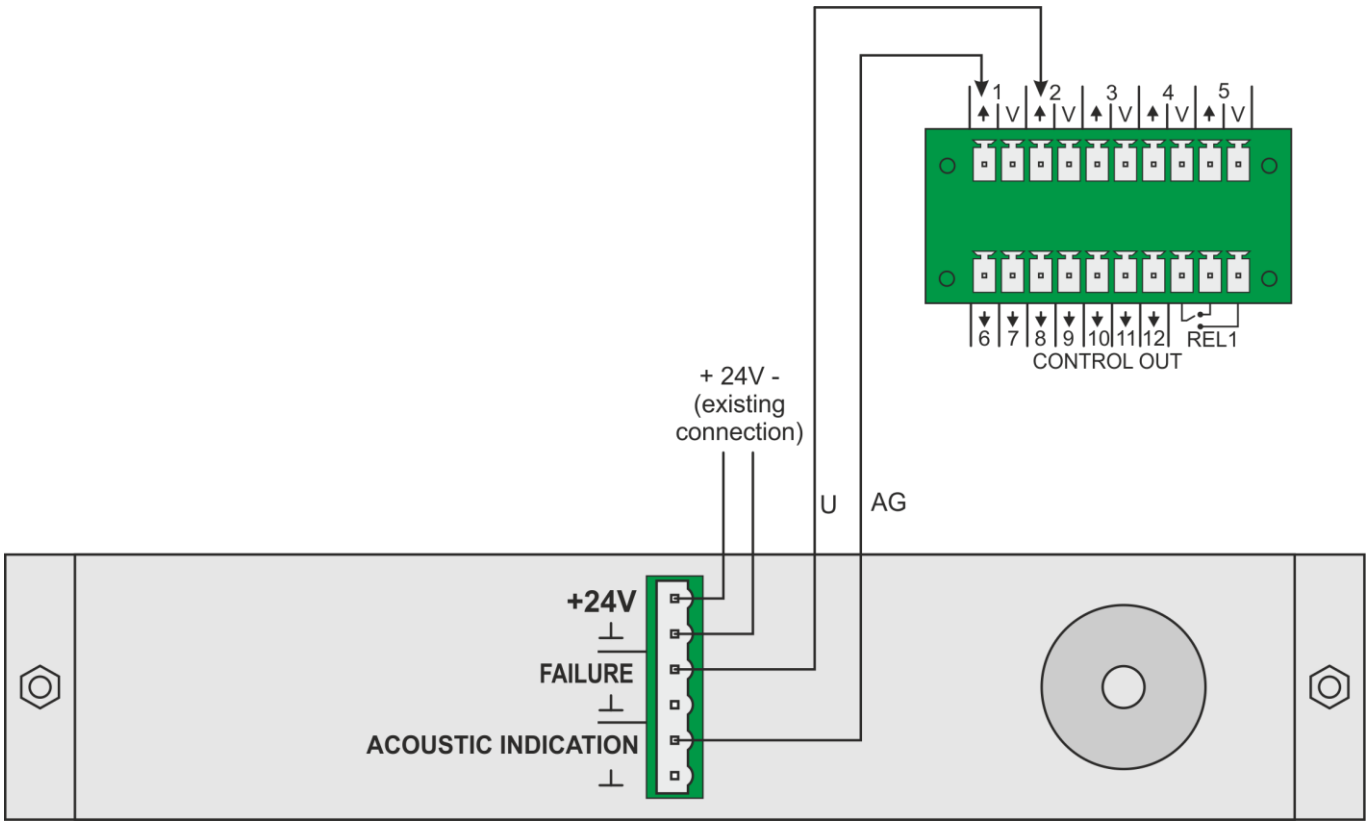


Fig.13. The indication panel – example of connection to the controller.

4.4. The RAWP600RZ fan panel.

The DSO cabinet is equipped with a ventilation panel located in the upper part of the housing to force the air flow to the heat emitting devices. Normally, the ventilation panel is mounted in a 36U, 42U, 45U, 50U, and (optionally) 24U cabinet.

The fans are controlled by a nearby bimetallic thermostat that allows setting the activation temperature in the range 0-60ºC with the adjustment knob. The fans are powered from the 230 V mains; in the case of the power loss, they are switched off.

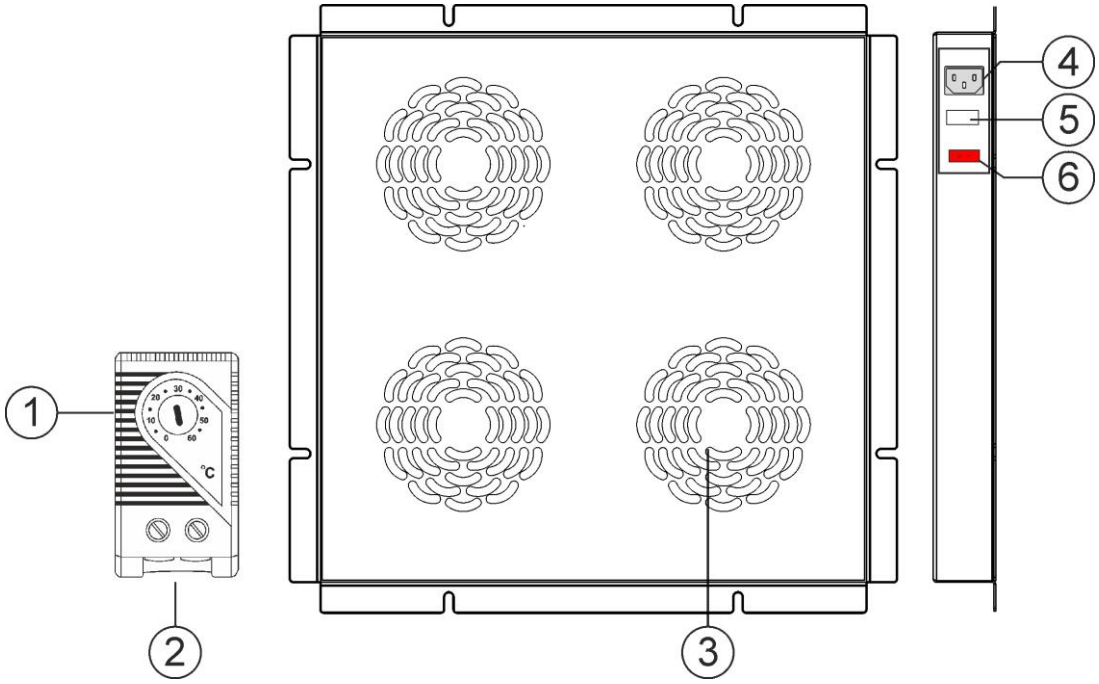


Fig. 14. Fan panel with the a thermostat.

Table 8. Components of the fan panel.

Component No.	Description
1	Bimetallic thermostat
2	On-off temperature control knob (in the range 0-60ºC).
3	Airflow openings of the fan panel
4	The 230 V AC power outlet
5	The T 630mA fuse socket
6	Fan power switch

Table 9. Technical parameters of the fan panel.

Supply voltage:	230 V AC / 50Hz
Current consumption	Max. 0,3 A
Efficiency	Max. 732m^3/h
The adjustment of activation temperature	0÷60ºC
Thermostat type	Bimetallic
Mounting in the RACK cabinet	Mounted as standard – 36U, 42U, 45U, 50U Mounted optionally – 24U

5. The PS24DSOxxxx power supply unit.

The PS24DSOxxxx power supply is the main component of the DSO power supply system supplying power to the controller and routers of the DSO system during normal operation (mains supply operation) and performs advanced battery charger functions.

Due to its modularity, the power supply can be configured in one of several possible variants, differing in power, the number of outputs for audio amplifiers, and the number of battery strings. Depending on the design requirements the power supply can have a power of 320 - 1000W and work with batteries with a capacity of up to 460Ah.

In addition, each power supply unit is equipped with an additional Ethernet module with a 10Base-T/100Base-TX interface to connect to the Internet. Such a configuration enables the remote monitoring of the Voice Alarm System over the Internet from anywhere.

Choosing the right power supply configuration taking into account all the requirements is done automatically using the "CONFI-DSO" support program.

5.1. Block diagram.

The power supply unit is based on the high performance AC / DC inverter with an integrated power factor correction PFC. The used microprocessor system is responsible for the complete diagnostics of parameters of the PSU and batteries. The figure below shows a block diagram of the power supply along with the selected functional blocks. The power supply unit is additionally equipped with the Ethernet communication module allowing remote monitoring of system parameters.

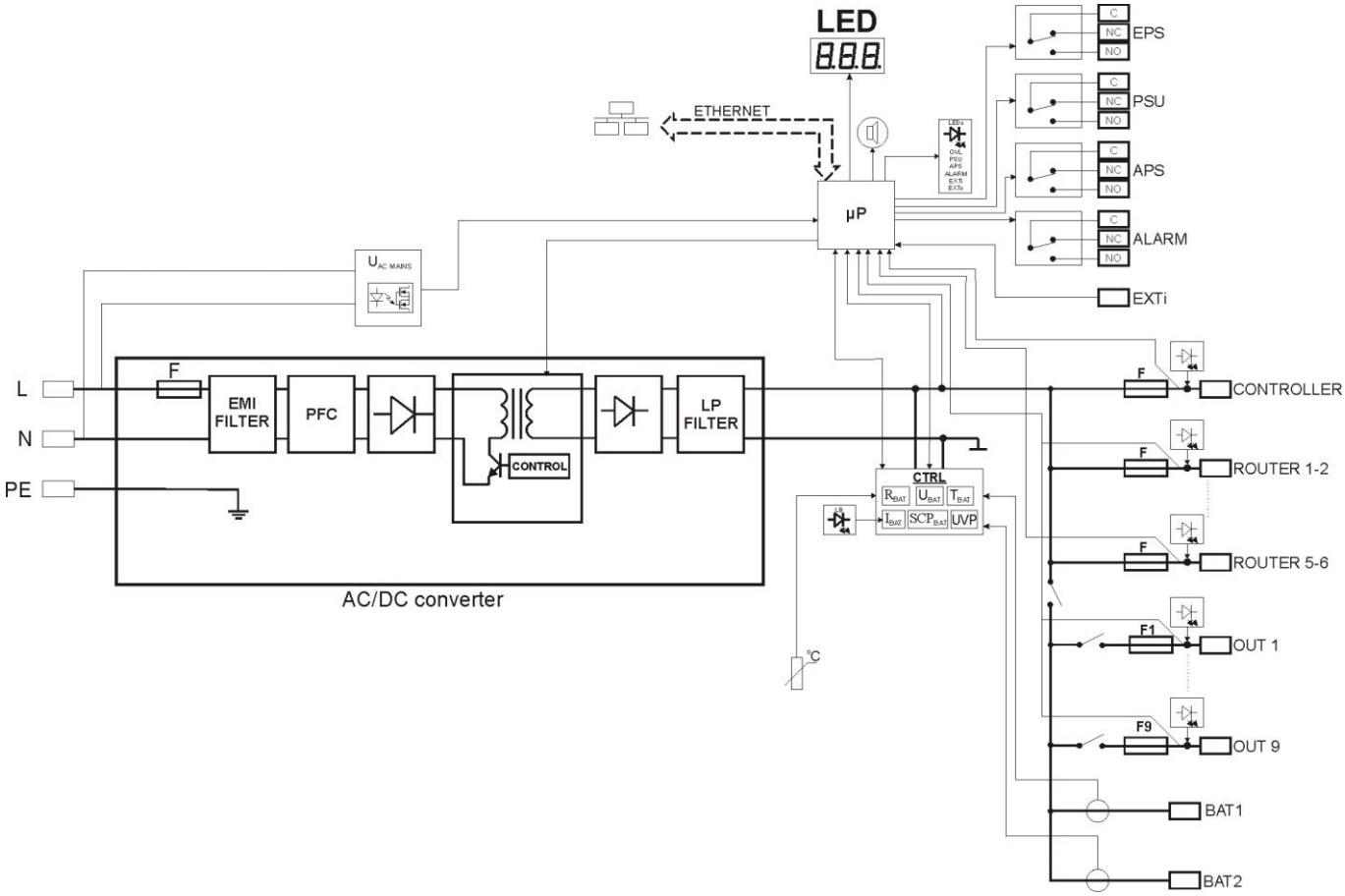


Fig. 15. Block diagram of the power supply unit.

5.2. Description of components and electrical contacts of the power supply unit.

The LED display with buttons on the front panel of the power supply allows signaling the status of the power supply and displaying the basic parameters. Panel functions and operation are the same in all available models.

Fig. 16. Front panel of the power supply unit.

The figure below shows the rear panel of the power supply in the maximum configuration, i.e. the connector for the two battery strings and the 9 outputs for the audio amplifiers. In other versions, the power supply can be equipped with a connector for connecting one battery string and 5 outputs for connecting audio amplifiers.

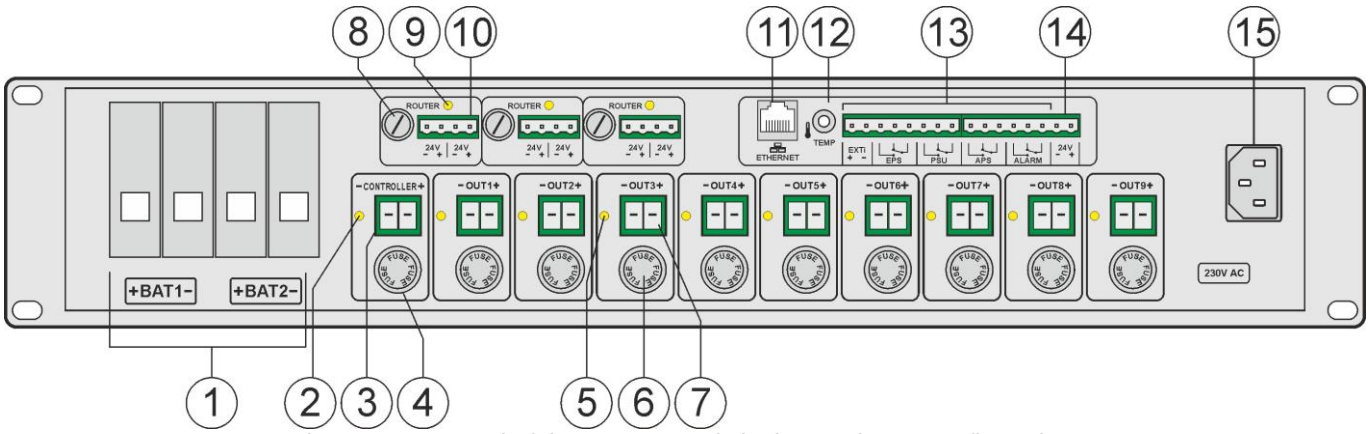


Fig. 17. Rear panel of the power supply in the maximum configuration.

