Pulsar®

INTRE-C
v.1.0

Interfaces
RS485-ETHERNET
EN54C-LCD

REACH® compliance | RoHS | CE

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Features:

- permission of Scientific and Research Centre for Fire Protection - National Research Institute for use with power supplies of EN54C-LCD series
- up to 247 devices served on a RS485 bus
- automatic detection of PSUs on the RS485 bus
- dynamic addressing of PSUs
- automatic email notifications of PSU malfunctions
- connection to ETHERNET network via the RJ45 connector
- compliance with IEEE 802.3 standard
- 10/100 Mb/s transmission speed
- full-duplex or half-duplex operation (auto-negotiation)
- galvanic isolation between ETHERNET interface and RS485
- 10÷30 V DC power
- cooperation with the PowerSecurity web application
- optical indication
- IP65 hermetic enclosure
- warranty: 3 years from production date

1. General description.

The RS485-ETHERNET interface is intended for cooperation with PSUs of the EN54C-LCD series.
The PowerSecurity software enables remote monitoring of parameters through a cyclical preview of the current status of the power supply, reading the event log and diagrams of currents and voltages and performing remote battery test.

Interface is a device used to convert signals between RS485 bus and Ethernet network. For proper operation, unit requires an external power supply in range of 10÷30 V DC e.g. drawn from a PSU of EN54C series. Unit is mounted in a hermetic enclosure protecting against adverse environmental conditions.
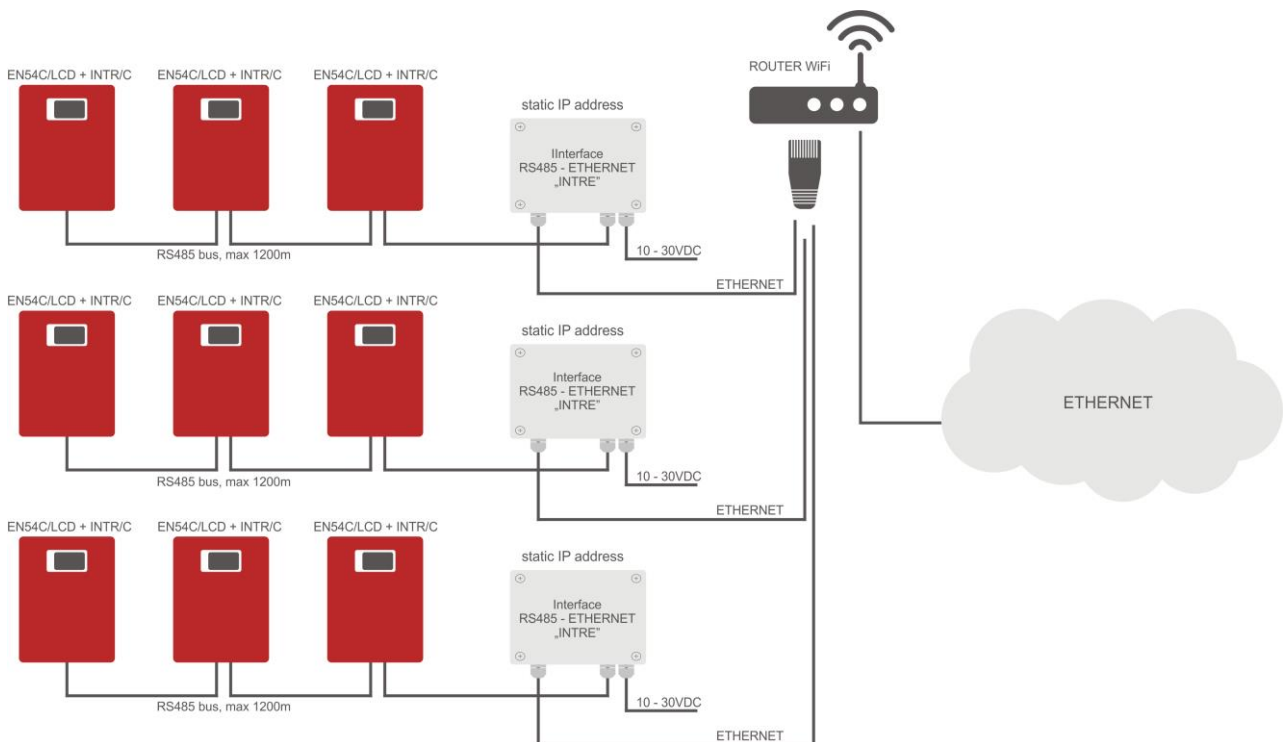
Fig.1. Schematic diagram of Ethernet network communication.

The network topology is based on an Ethernet switch (e.g. switch, router) to which subsequent segments of power supplies are connected (connected in the RS485 bus) via the RS485-Ethernet interface. Each interface has a static IP address. The communication between a PC and an end PSU is effected through entering of the IP address of the interface, the address of the PSU in the RS485 bus, and the number of the port in which the communication takes place. An interface may support a maximum of 247 PSUs on one RS485 bus.

2. Components arrangement.

The figure below shows the distribution of the major components and connectors of INTRE-C interface.
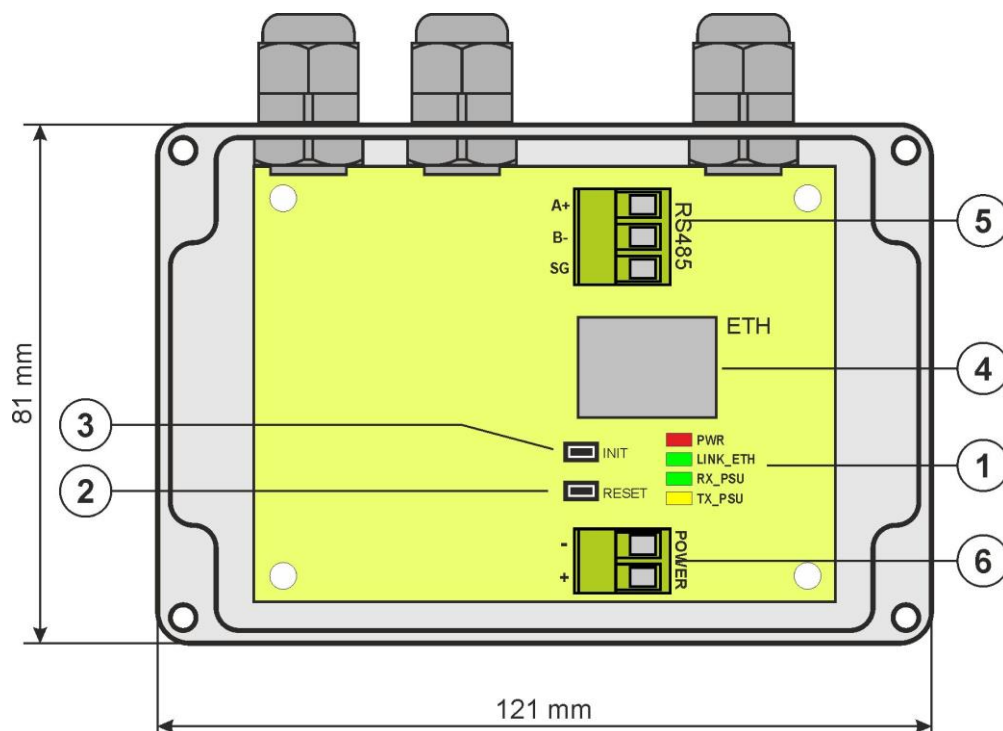
Fig. 2. The interface view.

Table 1. Description of the components.

