Energetyka

MUPASZ 101

smart energy management

Bay controler

User manual

Document version: 01i02
Update: 2016-10-12

Safety information

The case must be properly grounded.

Dangerous voltages can occur on the connectors, even though the auxiliary voltage has been disconnected.

National and local electrical safety regulations must always be followed.

Whenever changes are made in the device, measures should be taken to avoid inadvertent tripping.

Exploration of damaged device can result in malfunction of protected object and result in threat to life and health.

Comments

We reserve the right to modify the device.

Device is an industrial monitoring and control instrument.

Remaining user documentation can be downloaded from energetyka.itr.org.pl

The device meets requirements of the of the European Directive ROHS 2011/65/EU

The device after use is electrical and electronic waste, recyclable accordance with European Directive 2012/19/EU (WEEE) on waste electrical and electronic equipment.
The device contains a Li or Li-SOCl2 battery, which is subject to selective collection accordance with European Directive 2013/56/EU.

Table of Contents:

1. Introduction

1.1. Symbols

Electrical warning symbol indicates the presence of hazardous energy circuits or electric shock hazards.

The warning symbol indicates the important information related to the threat to life and health.

The information symbol indicates the clarification of relevant features and parameters of the device.

1.2. Conventions

Menu selection method:

The menu or information windows (parameters) are displayed on LCD screen. In both cases, if the information content takes more than one screen, navigation buttons up/down can be used. Windows and commands are at the lowest menu level.

Selection of menu/window/command can be done with navigation buttons.

To enter some of menu/window/command, it is possible to use context buttons. They are also used when editing the parameters.

The convention of marking the keyboard buttons and menus:

Keyboard buttons are depicted with graphic symbols.

The designation of context button is depicted by a graphic symbol and its name on the LCD display.

🔘 graphic symbol of context button

🔘 **Logging** – description of the button on the LCD screen

The convention of the texts displayed on the menu:

Menu > Management > Settings – the path to the menu / window / command; it always starts with **Menu**; the subsequent branches are separated by **>**

Options – parameter name

Setting – name of the menu /window / command

1.3. Functionality and accessories

Profile	
	Logic - Used to edit operational logic of the device, utilizes: protections, automatic functions, logic gates, comparators, timers, flip-flops, registers, event blocks, etc. Available via ELF program.
	Simulator - Used to carry out simulations of designed logic and preview analog-digital signals in the profile schematics. Forcing of input signals and measurement values can be carried out using data saved in COMTRADE format. Available via ELF program.
	Bay view – Allows editing graphic representation of bay schematics, visible in the device, via ELF program.
	Freely programmable diodes - 16 freely programmable tricolour diodes. The Elf program allows their editing: assignment of functions to be signaled, signaling order, description, colours and display mode.
	Set points - Used to preview and edit parameters: nominal values, protections, automatic functions, control and monitoring systems, autodiagnostics; grouped into sets of set points.
	Texts - Used to preview texts predefined in the device, in supported languages, and to edit editable texts. Available via ELF program.
	Selected counters - Used to configure Selected Event Counters window.
	Selected measurements - Used to configure Selected Measurements window.
	Selected MODBUS records - Used to map MODBUS registers.
	Control – the functionality used for local and remote control of connectors, clearing of the signalization, and carrying out user commands.
Monitoring	
	Configuration - Used to preview and edit configuration parameters of the device, i.a. system clock, communication ports, user interface.
	Log - Used to preview events logged in the device.
	Event counters - Each event defined in the device has a 16-bit counter assigned. Used to preview their values in Event Counter window.
	States - Used to preview system states, digital inputs and outputs, signal diodes, communication ports, user login information.
	Measurements - Used to preview measurements, along with their status.
	UM – User Manager controls and identifies users access to functions of the device.
	RALG - Algorithm register - used to preview, in textual and graphical form, algorithm operating states, of e.g. protections, automatic functions, switches.
	Service - Group of service parameters available to users with service privilege.
Extensions	
	SLOG - System log. Stores time-and-date stamped device operation logs i.a. user logging, last modification of set points, control commands.