Table 10. Components of the power supply unit.

Component No.	Description
1	"BAT1" and "BAT2" battery connector
2	LED light indicating the controller fuse status
3	The "CONTROLLER" 24 V power supply output of the controller
4	The controller power output fuse (F 10 A / 250 V / 6,3x32mm)
5	Amplifier fuse status LED
6	The amplifier power output fuse (F 30 A / 250 V / 6,3x32mm)
7	The 24V power supply output of the amplifier „OUT1" ÷ „OUT9"
8	The router power output fuse (F 6,3 A / 250 V / 5x20mm)
9	LED light indicating the router fuse status
10	The "ROUTER" 24 V power supply output of the router
11	The "ETHERNET" output
12	Input of the "TEMP" temperature sensor
13	technical output connector: **EXTi** – technical input of collective failure **EPS** – technical output of AC power failure indication - relay type **PSU** – technical output of power supply failure indication - relay type **APS** – technical output of battery failure indication - relay type **ALARM** – technical output of collective failure of the PSU - relay type **CAUTION!** In Fig.17 the set of contacts shows a potential-free status of the relay which corresponds to a failure.
14	The 24 V power supply output of the indication panel
15	The 230 V power supply input

5.3. Control panel.

The power supply is equipped with a panel with buttons and a LED display that allows reading of electrical parameters and reading the status of the power supply. The panel buttons are used to select and confirm the parameter that is to be currently displayed. The 230 V AC, AUX and ALARM LED lights indicate the presence of 230 V AC voltage, 24 V receivers' voltage, and the collective failure of the power supply unit, respectively.

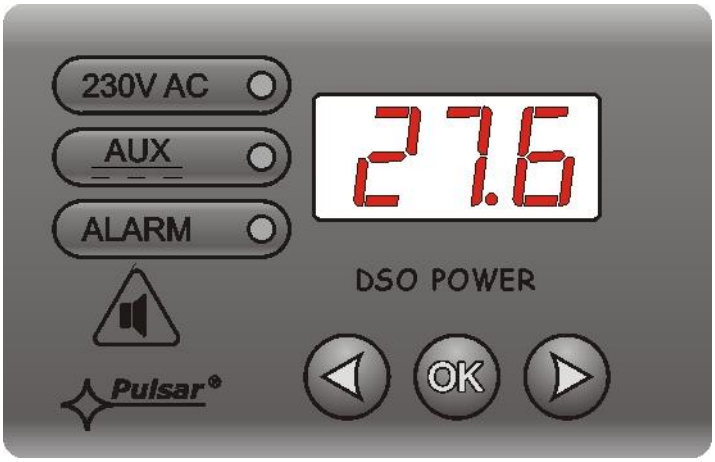
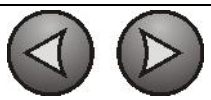


Fig. 18. Control panel.

Table 11. Description of the buttons and LEDs of the LED panel.

	Description
	- Selection buttons
	- Button confirming the selection
	- Green LED indicating the presence of 230 V AC voltage
	- Green LED AUX indicating the presence of 24 V AC voltage
	- Yellow LED ALARM indicating the collective failure of the PSU

5.4. Main menu.

The power supply has a menu from which you can view the current electrical parameters. A diagram explaining the menu structure is shown below.

By default, the display shows the output voltage (section 5.4.1). Use the buttons to navigate through the following parameters in the power supply menu: the battery current indicator (section 5.4.2), the resistance of the first battery string (section 5.4.3), the resistance of the second battery string (section 5.4.3), the battery temperature indicator (section 5.4.4), failure history (section 5.4.5), and current failures (section 5.4.6).

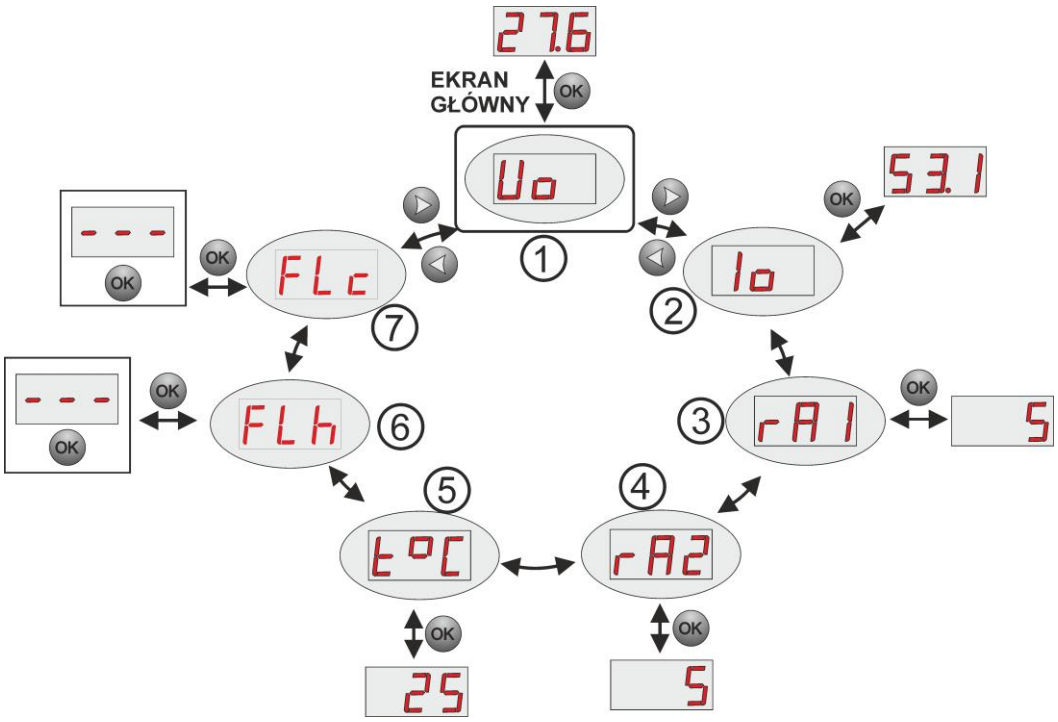


Fig. 19. Display menu

Table 12. Meaning of the display symbols.

	Symbol	Description
①	Uo	Output voltage of the PSU [V]
②	Io	The current drawn from the battery [A] (displayed only during battery operation)
③	rA1	Resistance of the first battery circuit [mΩ]
④	rA2	Resistance of the second battery circuit [mΩ]
⑤	t°C	Battery temperature [ºC]
⑥	FLh	Failure history
⑦	FLc	Current failures

5.4.1. Voltage indicator „Uo” Uo

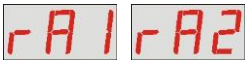
The voltage indicator displays the output voltage of the PSU. If the voltage drops below 26 V or exceeds 29.2V the power supply will report a failure.

The resolution of voltage measurement is 0.1V and should be treated with caution. If a greater accuracy is required, use a multimeter.

5.4.2. The battery current indicator „Io” Io

The battery current indicator displays the measured current drawn from the battery by the receivers during battery-assisted operation. During normal operation, the "Io" parameter is not shown on the display.

The resolution of voltage measurement is 0.1 V and should be treated with caution. If a greater accuracy is required, use a multimeter.

5.4.3. The battery circuit resistance indicator „rA1”, „rA2” 

The battery circuit resistance indicator shows the measured increase in the resistance in the first "rA1" and the second "rA2" circuit of batteries connected to the power supply. The resistance is influenced by many factors.
- The quality of the batteries
- The quality of battery cables and connections
- The type of F_{BAT} fuses

If the resistance increase exceeds 60 mΩ, the power supply will report a failure.
The measurement result is displayed with a resolution of 1 mΩ.

5.4.4. The battery temperature indicator „t°C” 

The battery temperature indicator displays the measured temperature of the batteries connected to the power supply unit. The temperature measurement is used by the automation system of the power supply to compensate the charging voltage.
The measurement result is displayed with a resolution of 1°C.

5.4.5. Failure history “FLh” 

The power supply stores the last 30 failures in the non-volatile memory, allowing for a later review.
Use the „<” or „>” buttons in order to display the **FLh** parameter and confirm by pressing the "OK" button to browse the failure history. The failure number and its code will be displayed. Pressing the "OK" button again will display the next failure in the memory.

The event log of the new power supply stores events that occurred during the performance tests at the production stage.

- Use the „<” or „>” buttons in order to display the "FLh" parameter

- Press „OK”

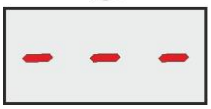
- The number 1, indicating the failure number in the memory, will be displayed
Then, after 1s., the next error code will be automatically displayed

- Press „OK”

- The number 2, indicating the failure number, will be displayed
Then, after 1s., the next error code will be automatically displayed

- If there are more failures in the memory, press the "OK" button to display the next codes

- The „- - -„ parameter on the display indicates the end of the failure list



5.4.6. The current failures „FLc” 

In the event of abnormal electrical parameters during operation, the power supply will indicate a failure by illuminating the corresponding LED on the panel and activating the acoustic indication (if not disabled).

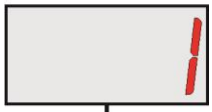
The power supply unit can simultaneously signal several failures at the same time. In such a case, all failure codes and their priority can be viewed in the **FLc** menu. While in the menu, each time you press the "OK" button on the panel, the next error code that caused the failure is displayed. If several failures occur simultaneously, pressing the "OK" button again will display the next code. The order of failure display is arranged according to priority. The failures that are displayed first are of the highest priority.

The section 5.4.7 summarizes all failure codes that may appear during the power supply operation. The individual codes are accompanied by appropriate optical signaling on the panel, acoustic signaling and the activation of a dedicated technical output.

- Use the „<” or „>” buttons in order to display the "FLc" parameter

- Press „OK”

- The number 1, indicating the failure number (highest priority) in the memory, will be displayed
Then, after 1s., the error code will be automatically displayed

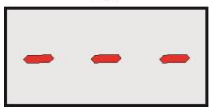


- Press „OK”

- The number 2, indicating the failure number in the memory, will be displayed
Then, after 1s., the next error code will be automatically displayed

- If there are more failures in the memory, press the "OK" button to display the next codes

- The "- -" parameter on the display indicates the end of the failure list



5.4.7. The list of failure codes.

The power supply will indicate a failure with the appropriate code on the LED display. To identify the cause of failure, read the code found in the list below.

Table 13. The list of failure codes.

Failure code	Description	Activation of technical outputs	Causes, comments	Additional information
F01	No AC supply	EPS ALARM	No AC mains voltage - The power supply fuse on the safety strip is switched off	
F02	Fuse of the OUT1..9 or the controller.	PSU ALARM	- Blown fuse in the output circuit OUT1..9 or the controller circuit	Section 5.7
F04	Overload the output!	PSU ALARM	- OFF on the LED display. RESET the power supply (turn the power off and on).	Section 5.7
F05	Undercharged battery.	APS ALARM	- Batteries worn out - Undercharged batteries	Chapter 6
F06	High voltage OUT.	PSU ALARM	- The voltage at the OUT output greater than 29.2 V	
F08	Failure of the charging circuit	PSU ALARM	- Power supply voltage too low, below 26 V - Failure in the charging circuit of the power supply unit	
F09	Low voltage OUT.	PSU ALARM	- The voltage at the OUT output lower than 26 V	
F10	Low battery voltage	APS ALARM	- The battery voltage below 23 V during battery-assisted operation	
F11	Low battery voltage - disconnection.	APS ALARM	- The battery voltage below 20 V during battery-assisted operation	Section 6.5
F12	The EXTi external input.	ALARM	- Activation of the input of collective failure EXTi	Section 5.6
F14	Failure of the temperature sensor.	PSU ALARM	- Faulty temperature sensor - Disconnected temperature sensor	Section 6.6
F15	Too high battery temperature.	PSU ALARM	- Too high ambient temperature of the power supply. - Batteries overloaded. - Faulty batteries.	Section 6.6
F16	No battery.	APS ALARM	- Unplugged batteries	Section 6.3
F17	Faulty battery.	APS ALARM	Batteries deeply discharged, voltage below 20 V	Chapter 6
F18	High resistance of the battery circuit	APS ALARM	- Batteries worn out - Loose battery connection wires	Section 6.1 Section 6.2
F24	The router fuse.	PSU ALARM	- Blown fuse in the output circuit of the router	
F50-F55	Internal damage of the power supply.	PSU ALARM	- Service codes	

5.5. Configuration of power supply settings.

The power supply has a configuration menu from which you can configure the settings by changing or activating certain parameters. A diagram explaining the menu structure is shown below.

