



# Application

## PowerSecurity

EN\*

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**TABLE OF CONTENTS**

|  |           |
|--|-----------|
| <b>1. GENERAL DESCRIPTION.....</b>   | <b>3</b>  |
| <b>2. CONFIGURING THE CONNECTION.....</b>  | <b>4</b>  |
| 2.1 ETHERNET NETWORK COMMUNICATION. ....   | 5         |
| <b>3. APPLICATION INTERFACE SPECIFICATIONS.....</b>                                    | <b>6</b>  |
| 3.1 THE MENU BAR. ....   | 6         |
| 3.2 MANAGER WINDOW. ....   | 7         |
| 3.3 REMOTE DESKTOP WINDOW.....   | 7         |
| <b>4. WINDOW MONITORING THE PSBEN POWER SUPPLY PARAMETERS. ....</b>                    | <b>8</b>  |
| 4.1 THE „PREVIEW” TAB .....8   | 8         |
| 4.2 THE „DIAGRAMS” TAB .....9  | 9         |
| 4.3 THE „HISTORY” TAB.....10   | 10        |
| 4.3.1 <i>Reading the history of events of the power supply with LED display.</i> ..... | 10        |
| 4.3.2 <i>Reading the history of events of the power supply with LCD display.</i> ..... | 11        |
| 4.4 REMOTE BATTERY TEST.....12   | 12        |
| <b>5. WINDOW MONITORING THE EN54 POWER SUPPLY PARAMETERS.....</b>                      | <b>13</b> |
| 5.1 THE „PREVIEW” TAB .....13  | 13        |
| 5.2 THE „DIAGRAMS” TAB .....15   | 15        |
| 5.3 THE „HISTORY” TAB.....16   | 16        |
| 5.3.1 <i>Reading the history of events of the power supply with LED display.</i> ..... | 16        |
| 5.3.2 <i>Reading the history of events of the power supply with LCD display.</i> ..... | 17        |
| 5.4 REMOTE BATTERY TEST.....18   | 18        |
| <b>APPENDIX A – FAILURE CODES OF THE PSBEN 13,8 V POWER SUPPLY.....</b>                | <b>19</b> |
| <b>APPENDIX B – FAILURE CODES OF THE PSBEN 27,6 V POWER SUPPLY.....</b>                | <b>20</b> |
| <b>APPENDIX C – FAILURE CODES OF THE EN54 27,6 V POWER SUPPLY.....</b>                 | <b>21</b> |

## 1. General description

The PowerSecurity is a program which enables a remote monitoring of the parameters of power supplies of the PSBEN and EN54 series, which feature a communication interface. In addition, the program enables combining power supply units, previewing the PSU's status, reading the event log and diagrams of electrical parameters and remote battery test.

For proper operation of the software, a PC with Windows XP or newer is required.



The "PowerSecurity" program can be downloaded at <http://www.pulsar.pl/pliki/PowerSecurity.exe>

## 2. Configuring the connection.

In order to configure the connection between the PSU and the PowerSecurity program, choose the "New Power Supply" option from the "Power Supplies" menu.

The "Configuration of connection" window enables defining necessary parameters of the connection depending on the type of communication interface.



**Caution.**  
Full procedure of configuring the connection is included in the user manual of individual interfaces.

| PSU                                       | Description  |
|---|--|
| <b>Name</b>                               | <b>PSU's name</b> - The name that should be assigned individually to each PSU.     |
| <b>Address</b>                            | <b>1 ÷ 247</b> ;<br>The address of another PSU, depending on the interface type.   |
| <b>Refresh period of the preview [ms]</b> | <b>100 ÷ 60 000ms</b> ;<br>Refresh period of the parameters in the preview window. |

| MODBUS RTU – TCP/IP CONNECTION | Description  |
|--------------------------------|--|
| <b>Type</b>                    | <b>Modbus RTU – TCP/IP</b> - connection type, depending on the interface type. |
| <b>TCP Address</b>             | <b>e.g. 192.168.1.100</b> - TCP connection address.                            |
| <b>Port TCP</b>                | <b>e.g. 2101</b> - A port assigned to the TCP connection.                      |

| MODBUS RTU CONNECTION     | Description  |
|---------------------------|--|
| <b>Type</b>               | <b>Modbus RTU</b> - connection type, depending on the interface type.  |
| <b>Port</b>               | <b>AUTO</b> – automatic detection of the port to which the interface is connected.<br><b>COMx</b> – manual selection of the port to which the interface is connected, X denotes the port number. |
| <b>Transmission speed</b> | <b>AUTO</b> – Automatic detection of the communication speed.<br><b>9600 - 115,200</b> – manual selection of the communication speed.  |
| <b>Parity checking</b>    | <b>Parity</b> – checking the parity of the transmission.   |

| Timing parameters of the transmission              | Description  |
|--|--|
| <b>Response time [ms]</b>                          | <b>100 ÷ 60 000ms</b> – response time depending on the type of interface.                    |
| <b>The interval between the transmissions [ms]</b> | <b>0</b> - The minimal interval between transmissions.                                       |
| <b>The number of retransmissions</b>               | <b>3</b> - The number of retransmissions after which the program reports a connection error. |

Fig. 1. The connection configuration window - the Modbus RTU-TCP/IP connection.

Fig. 2. The connection configuration window – the Modbus RTU connection.

## 2.1 ETHERNET network communication.

Communication in the Ethernet network is possible due to the additional interfaces: Ethernet „INTE” and RS485-ETH „INTRE”, according to the IEEE802.3 standard.

The Ethernet „INTE” interface features full galvanic isolation and protection against surges. It should be mounted inside the enclosure of the PSU.

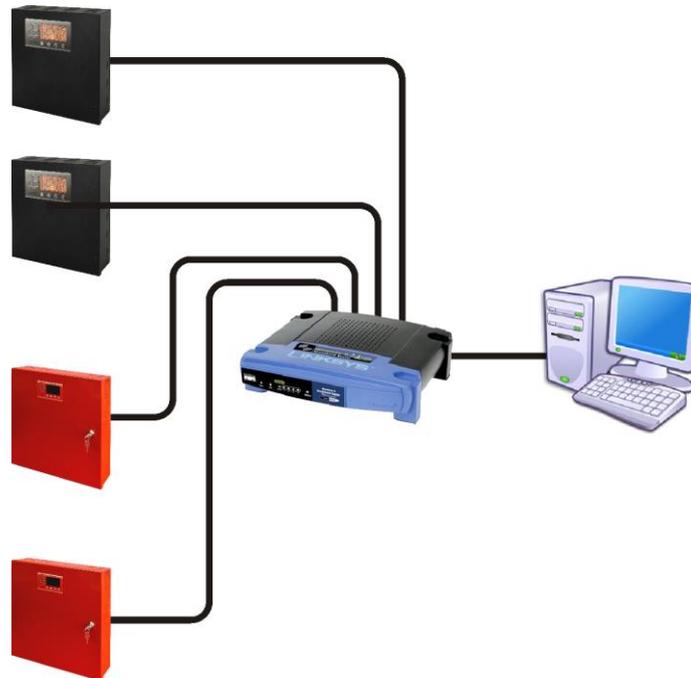


Fig. 3. Ethernet network communication using the Ethernet „INTE” interface.

The RS485-WiFi „INTRE” interface is a device used to convert signals between the RS485 bus and the Ethernet network. For proper operation, the unit requires an external power supply in the range of 10÷30 V DC e.g. drawn from a PSU of the PSBEN or EN54 series. The interface features full galvanic isolation and protection against surges. The unit is mounted in a hermetic enclosure protecting against adverse environmental conditions.

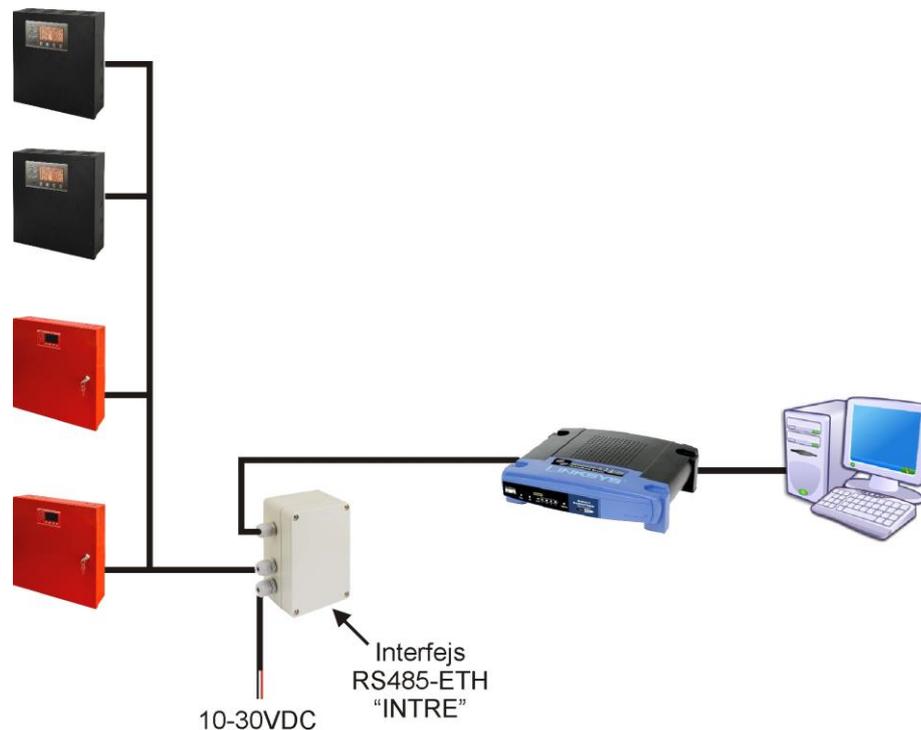


Fig. 4. Ethernet network communication using the RS485-Ethernet „INTRE” interface.