Component no.	Description
[1]	**LEDs** – optical indication: **PWR** – supply voltage **LINK_ETH** – Ethernet port connected **TX_PSU** – data transmission **RX_PSU** – receiving data
[2]	**RESET button** reset the interface settings
[3]	**INIT button** interface initialization
[4]	**RJ45 ETHERNET** interface socket (see Table 2)
[5]	**Connector of the RS485 bus** **A+, B-** – RS485 data transmission **SG** – signal ground
[6]	**Power supply connector 10÷30 V DC**

3. Installation.

3.1 Basic guidelines.

When installing the INTRE-C interface, please follow the general rules that will help to avoid electromagnetic interferences and incorrect operation of the device:
- supply the interface with the power source of low ripple voltage
- power cable should be as short as possible
- signal beams should be led at a minimum distance of 50 cm from each other, while the intersections between them should be done at an angle of 90°
- interface installation site should be located at a considerable distance from the equipment generating large impulse disturbances, such as inverters, contactors, relays

4. Connection to RS485 bus.

The RS485-ETHERNET interface is connected to the RS485 bus via the „RS485" connector. Connect the wires of the RS485 bus to the A+, B- terminals of the connector. They are marked and connected the same way as the rest of devices (A+ to A+, B- to B-).

Use a twisted-pair cable as a transmission wire of the RS485 bus. The „point-to-point" topology is recommended, while the „star" topology should be avoided. If the wires are long enough, it is recommended to use shielded cables to avoid errors during the communication and to lower the susceptibility to noise and radio interference. It is recommended to mount the terminal resistors at the ends of the bus with a resistance close to the impedance of the used cable, which is 120 Ohm.

4.1 Connection to the Ethernet networ.

The connection of the RS485-ETHERNET interface to the Ethernet network should to be made with a U/UTP twisted-pair cable, of min. 5 category, ending with RJ45 plugs, connected according to colour and accordingly to the EIA/TIA 568B standard. If the dedicated location shows a high level of electromagnetic interference, use a F/UTP or S/UTP shielded cable, thereby substantially reducing penetration of electromagnetic interference.

The connection of the interface to the Ethernet network uses a cable with RJ45 plugs, non-interlaced.
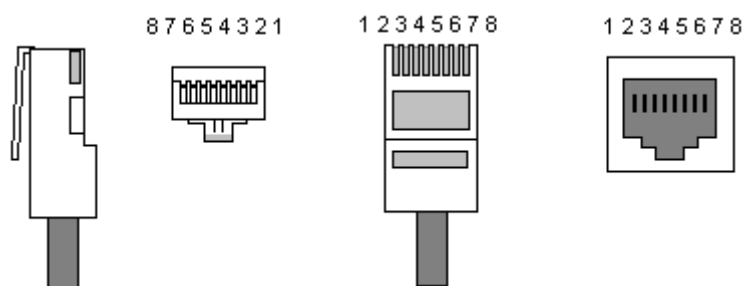
Table 2. Description of pins in RJ45 socket.

Pin 1	TXD+	Transmitting +	white-orange
Pin 2	TXD-	Transmitting -	orange
Pin 3	RXD+	Receiving +	white-green
Pin 4	EPWR+	---	blue
Pin 5	EPWR+	---	white-blue
Pin 6	RXD-	Receiving -	green
Pin 7	EPWR-	---	white-brown
Pin 8	EPWR-	---	brown

5. Installation of the interface.

1. Lead the cable of the RS485 bus through the cable gland and the appropriate hole in the enclosure and then connect to the RS485 connector of the interface. The A+, B- cables should be connected the same way as the rest of devices (A+ to A+, B- to B-) In the case of shielded wires, the shield should be connected to the SG signal ground terminal.
2. Optionally, mount the 120 Ohm terminal resistors at the end of the RS485 bus.
3. Lead the Ethernet cable through the cable gland and the appropriate hole in the enclosure and then clamp the RJ45 plug. Next, plug the cable in the RJ45 socket of the interface. Plug the other end of the twisted pair in the RJ45 socket of the router, usually marked as „LAN".
4. Lead the power supply cable through the cable duct and the appropriate hole in the enclosure and then connect it to the 'Power' power supply connector. The power source should supply a voltage in the range of 10÷30 V D e.g. drawn from a PSU of the EN54C series. The best solution is to use a PSU that is plugged into the RS485 bus and located close to the interface.
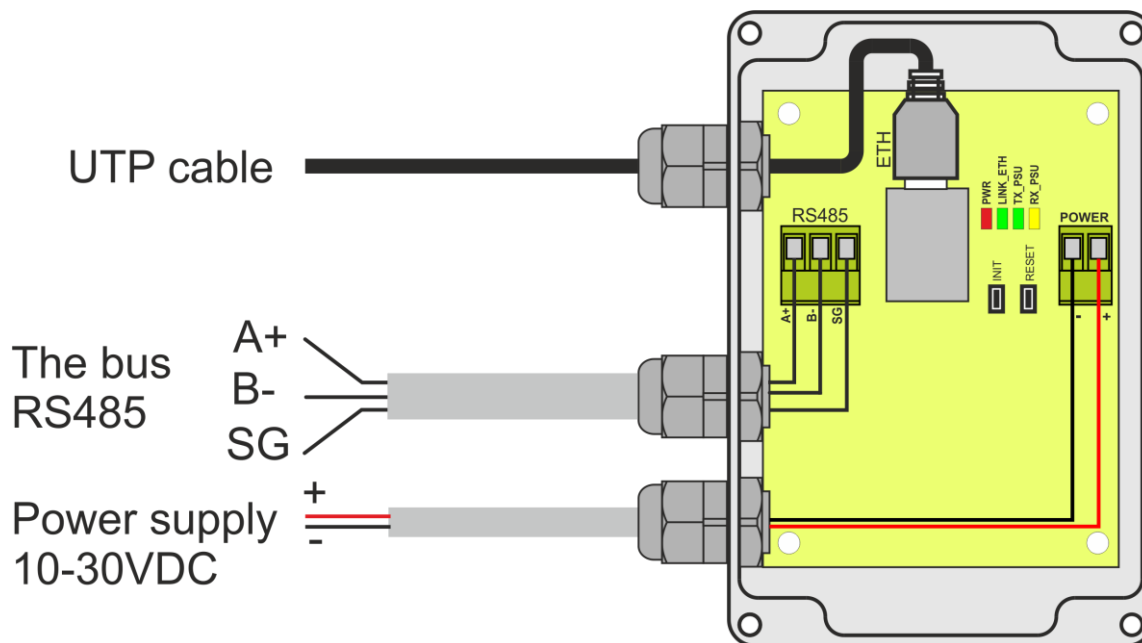

Fig. 3. The view of the interface with a description of the wires.

6. „PowerSecurity" web application.

The PowerSecurity web application has been embedded in the INTE-C and INTRE-C communication interfaces. The programme is a website uploaded from an embedded WWW server which is loaded upon entering the IP address in the web browser window..

Upon loading the PowerSecurity application, access is gained to the preview of the status of the PSU connected with an INTE-C interface, or to the preview of all PSUs in the RS485 bus in case of an INTRE-C interface.

From the WWW browser level, the current status of the PSU can be checked, with preview of such parameters as output voltages, presence of 230 V supply, or resistance of the battery circuit.

Moreover, the application has an option of interface configuration for the function of remote alerting through email notification including information on the status of the PSU in case of occurrence of specific events.

4.1 Configuring the connection.

To activate remote communication with the PSU, first setup the connection between the PSU and the interface, followed by preliminary configuration of the Ethernet INTRE-C module.

The IP address of the module should be entered in the web browser window. The default value is IP=192.168.1.100.
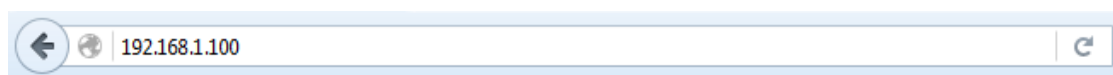
If the entered IP address is correct, the module login page will be loaded on the browser screen.
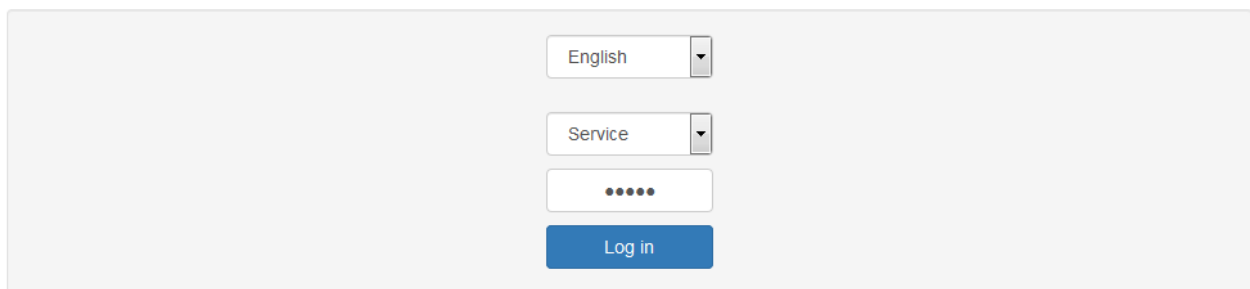

Fig. 4. Ethernet module login page.