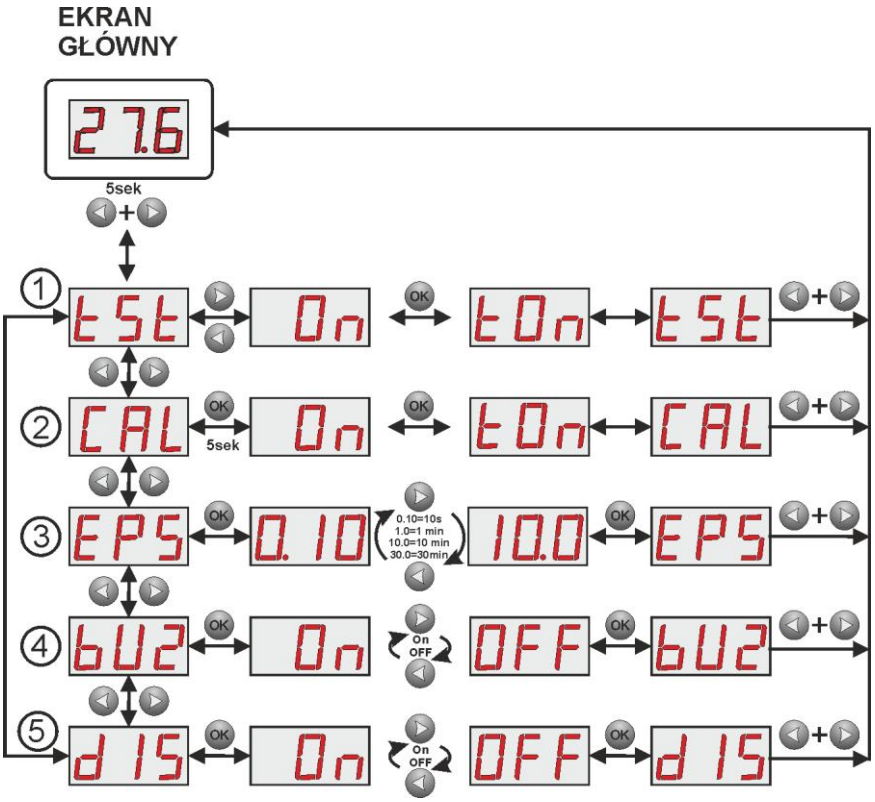


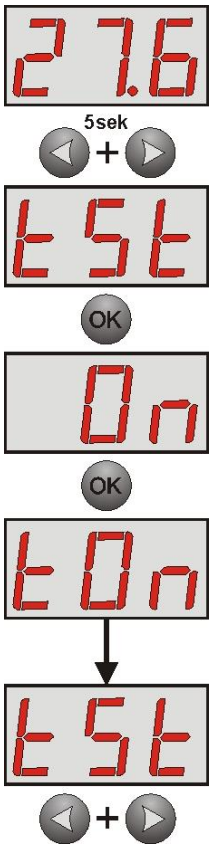
Fig. 20. Power supply configuration menu.

Table 14. Description of symbols.

	Symbol	Description	Additional information
①	tSt	**Battery test – „tSt”** **On** – performing the battery test **Ton** – battery test in progress	Section 5.5.1 6.1
②	CAL	**Calibration of the battery circuit” "CAL"** **On** – Calibration **Ton** – Calibration in progress	Section 5.5.2 6.2
③	EPS	**EPS output delay - "EPS"** Adjustable time lag of the AC power failure indication **0.10 - 10s** (factory setting) **1.0 - 1min** **10.0 - 10min** **30.0 - 30min**	Section 5.5.3
④	bUZ	**Acoustic indication – „bUZ”** **On** – Acoustic indication on **OFF** – Acoustic indication OFF	Section 5.5.4
⑤	d IS	**Turning off LED display backlight** On – dimming on OFF – dimming off	Section 5.5.5

5.5.1. Performing the battery test – „tSt” 

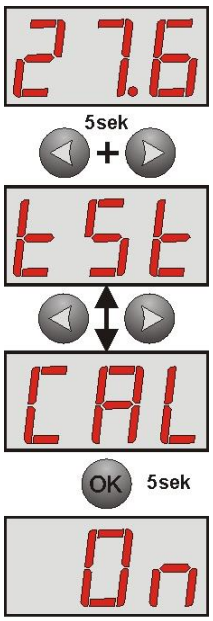
The "tSt" function runs a manual test of the batteries connected to the power supply. If the test result is negative, it will be signaled by the power supply with an appropriate message, a beeping sound, while the APS and ALARM technical outputs will change their status into opposite.



- Simultaneously press the „<,>” rightmost and leftmost buttons and hold for at least 5 seconds
- The „tSt” parameter will be displayed
- Press „OK”
- The „On” parameter will be displayed
- Press „OK”
- The information about starting the battery test will be displayed
- After the battery test, the „tSt” parameter will be displayed
(In the event of a negative test result, the power supply will indicate a failure)
- To return to the main menu, simultaneously press the „<,>” rightmost and leftmost buttons

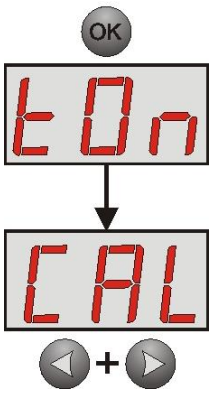
5.5.2. Calibration of the battery circuit” "CAL" 

The battery circuit calibration function measures the reference resistance in the battery circuits independently for each battery string. Calibration should be performed after the installation of new batteries.



- Simultaneously press the „<,>” rightmost and leftmost buttons and hold for at least 5 seconds
- The „tSt” parameter will be displayed
- Use the „<” or „>” buttons in order to display the "CAL" parameter
- Press the „OK” button and hold it down for at least 5 seconds
- The information about the readiness for the calibration process will be displayed

- Press the "OK" button - the calibration procedure is started (see section 6.2)



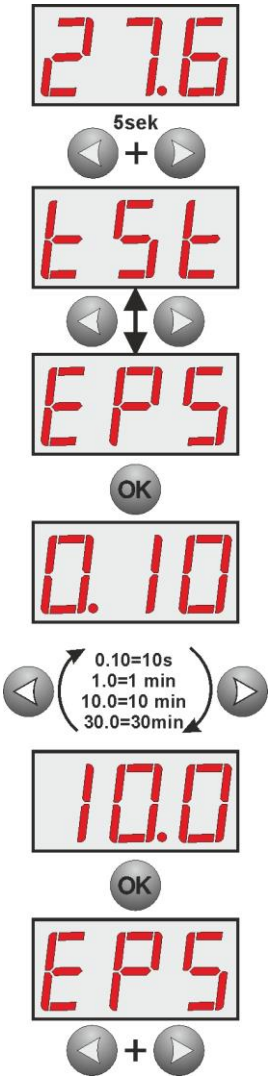
- To return to the main menu, simultaneously press the „<,>” rightmost and leftmost buttons

5.5.3. Setting the EPS output delay - "EPS”

The power supply has a programmable delay function of the 230 V power failure indication. The time after which the alarm is sounded can be selected from four available ranges:

- 10s (factory setting)
- 1min
- 10min
- 30min

The 230V power failure is indicated by changing the status of the "EPS" and "ALARM" technical outputs.



- Simultaneously press the „<,>” rightmost and leftmost buttons and hold for at least 5 seconds

- The „tSt” parameter will be displayed

- Use the „<” or „>” buttons in order to display the "EPS" parameter

- Press „OK”

- The information about the current setting will be displayed

- Use the „<” or „>” buttons to set the time lag
  - 0.10 - 10s (factory setting)
  - 1.0 - 1min
  - 10.0 - 10min
  - 30.0 - 30min

- Press the „OK” button to confirm

- To return to the main menu, simultaneously press the „<,>” rightmost and leftmost buttons

5.5.4. Switching on / off the „bUZ"acoustic indication 

Failures that may occur during operation of the power supply are signaled acoustically. The frequency and number of signals depends on the type of event.

Table 15. Acoustic indication.

No.	Description	Event
1	1 signal every 10s, battery operation	No 230 V mains supply
2	1 signal every 10s, mains operation	Battery failure, undercharged batteries
3	2 signals every 10s, battery operation	Low battery level
4	Fast signals, battery operation	The power supply will shut down due to discharged batteries
5	Continuous signaling	PSU failure (section 5.4.7)

- Simultaneously press the „<,>” rightmost and leftmost buttons and hold for at least 5 seconds
- The „tSt” parameter will be displayed
- Use the „<” or „>” buttons in order to display the "bUZ" parameter
- Press „OK”
- The information about the current setting will be displayed
- Use the „<” or „>” buttons to set the desired option
  On – acoustic indication on
  OFF – acoustic indication off
- Press the „OK” button to confirm
- To return to the main menu, simultaneously press the „<,>” rightmost and leftmost buttons

5.5.5. Turning off LED display backlight „dIS" 

The turning off LED display backlight function turns off display backlight after an idle time of 5 minutes since the last key press. If the display backlight is turned off, pressing any button on the desktop re-activates the display.

- Simultaneously press the „<,>” rightmost and leftmost buttons and hold for at least 5 seconds

- The „tSt” parameter will be displayed

- Use the „<” or „>” buttons in order to display the "dIS" parameter

- Press „OK”

- The information about the current setting will be displayed

- Use the „<” or „>” buttons to set the desired option
  On – dimming on
  OFF – dimming off

- Press the „OK” button to confirm

- To return to the main menu, simultaneously press the „<,>” rightmost and leftmost buttons

5.6. Technical Inputs/outputs EPS, PSU, APS, ALARM, and EXTi.

The power supply is fitted with relay indication outputs changing state upon the occurrence of a specific event:

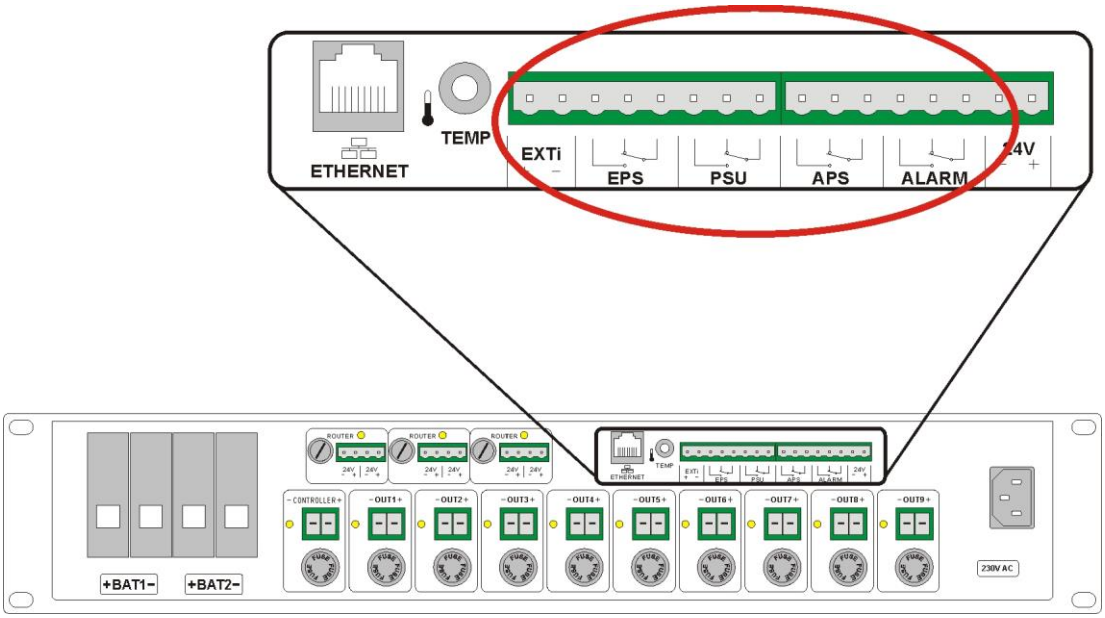


Fig. 21. Technical outputs/inputs of the power supply.

- **EPS – output of 230V AC power failure indication**.
  Output indicating 230V AC power failure.

CAUTION! In Fig.21 the set of contacts shows a potential-free status of the relay, which corresponds to AC power failure.

- **PSU** – output of power supply failure indication.
  Output indicating PSU failure. Failure can be triggered by the following events:
  - Battery voltage below 26 V
  - Battery voltage higher than 29.2 V
  - Failure of the battery charging circuit
  - Fuse failure OUT1…9
  - Router output fuse failure
  - Overload of the PSU
  - Too high battery temperature
  - Temperature sensor failure
  - Internal damage of the power supply

CAUTION! In Fig. 21 the set of contacts shows a potential-free status of the relay, which corresponds to a failure of the PSU.

- **APS - output of battery failure indication**
  Output indicating failure in the battery circuit. Failure can be triggered by the following events:
  - Undercharged batteries
  - Unplugged batteries
  - High resistance of the battery circuit
  - Battery voltage below 23 V during battery-assisted operation
  - Fuse failure in the battery circuit
  - No continuity in the battery circuit

CAUTION! In Fig. 21 the set of contacts shows a potential-free status of the relay which corresponds to a battery failure.

- **ALARM – technical output of collective failure indication.**
  Output indicating collective failure. In the case of failure at any EPS, APS, or PSU output or at the EXTi input, the collective failure signal ALARM will be generated.

CAUTION! In Fig.21 the set of contacts shows a potential-free status of the relay, which corresponds to power supply failure (collective failure of the PSU).

- **EXTi - technical input of collective failure.**
  The EXTi technical input (external input) indicates the collective failure and is designed to connect the ALARM indication of collective failure from another DSO cabinet.
  The indication of collective failure is used in complex systems consisting of several DSO cabinets and allows sending a single failure signal to the fire system control panel.

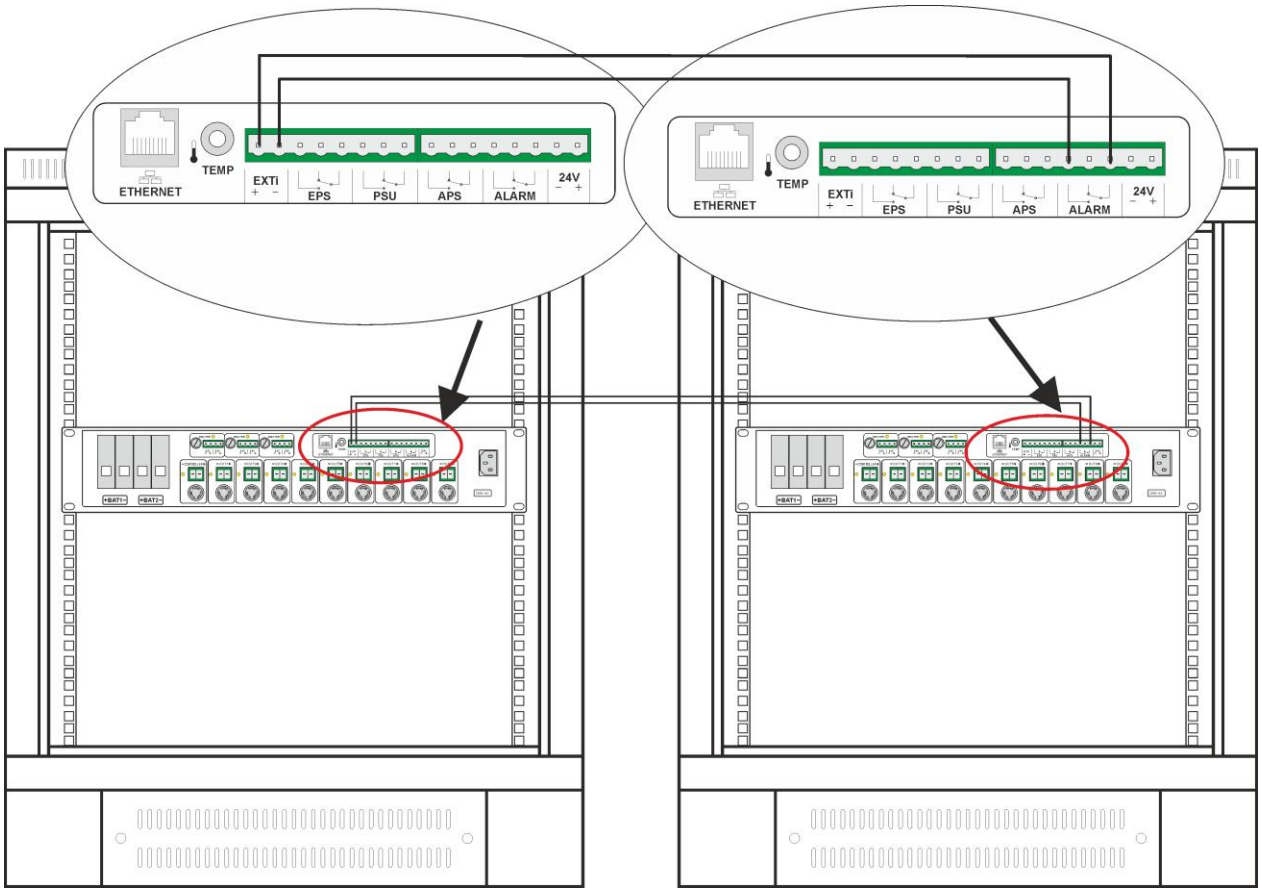


Fig. 22. The schematic diagram of connection of a collective failure signal.