### 3. Application Interface Specifications.

The main interface of the PowerSecurity program is the standard window with the elements and the corresponding functions assigned in an intuitive way. The application allows to configure the connections, analyze the parameters and manage large numbers of power supplies.

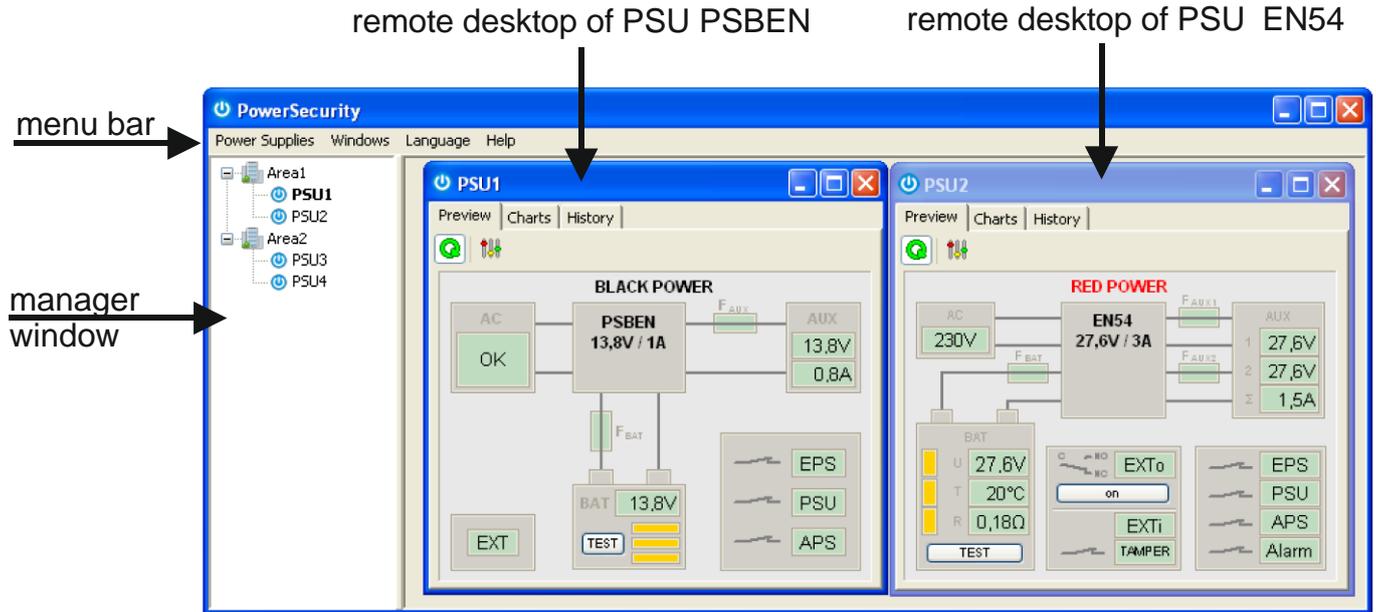


Fig. 5. The „Power security” window.

The main panel can be divided into smaller areas, depending on the number of monitored power supplies.

The program includes a manager mode, which allows combining power supplies for easier analysis and orientation regarding the assignment to the selected areas.

The application allows both the visualization and analysis of the received data. Exceeding the permissible parameters is indicated by highlighting in red the appropriate area or by flashing warning light. The individual tabs allow to show the power supply parameters on the graph and to read the history of events, along with information about the current state of technical outputs and electrical parameters.

#### 3.1 The MENU bar.

The tabs on the menu bar allow changing the interface language, saving and reading the current configuration and the management of open windows.

| The „Power Supplies” Menu |                                 |
|---------------------------|---------------------------------|
| <b>New Power Supply</b>   | Adding a new power supply       |
| <b>Load settings</b>      | Load saved settings from a file |
| <b>Save settings</b>      | Save all settings to a file     |
| <b>Exit</b>               | Exit the program                |



| The „Windows” Menu |  |
|--------------------|--|
| <b>Horizontal</b>  | Horizontal alignment of windows                                |
| <b>Vertical</b>    | Vertical alignment of windows                                  |
| <b>Align</b>       | Alignment of windows on the space available in the main window |



|                     |                             |
|---------------------|-----------------------------|
| The „Language” Menu | Allows to choose a language |
|---------------------|-----------------------------|



### 3.2 Manager window.

The manager window allows to combine the monitored power supplies, giving greater control in case of more complex systems.

During normal operation of the system where all of the connected power supplies are working correctly and do not signal any failures, the names of power supplies are displayed in black (see picture below – Power Supply 1).

If the connection with the power supply has been intentionally disconnected, the power supply is displayed in gray, indicating that the connection with the power supply is disabled (see figure below - Power Supply 3).

In the case of failure of power supply while monitoring the system, the name and the group of a given power supply unit will be highlighted in red (see picture below - Power Supply 2).



Fig. 6. Status indication of the monitored power supplies.

### 3.3 Remote desktop window.

Remote desktop window of the power supplies displays the panels of the monitored power supplies. Depending on the type of power supply (power supplies of the PSBEN or EN54 series), the program opens the desktop, automatically choosing its appearance and displayed parameters.

The position of the remote desktop window can be set via the "Windows" menu bar.

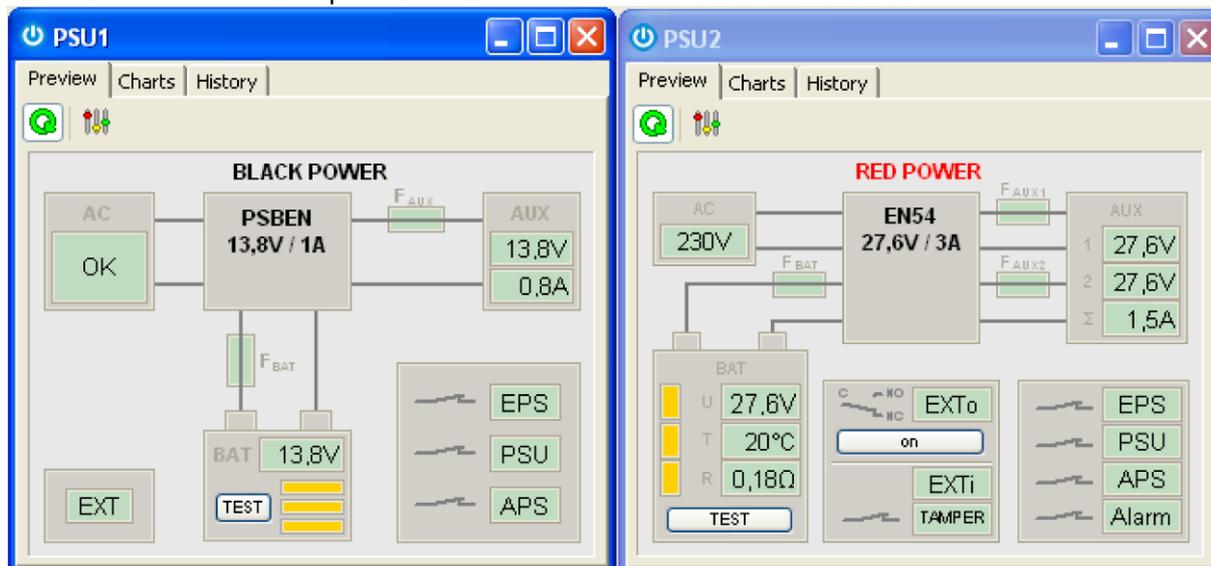


Fig. 7. Remote desktop windows of the power supplies: PSBEN (left), EN54 (right),

### 4. Window monitoring the PSBEN power supply parameters.

The window monitoring the PSU parameters appears after configuring a new connection or after loading the previously saved configuration. The window contains the title bar with the name of the connected PSU and the menu bar divided into three tabs: preview, charts and history.