If the browser does not display the page above, check the Ethernet configuration.
In particular, check the following:
- are the addresses of the network adapters of the computer and router found in the same subnet,
  i.e. within the range 192.168.1.0 – 192.168.1.255
- addresses of the network adapters of the computer and router must be different from the address
  of the interface, i.e. 192.168.1.100
Appropriate configuration may be performed in the network adapter settings.
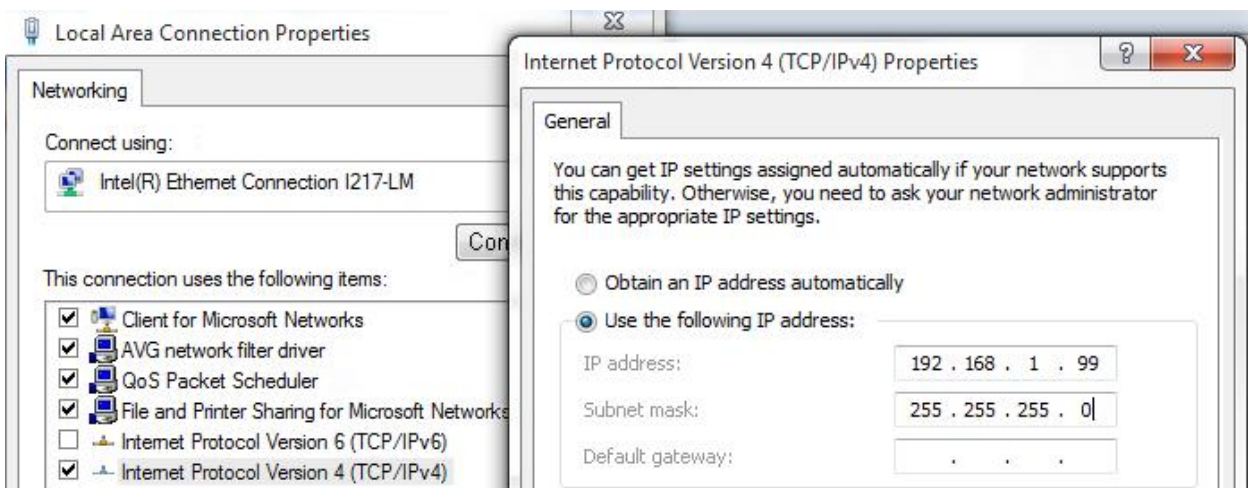

Fig. 5. Network adapter settings tab.

Upon loading of the login page, choose the installer's name and enter the access password.
The default settings are:

    name = „Service"
    Password: = „admin".

It is recommended to change the installer's name and the password upon the first logging.

An Ethernet module enables restoration of default logging values in case they are lost. To this end, open the PSU casing so as to gain access to the module installed inside. Then locate the communication module and press „INIT" for approx. 5 secs.

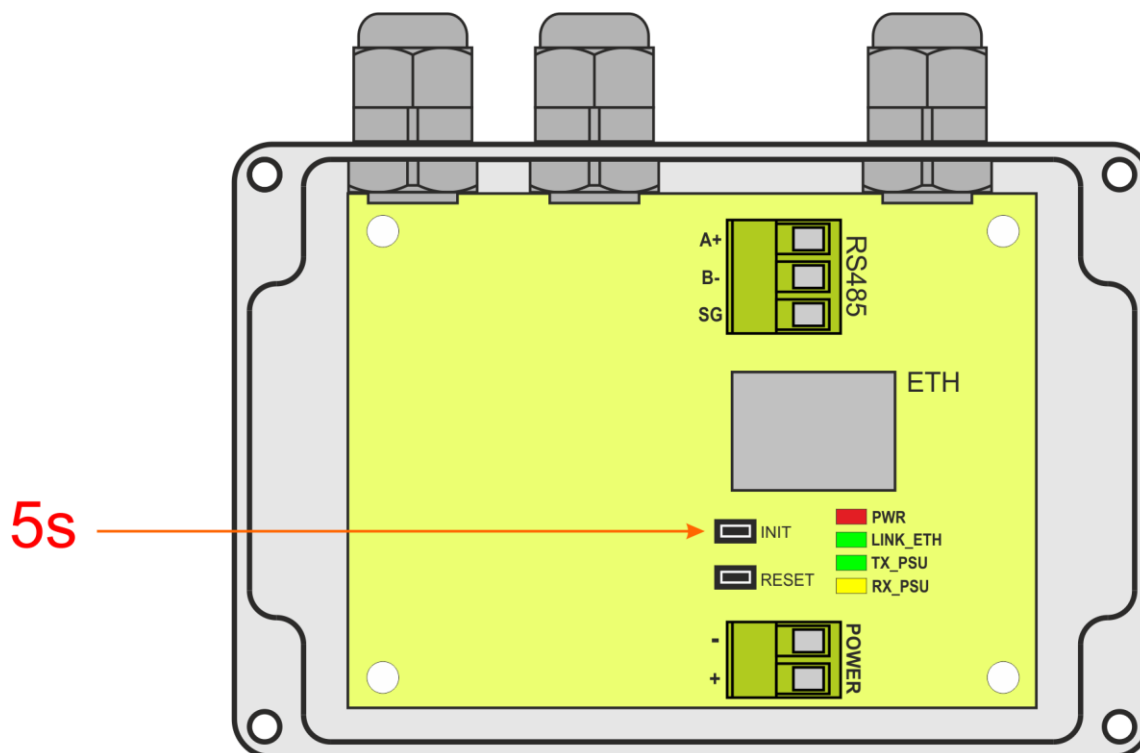Fig. 6. View of the Ethernet module.

The following default parameters will be restored:

    IP address: **192.168.1.100**
    Installer's level:
        Name: **„Service"**
        Password::   **„admin"**
    User's level:
        Name: **„User"**
        Password::   **„user"**

4.2 Device's

Upon a correctly conducted logging operation, the PowerSecurity web application with visible available devices will be loaded.