Diagnostics	
	SC – Self check, monitoring of internal states of the device.
	CBD - Diagnostyka wyłącznika - służy do wyznaczania krytycznych parametrów wyłącznika/stycznika w trakcie jego eksploatacji.
Other	
	Maintenance, inspections, repairs – handling of the device during normal operation.
	Storage and transportation – handling of the device during storage and transportation.
	Place of installation of the device.
	Disposal – handling of the decommissioned devices.
	Guarantee – guarantee conditions.
	Service – service during and after guarantee period.
	Accessories – additional or service elements.
	Contact – the address of the manufacturer and service.

2. General

2.1. Designated use

MUPASZ 101 is designated for protecting incoming feeder and outgoing bays in low and medium voltage electrical grids. Depending on the specific embodiments enable a full protection against the effects of phase-to-phase short-circuits and earth faults . Cooperate with CR / CRR (Rogowski coil) current transducers.

Fig. 2.1.1 The view of MUPASZ 101

MUPASZ 101 bay controller may have up to 3 bay types (profiles) implemented which may be freely modified and adapted to the user's requirements. Logic function simulator is included. The user may also redesign implemented bay views and usage of 6 signaling diodes.
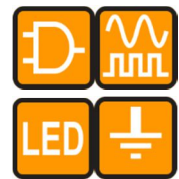
MUPASZ 101 works with ELF application used to design individual bay operation logic, parameterization of protections, to configuration, to read measurements and events, and to control device operation in service mode.

The regular 36 months warranty period may be extended to 60 or 120 months.

2.2. Features

MUPASZ 101 has the following functional features.

Operation in

- line bay
- busbar coupling bay
- incoming feeder bay

Connector types

- circuit breaker
- contactor
- load switch
- disconnecting switch
- disconnecting-earthing switch
- truck
- earthing switch

Control

- local/remote: user interface, transmission, binary inputs
- switches: open, close, insertion, withdrawal
- cancelling:
  - failures AW - TRIP
  - signaling UP - ALARM
  - lock - LOCK
- binary and analog outputs
- user commands

Protections

- current protections: I>, I>>,I>>>, I>IDMT, I2f>
- zero-sequence overcurrent protections: I0>, I0>IDMT
- technological protection: Tech

Options of protections

- operation based on RMS values
- directional action
- operation in CBF mode
- acceleration/deceleration of protection action

Measurements

- current: I1, I2, I3, I0
- frequency: f
- angle between current signals and voltage signals

Diagnostics

- SC - Selfcheck
  - voltage: supply, reference, battery
  - memory: program and data
  - correctness of internal module-to-module communication
  - calibration factors of measurement channels;
  - device set points
- CBD - Circuit Breaker Diagnostics

Extensions

- SLOG – System Log

Autotest

- CCT - Cumulated Current Test
- CBCT - Circuit Breaker Control Test

User interface

- three languages: Polish, English, Russian
- up to 12 users
- colour display 320 × 240 pixels
- 5 signal diodes: Emergency trip, Alarm, Lock, Power supply, Device failure
- 6 freely configurable diodes
- configuration of displayed measurements and event counters
- bay view editing: switches, electrical symbols, lines, nodes, texts, measurements, clock, states of binary inputs and outputs, events, messages, signaling operational states

Other functions

- event log capacity 500 events
- filtering of events displayed
- each defined event has 16 bit counter assigned
- power outputs (relay-semiconductor type)
- auto-logging
- editing selected texts, e.g. names of protections, connectors and signal diodes
- algorithm operational status registers
- user registers for free assignment of analog-digital signals