#### 4.1 The „Preview” tab

After loading the connection configuration, the "Preview" tab will be displayed. Press the  icon in the upper left corner to connect the power supply. Once the connection is established, the current parameters of the power supply, automatically updated according to the refresh cycle set during configuration, will be displayed.

Pressing the  icon enables opening the connection configuration window and changing certain communication parameters. If it is necessary to edit the parameters that are not available from this level, close the current connection and open a new one ("New power supply" from the main window).

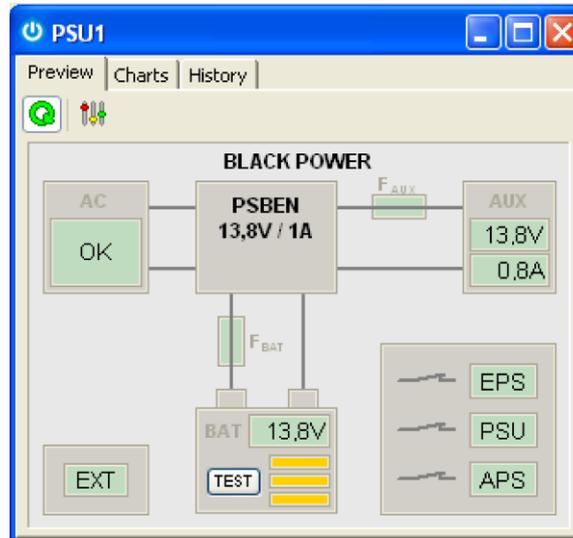
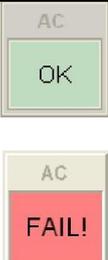
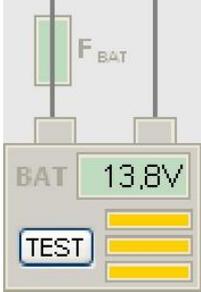
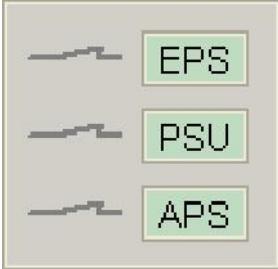
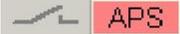


Fig. 8. The „Preview” tab of the PSBEN power supply.

Graphically, the tab of the parameters preview is divided into sections, which symbolically represent the most important components of the power system

The electrical parameters at the AUX output (voltage and current) and the status of the 230 V mains supply are monitored. What is more, the battery block shows the actual voltage and the battery charging level. The TEST button performs a remote battery test at any time. The graphic symbols of the technical outputs of power supply are located in the lower right corner. In case of failures, their contacts switch from closed to open position and the backlight changes to red. The EXT window located in the lower left corner indicates the status of the input of collective failure – in case of the input activation its backlight changes into red.

|   |   |
|---|---|
|  | <p><b>Mains supply status:</b></p> <p>230 V mains supply ON: OK.</p> <p>No 230 V mains supply</p>   |
|  | <p><b>Electrical parameters at the AUX output of the PSU:</b></p> <ul style="list-style-type: none"> <li>- output voltage [V]</li> <li>- output current [A]</li> <li>- output fuse status</li> </ul> <p> In case of the fuse activation, the symbol changes into red and flashes</p> |

|  |   |
|--|---|
|   | <p><b>Information window with the PSU type</b></p>  |
|   | <p><b>Current battery status:</b></p> <ul style="list-style-type: none"> <li>- battery voltage [V]</li> <li>- charging level</li> <li>- TEST; performing battery test (see section 4.4)</li> <li>- battery fuse status</li> </ul>  In case of the fuse activation, the symbol changes to red and flashes.  |
|   | <p><b>Input of collective failure EXT IN status.</b><br/>In case of the input activation, its backlight changes into red.</p>   |
|  | <p><b>Status of the technical outputs of the PSU.</b></p> <p><b>EPS</b> - AC power ON indication<br/>             open, red backlight                      = AC power failure<br/>             closed, green backlight                 = AC power ON:OK.</p> <p><b>PSU</b> – PSU failure indication<br/>             open, red backlight                      = failure<br/>             closed, green backlight                 = PSU status OK.</p> <p><b>APS</b> – battery failure indication<br/>             open, red backlight                      = battery failure<br/>             closed, green backlight                 = battery OK.</p>  Failure example, the output is open and highlighted in red. |

### 4.2 The „Diagrams” tab

The "Diagrams" tab enables reading the history of the parameters (current, voltage) stored in the internal memory of the PSU and reading the values from the charts. The "Diagrams" tab is available only for power supplies with LCD display.

During normal operation, the PSU records the voltage and current values at the AUX output circuit and saves them in the internal nonvolatile memory. Recording is performed at 5 minute intervals and the memory capacity allows for about 6100 entries. The data is stored in the circular buffer: when the memory is full, the oldest entries are overwritten by the new ones.

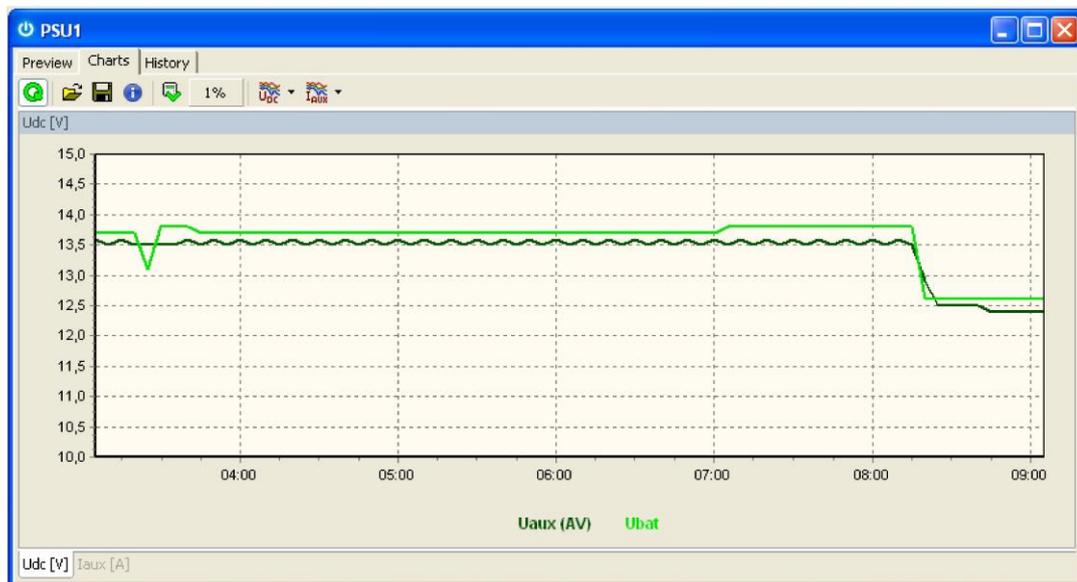


Fig. 9. The „Diagrams” tab.

To read the internal memory of the power supply, press the  button in the upper left corner. Depending on the amount of data recorded, the reading can take from a few seconds up to several minutes. The reading starts from the most recent entries and its progress is displayed as a percentage value. The reading can be stopped at any time by pressing the  button.

The diagram presents the following parameters:

- **Uaux** - output voltage (mean value within 5 minutes)
- **Uaux min** - minimum output voltage
- **Uaux max** - maximum output voltage
- **Ubat** - battery voltage (mean value within 5 minutes)
- **Iaux** - output current (mean value within 5 minutes)
- **Iaux max** - maximum output current
- **Iaux min** - minimum output current

The chart's color corresponds to the color of the label located below.

To indicate whether the individual minimum, maximum or average values should be visible on the diagram, use the toolbar icons, e.g. .

The diagram window can be scaled by pressing the left mouse button and selecting the area to be enlarged. To enlarge the selected diagram, press the mouse button and move the mouse from left to right. To return to normal scale, move the mouse from right to left.

The program enables storing the read data for further analysis. Press the  button to save the data in .csv or .dat format, allowing reloading and displaying data in a chart window.

The information about the type of power supply, its position in the manager list and the communication address can be obtained by pressing the  button. This information is particularly useful when importing a file from another PSU.