5.7. Technical outputs - connection with DSO controller.

The technical outputs are connected with wires to the Alarm System controller. The wires can be used to connect the controller to the appropriate connector in order to monitor technical signals.

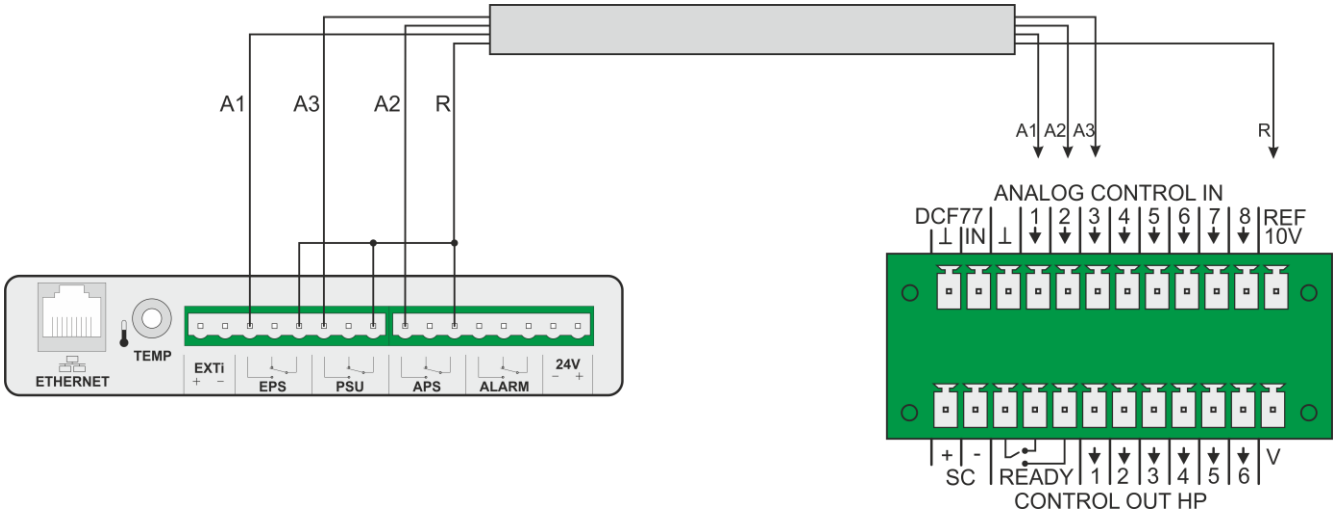


Fig. 23. The scheme of connecting the technical outputs to the DSO controller.

The configuration of A1, A2, and A3 outputs, depending on the functions performed, shall be made in the controller itself and using a dedicated software.

5.8. Overload/short circuit of the power supply output.

In the event of short-circuit in any of the OUT1 ... OUT9 amplifier outputs, the controller output, or router outputs, the corresponding fuse in the circuit is permanently blown. Restoration of the voltage at the output requires fuse replacement (use a replacement of the same parameters).

The PSU has output overload detection function. In exceptional circumstances, if the power supply is overloaded and the output voltage of the power supply drops below 20V, the power supply will disconnect all power outputs. The „OFF" parameter will be displayed Then, make sure that any of the amplifiers is not supplied from the PSU during normal operation (at 230 V mains voltage) and RESET the power supply (turn the power off and on).

6. The reserve supply circuit

The power supply is equipped with intelligent charging and battery control circuits that enable adequate maintenance and monitoring of their condition.

The system allows connection of 1 or 2 strings (circuits) of batteries, each with up to 230Ah, which allows for a total capacity of 460Ah. In order to ensure sufficiently long battery life, the charging voltage compensation function is used, which, together with the temperature sensor, is responsible for adjusting the voltage at the battery terminals depending on their temperature. It is recommended to place the temperature sensor between the batteries.

If the power supply driver detects a fault in the battery circuit, then the appropriate indication and the activation of the APS and ALARM outputs are triggered.

6.1. Battery test.

The PSU performs the battery test every 5 minutes. During the test the power supply controller measures the electrical parameters in accordance with the implemented measurement procedure.

A negative result occurs when the continuity of the battery circuit is interrupted, the resistance in the battery circuit exceeds the reference resistance by 60 mΩ, or when the terminal voltage drops below 24 V. Such failure may indicate a significant battery consumption or loosening of the connection cables.

The battery test can be activated manually from the menu of the power supply (see section 5.5.1), e.g. in order to test the replaced batteries after periodic maintenance.

6.2. Calibration of the batteries.

The power supply is equipped with a battery calibration function to be carried out when replacing the batteries with new ones

Replacing the batteries with new ones, fitting them properly and starting the calibration procedure should be performed with full awareness of the risks that may result from improper operations.

According to the guidelines of the Scientific and Research Centre for Fire Protection and VdS, batteries should be replaced after 4 years of use regardless of their condition.

When replacing batteries, make sure that they are from the same manufacturer and from the same production batch. Battery replacement must be carried out simultaneously for all battery strings.

During the calibration process, the power supply driver measures the reference resistance for the newly installed batteries, including connections and other circuit components.

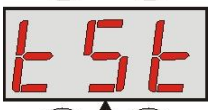
The result of the resistance measurement is influenced by many factors. It is recommended that the new batteries should be recharged using an external charger before installing them in the cabinet.

In addition, during the installation, special attention should be paid to mechanical connections with the battery,that is make sure that cable terminals are properly connected with the clamp caps and check the condition of the connecting cables.

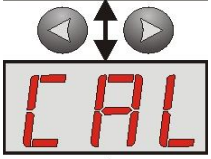
Starting the calibration procedure

- Simultaneously press the „<,>” rightmost and leftmost buttons and hold for at least 5 seconds

- The „tSt” parameter will be displayed



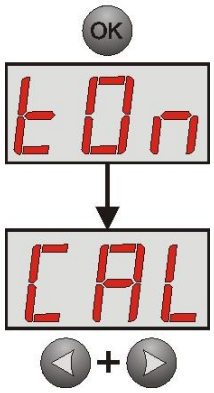
- Use the „<” or „>” buttons in order to display the "CAL" parameter



- Press the „OK” button and hold it down for at least 5 seconds

- The information about the readiness for the calibration process will be displayed

- Press the "OK" button - the calibration procedure is started



- To return to the main menu, simultaneously press the „<,>” rightmost and leftmost buttons

The measurement of the resistance of the battery circuit is performed during the calibration process. The resistance cannot exceed 60 mΩ. If the resistance exceeds the permissible value, make sure that the wires are properly connected to the batteries and whether the batteries are not discharged. After proper calibration of the power supply, the controller stores the resistance measurements as reference values.

During normal operation, the PSU performs the battery test (accompanied by, among others, the measurement of resistance increase in the battery circuit) every 5 minutes. If the resistance increase exceeds 60 mΩ the power supply will report a failure at the APS and ALARM technical outputs.

6.3. Battery Detection.

The power supply driver checks the voltage at the terminals and, depending on its value, responds appropriately:

U_{BAT} below 20 V - faulty batteries, automatic disconnection from power supply circuits
U_{BAT} above 20 V - battery OK, automatic connection to power supply circuits

6.4. Protection against the battery terminals short-circuit.

The PSU is fitted with a circuit protecting against the battery terminals short-circuit. In the event of a short circuit, the control circuit immediately disconnects the batteries from the power supply so that there is no voltage drop at the outputs. Automatic reconnecting the batteries to the power supply circuits is possible once the short circuit is removed and cables are properly connected.

Caution! If the system uses two battery strings and the second string was connected during the short circuit, then the fuse in its circuit will be damaged.

6.5. Under-voltage protection (UVP).

The PSU is equipped with the discharged battery disconnection and indication system. During the battery-assisted operation, reducing voltage below 20 V±0.2 V at the battery terminals will disconnect the battery within 15 seconds and turn on acoustic indication.
Re-connecting the battery to the power supply occurs automatically once the 230 V mains voltage is restored.

6.6. Battery temperature measurement.

The power supply unit is fitted with a temperature sensor to monitor the temperature parameters of the installed battery. The sensor is located near the battery so its readings should not be confused with the ambient temperature. The measurement of the battery temperature and the charging voltage compensation extend the battery life.

7. Remote monitoring.

The power supply is equipped with an additional Ethernet module with a 10Base-T/100Base-TX interface to connect to the Internet. Such a configuration enables the remote monitoring of the Voice Alarm System over the Internet from anywhere.

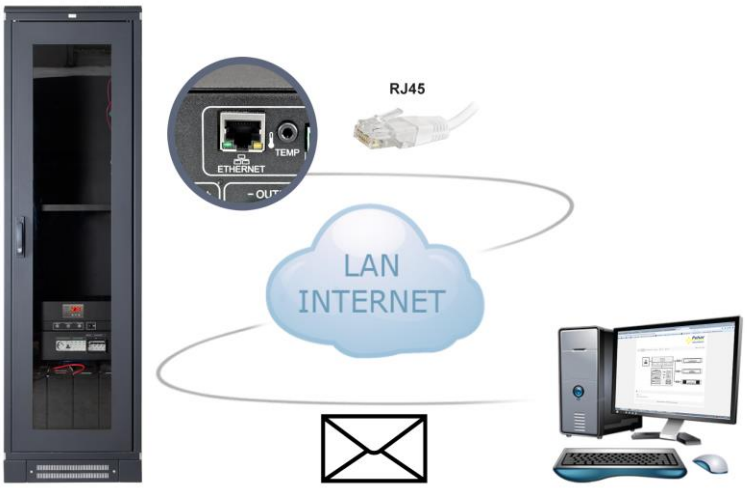


Fig. 24. Explanatory figure showing the remote monitoring via the INTERNET network.

The Ethernet module has a built-in powerful web server that allows remote monitoring of the current status of the power supply in the browser of any PC computer. In addition, an automatic email alert is available.
The messages contain information about the current errors, e.g.: "No AC power", "High resistance in the battery circuit", "AUXn fuse failure", etc., with the exact time of failure. In addition, each event contains additional information in the form of technical parameters recorded at the time of occurrence.

Time periods between alerts and types of initiating events are individually configured by the user.

7.1. Connection configuration.

To enable remote communication with the power supply, perform a pre-configuration of the built-in Ethernet module. This configuration can be performed after connecting the power supply to the notebook as shown below.

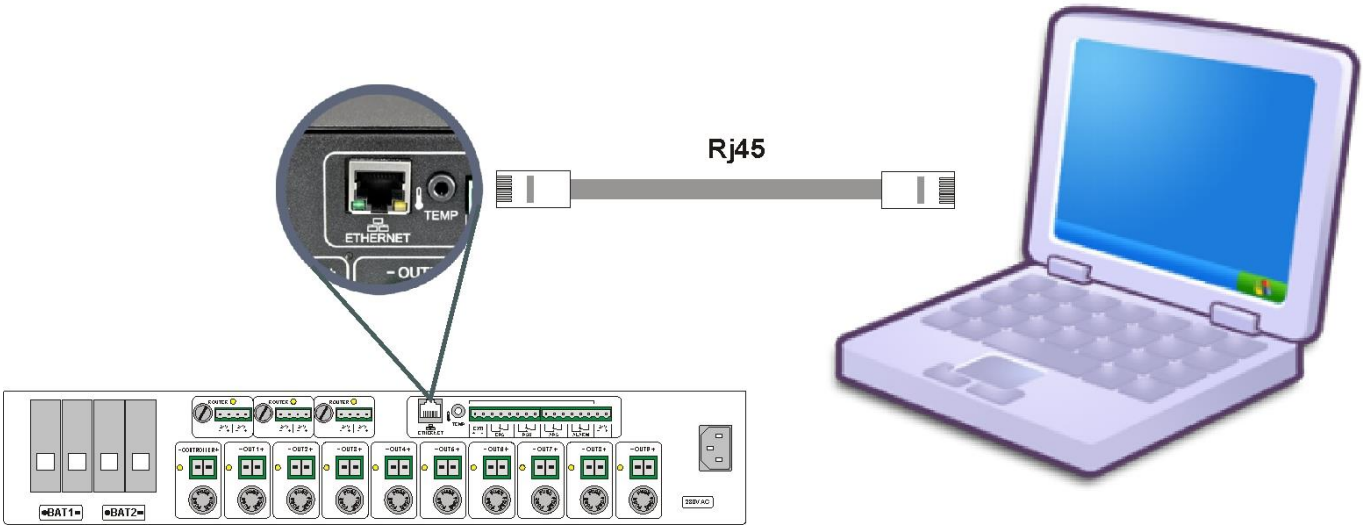
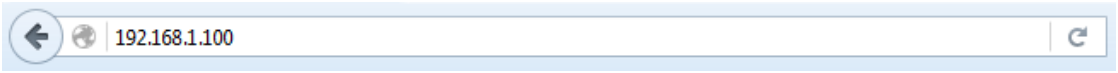


Fig. 25. Schematic diagram of the connection between PSU and computer.