2.3. Front panel

The front panel hosts:
- graphic display;
- control keyboard of the device;
- LED signal diodes;
- USB service port for communication with ELF software tool..
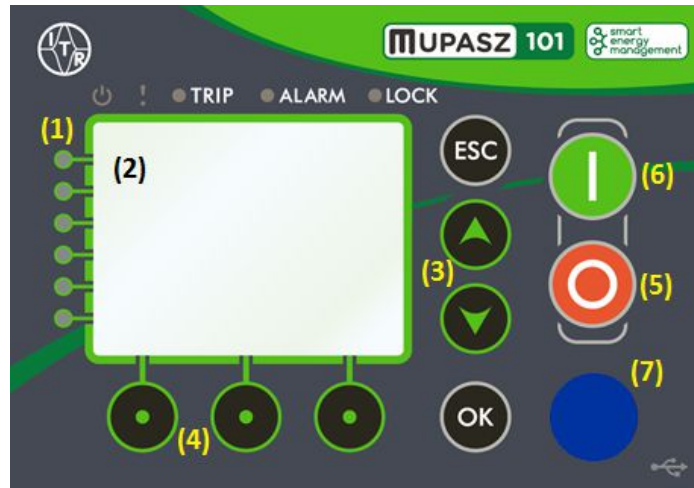
1) Freely programmable diodes; diode descriptions on graphic display.
2) Colour graphic 320x240 pixels display.
3) Menu navigation keys.
4) Context keys.
5) Control key – OPEN.
6) Control key – CLOSE.
7) USB mini B service connection port.

2.4. Control keyboard

Control keyboard of the device has 12 navigation, function, control and context keys. Navigation and context keys are used to navigate around the display MENU and to review and edit parameters.

Tab. 2.4.1 Control keyboard

Przycisk	Opis
▲	navigation key - UP arrow
▼	navigation key - DOWN arrow
ESC	navigation/function key ESC - cancel/return
OK	navigation/function key OK - acceptance
●	function key, function description is displayed
I	function key CLOSE used to issue the „close" command to the main switch, e.g. the circuit breaker
O	function key OPEN used to issue the „open" command to the main switch, eg. the circuit breaker

⚠️ *The function keys O OPEN and I CLOSE allow issuing commands to the main switch. The "open" command is always executable. For the „close" command to be executed the **Local** or **Local and remote** mode must be active. Additionally, access to the „close" command may be restricted for some users (see 3.11.1 Users).*

2.5. Signal diodes

In addition to graphic display and control keyboard, device front panel has 11 signal LEDs, 6 of them are programmable. They signal the most important states of device operation, resulting from operation of algorithms, or existing situation, such as establishing a lock, emergency CB opening, ALARM signalization (UP-bay damage).

Tab. 2.5.1 Meanings of predefined diodes

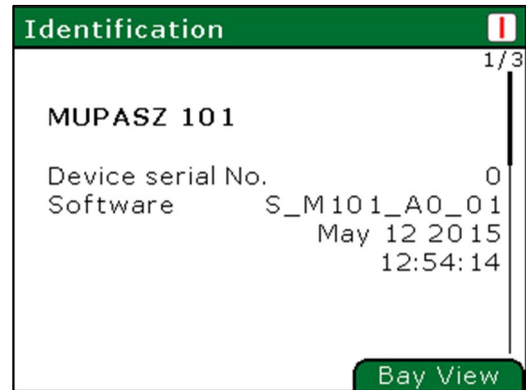| Diode	Color	Meaning
⏻	green	Signals feeding of correct supply voltage to the device Continuous light.
!	red	Signals action of SC Self Check mechanism. Continuous light.
TRIP	red	Signals opening of the CB caused by tripping of protection set to disconnection or disconnection with lock. Continuous light.
ALARM	yellow	Signals protection tripping the signalization. Flashing/continuous light.
LOCK	yellow	Signals that the device is locked following activation of any lock. Continuous light.

2.6. Identification

Menu > Identification

The **Identification** branch includes three windows. In the first one there are displayed all parameters identifying device hardware and software:

- name – **MUPASZ 101**
- serial number - **13**
- software version – **S_M101_A0_01**.