During the first startup of the PowerSecurity application, the field of PSUs will be empty, despite the physical connection being established. For the PSU to appear in this field, start the detection procedure – see section „INTRE-C Interface – Detection".
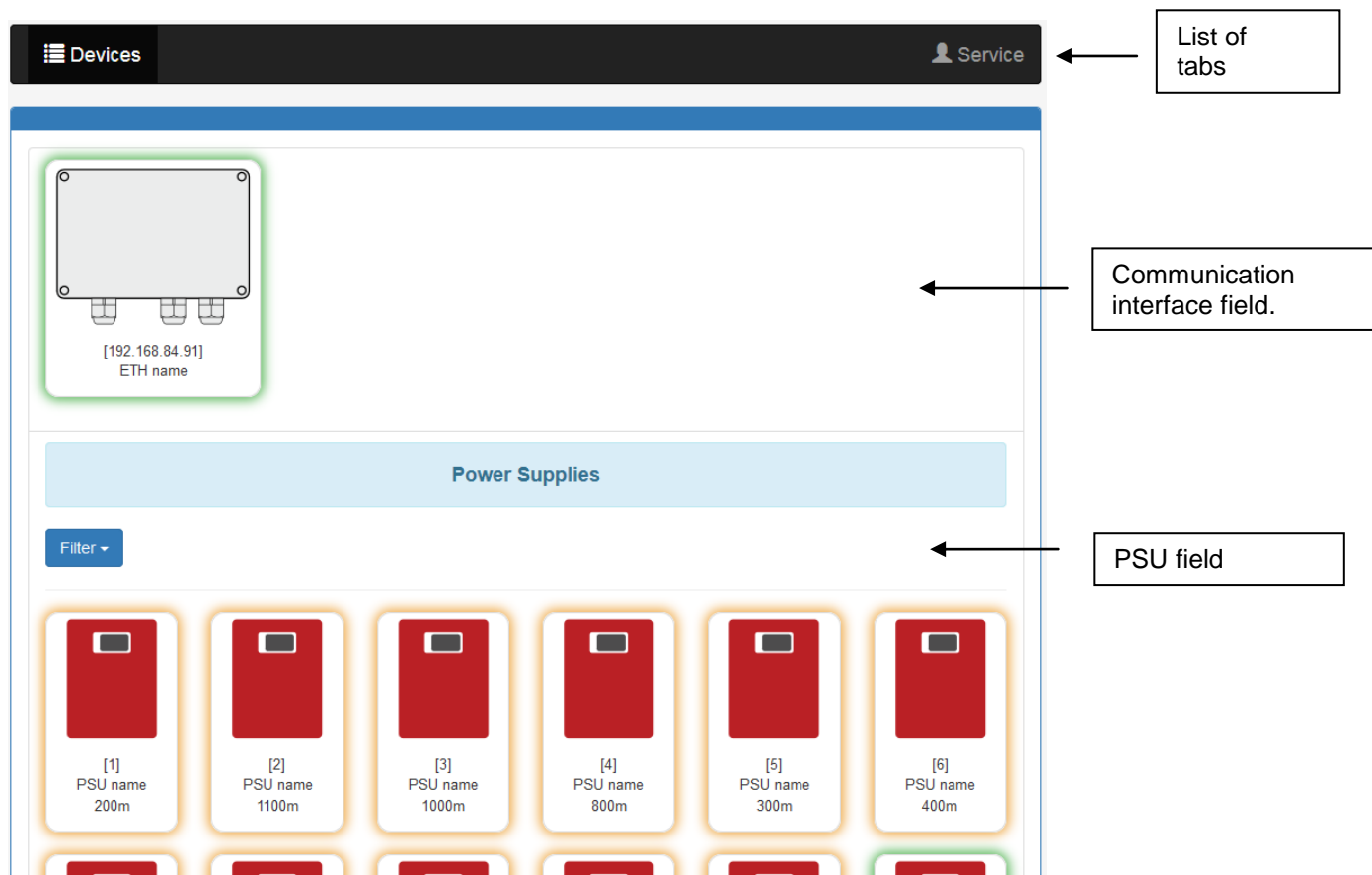
Fig. 7. View of the „Devices" tab.

The information window consists of three essential components: a menu bar containing the list of tabs, a communication interface field, and the PSU field.

In the picture above, the list of tabs only features two items: „Devices" and „Installer". This list has many more functions which will appear dynamically, only upon selection of one device: an interface or a PSU.

In order to gain access to the device (interface or PSU) configuration, select it with the cursor in the browser window or point on the „Devices" tab and make a selection from a drop-down list.
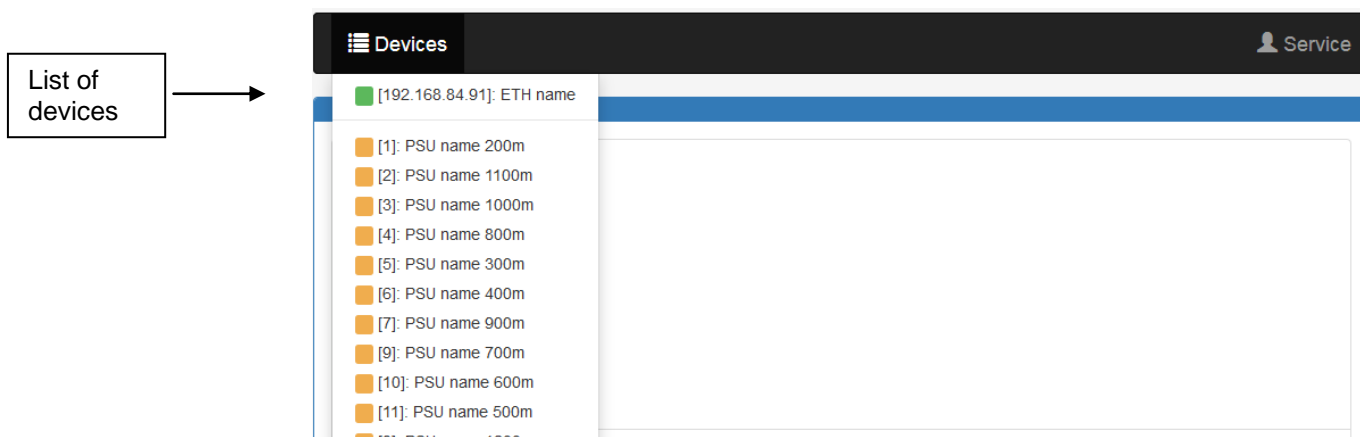
Fig. 8. List of devices.

Hovering the mouse over an element changes its backlight, evidencing the device's status.
Three statuses are possible:

No errors	– green backlight
Errors	– yellow backlight
No communication	– grey backlight

1.   4.3 Power supply – Status 🏠

Upon selection of the PSU in the „Devices" tab, the „Status" tab is loaded in the browser window, showing an active flowchart of the PSU, together with parameters in individual circuits.
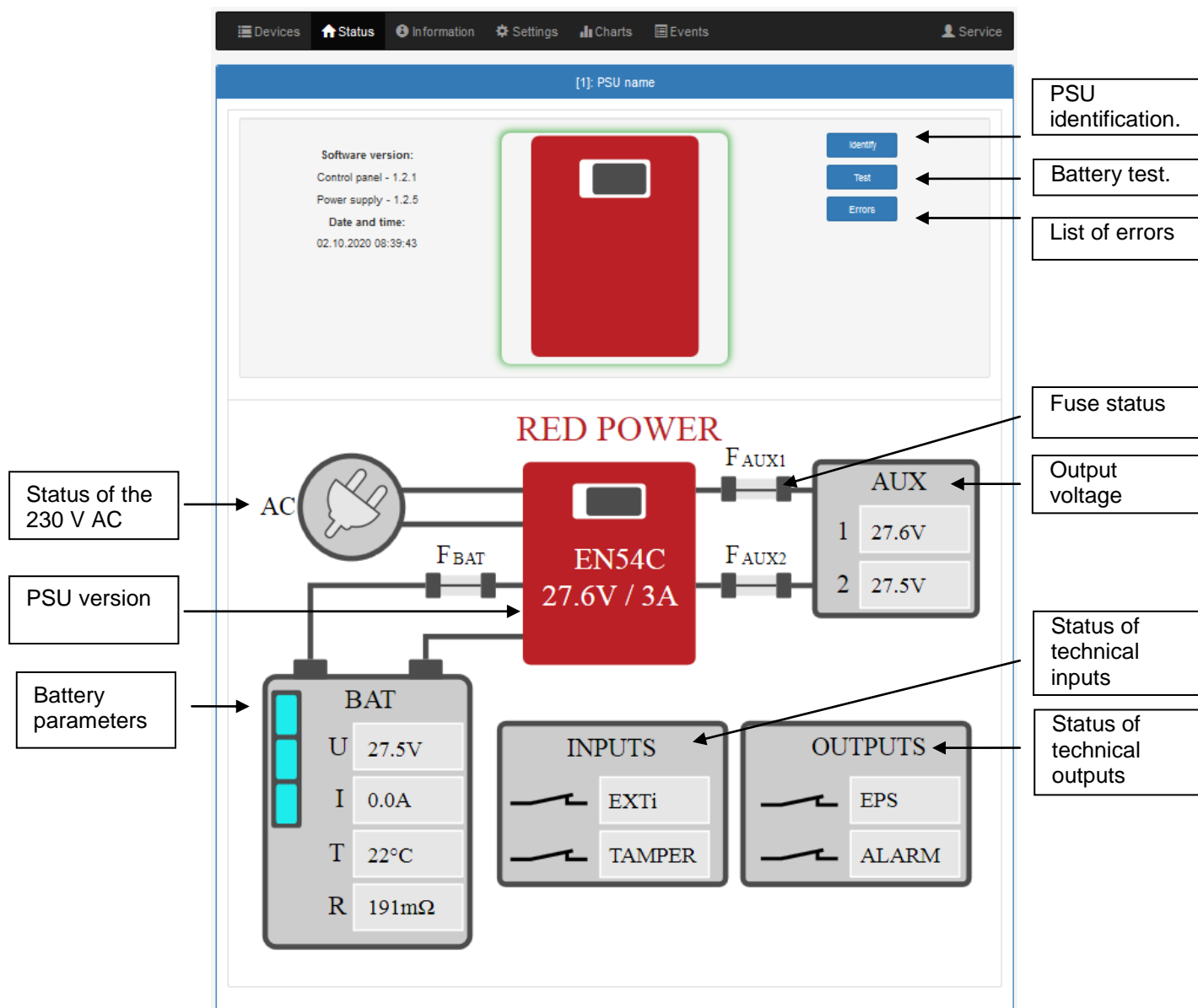

Fig. 9. View of the „Status" tab.