Enter the IP address of the module in the web browser window. The default IP address is 192.168.1.100.



If the entered IP address is correct, the module login page will be loaded on the browser screen.

Fig. 26. Ethernet module login page.

If your browser does not display the above page, then check the Ethernet configuration. In particular, check:

- Whether the addresses of the Network Interface Card of the computer and the router are on the same subnet, that is in the range 192.168.1.0 – 192.168.1.255
- The addresses of the Network Interface Card of the computer and the router must be different than the address of the power supply, that is 192.168.1.100

The appropriate configuration can be made in the settings of the Network Interface Card.

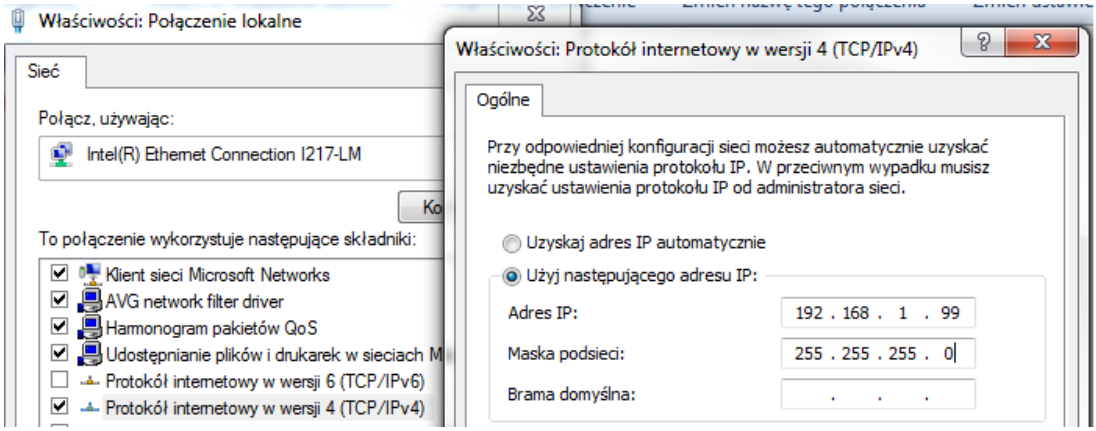


Fig. 27. NIC (Network Interface Card) settings tab.

When the page opens, select the administrator name and enter the password. The default values are:
Name: = „Admin”
Password = „admin”

It is recommended to change administrator name and password after the first login.

The Ethernet Module allows you to restore the default login values in case they are lost. For this purpose, remove the top cover of the power supply to access the module installed inside. Then locate the communication module (see image below) and press the "INIT" button for approx. 5s.

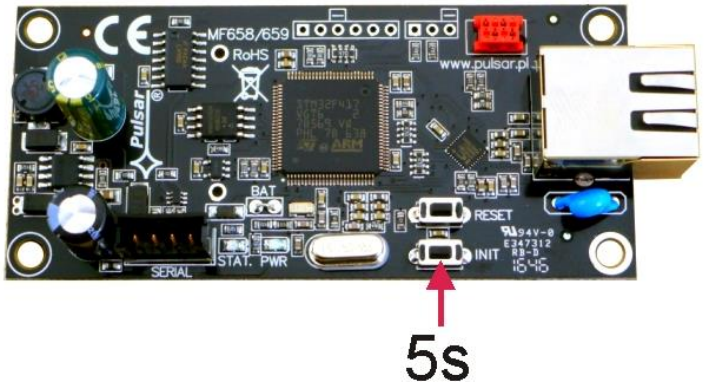


Fig. 28. The view of the Ethernet module.

The following default parameters will be restored:

IP address: **192.168.1.100**

Administrator level:
Name: **„Admin”**
Password: **„admin”**

User level:
Name: **„User”**
Password: **„user”**

7.2. Status

After proper login, the main window will be loaded showing the current state of the DSO power system. The available parameters that can be read include: the voltage at the power supply output, the state of the mains supply (presence or absence), or fuse status. In addition, the battery block shows the current voltage, current drawn from the batteries, temperature, and resistance values in both strings. The "Test" button allows you to perform a remote battery test at any time.

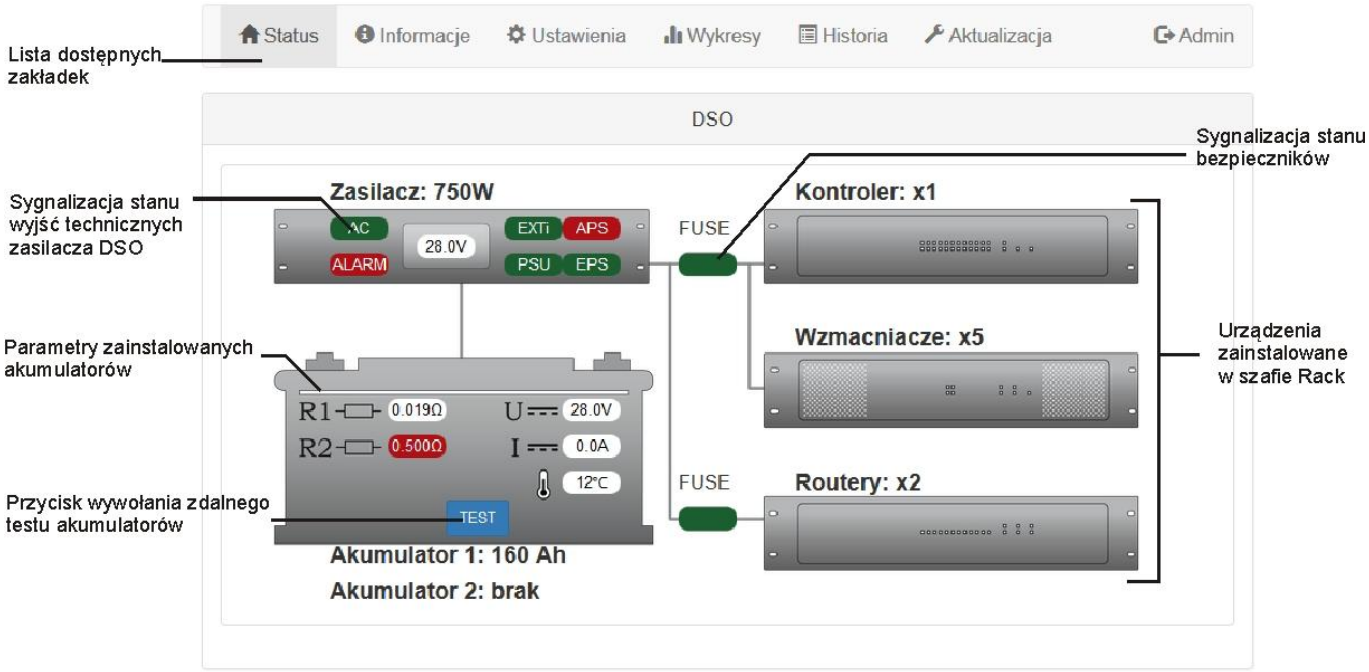


Fig. 29. The main screen view.

7.3. Information .

The "Information" tab" is presented below. The presented parameters are read-only.
Meaning of the menu items:

Date and time	- date and time of the power supply unit of the DSO
Software version	- version of the software controlling the PSU and Ethernet server
S/N	- Serial number of the power supply unit
Configuration Number	- the number identifying the DSO system configuration
Peripherals	- Information about the current state of the peripherals of the power supply

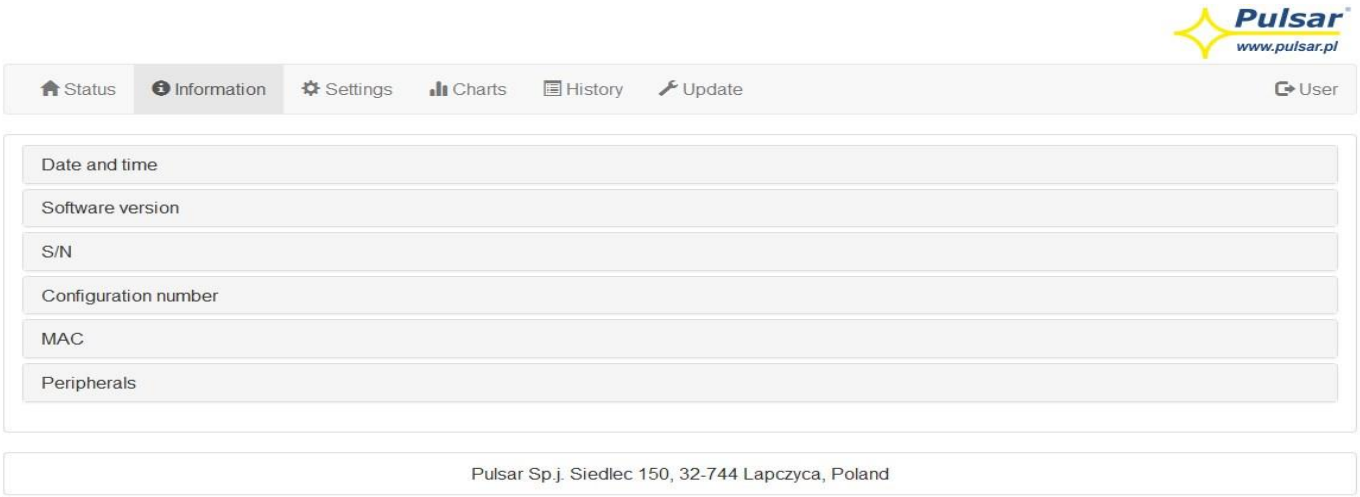


Fig. 30. "Information" tab.

7.4. Settings .

After selecting the "Settings" tab, you can configure the selected parameters of the power supply. The modification is only available when logged in as an administrator.

The default login parameters at the administrator level:
Name: **„Admin"**
Password: **„admin"**

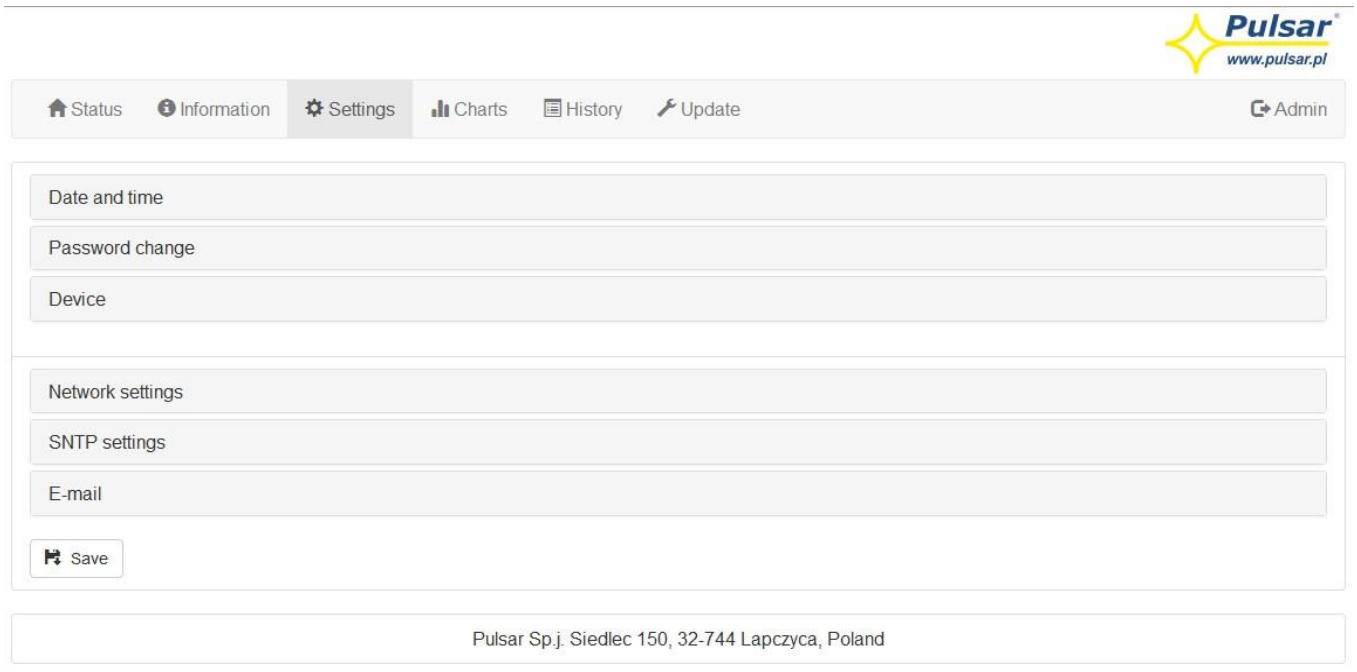


Fig. 31. "Settings" tab.

7.4.1 Date and time.

After entering the "Date and Time" settings, a window where you can set the system clock date and time is displayed.

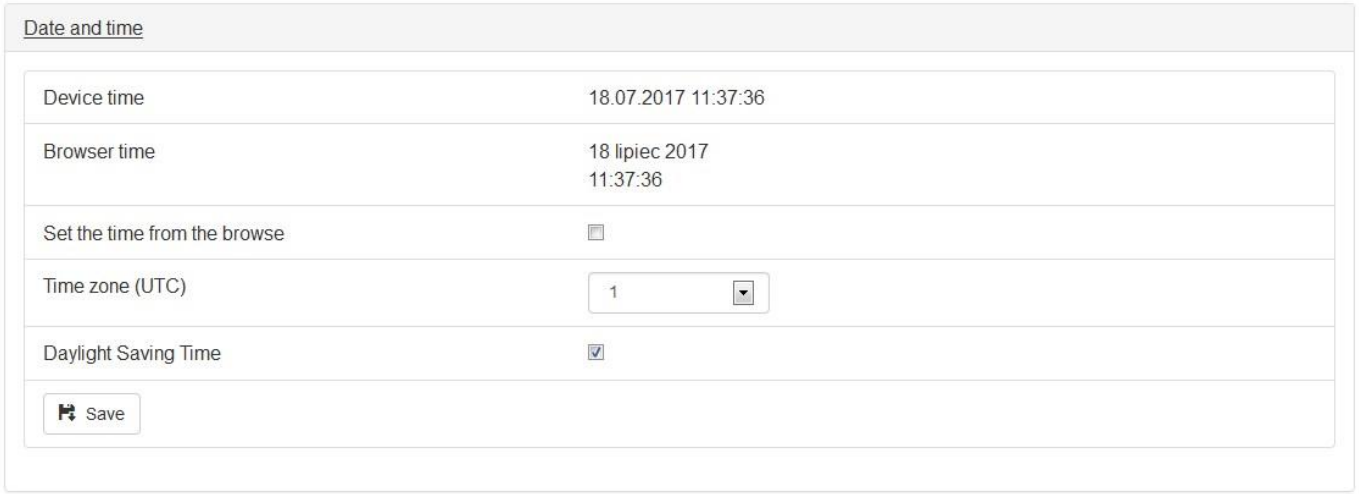


Fig. 32. Setting the date and time of the power supply.