### 4.3 The „History” tab

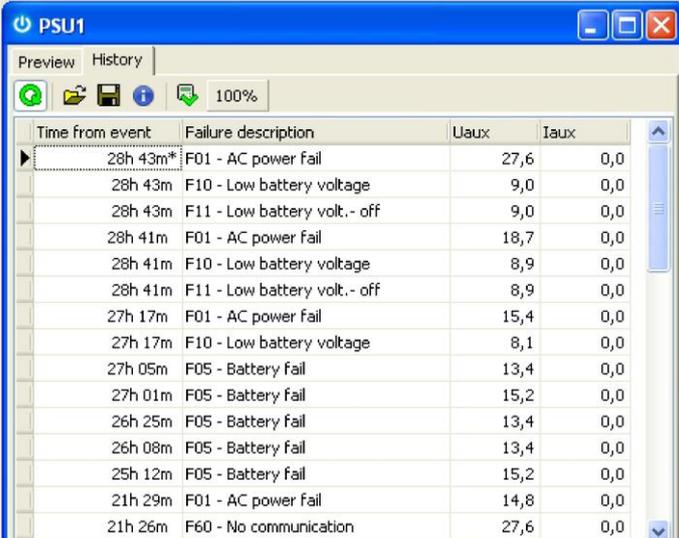
The „History” tab enables reading the history of events stored in the memory of the PSU in case of any incorrect parameters during operation.

There are two history windows available, depending on the type of power supply:

- The power supplies with seven-segment LED can display the history of the last 30 events.
- The power supplies with LCD displays are fitted with an additional memory system that allows storing over 2000 events containing more detailed information about the status of the power supply.

#### 4.3.1 Reading the history of events of the power supply with LED display.

To read the history of events of the power supply with LED display press the  button. The reading starts from the most recent entries. The reading can be stopped at any time by pressing the  button.



| Time from event | Failure description           | Uaux | Iaux |
|-----------------|-------------------------------|------|------|
| 28h 43m*        | F01 - AC power fail           | 27,6 | 0,0  |
| 28h 43m         | F10 - Low battery voltage     | 9,0  | 0,0  |
| 28h 43m         | F11 - Low battery volt. - off | 9,0  | 0,0  |
| 28h 41m         | F01 - AC power fail           | 18,7 | 0,0  |
| 28h 41m         | F10 - Low battery voltage     | 8,9  | 0,0  |
| 28h 41m         | F11 - Low battery volt. - off | 8,9  | 0,0  |
| 27h 17m         | F01 - AC power fail           | 15,4 | 0,0  |
| 27h 17m         | F10 - Low battery voltage     | 8,1  | 0,0  |
| 27h 05m         | F05 - Battery fail            | 13,4 | 0,0  |
| 27h 01m         | F05 - Battery fail            | 15,2 | 0,0  |
| 26h 25m         | F05 - Battery fail            | 13,4 | 0,0  |
| 26h 08m         | F05 - Battery fail            | 13,4 | 0,0  |
| 25h 12m         | F05 - Battery fail            | 15,2 | 0,0  |
| 21h 29m         | F01 - AC power fail           | 14,8 | 0,0  |
| 21h 26m         | F60 - No communication        | 27,6 | 0,0  |

Fig. 10. The „History” tab.

The table of the history of events of the power supply includes information about:

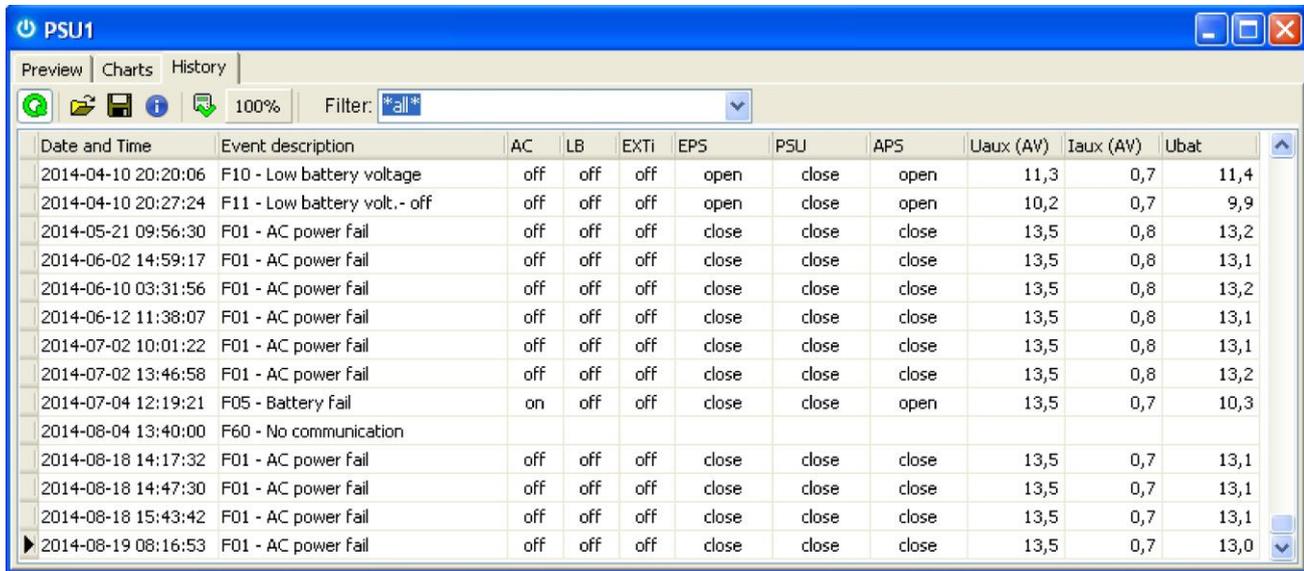
- The time elapsed since the event – the time that has elapsed since the occurrence of the event. For example 4h 54m means that the event occurred 4 hours and 54 minutes ago.  
In case of power loss (no 230 V mains supply) during the PSU operation while the battery is not connected or fully discharged, the information about the time until the next switch of the power supply is lost. In such a case, an asterisk symbol appears next to the time display, e.g. 4h 53m \*, informing about the situation.
- Event description – event code and its description. Appendixes A, B and C at the end of the manual summarize all the failure and event codes that may occur during the power supply operation. The individual codes are accompanied by appropriate optical indication on the panel, acoustic indication and activation of the dedicated technical output.
- Uaux, Iaux – output voltage and output current saved in the memory at the time of a given event.

The program enables storing the read data for further analysis. Press the  button to save the data in .csv or .dat format, allowing reloading and displaying data in a chart window.

The information about the type of power supply, its position in the manager list and the communication address can be obtained by pressing the  button. This information is particularly useful when importing a file from another PSU.

### 4.3.2 Reading the history of events of the power supply with LCD display.

To read the history of events of the power supply with LCD display press the  button. The reading starts from the most recent entries. The reading can be stopped at any time by pressing the  button.



| Date and Time       | Event description             | AC  | LB  | EXTi | EPS   | PSU   | APS   | Uaux (AV) | Iaux (AV) | Ubat |
|---------------------|-------------------------------|-----|-----|------|-------|-------|-------|-----------|-----------|------|
| 2014-04-10 20:20:06 | F10 - Low battery voltage     | off | off | off  | open  | close | open  | 11,3      | 0,7       | 11,4 |
| 2014-04-10 20:27:24 | F11 - Low battery volt. - off | off | off | off  | open  | close | open  | 10,2      | 0,7       | 9,9  |
| 2014-05-21 09:56:30 | F01 - AC power fail           | off | off | off  | close | close | close | 13,5      | 0,8       | 13,2 |
| 2014-06-02 14:59:17 | F01 - AC power fail           | off | off | off  | close | close | close | 13,5      | 0,8       | 13,1 |
| 2014-06-10 03:31:56 | F01 - AC power fail           | off | off | off  | close | close | close | 13,5      | 0,8       | 13,2 |
| 2014-06-12 11:38:07 | F01 - AC power fail           | off | off | off  | close | close | close | 13,5      | 0,8       | 13,1 |
| 2014-07-02 10:01:22 | F01 - AC power fail           | off | off | off  | close | close | close | 13,5      | 0,8       | 13,1 |
| 2014-07-02 13:46:58 | F01 - AC power fail           | off | off | off  | close | close | close | 13,5      | 0,8       | 13,2 |
| 2014-07-04 12:19:21 | F05 - Battery fail            | on  | off | off  | close | close | open  | 13,5      | 0,7       | 10,3 |
| 2014-08-04 13:40:00 | F60 - No communication        |     |     |      |       |       |       |           |           |      |
| 2014-08-18 14:17:32 | F01 - AC power fail           | off | off | off  | close | close | close | 13,5      | 0,7       | 13,1 |
| 2014-08-18 14:47:30 | F01 - AC power fail           | off | off | off  | close | close | close | 13,5      | 0,7       | 13,1 |
| 2014-08-18 15:43:42 | F01 - AC power fail           | off | off | off  | close | close | close | 13,5      | 0,7       | 13,1 |
| 2014-08-19 08:16:53 | F01 - AC power fail           | off | off | off  | close | close | close | 13,5      | 0,7       | 13,0 |

Fig. 11. The „History” tab.