In succeeding windows aggregated information relating bay state is displayed, such as main switch state, control mode and address data.
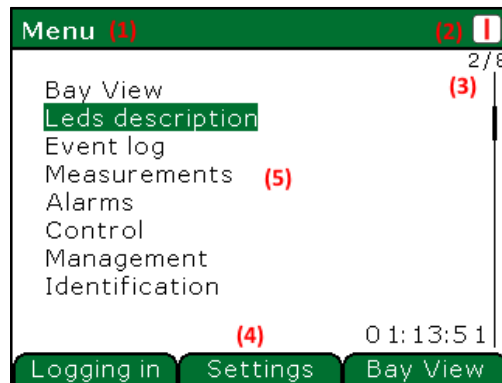
```
Identification                    █
                              1/3

  MUPASZ 101

Device serial No.           0
Software        S_M101_A0_01
                  May 12 2015
                     12:54:14


                      Bay View
```

3. Operation manual

 The below shown views may differ for different device specifications.

3.1.   Window

Rys. 3.1.1 Main window

In the main window of fig 3.1.1 there are presented elements shown in most user interface windows.
 1)   The upper line contains the window caption. i.e. the name of relevant branch or window the user is watching at.
 2)   On the right hand side of the caption icons are located which inform about alarms, locks and emergency CB opening.

Tab. 3.1 Meaning of system icons

Icon	Meaning
—	CB in open state
|	CB in closed state
+	CB in out of service state
▲	CB in lock state
●	Pick-up state
■	CB tripped
▢	Device internal state
⧗	Memorization of configuration data in the device
🔒	No access from user interface (no user logged-in)

 3)   Position of the cursor (line number) or number of the screen (e.g. in the Log) is located between the header line and the scrollbar.
 4)   In the lower line functions of the context keys ● are displayed.
 5)   The central part of the display is used for presenting numbers, texts or graphic.

3.2. Menu

The ▲, ▼ and OK, ESC keys are used to navigate around the device menu. In order to reach destination one should navigate using the ▲, ▼ keys. The OK key is used to accept entering the selected branch. The ESC key allows moving one level up in the menu tree.

For quick moving to selected windows or branches the ● context keys are used. Their current meaning is displayed in the bottom line.

For example in order to move from the main window to the **Logging** window the following path should be followed: **Menu** > **Management > Monitoring > Logging** or to use the ● **Logging** context key. **e** .

```
Menu                    ▌
                      2/8
Bay View
Leds description
Event log
Measurements
Alarms
Control
Management
Identification

             0 1:1 3:5 1

Logging in   Settings   Bay View
```
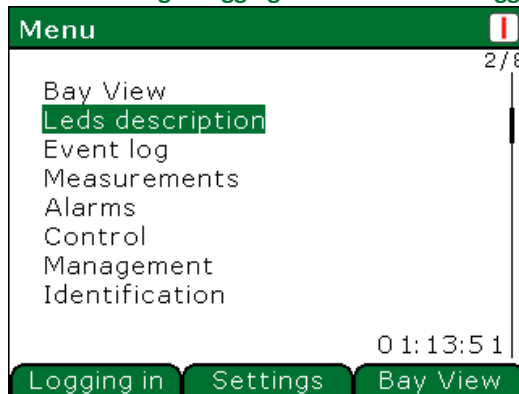*Fig. 3.2.1 Menu main window*

The context key in the main window are used for:
- ● the left one – moving to the user **Logging** window,
- ● the middle one - moving to the parameter **Configuration** window,
- ● the right one - moving to the **Bay view** window.

> The right hand side context key is used for navigating through all widows listed in the main menu starting from the Bay view window and ending in the Identification window.

3.3. View and edition of parameters

Below a method of editing MONOLISTS, MULTILISTS and NUMBERS is presented for an exemplary protection I > IDMT (1).

The edition of MULTILIST type parameter consists in selecting any combination of elements from the list. The edition of MONOLIST type parameter consists in selecting a single element from the list.
The edition of a NUMBER consists in entering the number in proper format and admissible range.