Device Time – The current time of the system clock of the power supply.
Browser time – The current time of local computer browser.
Set time from browser – Select to synchronize the time of the PSU with the time of the browser.
Time zone (UTC) – Time zone settings
Adjust clock for Daylight Saving Time – Automatic summer/winter time change

Press "Save" to confirm the changes.

7.4.2 Password change.

After selecting the "Change Password" option you can change the default user and administrator password settings. It is recommended to change the default user and administrator passwords the first time you log on to the system.
The new password must be entered twice in the appropriate fields. If both passwords are different then the field will be highlighted in red.

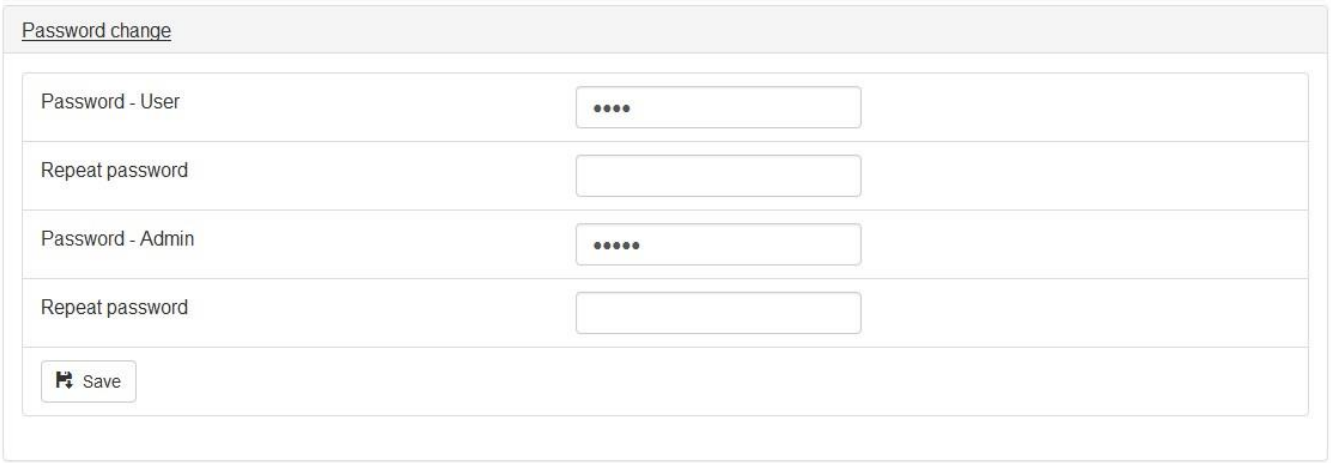


Fig. 33. Password change.

Press "Save" to confirm the changes.

7.4.3 The device

Selecting the "Device option" displays a box, where you can type any name that identifies the power supply. This name will be displayed on the "Status" home page as well as in email headers, event history files, and graphs.

Fig. 34. Name change.

7.4.4 Network settings.

Select the "Network settings" for access to the network parameters enabling the communication with the power supply.

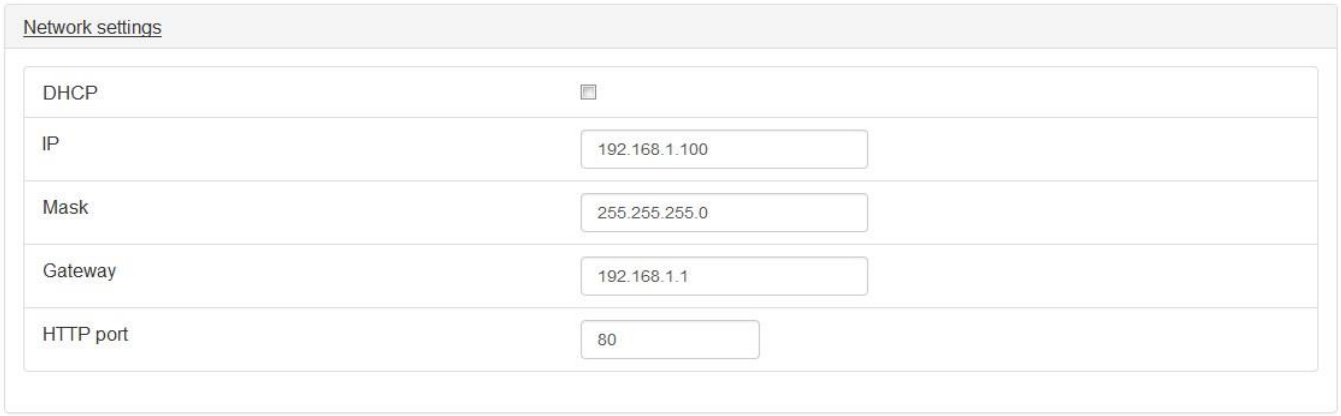


Fig. 35. Network settings.

DHCP – automatic IP address assignment. Once selected, the IP address will be automatically assigned to the PSU from a pool of free addresses each time the power is turned on. The fields of subsequent IP parameters: Mask, Gateway - are inactive.
IP – Place to enter a fixed IP address. When selecting this option, enter the available IP address for power supply identification.
Mask – Place to enter the IP subnet mask. It is usually expressed as 255.255.255.0
Gateway – gateway address. An address that usually allows you to access the Internet or communicate with computers outside your local network.
HTTP port – The browser port number. The default value for http is 80.

7.4.5 SNTP settings.

After choosing the "SNTP Settings", you can configure SNTP parameters. The SNTP protocol allows synchronizing the power supply time with the SNTP server based on UTC time.

Fig. 36. SNTP protocol settings.

Turn on - Enables the time synchronization function of the power supply
Port - SNTP server port number
IP - SNTP server address

7.4.6 Email.

The DSO power supply allows sending email notifications to 2 recipients when a specific event occurs. The function includes SSL-encrypted SMTP user authentication to maintain the security of your mail account.

After choosing the "E-mail" option, you can configure email client parameters.

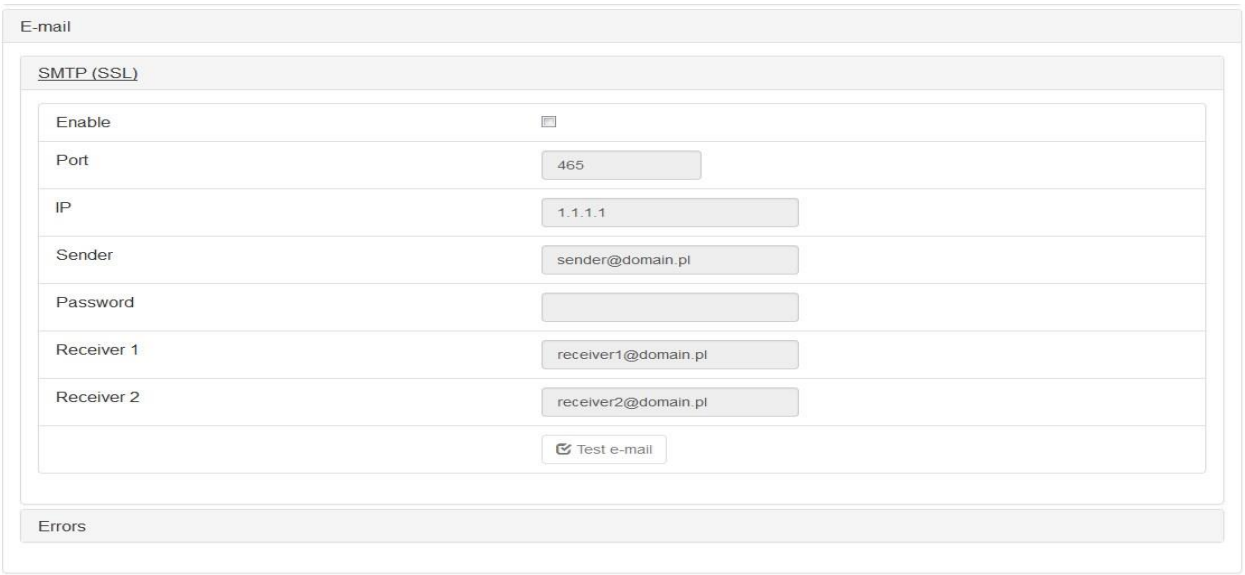


Fig. 37. The settings of the SMTP.

Turn on - sets up remote email notification
Port - Port number of the outgoing mail
IP - IP address of the outgoing mail
Sender - Email account address
Password - Email account password
Recipient 1 - Email address of the recipient 1
Recipient 2 - Email address of the recipient 2
Email test - Press to send an email to recipients

When you expand the "Errors" option, it is possible to choose events, which will initiate notification sending. When an email notification event occurs, the power supply will send the message to the recipients after the time set in the "send automatically" field. A full list of events is shown in the window below.

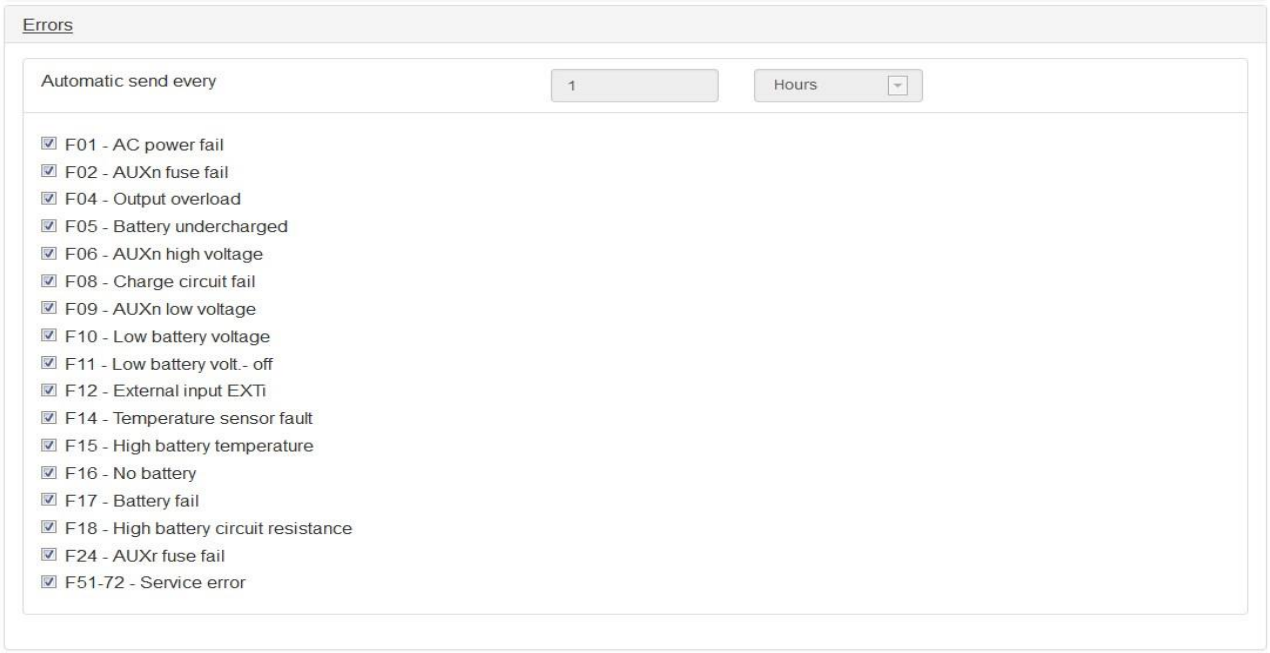


Fig. 38. The list of events for email notification.

7.5. Graphs

The "Graphs" tab allows you to read the history of parameters (current, voltage, resistance in the battery circuit, and temperature) in the form of graphs stored in the memory of the power supply.

During normal operation, the power supply registers the electrical parameters both at the output and battery circuits and then stores them in the internal non-volatile memory. The parameters are saved every 5 minutes and the memory capacity allows recording for more than a 100 day period. The oldest log entries are overwritten cyclically when storage is full.

The power supply unit has a separate space in the internal memory where it records the recorded battery temperature. The parameters are saved every 6 hours, which allows recording the temperature for a period of 5 years. Thanks to this extended registration period, the user can check the range of temperature changes and determine its impact on battery life.

The rated operating temperature of the batteries recommended by the majority of manufacturers is 25°C. Operation at higher temperatures results in significantly reduced battery life in such a way that the service life is reduced by half for each sustained temperature rise of 8°C above the nominal temperature. This means that the battery lifespan, when operated at 33°C, can be decreased by 50%!

The sample graph read from the DSO power supply is presented below.

Fig. 39. The view of the "Graph" tab.

To read the power supply event log, set the date range (start and end) from which the data will be downloaded, and then press the "Download" button. Data reading starts with the latest entries and progress is displayed in the bar above the graph. The read operation can be aborted at any time by pressing the "Abort" button.

The graph presents the following parameters:
- **Uaux** - Output voltage
- **Ubat** - Battery voltage
- **Ibat** - Output current drawn from the battery
- **R1** - Resistance of the first battery string
- **R2** - Resistance of the second battery string

The graph window is automatically scaled with respect to the minimum and maximum values in the vertical axis. In the horizontal axis, use the mouse wheel for manual scaling.

The program allows you to save data from the graphs for later analysis. By pressing the "Save to file" button, the data is saved in the "csv" format, the individual columns are separated with a semicolon. The saved files can be accessed by spreadsheets.