Among the available parameters, the output voltage of the PSU, the status of the electricity network (presence or absence), or the status of fuses may be read. Moreover, the battery block shows the current voltage, the current drawn from the batteries, the temperature and the value of resistance.

In the picture above, the PSU signals a malfunction, which may be recognized through displays with yellow backlight.

„Identify" button – facilitates the identification of a PSU at the installation site. Upon pressing, LED diodes on the front panel flash for 5 seconds.

„Test" button – performs a remote battery test at any time.

„Errors" button – a window appears upon pressing, displaying the current errors of the PSU, if any.

4.4 Power supply – Installation

The picture below shows the „Information" tab. The displayed information only has a read-only status.

DATE AND TIME – date and system time of the device
SOFTWARE VERSION – control software version
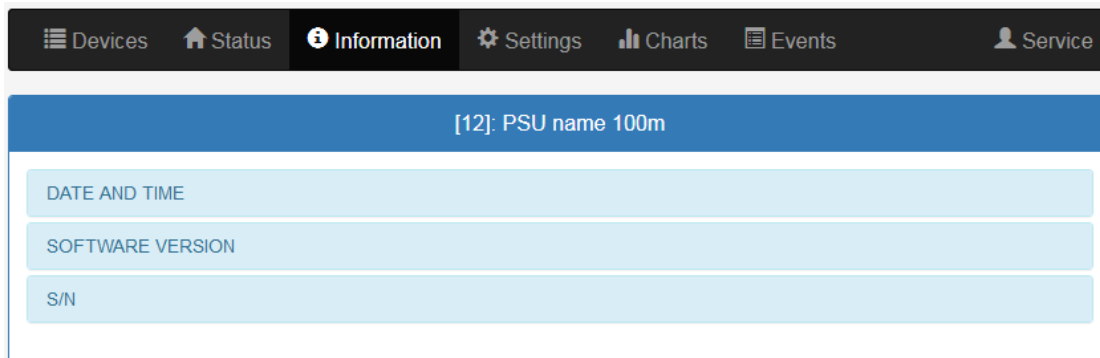**S/N** – serial number of the device

Fig. 10. „Information" tab.

4.5 Power supply – Settings

Upon selection of the „Settings" tab, selected PSU parameters may be configured. This modification is only available upon logging in to the account as the installer.

Default login parameters on the installer's level:
Name: **„Service"**
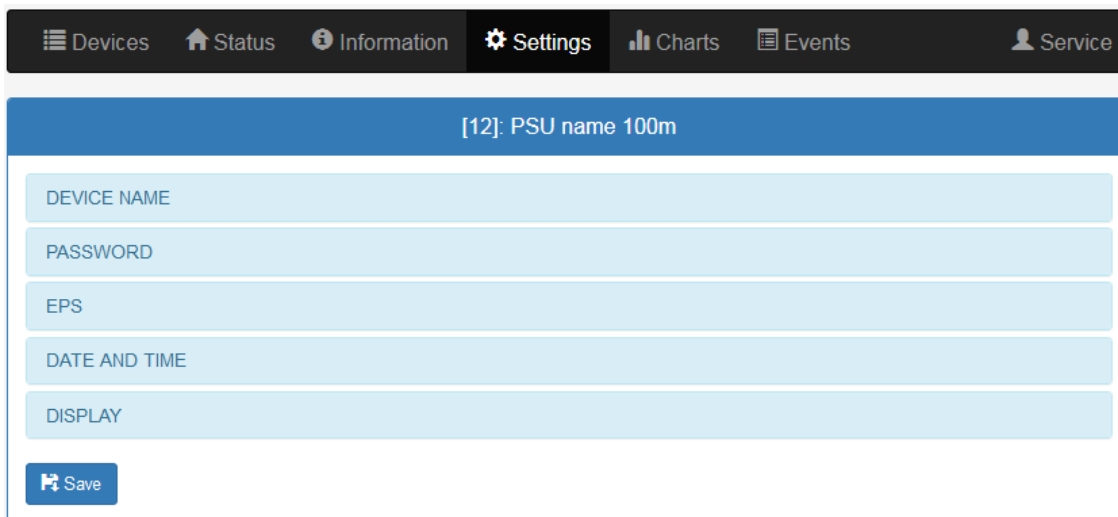Password::   **„admin"**

Fig. 11. „Settings" tab.

4.5.1 Device name.

In the „Device Name" section, a name to be identified with the PSU should be entered. The name is recorded directly in the device's internal memory and enables its identification, both from the level of the LCD panel of the PSU and from the web application.
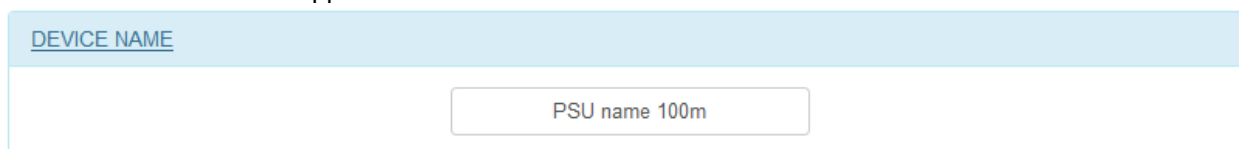

Fig. 12. Device name.

In order to confirm the introduced changes, press „Save".

4.5.2 Password.

In the „Password" section, it is possible to change the default settings of the user and installer passwords.
It is recommended to change the default user and installer passwords upon the first system logging.

The new password should be entered twice in the appropriate boxes. If the two passwords do not match, the password box will be backlit red.

Fig. 13. Changing password.

In order to confirm the introduced changes, press „Save".

4.5.3 EPS.

In the „EPS" field, it is possible to change the signalling time of the EPS technical output. The EPS output signals the loss of 230 V supply. Under normal conditions, in presence of the 230 V supply, the output terminals are connected together; in case of supply outage, the output goes into an opened status after the lapse of a preset time.

Fig. 14. EPS technical output signalling time setting.

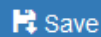In order to confirm the introduced changes, press „Save".

4.5.4 Date and time.

In the „Date and Time" field, a window appears in which the date and time of the system clock of the PSU may be set. Setting correct date and time is important for keeping chronology of events stored in internal memory.

Fig. 15. PSU date and time setting.

Device time   – current system clock time of the PSU.
Browser time   – current browser time of the local computer.
Set the browser time   – upon selection, the PSU time is synchronized with the browser time.

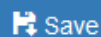In order to confirm the introduced changes, press „Save". 🖫 Save

4.5.5 Display.

In the „Display" field, it is possible to set the display parameters of the LCD panel of the PSU. This includes change of the menu language, backlight intensity, contrast, malfunction signalling of the PSU with flashing backlight, and key lock.
Intensity of LCD backlight can be set in range from 0 to100%, in 10% intervals.
Display features a function of constant or temporary backlight mode. In temporary mode, screen will turn off if no buttons are pressed within 5 minute.

Fig. 16. Display parameters setting.