The table of the history of events of the power supply includes information about:

- Time and date – date and time of the event
- Event description – event code and its description. Appendixes A, B, and C at the end of the manual summarize all the failure and event codes that may occur during the power supply operation. The individual codes are accompanied by appropriate optical indication on the panel, acoustic indication and activation of the dedicated technical output.
- AC – AC 230 V power indication:  
ON = AC power on  
OFF = AC power off
- LB – battery charging indication  
ON = battery charging  
OFF = no charging, battery fully charged
- EXTi – status of the technical input  
ON = input activated  
OFF = input not activated

- EPS – technical output indicating AC power loss
  - open = AC power loss
  - closed = AC power - OK.
- PSU – technical output indicating PSU failure
  - open = failure
  - closed = PSU operation - OK.
- APS – technical output indicating battery failure
  - open = battery failure
  - closed = battery OK.
- Uaux (avg)– output voltage, mean value
- Iaux (avg) output current, mean value
- Ubat – battery voltage

Use the “Filter” menu on the toolbar to filter the displayed events by the selected event code.

The program enables storing the read data for further analysis. Press the  button to save the data in .csv or .dat format, allowing reloading and displaying data in a chart window.

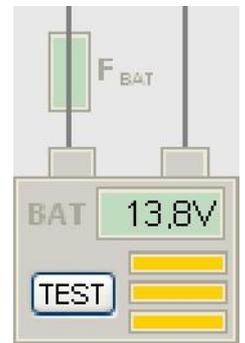
The information about the type of power supply, its position in the manager list and the communication address can be obtained by pressing the  button. This information is particularly useful when importing a file from another PSU.

#### 4.4 Remote battery test

In the „Preview” tab, use the „TEST” button on the battery icon to perform the remote battery test.

After pressing the button, the battery test command is sent to the power supply. If the battery is OK, it will be indicated by the “Battery OK” message once the test is completed. If the battery is discharged or worn out, it will be indicated by the “Battery failure” message.

The battery test will not be performed if the PSU is not configured to operate without battery.



### 5. Window monitoring the EN54 power supply parameters.

The window monitoring the PSU parameters appears after configuring a new connection or after loading the previously saved configuration. The window contains the title bar with the name of the connected PSU and the menu bar divided into three tabs: preview, charts and history.

#### 5.1 The „Preview” tab

After loading the connection configuration, the "Preview" tab will be displayed. Press the  icon in the upper left corner to connect the power supply. Once the connection is established, the current parameters of the power supply, automatically updated according to the refresh cycle set during configuration, will be displayed.

Pressing the  icon enables opening the connection configuration window and changing certain communication parameters. If it is necessary to edit the parameters that are not available from this level, close the current connection and open a new one ("New power supply" from the main window).

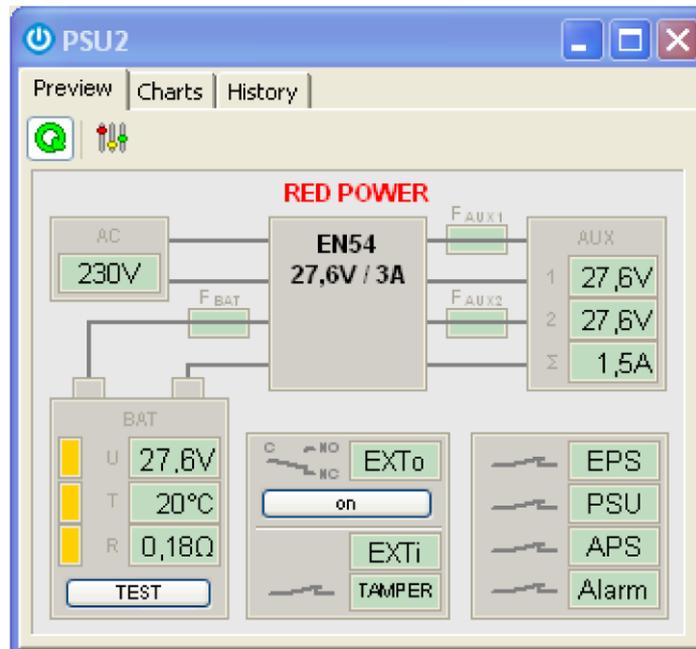
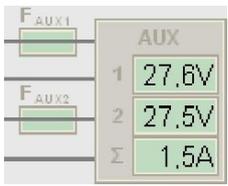
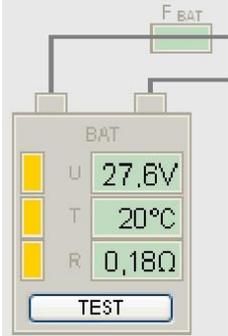
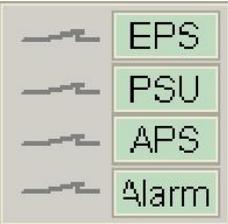


Fig. 12. The „Preview” tab of the EN54 power supply.

Graphically, the tab of the parameters preview is divided into sections, which symbolically represent the most important components of the power system.

The electrical parameters at the AUX1 and AUX2 outputs (output voltages and total current), the status of the 230 V mains supply (ON/OFF) and the voltage value are monitored. What is more, the battery block shows the actual voltage, battery charging level and the internal resistance of the battery circuit. The TEST button performs a remote battery test at any time. The graphic symbols of the technical outputs of power supply are located in the lower right corner. In case of failures, their contacts switch from closed to open position and the backlight changes to red. The EXTi window located in the central part indicates the status of the input of collective failure – in case of the input activation its backlight changes into red. The EXT0 window indicates the status of the controlled relay output - if the relay is activated, it changes to red. The TAMPER window indicates the status of the tamper input – in case of open circuit (enclosure opening) its backlight changes into red.

|   |  |
|---|--|
|  | <p><b>Mains supply status (mains supply value)</b><br/> 230 V mains supply:<br/> - green backlight if the voltage is in the range between 230 V -15% - +10%<br/> - blue backlight if the voltage is below 230 V – 15%<br/> - red backlight if the voltage is over 230 V +10%</p> |
|  | <p>No 230 V mains supply</p>   |

|   |   |                     |                    |                         |                   |                     |           |                         |                  |                     |                   |                         |               |
|---|---|---------------------|--------------------|-------------------------|-------------------|---------------------|-----------|-------------------------|------------------|---------------------|-------------------|-------------------------|---------------|
|    | <p><b>Electrical parameters at the AUX outputs of the PSU:</b></p> <ul style="list-style-type: none"> <li>- output voltage at the AUX1 output [V]</li> <li>- output voltage at the AUX2 output [V]</li> <li>- total output current</li> <li>- the fuse status at the AUX1 output</li> <li>- the fuse status at the AUX2 output</li> </ul> <p> In case of fuse activation, the symbol changes to red and flashes.</p>   |                     |                    |                         |                   |                     |           |                         |                  |                     |                   |                         |               |
|    | <p><b>Information window with the PSU type</b></p>  |                     |                    |                         |                   |                     |           |                         |                  |                     |                   |                         |               |
|    | <p><b>Current battery status:</b></p> <ul style="list-style-type: none"> <li>- battery voltage [V]</li> <li>- charging level</li> <li>- TEST: performing battery test (see section 5.4)</li> <li>- battery fuse status</li> <li>- battery temperature</li> <li>- resistance of the battery circuit</li> </ul> <p> In case of fuse activation, the symbol changes to red and flashes.</p>   |                     |                    |                         |                   |                     |           |                         |                  |                     |                   |                         |               |
|   | <p><b>EXTo</b> - controlled relay output EXTo status.<br/>its backlight changes into red and the contacts change their position (C closed with NO)</p> <p><b>On</b> – the start button of the controlled relay output EXTo.</p> <p><b>EXTi</b> – input of the collective failure EXTi status.<br/>In case of the input activation, its backlight changes into red.</p> <p><b>TAMPER</b> – TAMPER input status.<br/>In case of the input activation, its backlight changes into red and the contacts change their position (opening).</p>  |                     |                    |                         |                   |                     |           |                         |                  |                     |                   |                         |               |
|  | <p><b>Status of the technical outputs of the PSU.</b></p> <p><b>EPS</b> - AC power ON indication</p> <table border="0"> <tr> <td>open, red backlight</td> <td>= AC power failure</td> </tr> <tr> <td>closed, green backlight</td> <td>= AC power ON:OK.</td> </tr> </table> <p><b>PSU</b> – PSU failure indication</p> <table border="0"> <tr> <td>open, red backlight</td> <td>= failure</td> </tr> <tr> <td>closed, green backlight</td> <td>= PSU status OK.</td> </tr> </table> <p><b>APS</b> – battery failure indication</p> <table border="0"> <tr> <td>open, red backlight</td> <td>= battery failure</td> </tr> <tr> <td>closed, green backlight</td> <td>= battery OK.</td> </tr> </table> <p><b>ALARM</b> – collective failure indication</p> <p> Fault example, the output is open and highlighted in red.</p> | open, red backlight | = AC power failure | closed, green backlight | = AC power ON:OK. | open, red backlight | = failure | closed, green backlight | = PSU status OK. | open, red backlight | = battery failure | closed, green backlight | = battery OK. |
| open, red backlight   | = AC power failure  |                     |                    |                         |                   |                     |           |                         |                  |                     |                   |                         |               |
| closed, green backlight   | = AC power ON:OK.   |                     |                    |                         |                   |                     |           |                         |                  |                     |                   |                         |               |
| open, red backlight   | = failure   |                     |                    |                         |                   |                     |           |                         |                  |                     |                   |                         |               |
| closed, green backlight   | = PSU status OK.  |                     |                    |                         |                   |                     |           |                         |                  |                     |                   |                         |               |
| open, red backlight   | = battery failure   |                     |                    |                         |                   |                     |           |                         |                  |                     |                   |                         |               |
| closed, green backlight   | = battery OK.   |                     |                    |                         |                   |                     |           |                         |                  |                     |                   |                         |               |

## 5.2 The „Diagrams” tab

The "Diagrams" tab enables reading the history of the parameters (current, voltage) stored in the internal memory of the PSU and reading the values from the charts. The "Diagrams" tab is available only for power supplies with LCD display.