When importing the event log into a spreadsheet, you must select the "UTF-8" encoding method and separate the columns with a semicolon. Otherwise, the imported text may be incorrectly recognized.

7.6. History

The "History" tab allows you to read events recorded in the memory of the power supply. The available memory can store a maximum of 32768 events.

To read the power supply event history, set the date range (start and end) from which the data will be downloaded, and then press the "Download" button. Data reading starts with the latest entries and progress is displayed in the bar above the table. The read operation can be aborted at any time by pressing the "Abort" button.

It is possible to read the whole history of the power supply at once. To do that, press the "Download all" button.

Type	No.	Date and time	Event	Signals	Uaux [V]	Ubat [V]	Ibat [A]	Tbat [℃]	R1 [Ω]	R2 [Ω]
ℹ	536	19.07.2017, 10:05:53	I24 - Loged in, 192.168.192.135 (2)	0000110			1.8	27	none	none
ℹ	535	19.07.2017, 09:34:03	I24 - Loged in, 192.168.192.135 (2)	0000110			1.9	27	none	none
⚠	534	19.07.2017, 09:33:19	F01 - AC power fail	0001111			6.4	27	0.002	none
ℹ	533	19.07.2017, 09:05:31	I15 - AUXn voltage ok	1101111			0.0	27	0.002	none
⚠	532	19.07.2017, 09:05:29	F09 - AUXn low voltage	1001010			1.9	27	0.002	none
ℹ	531	19.07.2017, 09:05:19	I25 - System start, (1)	0000000	0.0	0.0	0.0	0	none	none
ℹ	530	19.07.2017, 08:36:10	I24 - Loged in, 192.168.84.91 (1)	0000110	25.1	25.2	1.8	27	none	none
⚠	529	19.07.2017, 08:16:42	F01 - AC power fail	0001111	27.2	27.2	1.9	27	0.002	none
ℹ	528	19.07.2017, 08:16:30	I06 - Battery temperature ok	1001010	27.3	27.3	1.2	27	0.002	none
⚠	527	19.07.2017, 08:16:27	F15 - High battery temperature	1101010	27.5	27.5	0.0	81	0.002	none
ℹ	526	18.07.2017, 11:47:09	I24 - Loged in, 192.168.84.91 (1)	1001111	27.3	27.3	0.0	25	0.002	none
ℹ	525	12.07.2017, 06:45:33	I24 - Loged in, 192.168.84.91 (1)	1001111	27.2	27.2	0.0	28	0.002	none
ℹ	524	13.06.2017, 13:54:27	I24 - Loged in, 192.168.84.91 (1)	1001111	27.3	27.4	0.0	25	0.002	none
ℹ	523	13.06.2017, 13:37:19	I25 - System start, (3)	0000000	0.0	0.0	0.0	0	none	none
ℹ	522	13.06.2017, 13:36:44	I26 - Firmware update	1001111	27.3	27.4	0.0	25	0.000	none
ℹ	521	13.06.2017, 13:36:38	I24 - Loged in, 192.168.84.91 (2)	1001111	27.3	27.4	0.0	25	0.000	none
ℹ	520	13.06.2017, 13:34:25	I24 - Loged in, 192.168.84.91 (1)	1001111	27.3	27.4	0.0	25	0.000	none
ℹ	519	13.06.2017, 13:34:01	I04 - Battery connected	1101111	27.4	27.3	0.0	24	none	none

AC - Off
LB - Off
EXTI - Off
EPS - Close
PSU - Close
APS - Close
ALARM - Close

Fig. 40. The "History" tab.

The event log is displayed in chronological order in the table. The table contains the information about the exact time of occurrence of a certain event, the error code, the description of the event type, electrical parameters, and the state of the individual technical outputs.

The history has two types of events that can be recognized by icon type:

ℹ Information about the system or return to the normal operation

⚠ Errors with information about failures.

The program allows you to filter events by content. After selecting the appropriate "Info" or "Errors" field and selecting the event code, the program will automatically filter the page displaying only the appropriate information.

The program allows you to save data from the graphs for later analysis. By pressing the "Save to file" button, the data is saved in the "csv" format, the individual columns are separated with a semicolon. The saved files can be accessed by spreadsheets.

When importing the event log into a spreadsheet, you must select the "UTF-8" encoding method and separate the columns with a semicolon. Otherwise, the imported text may be incorrectly recognized.

7.7. Update.

The power supply unit supports the software update function via a file downloaded at www.pulsar.pl.
To update the power supply software you must:

- Download the latest version of the file at the www.pulsar.pl
- Press the "Search" button in the browser and enter the name of a data file previously saved to the disk
- Press the "Save" button - the new program will be loaded into the power supply

CAUTION! Do not turn off the power supply until updating the software has been completed.

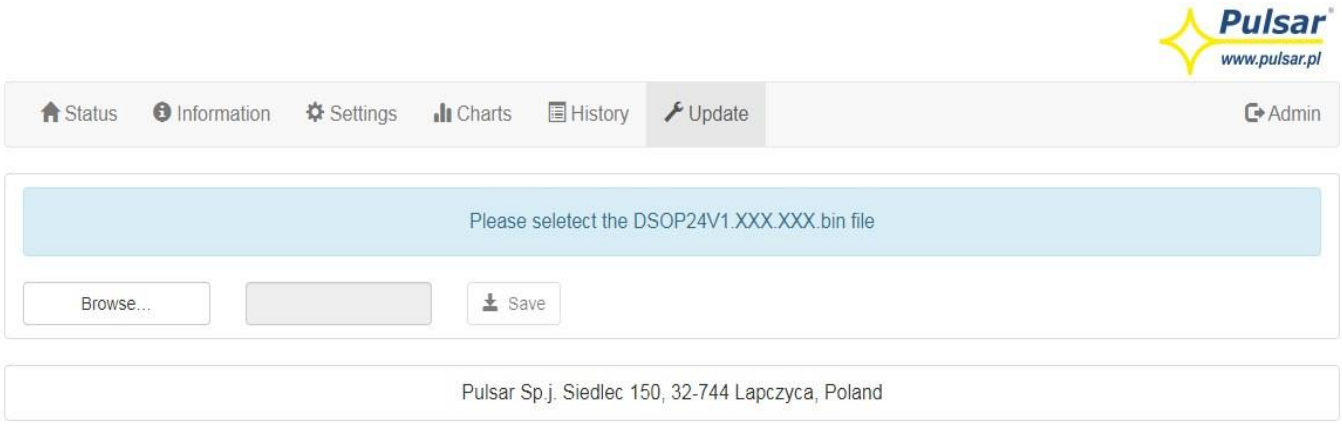


Fig.41. The "Update" tab.

8. The CONFI-DSO program for designers.

The CONFI-DSO program is designed for the proper and fast configuration of the DSO (voice alarm system) cabinet. The program has been designed with BOSCH; the main panel of the program is shown below.

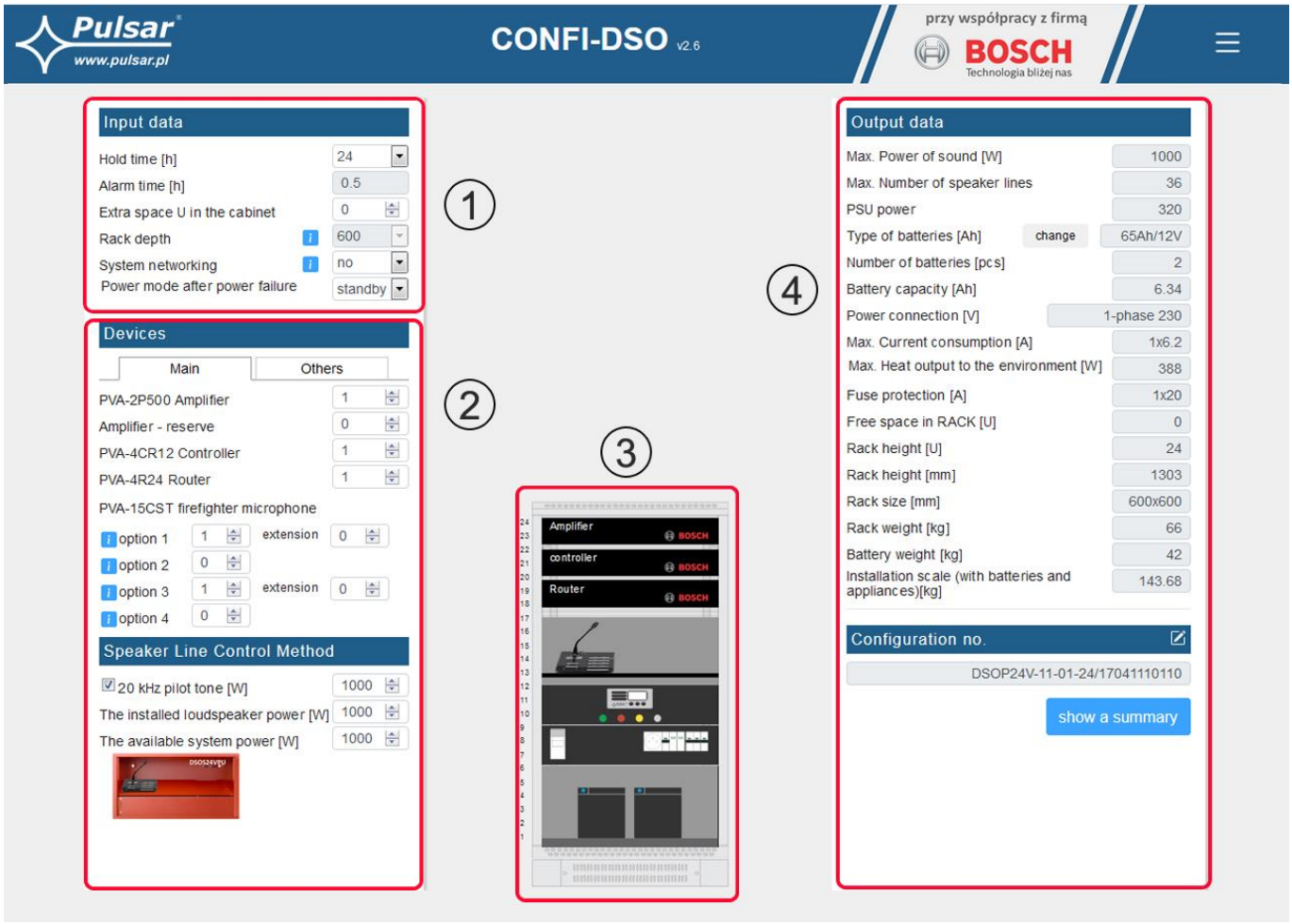


Fig. 42. The main panel of the CONFI-DSO program.

There are four main areas in the main panel.

Area 1 contains input data that needs to be configured according to the requirements of the proposed DSO. In this section you should indicate, among others, the required system back up time (6h, 24h, or 72h), additional space in the RACK cabinet, and power consumption mode of the system after power failure. It is also possible to manually change the cabinet depth from 600mm to 800mm (not applicable for the 24U height; these cabinets are available in 600mm version only).

The Area 2 includes a list of devices that can be installed in the DSO. The list includes two types of units.
The list includes two types of units.
The first type of units, the "Main" tab, includes sound system equipment of the PAVIRO system by BOSCH, e.g. the PVA-2P500 amplifier, PVA-4CR12 controller, PVA-4R24 router, and the PVA-15CST microphone with keypad extension. The program will calculate all parameters based on the mentioned units even though they are not included in the DSOP24V power supply system. Enter the number of devices to be installed in the corresponding fields.
Select the proper installation location in the "Firefighter's Microphone" field. There are 5 options available.
The differences between the variants result from the installation location of the firefighter's microphone and its distance from the DSO cabinet In the case of significant distance from the DSO cabinet, voltage drops on the power lines, preventing the firefighter's microphone from operating properly over a wide range of power supply voltage variations, may occur. To prevent this, you must provide power from an additional power supply.

The second type of devices, the "Other" tab, contains a list of additional equipment (with some exceptions):
- End of Line (EOL) Supervision Board – the number of boards to be added to the order.
- Ventilation panel with a thermostat - the panel is automatically added to each configuration. It is possible to remove it in the case of small systems (cabinets with a height of 24U only).

In this section, you also need to configure the loudspeaker line control method - 20 kHz pilot tone when the field is selected or the impedance method when the field remains unchecked.
The parameters of the system are automatically updated by the system when new devices are added. This results in an optimum configuration of the DSO power supply system.

Area 3 provides a graphical representation of the power system cabinet based on the current configuration. When adding or removing system devices, the cabinet drawing is updated on a regular basis. The cabinet height is selected from the range 24U - 50U.

Area 4 contains output data that summarize the currently configured system of the DSO cabinet. The data provides information, among others, on the maximum sound power, the number of loudspeaker lines, the weight of the system, or the power consumed from the power grid. The program also provides information about the maximum heat output to the environment from the cabinet, taking into account all installed devices. This parameter can be useful when designing a cooling system for a room in which a DSO cabinet will be installed.

In this step it is possible to change the battery capacity to be greater than that calculated by the program.

The CONFIG-DSO always selects the minimum DSO power supply configuration.
If you manually change the battery capacity, some parameters will be updated in the output area (fig. 41).
If you re-enter any change in the input area then the program will re-calculate the minimum DSO power supply configuration. Thus the previously introduced change of battery capacity will not be taken into account. After each change, you need to manually re-enter the desired battery capacity.

Another important element in the output data area is a configuration code that automatically identifies the designed DSO by an automatically generated string of digits.

9. Technical parameters.

Parameters of the DSO system (Table 16).
Electrical parameters of the DSO (Table 17).
Safety of Use (Table 18).
Operation parameters (Table 19).

Table 16. Parameters of the DSO system.

Functional class: EN 12101-10:2007	A
230V/400V mains connection	Single-phase 230 V or 3-phase 3x230 V / 400 V [1)]
Surge protection	type 3 (D) according to the EN 61643-11 standard
Dimensions of the RACK cabibnets	24U(600x600), 36U(600x600), 42U(600x600, 600x800), 45U (600x600, 600x800), 50U (600x800)[1])
Maximum battery capacity	460Ah max. [1)]
The number of batteries	4 max [1)]
Battery type	Sealed Lead-Acid (SLA) batteries (AGM, gel)
The number of battery strings	1 or 2 [1)]
Status indication	Panel for optical and acoustic indication., 60dB/1m; compliant with the PN-EN54-16 standard [1)]
Cooling	Convection or forced cooling [1)]

[1)] Depending on the DSO configuration.