In order to confirm the introduced changes, press „Save". 🖫 Save

4.5.6 RS485/TTL.

In the RS485/TTL field, the communication parameters of the PSU may be manually set. To enable the establishment of communication between the PSU and the interface, the communication parameters must be identical in both devices.

If communication takes place between a PSU and an INTE-C interface, the address and connection speed settings may be omitted. Full connection configuration, including the address and speed, is performed using the „Detection" function, as described in the section „INTE-C Interface – Detection".

Fig. 17. Communication parameters setting.

In order to confirm the introduced changes, press „Save". 🖫 Save

4.6 Diagrams

The „Graphs" tab enables reading of the history of parameters (current, voltage, resistance of the battery circuit, temperature) in the form of graphs registered in the memory of the PSU.

During normal work, the PSU registers the electric parameters, both in the output and battery circuit, and subsequently records them in the internal data memory. The record is performed in 5-minute intervals, and the memory capacity enables registration of the parameters for more than 100 days. The memory is recorded in a circular cycle, i.e. when the memory is filled up, the oldest entries are overwritten by the latest ones.

The PSU has a separate space in the internal memory, used for recording of the registered battery temperature. The recording cycle is performed in 6-hour intervals, enabling temperature registration for a period of 5 years. With such an extended registration period, the user is able to control the temperature fluctuation range and to determine its impact on the life of the batteries.

Nominal battery operating temperature recommended by many manufacturers is 25°C. Working at elevated temperatures will significantly shorten battery lifetime. Service life is reduced by half for each sustained temperature rise of 8°C above nominal temperature. This means that battery lifespan, when operated at 33°C, can be decreased by 50%!

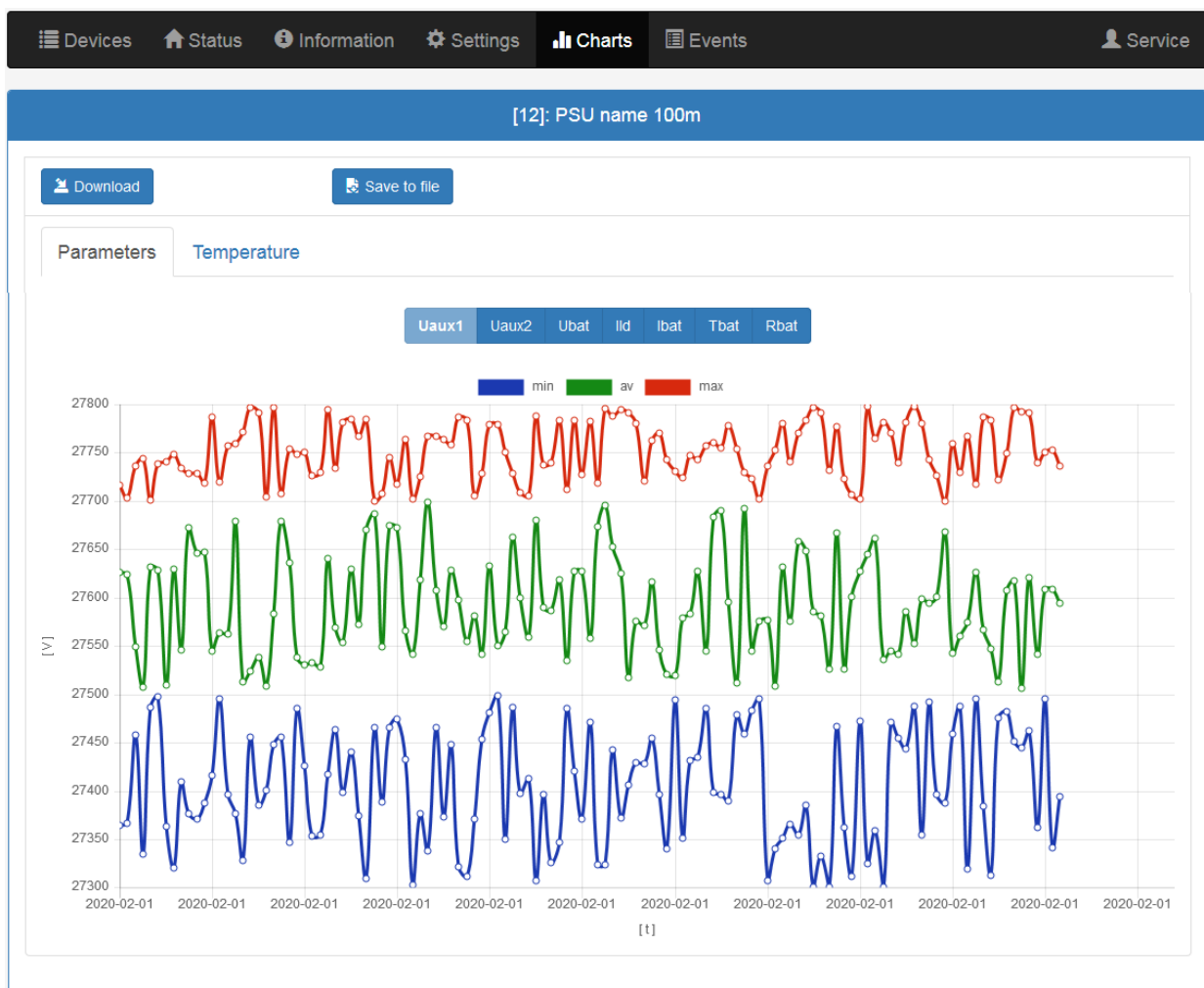An example graph read from the PSU is presented below.

Fig. 18. Example graph of parameters, read from the EN54C-LCD PSU.

In order to read the content of the internal memory of the PSU, press „Download". The reading of the data starts from the latest entries, and its progress is displayed on a bar above the table. The readout operation can be interrupted at any moment by pressing the button „Cancel" button.

The graph shows the following parameters:
- **Uaux1**   - output voltage AUX1
- **Uaux2**   - output voltage AUX2
- **Ubat**   - battery voltage
- **Ild**   - battery charging current

- **Ibat**   - current drawn from the battery
- **Tbat**   - battery temperature
- **Rbat**   - resistance of battery

The graph window is automatically scaled in reference to the minimum and maximum values on the vertical axis. Graphs may be scaled using the mouse wheel, upon pointing to the relevant axis of the graph..

The program enables archiving of data from the read graphs for later analysis. By pressing „Save in File", the data are recorded in the „.csv" text format, with individual columns being separated with a semicolon.
The reading of the recorded file is possible using spreadsheets.

> When importing the history of events to a spreadsheet, select the „UTF-8" coding and separation of columns with a semicolon. Otherwise, the imported text may be incorrectly recognized.

4.7 Event

„Event" tab enables reading history of events stored in memory of PSU.

In order to read the history of events of the PSU, press „Download". The readout of the data starts from the latest entries, and its progress is displayed on a bar above the table. The reading operation can be interrupted at any moment by pressing the „Cancel" button.

Fig. 19. Example events read from the EN54C-LCD PSU.

The read history of events is displayed as a table, following the chronological order. The table includes the exact time of occurrence of the event, the error code, the description of the event type, as well as electrical parameters and the status of individual technical outputs.

The program enables filtration of events by content. Upon marking of the appropriate field „Info" or „Errors" and indicating the event code, the programme will filter the page automatically, only displaying the indicated information.
The program enables archiving of data from the read graphs for later analysis. By pressing „Save in File", the data are recorded in the „csv" text format, with individual columns being separated with a semicolon.
The reading of the recorded file is possible using spreadsheets.

When importing the history of events to a spreadsheet, select the „UTF-8" coding and separation of columns with a semicolon. Otherwise, the imported text may be incorrectly recognized.