During normal operation, the PSU records the voltage and current values at the AUX output circuit and saves them in the internal nonvolatile memory. Recording is performed at 5 minute intervals and the memory capacity allows for about 6100 entries. The data is stored in the circular buffer: when the memory is full, the oldest entries are overwritten by the new ones.



Fig. 13. The „Diagrams” tab.

To read the internal memory of the power supply, press the  button in the upper left corner. Depending on the amount of data recorded, the reading can take from a few seconds up to several minutes. The reading starts from the most recent entries and its progress is displayed as a percentage value. The reading can be stopped at any time by pressing the  button.

The diagram presents the following parameters:

- **Uaux1 avg** - AUX1 output voltage (mean value within 5 minutes)
- **Uaux1 min** - minimum output voltage at the AUX1
- **Uaux1 max** - maximum output voltage at the AUX1
  
- **Uaux2 avg** - AUX2 output voltage (mean value within 5 minutes)
- **Uaux2 min** - minimum output voltage at the AUX2
- **Uaux2 max** - maximum output voltage at the AUX2
  
- **Uac avg** - mains supply (mean value within 5 minutes)
- **Uac min** - minimum mains supply
- **Uac max** - maximum mains supply
  
- **Ubat** - battery voltage (mean value within 5 minutes)
- **Ubat min** - minimum battery voltage
- **Ubat max** - maximum battery voltage
  
- **Iaux** - total output current (mean value within 5 minutes)
- **Iaux max** - maximum total output current
- **Iaux min** - minimum total output current
  
- **Tbat** - battery temperature
- **Rbat** - resistance of the battery circuit

The chart's color corresponds to the color of the label located below.

To indicate whether the individual minimum, maximum or average values should be visible on the diagram, use the toolbar icons, e.g. .

The diagram window can be scaled by pressing the left mouse button and selecting the area to be enlarged. To enlarge the selected diagram, press the mouse button and move the mouse from left to right. To return to normal scale, move the mouse from right to left.

The program enables storing the read data for further analysis. Press the  button to save the data in .csv or .dat format, allowing reloading and displaying data in a chart window.

The information about the type of power supply, its position in the manager list and the communication address can be obtained by pressing the  button. This information is particularly useful when importing a file from another PSU.

### 5.3 The „History” tab

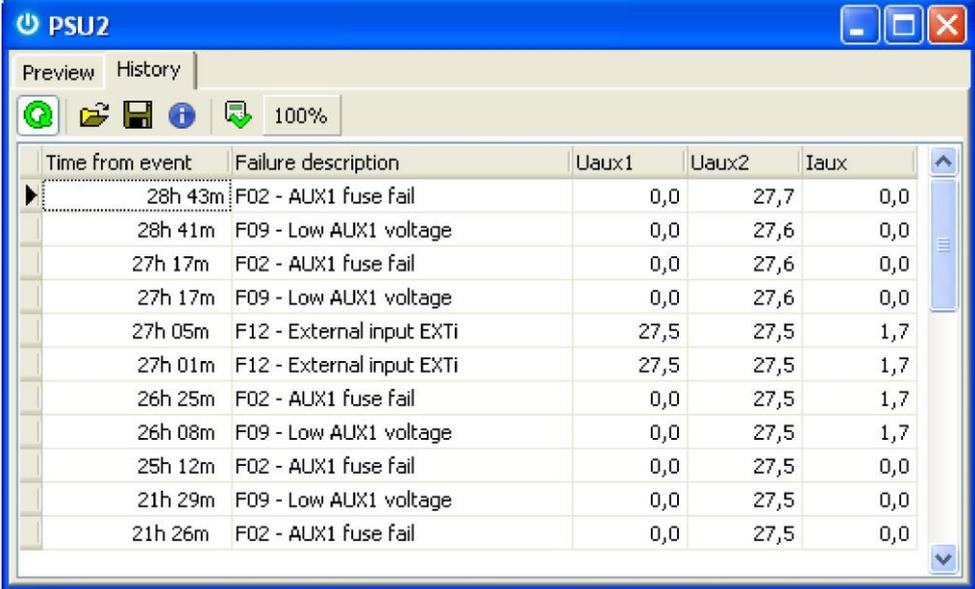
The „History” tab enables reading the history of events stored in the memory of the PSU in case of any incorrect parameters during operation.

There are two history windows available, depending on the type of power supply:

- The power supplies with seven-segment LED can display the history of the last 30 events.
- The power supplies with LCD displays are fitted with an additional memory system that allows storing over 2000 events containing more detailed information about the status of the power supply.

#### 5.3.1 Reading the history of events of the power supply with LED display.

To read the history of events of the power supply with LED display press the  button. The reading starts from the most recent entries. The reading can be stopped at any time by pressing the  button.



| Time from event | Failure description       | Uaux1 | Uaux2 | Iaux |
|-----------------|---------------------------|-------|-------|------|
| 28h 43m         | F02 - AUX1 fuse fail      | 0,0   | 27,7  | 0,0  |
| 28h 41m         | F09 - Low AUX1 voltage    | 0,0   | 27,6  | 0,0  |
| 27h 17m         | F02 - AUX1 fuse fail      | 0,0   | 27,6  | 0,0  |
| 27h 17m         | F09 - Low AUX1 voltage    | 0,0   | 27,6  | 0,0  |
| 27h 05m         | F12 - External input EXTi | 27,5  | 27,5  | 1,7  |
| 27h 01m         | F12 - External input EXTi | 27,5  | 27,5  | 1,7  |
| 26h 25m         | F02 - AUX1 fuse fail      | 0,0   | 27,5  | 1,7  |
| 26h 08m         | F09 - Low AUX1 voltage    | 0,0   | 27,5  | 1,7  |
| 25h 12m         | F02 - AUX1 fuse fail      | 0,0   | 27,5  | 0,0  |
| 21h 29m         | F09 - Low AUX1 voltage    | 0,0   | 27,5  | 0,0  |
| 21h 26m         | F02 - AUX1 fuse fail      | 0,0   | 27,5  | 0,0  |

Fig. 14. The „History” tab.

The table of the history of events of the power supply includes information about:

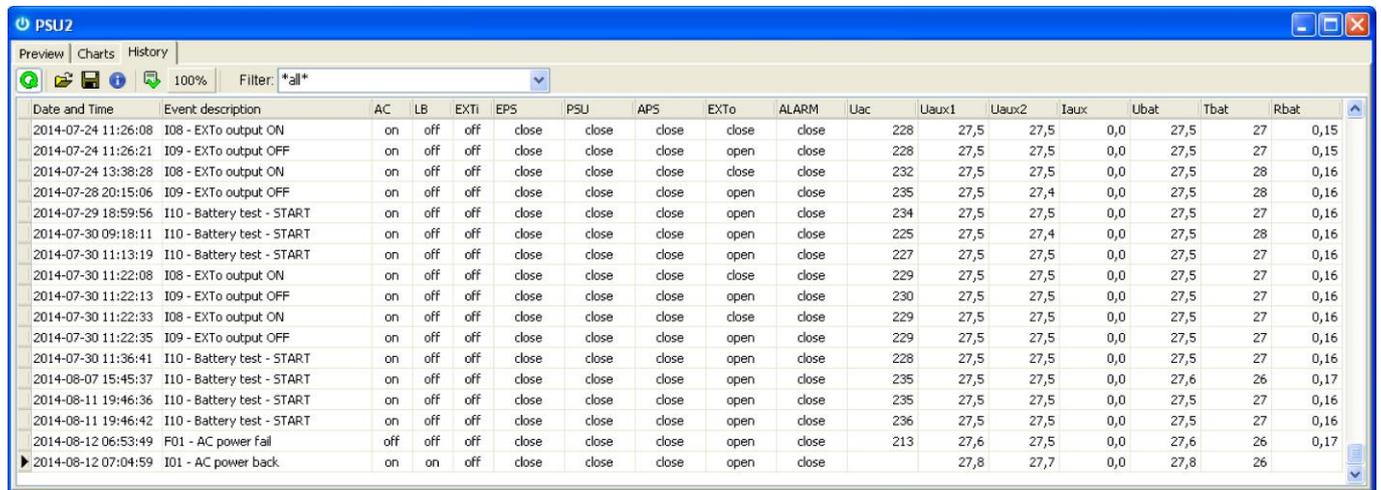
- The time elapsed since the event – the time that has elapsed since the occurrence of the event. For example 4h 54m means that the event occurred 4 hours and 54 minutes ago.  
In case of power loss (no 230 V Amains supply) during the PSU operation while the battery is not connected or fully discharged, the information about the time until the next switch of the power supply is lost. In such a case, an asterisk symbol appears next to the time display e.g. 4h 53m \*.
- Event description – event code and its description. Appendixes A, B and C at the end of the manual summarize all the failure and event codes that may occur during the power supply operation. The individual codes are accompanied by appropriate optical indication on the panel, acoustic indication and activation of the dedicated technical output.
- Uaux, Iaux – output voltage and output current saved in the memory at the time of a given event.