Table 17. Electrical parameters of the DSO.

Supply voltage:	176 ÷ 264 V AC
Current consumption	6A max. @230 V AC [1)]
Power supply frequency	50Hz
Power factor correction (PFC)	0,95
PSU power	1000 W max. [1)]
Efficiency	90% max
Output voltage	22,0 V÷ 28,8 V DC – buffer operation 20,0 V÷ 28,8 V DC – battery operation [2)]
Maximum output current (outputs): **- routers** **- controller**	 6x2,5 A 10,5 A
Output current Imax $_A$ = Imax $_B$ (routers + controller outputs)	10,6 A
The maximum output current of amplifiers OUT1…9	9x32,5 A [1) 3)]
The maximum resistance of the battery circuit during the calibration process	60mΩ
The maximum increase of the resistance of the battery circuit	60mΩ
Ripple voltage	150mV p-p max.
Current consumption by PSU systems during battery operation	500mA max. [1)]
Battery charging current	24 A max. [1)]
The number of battery strings	1 or 2 [1)]
The coefficient of temperature compensation of the battery voltage	-40mV/ ºC (-5ºC ÷ 40ºC)
Low battery voltage indication	Ubat < 23V, during battery operation
Short-circuit protection SCP	9xF30A – OUT1..OUT9 outputs, fast acting melting fuses, failure requires fuse replacement 3xF6,3A – „Router” outputs, fast acting melting fuses, failure requires fuse replacement F10A – „Controller” output, fast acting melting fuse, failure requires fuse replacement
Overload protection OLP	105÷130% of the PSU power, automatic return
Short-circuit protection in the battery circuit	2x100A max. [1)] – time-delay melting fuses, failure requires fuse

SCP	replacement
Under-voltage protection (UVP).	U<20V (± 2%) – disconnection (+BAT) of the batteries
Technical outputs: **- EPS; output indicating AC power failure** **- APS; output indicating battery failure** **- PSU; output indicating PSU failure** **- ALARM; output indicating collective failure**	- Type – relay
EXTi technical input	Normal operation (no failure): opened Failure- electrical contacts are closed
Ethernet communication	10Base-T/100Base-TX
Optical indication	- Output voltage readings - Output current readings - Resistance of the battery circuit readings - Mains supply voltage readings - Failure codes with history
Acoustic indication:	- Piezoelectric indicator ~75dB /0.3m
Fuses: **- OUT1...OUT9** **- ROUTER** **- CONTROLLER** **- BATTERY**	 F 30A / 250V/ 6,3x32mm F 6.3A / 250V/ 5x20mm F 10A / 250V/ 6,3x32mm T 100A [1] / 250V, 22x58mm
Mounting dimensions:	W=19”, H=2U

[1] Depending on the DSO configuration.
[2] Full range of operating temperatures, taking into account accelerated charging and discharged batteries during battery operation
[3] Permissible only during battery operation.

Table 18. Safety of Use.

Protection class EN 62368-1	I (first)
Protection grade EN 60529	IP30
Insulation electrical strength: - between the input (network) circuit and the output circuits of the PSU (I/P-O/P) - between the input circuit and PE protection circuit (I/P-FG) - between the 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, output, and protective circuit	 100 MΩ, 500V DC

Table 19. Operation parameters.

Environmental class EN 12101-10:2007	1
Operation temperature	-5ºC...+40ºC
Storage temperature	-25ºC...+60ºC
Relative humidity	20%...90%, no condensation
Sinusoidal vibrations during operation: 10 ÷ 50Hz 50 ÷ 150Hz	 0,1g 0,5g
Surges during operation	0,5J
Direct insolation	unacceptable
Vibrations and surges during transport	According to the PN-83/T-42106 standard

10. Installation.

10.1. Requirements.

The DSO should be mounted by a qualified installer, holding relevant permits and licenses (applicable and required for a given country) for 230 / 400 V AC and low-voltage installations. The installer should be trained in commissioning and operation of the power supply system of the DSO by the Pulsar company.

The electrical system shall follow valid standards and regulations. The DSO cabinet should be mounted in such a way to provide both front and rear access for service personnel. Always ensure a free, convection air flow around the cabinet.

As the power supply unit of the DSO cyclically runs a periodic battery test, during which the connection resistance is measured, special attention should be paid to the proper installation of the battery cables.

10.2. Installation procedure.

CAUTION!
Before installation, make sure that the voltage in the 230/400V power-supply circuit is cut off. Selection of installation cables should take account §187 of the Regulation of the Minister of Infrastructure on technical conditions to be met by buildings and their location, as amended on 12 March 2009.

1. The equipment should be installed in the appropriate compartments of the cabinet as described on the labels.
2. Make additional connections (using a PE protective conductor) between the equipment enclosures and PE plates.
3. Connect the 24 V power supply cables to the appropriate equipment (amplifiers, controller, and routers) as described in the cables.
4. Connect the technical outputs of the power supply to the DSO control panel when needed.
   - ALARM; technical output of collective failure of the PSU
   - EPS; technical output of AC power failure indication
   - PSU; technical output of power supply failure indication.
   - APS; technical output of battery failure indication
   - EXTI; technical input of collective failure
5. Remove the battery fuse cover and then remove fuses from the sockets. Insert the battery in the designated compartment of the enclosure. Connect the battery with the power supply board paying special attention to the correct polarity. The battery should be connected in series using the special connectors (included). Insert the fuses into the battery sockets, attach the circuits and install the protective cover.
6. Connect the temperature sensor plug by inserting the plug into the socket from the rear side of the power supply (Fig. 16). The sensor should be placed between the batteries to properly measure their temperature.
7. Connect the power cables (230 / 400 V AC) to the L1-L2-L3-N contacts of the power supply (or L-N in the case of a single-phase connection). Connect the ground wire to the terminal marked by the earth symbol PE. Use a five-core cable (or three-core cable for a single-phase connection) with a yellow and green PE protection wire to make the connection.

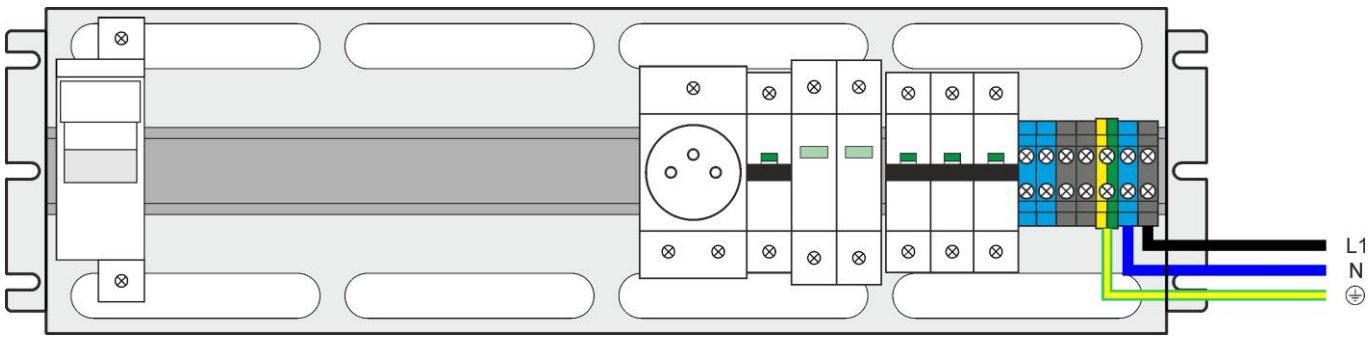


Fig. 46. Connection to the power system – a single-phase 230 V AC connection.

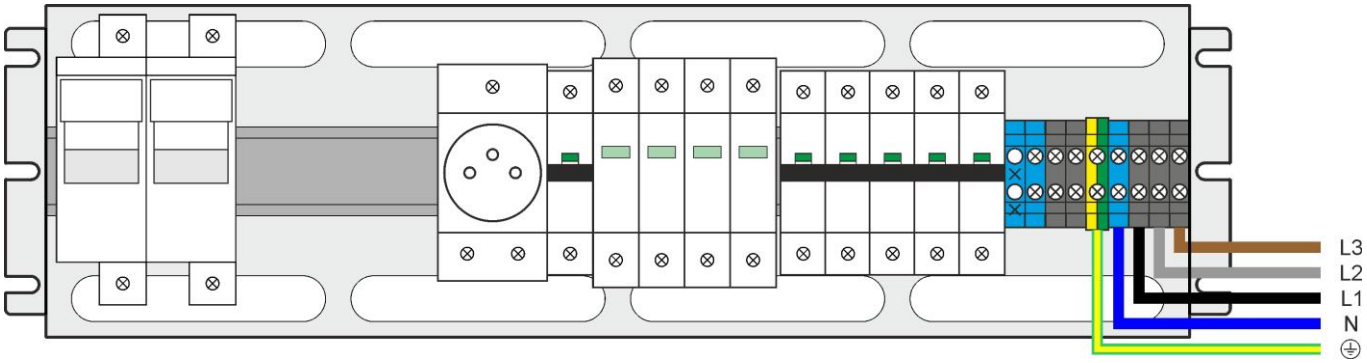


Fig.47. Connection to the power system – 3-phase 400 V AC connection.

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. 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.

8. Switch on the 230 / 400 V AC supply. The corresponding LEDs on the front panel of the power supply should be lit: green AC and AUX.
9. Perform the battery calibration procedure as described in section 6.2. After the calibration process, the power supply should not indicate any failures.
10. After the connection is completed, perform the system check procedure as described in section 10.3.

10.3. The procedure for checking the DSO.

1. Check the indication displayed on the front panel of the power supply unit:
   a) On the LED display (see section 5.3) the power supply should indicate a voltage in the range of 22 ÷ 28,8 V depending on the battery charge and ambient temperature.
   b) The 230 V AC LED should remain lit to indicate the presence of the supply voltage.
   c) The AUX LED should remain lit to indicate the presence of the output voltage.
2. Check the output voltage after 230 / 400 V AC power failure.
   a) Simulate the lack of 230 / 400 V AC mains voltage by disconnecting the main circuit breaker.
   b) The 230 V AC LED should go out.
   c) The AUX LED should remain lit to indicate the presence of the output voltage.
   If the indication panel is installed, the yellow indicator will light be lit and the alarm sound will be activated.
   d) The EPS and ALARM technical outputs will change their status into opposite after 10s / 1min / 10min / 30min, depending on the "EPS" parameter set in the power supply configuration menu (the default setting is 10s).
   e) Turn on the 230 / 400 V AC mains voltage again. Indication should return to the initial status within a few seconds.
3. Check whether the lack of continuity in the battery circuit is properly indicated.
   a) Disconnect one of the battery circuits (230 / 400 V AC mains supply) during normal operation of the power supply unit by disconnecting the fuse.
   b) Within 5 minutes the PSU will start signaling a failure in the battery circuit.
   c) The ALARM LED will start blinking.
   d) The APS and ALARM technical outputs will change status into opposite.
   If the indication panel is installed, the yellow indicator will light be lit and the alarm sound will be activated.
   e) Turn on the fuse in the battery circuit again.
   f) The power supply should return to normal operation, indicating the initial status, within 5 minutes after the battery test is completed.
   g) Repeat the a..f procedures for the second battery string.

11. Technical inspections and maintenance.

Technical inspections and maintenance can be performed after disconnecting the power supply of the DSO 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 the case of fuse replacement, use a replacement of the same parameters.

Technical inspections should be performed at least every 12 months (recommended every 6 months). During the technical maintenance, the DSO system verification procedure [10.3] and the battery test report [10.4] must be completed.

Re-tighten all screw connections on the receiver wires after 4 weeks from the installation of the power supply unit.

According to the guidelines of the Scientific and Research Centre for Fire Protection and VdS, batteries should be replaced after 4 years of use regardless of their condition.

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

In Poland, according to the European Union WEEE Directive, waste electrical and electronic equipment, marked with a crossed out wheeled bin symbol, should be disposed of separately from normal household waste. The user is obliged to throw the end-of-life equipment in a WEEE collection point. WEEE collection points are run by wholesale and retail sellers of this equipment, and municipal organizational units operating in the field of collecting municipal waste. The proper implementation of these obligations is particularly important when the waste equipment contains hazardous components which have a negative impact on the environment and human health.

CAUTION! The DSO uses sealed lead acid batteries (SLA). Used batteries must be disposed of in accordance with the applicable regulations.

The warranty conditions

The warranty conditions can be found at: www.pulsar.pl

SEE

THE WARRANTY CONDITIONS FOR SLA BATTERIES
- Additional arrangements

The presented warranty conditions for SLA batteries are valid in conjunction with General Warranty Terms of the PULSAR company.

1. The battery will not be considered defective if its capacity during the warranty period has not dropped to **80 [%]** of the rated capacity.
2. The warranty applies only to batteries designed for **buffer operation. Cyclic batteries are not covered by this warranty.**
3. The warranty period will be reduced by 50 [%] for each sustained temperature rise of 8 [° C] above nominal operating temperature of the battery of 25 [°C].
4. The PULSAR company **is not responsible for:**
   - Batteries with unreadable serial number;
   - Damages resulting from improper charging or installation;
   - Mechanical damages to the enclosure and polarity terminals (clamp caps) caused by the installation, commissioning, and operation of the batteries;
   - Damages caused by fire, high temperature (overheating), explosion, or freezing;
   - Damages caused by misuse or negligence;
   - Damages caused by force majeure.
5. The PULSAR company reserves the right to verify battery operating conditions by reading the operating history of the DSO power supply system. The data can be read remotely or locally by employees of the PULSAR company
6. In the case of unjustified claim, the claimant may be charged with the travel and manhour costs of a PULSAR employee incurred by the PULSAR company.
7. The warranty is valid only upon presentation of the invoice and delivering the battery subjected to complaint along with a description of the defect at the expense of the claimant.

Pulsar sp. j.
Siedlec 150, 32-744 Łapczyca, Poland
Phone (+48) 14-610-19-40, Fax. (+48) 14-610-19-50
Email: biuro@pulsar.pl, sales@pulsar.pl
http:// www.pulsar.pl, www.zasilacze.pl