4.8 INTE-C interface configuration.

In order to gain access to the interface configuration, select it with the cursor in the browser window or point on the „Devices" tab and make a selection from a drop-down list.
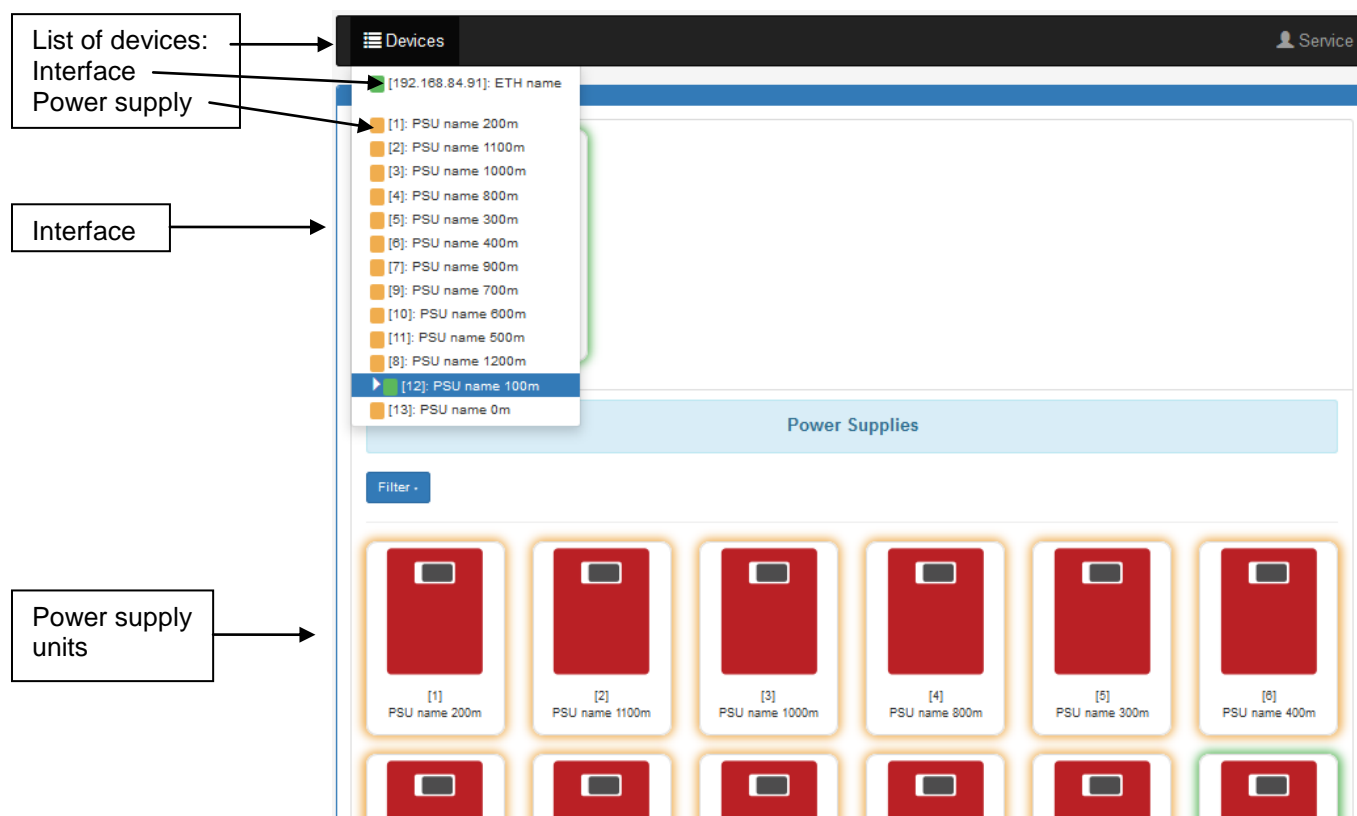

Fig. 20. View of the „Devices" tab.

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4.9 Interface INTRE-C – Status 🏠

Upon selection of an interface in the „Devices" tab, the „Status" tab is loaded in the browser window.
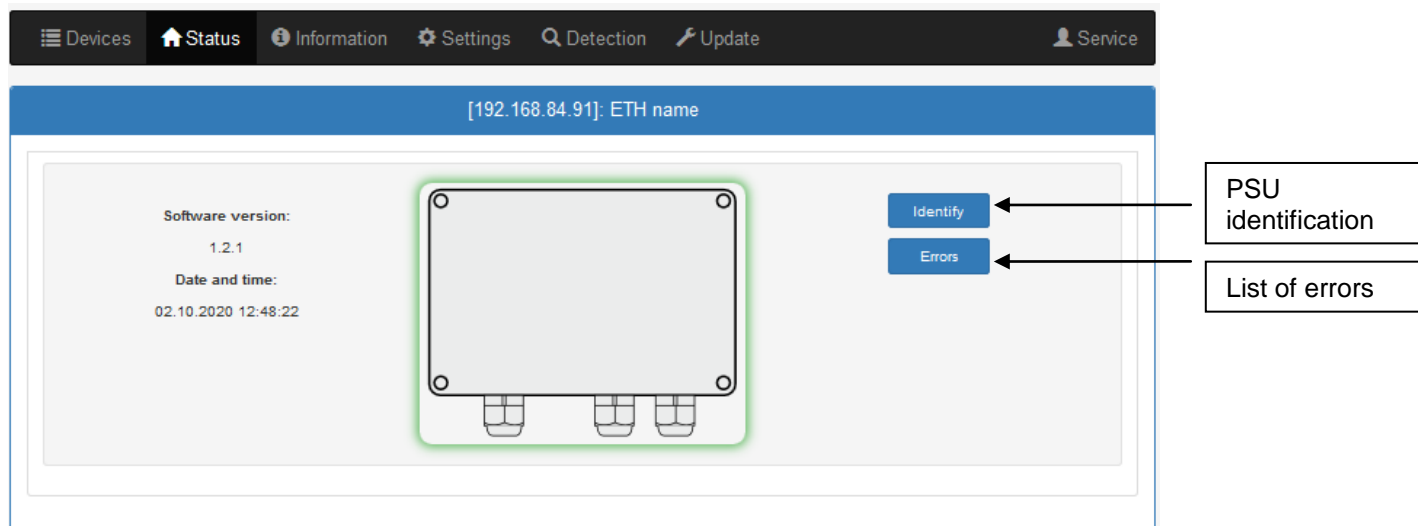
Fig. 21. View of the „Status" tab.

„Identify" button – facilitates the identification of an interface at the installation site. Upon pressing, LED diodes flash for 5 seconds.

„Errors" button – a window appears upon pressing, displaying the current errors of the interface, if any.

4.10 Interface INTRE-C – Installation ℹ️.

The picture below shows the „Information" tab. The displayed information only has a read-only status.

DATE AND TIME – date and system time of the device
SOFTWARE VERSION – control software version
S/N – serial number of the device
MAC – MAC address of the interface

Fig. 22. „Information" tab.

4.11 Interfejs INTRE-C – Settings ⚙

Upon selection of the „Settings" tab, selected interface parameters may be configured. This modification is only available upon logging in to the account as the installer.
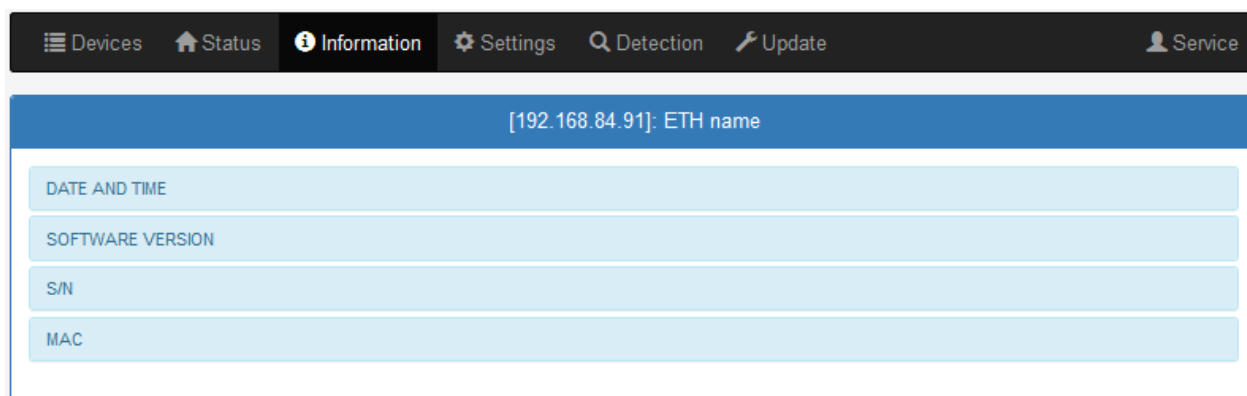
ⓘ   Default login parameters on the installer's level:
        Name: **„Service"**
        Password: **„admin"**

☰ Devices	🏠 Status	ⓘ Information	⚙ Settings	🔍 Detection	🔧 Update	👤 Service

[192.168.84.91]: ETH name

DEVICE NAME
PASSWORD
NETWORK
DATE AND TIME
SNTP
E-MAIL
RS485/TTL

▶ Save

Fig. 23. View of the „Settings".