The program enables storing the read data for further analysis. Press the  button to save the data in .csv or .dat format, allowing reloading and displaying data in a chart window.

The information about the type of power supply, its position in the manager list and the communication address can be obtained by pressing the  button. This information is particularly useful when importing a file from another PSU.

### 5.3.2 Reading the history of events of the power supply with LCD display.

To read the history of events of the power supply with LCD display press the  button. The reading starts from the most recent entries. The reading can be stopped at any time by pressing the  button.



| Date and Time       | Event description          | AC  | LB  | EXTi | EPS   | PSU   | APS   | EXTto | ALARM | Uac | Uaux1 | Uaux2 | Iaux | Ubat | Tbat | Rbat |
|---------------------|----------------------------|-----|-----|------|-------|-------|-------|-------|-------|-----|-------|-------|------|------|------|------|
| 2014-07-24 11:26:08 | I08 - EXTo output ON       | on  | off | off  | close | close | close | close | close | 228 | 27,5  | 27,5  | 0,0  | 27,5 | 27   | 0,15 |
| 2014-07-24 11:26:21 | I09 - EXTo output OFF      | on  | off | off  | close | close | close | open  | close | 228 | 27,5  | 27,5  | 0,0  | 27,5 | 27   | 0,15 |
| 2014-07-24 13:38:28 | I08 - EXTo output ON       | on  | off | off  | close | close | close | close | close | 232 | 27,5  | 27,5  | 0,0  | 27,5 | 28   | 0,16 |
| 2014-07-28 20:15:06 | I09 - EXTo output OFF      | on  | off | off  | close | close | close | open  | close | 235 | 27,5  | 27,4  | 0,0  | 27,5 | 28   | 0,16 |
| 2014-07-29 18:59:56 | I10 - Battery test - START | on  | off | off  | close | close | close | open  | close | 234 | 27,5  | 27,5  | 0,0  | 27,5 | 27   | 0,16 |
| 2014-07-30 09:18:11 | I10 - Battery test - START | on  | off | off  | close | close | close | open  | close | 225 | 27,5  | 27,4  | 0,0  | 27,5 | 28   | 0,16 |
| 2014-07-30 11:13:19 | I10 - Battery test - START | on  | off | off  | close | close | close | open  | close | 227 | 27,5  | 27,5  | 0,0  | 27,5 | 27   | 0,16 |
| 2014-07-30 11:22:08 | I08 - EXTo output ON       | on  | off | off  | close | close | close | close | close | 229 | 27,5  | 27,5  | 0,0  | 27,5 | 27   | 0,16 |
| 2014-07-30 11:22:13 | I09 - EXTo output OFF      | on  | off | off  | close | close | close | open  | close | 230 | 27,5  | 27,5  | 0,0  | 27,5 | 27   | 0,16 |
| 2014-07-30 11:22:33 | I08 - EXTo output ON       | on  | off | off  | close | close | close | close | close | 229 | 27,5  | 27,5  | 0,0  | 27,5 | 27   | 0,16 |
| 2014-07-30 11:22:35 | I09 - EXTo output OFF      | on  | off | off  | close | close | close | open  | close | 229 | 27,5  | 27,5  | 0,0  | 27,5 | 27   | 0,16 |
| 2014-07-30 11:36:41 | I10 - Battery test - START | on  | off | off  | close | close | close | open  | close | 228 | 27,5  | 27,5  | 0,0  | 27,5 | 27   | 0,16 |
| 2014-08-07 15:45:37 | I10 - Battery test - START | on  | off | off  | close | close | close | open  | close | 235 | 27,5  | 27,5  | 0,0  | 27,6 | 26   | 0,17 |
| 2014-08-11 19:46:36 | I10 - Battery test - START | on  | off | off  | close | close | close | open  | close | 235 | 27,5  | 27,5  | 0,0  | 27,5 | 27   | 0,16 |
| 2014-08-11 19:46:42 | I10 - Battery test - START | on  | off | off  | close | close | close | open  | close | 236 | 27,5  | 27,5  | 0,0  | 27,5 | 27   | 0,16 |
| 2014-08-12 06:53:49 | F01 - AC power fail        | off | off | off  | close | close | close | open  | close | 213 | 27,6  | 27,5  | 0,0  | 27,6 | 26   | 0,17 |
| 2014-08-12 07:04:59 | I01 - AC power back        | on  | on  | off  | close | close | close | open  | close |     | 27,8  | 27,7  | 0,0  | 27,8 | 26   |      |

Fig. 15. The „History” tab.

The table of the history of events of the power supply includes information about:

- Time and date – date and time of the event
- Event description – event code and its description. Appendixes A, B and C at the end of the manual summarize all the failure and event codes that may occur during the power supply operation. The individual codes are accompanied by appropriate optical indication on the panel, acoustic indication and activation of the dedicated technical output.
- AC – 230 V power indication:
  - ON = AC power on
  - OFF = AC power off
- LB – battery charging indication
  - ON = battery charging
  - OFF = no charging, battery fully charged
- EXTi – external failure input
  - ON = failure
  - OFF = normal status
- EPS – technical output indicating AC power loss
  - Open = AC power loss
  - closed = AC power - OK.
- PSU – technical output indicating PSU failure
  - open = failure
  - closed = PSU operation - OK
- APS – technical output indicating battery failure
  - open = battery failure
  - closed = battery OK
- EXTto – controlled relay output
  - open = output on
  - closed = output off
- ALARM – technical output of collective failure
  - Open = AC power loss
  - closed = AC power - OK.

- $U_{ac}$  – 230 V mains supply voltage
- $U_{aux1}$  – voltage at the AUX1 output
- $U_{aux2}$  - voltage at the AUX1 output
- $I_{aux}$  – total output current
- $T_{bat}$  – battery temperature
- $R_{bat}$  – resistance of the battery circuit

Use the “Filter” menu on the toolbar to filter the displayed events by the selected event code.

The program enables storing the read data for further analysis. Press the  button to save the data in .csv or .dat format, allowing reloading and displaying data in a chart window.

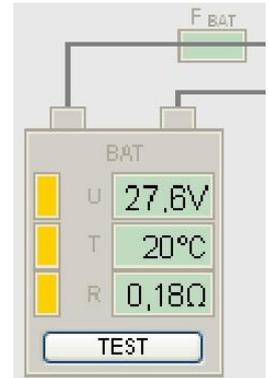
The information about the type of power supply, its position in the manager list and the communication address can be obtained by pressing the  button. This information is particularly useful when importing a file from another PSU

## 5.4 Remote battery test

In the „Preview” tab, use the „TEST” button on the battery icon to perform the remote battery test.

After pressing the button, the battery test command is sent to the power supply. If the battery is OK, it will be indicated by the “Battery OK” message once the test is completed. If the battery is discharged or worn out, it will be indicated by the “Battery failure” message.

After pressing the TEST button, it remains inactive for about 30 seconds before it can be used again.



## APPENDIX A – FAILURE CODES OF THE PSBEN 13,8 V POWER SUPPLY

| Failure code | Information                       | Technical output activation | Causes, comments   |
|--------------|-----------------------------------|-----------------------------|--|
| F01          | No AC power!                      | EPS FLT                     | - No AC mains supply<br>- F <sub>MAIN</sub> fuse failure   |
| F02          | AUX Fuse!                         | PSU FLT                     | - Blown F <sub>AUX</sub> fuse<br>- AUX output overload   |
| F03          | BAT fuse!                         | APS FLT                     | - Blown F <sub>BAT</sub> fuse<br>- Short circuit in the battery circuit<br>- Short circuit in the AUX output circuit |
| F04          | Output overload!!                 | PSU FLT                     | - PSU overload   |
| F05          | Faulty battery!                   | APS FLT                     | - Worn out batteries<br>- Undercharged batteries<br>- Battery not connected  |
| F06          | High AUX voltage!                 | PSU FLT                     | - The output voltage of the PSU over 14,7 V  |
| F07          | High battery voltage!             | PSU FLT                     | - Battery voltage >14 V  |
| F08          | Battery charging circuit failure! | PSU FLT                     | - The output voltage of the PSU set too low , below 13V<br>- Battery charging circuit failure                        |
| F09          | Low AUX voltage!                  | PSU FLT                     | - The output voltage below 11,8 V (during buffer operation)  |
| F10          | Low battery voltage!              | APS FLT                     | - The battery voltage has dropped below 11,5 V (during battery-assisted operation)                                   |
| F11          | Low battery voltage – off!        | APS FLT                     | - the battery voltage has dropped below 10 V (during battery-assisted operation)                                     |
| F12          | EXT external input!               | ALARM                       | - Activation of the input of collective failure: EXT IN  |
| F13          | PSU enclosure opening!            | PSU FLT                     |  |
| F50-F54      | Internal damage of the PSU.       | PSU FLT                     | - service codes  |
| F60          | No communication                  | PSU FLT                     | - no communication with LCD panel  |
| F61-F64      | LCD damage                        | PSU FLT                     | - service codes  |
| F65          | Access unlocked                   |                             | - passwords unlocked   |

| Event code | Description          |
|------------|----------------------|
| I00        | PSU start-up         |
| I01        | AC power restored    |
| I02        | AUX fuse replaced    |
| I03        | BAT fuse replaced    |
| I04        | Battery status: OK   |
| I05        | Battery test – START |
| I06        | Enclosure closed     |

**APPENDIX B – FAILURE CODES OF THE PSBEN 27,6 V POWER SUPPLY**

| Failure code   | Information                       | Technical output activation | Causes, comments   |
|----------------|-----------------------------------|-----------------------------|--|
| <b>F01</b>     | No AC power!                      | EPS FLT                     | - No AC mains supply<br>- F <sub>MAIN</sub> fuse failure   |
| <b>F02</b>     | AUX Fuse!                         | PSU FLT                     | - Blown F <sub>AUX</sub> fuse<br>- AUX output overload   |
| <b>F03</b>     | BAT fuse!                         | APS FLT                     | - Blown F <sub>BAT</sub> fuse<br>- Short circuit in the battery circuit<br>- Short circuit in the AUX output circuit |
| <b>F04</b>     | Output overload!!                 | PSU FLT                     | - PSU overload   |
| <b>F05</b>     | Faulty battery!                   | APS FLT                     | - Worn out batteries<br>- Undercharged batteries<br>- Battery not connected  |
| <b>F06</b>     | High AUX voltage!                 | PSU FLT                     | - The output voltage of the PSU over 29,4 V  |
| <b>F07</b>     | High battery voltage!             | PSU FLT                     | - Battery voltage >28 V  |
| <b>F08</b>     | Battery charging circuit failure! | PSU FLT                     | - The output voltage of the PSU set too low, below 26 V<br>- Battery charging circuit failure                        |
| <b>F09</b>     | Low AUX voltage!                  | PSU FLT                     | - The output voltage below 23,6 V (during buffer operation)  |
| <b>F10</b>     | Low battery voltage!              | APS FLT                     | - The battery voltage has dropped below 23 V (during battery-assisted operation)                                     |
| <b>F11</b>     | Low battery voltage – off!        | APS FLT                     | - the battery voltage has dropped below 20 V (during battery-assisted operation)                                     |
| <b>F12</b>     | EXT external input!               | ALARM                       | - Activation of the input of collective failure: EXTi  |
| <b>F13</b>     | PSU enclosure opening!            | PSU FLT                     |  |
| <b>F50-F54</b> | Internal damage of the PSU.       | PSU FLT                     | - service codes  |
| <b>F60</b>     | No communication                  | PSU FLT                     | - no communication with LCD panel  |
| <b>F61-F64</b> | LCD damage                        | PSU FLT                     | - service codes  |
| <b>F65</b>     | Access unlocked                   |                             | - passwords unlocked   |

| Event code | Description          |
|------------|----------------------|
| <b>I00</b> | PSU start-up         |
| <b>I01</b> | AC power restored    |
| <b>I02</b> | AUX fuse replaced    |
| <b>I03</b> | BAT fuse replaced    |
| <b>I04</b> | Battery status: OK   |
| <b>I05</b> | Battery test – START |
| <b>I06</b> | Enclosure closed     |

## APPENDIX C – FAILURE CODES OF THE EN54 27,6 V POWER SUPPLY

| Failure code | Information                              | Technical output activation | Causes, comments   |
|--------------|--|-----------------------------|--|
| F01          | No AC power!                             | EPS FLT<br>ALARM            | - No AC mains supply<br>- F <sub>MAIN</sub> fuse failure   |
| F02          | AUX1 fuse!                               | PSU FLT<br>ALARM            | - Blown F <sub>AUX1</sub> fuse   |
|              | AUX2 fuse!                               |                             | - Blown F <sub>AUX2</sub> fuse   |
| F03          | BAT fuse!                                | APS FLT<br>ALARM            | - Blown F <sub>BAT</sub> fuse<br>- Short circuit in the battery circuit<br>- Short circuit in the AUX1 and AUX2 output circuit |
| F04          | Output overload!!                        | PSU FLT<br>ALARM            | - PSU overload   |
| F05          | Undercharged battery!                    | APS FLT<br>ALARM            | - Worn out batteries<br>- Undercharged batteries   |
| F06          | High AUX1 voltage!                       | PSU FLT<br>ALARM            | - The output voltage of the PSU over 29,2 V  |
|              | High AUX2 voltage!                       |                             |  |
| F08          | Battery charging circuit failure!        | PSU FLT<br>ALARM            | - The output voltage of the PSU set too low, below 26 V<br>- Battery charging circuit failure                                  |
| F09          | Low AUX1 voltage!                        | PSU FLT<br>ALARM            | - The output voltage below 26 V  |
|              | Low AUX2 voltage!                        |                             |  |
| F10          | Low battery voltage!                     | APS FLT<br>ALARM            | - The battery voltage has dropped below 23 V (during battery-assisted operation)   |
| F11          | Low battery voltage – off!               | APS FLT<br>ALARM            | - the battery voltage has dropped below 20 V (during battery-assisted operation)   |
| F12          | EXT external input!                      | ALARM                       | - Activation of the input of collective failure: EXT <sub>i</sub>  |
| F14          | Temperature sensor failure!              | PSU FLT<br>ALARM            | - Temperature sensor failure<br>- Temperature sensor disconnected  |
| F15          | High battery temperature                 | PSU FLT<br>ALARM            | - Too high ambient temperature of the PSU.<br>- Overloaded batteries.<br>- Faulty batteries.                                   |
| F16          | No battery!                              | APS FLT<br>ALARM            | - Disconnected batteries   |
| F17          | Battery failure!                         | APS FLT<br>ALARM            | - Deeply discharged batteries, voltage below 20 V  |
| F18          | High resistance of the. Battery circuit! | APS FLT<br>ALARM            | - Worn out batteries<br>- Loose cables connecting the batteries  |
| F19          | High AC voltage!                         | PSU FLT<br>ALARM            | - Mains supply over 254 V AC   |
| F20          | Low AC voltage!                          | PSU FLT<br>ALARM            | - Mains supply below 195 V AC  |
| F21          | Enclosure opening!                       | PSU FLT<br>ALARM            | -----  |
| F50-<br>F54  | Internal damage of the PSU.              | PSU FLT<br>ALARM            | - service codes  |
| F60          | No communication                         | PSU FLT<br>ALARM            | - no communication with LCD panel  |
| F61-<br>F64  | LCD damage                               | PSU FLT<br>ALARM            | - service codes  |
| F65          | Access unlocked                          | -----                       | - passwords unlocked   |

| Event code | Description                                      |
|------------|--|
| I00        | PSU start-up                                     |
| I01        | AC power restored                                |
| I02        | AUX1 fuse replaced                               |
|            | AUX2 fuse replaced                               |
| I03        | BAT fuse replaced                                |
| I04        | Battery connected                                |
| I05        | Battery status: OK                               |
| I06        | Battery temperature: OK                          |
| I07        | AC voltage: OK                                   |
| I08        | EXTo output on                                   |
| I09        | EXTo output off                                  |
| I10        | Battery test – START                             |
| I11        | Enclosure closed                                 |
| I12        | The I <sub>max_a</sub> current exceeded          |
| I13        | The current has dropped below I <sub>max_a</sub> |

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http:// [www.pulsar.pl](http://www.pulsar.pl), [www.zasilacze.pl](http://www.zasilacze.pl)