4.11.1 Interfejs INTRE-C – Device name.

In the „Device Name" field, the name to be identified with the device should be entered. The name is recorded directly in the device's internal memory and enables its identification from the web application.

DEVICE NAME
ETH name

Fig. 24. Device name.

In order to confirm the introduced changes, press „Save". ▶ Save

4.11.2 Interfejs INTRE-C – Password.

In the „Password" field, it is possible to change the default user and installer password. It is recommended to change the default user and installer passwords upon the first logging to the system.

The new password should be entered twice in the appropriate boxes. If the two passwords do not match, the password box will be backlit red.
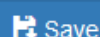
Fig. 25. Changing password.

In order to confirm the introduced changes, press „Save".

4.11.3 Interface INTRE-C – Network.
In the „Network" field, the network parameters enabling communication with the PSU can be accessed.


Fig. 26. Network settings.

DHCP – automatic IP address assignment. Upon selection of the option, the PSU, each time when power is switched on, will have an IP address automatically assigned from the pool of free server addresses. Fields of the following parameters: IP Address, Mask, Gateway, are inactive.

IP address – place for entering the fixed IP address. When selecting this option, enter a free and available web address.

Mask – place for entering the IP subnet mask. It is usually 255.255.255.0

Gateway – network gateway address. Address usually enabling access to the Internet or communication with computers outside the local network.

HTTP port – number of the web browser port. The default value for http is 80.

Modbus mode – mode of the modbus protocol: TCP or TCP over RTU.

Modbus port – number of the port through which the modbus protocol is sent. The default value TCP = 502 for TCPoverRTU = 2101.
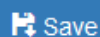
In order to confirm the introduced changes, press „Save".

4.11.4 Interface INTRE-C – Date and time.

In the „Date and Time" field, a window appears in which the date and time of the system clock of the interface may be set. Setting correct date and time is important for keeping chronology of events stored in internal memory.

Fig. 27. Date and time settings.

Device time   – current system clock time of the PSU.
Device time   – current system clock time of the PSU.
Browser time   – current browser time of the local computer.
Set the browser time – upon selection, the PSU time is synchronized with the browser time.
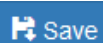
4.11.5 Interface INTRE-C – SNTP.

Upon selection of the „SNTP Settings" option, it is possible to configure the parameters of the SNTP protocol. The SNTP protocol is responsible for synchronization of the PSU time with the SNTP server on the basis of the model UTC time.

Fig. 28. SNTP protocol settings.

Activate   – enabling of the function of PSU time synchronization
Adres IP   – address of the SNTP server
Port   – number of the SNTP server port

In order to confirm the introduced changes, press „Save".

4.11.6 Interface INTRE-C – Email.

The interface has a function of remote alerting via automatically sent email notifications. The notifications include information on the current error codes with the exact malfunction occurrence time.

The email notifications are sent to 2 recipients. The service includes SSL encryption of the mail and authorization for the user's verification through the outgoing mail system (SMTP) in order to ensure safety of the mail account.

In the „Email" window, it is possible to configure the client's mail parameters.

Fig. 29. Email outgoing mail parameter settings.

Activate	– enabling of the function of remote email notification
Of the IP address	– IP address of the outgoing mail server
Port	– number of the outgoing mail port
Encryption (SSL)	– activation of the email encryption service
Authorization	– activation of the email authorization service
User name	– mail account user name
Password	– mail account password
Sender	– email address of the sender's mail account
Recipient 1	– email address of the recipient 1
Recipient 2	– email address of the recipient 2
Language	– notification content language selection
Email test	– upon pressing of the button, a test email notification will be sent to the recipients

In order to confirm the introduced changes, press „Save". **⊞ Save**

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Upon unfolding the „Malfunctions" option, it is possible to select the events that will trigger sending of notifications and will be placed on the list. In case of occurrence of an event from the list, the PSU will wait for a time set in the field „Notification delay time" and subsequently send a message to the recipients. A full list of events has been presented below.

Fig. 30. List of events triggering the sending of an email notification.

4.11.7 Interface INTRE-C – RS485/TTL.

In the RS485/TTL field, the communication parameters of the interface may be manually set. To enable the establishment of communication between the PSU and the interface, the communication parameters must be identical in both devices.

If communication takes place between a PSU and an INTE-C interface, the connection speed setting may be omitted. Full connection configuration, including the address and speed, is performed using the „Detection" function, as described in the section „INTE-C Interface – Detection".

Fig. 31. Communication parameters setting.

In order to confirm the introduced changes, press „Save".
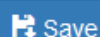
4.12 Interface INTRE-C – Detection.

In the „Detection" tab, functions enabling detection of PSUs connected to the interface and their appropriate configuration for work can be found.

The INTE-C interface only cooperates with one PSU, so one item will appear on the list of the detected PSUs.
The INTRE-C interface is connected to a RS485 bus and cooperates with up to 247 PSUs; this is the maximum number of items which may appear on the list.

Fig. 32. „Detection" tab.

The first step to perform is to search the PSUs connected to the interface. Upon pressing the „Detect Devices" button, the interface will perform an arbitration procedure. All PSUs properly connected to the bus will be detected and will appear on the list of devices. All devices physically connected to the bus should appear on the list. If the list is incomplete, check whether the devices are correctly connected and repeat the search process.

Fig. 33. List of devices detected on the bus.

The devices on the list are arranged by serial numbers; however, for the communication to be effected automatically, each device should be assigned with another address. To this end, press „Self-Addressing".

Fig. 34. List of devices on the bus – address assignment.

The next operation to be performed is optimal setting of the communication speed. Upon pressing the „Detect Speed" button, the interface performs a speed test with all PSUs on the bus and uses it as a basis to select the optimal communication speed, common for all PSUs.

In order to confirm the introduced changes, press „Save". **⊞ Save**
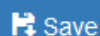
4.13 Update.
The devices support the function of software update by a file which may be downloaded from www.pulsar.pl.
In order to update the software of the interface or PSUs:
- download the latest version of the file from www.pulsar.pl
- press „Select File" in the browser and indicate its drive location. The list of devices compatible with the uploaded file will be loaded
- press „Start" – the new programme will be uploaded to the device

CAUTION! During a software update, do not disconnect the device until the process is accomplished.

≣ Devices ♠ Status ❶ Information ✿ Settings 🔍 Detection 🔧 Update	👤 Service

[192.168.84.91]: ETH name

📂Choose a file	EN54C_ETH_v1.2.3.bin

S/N	Device address	Device name	Software version	
1	0F-1E17-00-0000	192.168.84.91	ETH name	1.2.1	Start

Fig.35. View of the „Update" tab.

7. Specifications.

Power supply	10 ÷ 30V DC
Power consumption	max 0,8W
RS485 transmission's speed	max 115200 bauds, with parity check
LAN transmission's speed	10/100Mbps (auto-negotiation)
Optical indication	PWR – supply voltage indication (red LED) LINK_ETH – Ethernet port connected (green LED) TX – data transmission (yellow LED) RX – receiving data (green LED)
Operating conditions	humidity -10°C ÷ 40°C relative humidity 20%...90% no condensation
Dimensions (LxWxH)	121 x 81 x 60 [mm]
Net / gross weight	0,25 / 0,35 [kg]
Protection class	IP65
Storage temperature	-20ºC...+60ºC
Other	Permission of Scientific and Research Centre for Fire Protection - National Research Institute for use with power supplies of EN54C-LCD series