3.3.1. View of the parameters

An exemplary window with the **I > IDMT (1)**.
Parameters, depending on their type, are edited as in the examples below. **Options** and **Active events** are MULTILIST type, **Direction** and **Characteristic** are MONOLIST type; **Ir** and **T** are NUMBER type.
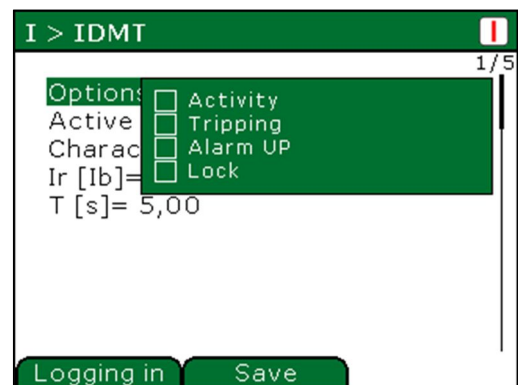
3.3.2. Edition of the MULTILIST parameter

The name of the edited parameter is displayed in the window header line. Elements of the list and the selection symbols are displayed underneath:
- ☐ not selected element,
- ☒ selected element.

Edition of the multilist is carried out by means of the following keys:

, - change of element,

Select – element select or deselect,

confirms edited value

results in leaving the window without saving changes.

3.3.3. Edition of the MONOLIST parameter

The name of the edited parameter is displayed in the window header line. Elements of the list and the selection symbols are displayed underneath:
- ○ not selected element,
- ⊙ selected element.

Edition of the monolist is carried out by means of the following keys:

, - change of element,

Select – element select,

confirms edited value,

results in leaving the window without saving changes.
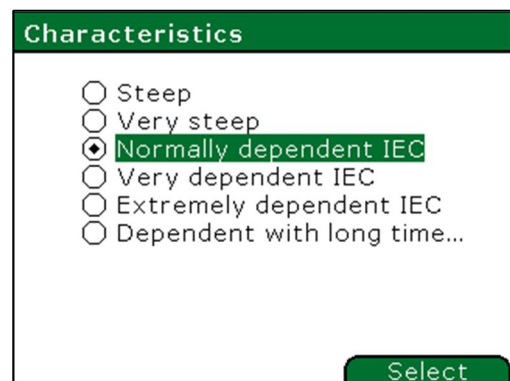
3.3.4. Edition of the NUMBER parameter

The name of the edited parameter is displayed in the window header line. Allowable range of the parameter (min, max) is displayed below.

Edition of number is carried out by means of the following keys:

🔽, 🔼 - increment or decrement one digit,

⚫ **<**, ⚫ **>** - position change,

🆗 - confirms edited value

🔘 - results in leaving the window without saving changes.

```
Ir [Ib]

min= 0,20
max= 4,00



        1,10


  <                        >
```
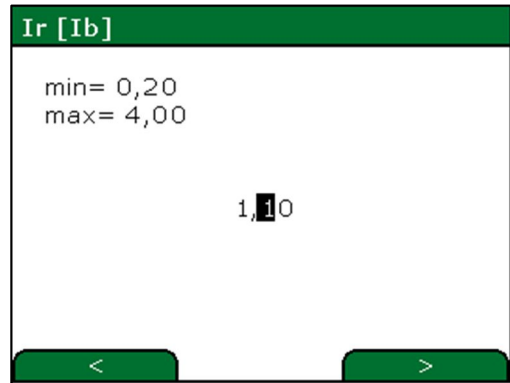
3rd3rd5th Preview of the parameters after edition

Changed parameters are displayed in red.

🟢 **Save** – used for storing all protection parameters. After its pressing a „write" message appears.

Pressing the 🔘 key results in leaving the **I > IDMT (1)** If the parameters were modified another windows opens in which the edition may be memorized

```
I > IDMT                    ▮
                          2/5
Options= ...
Active events= ...
Characteristics= Normally ...
Ir [Ib]= 1,10
T [s]= 5,00




Logging in    Save
```
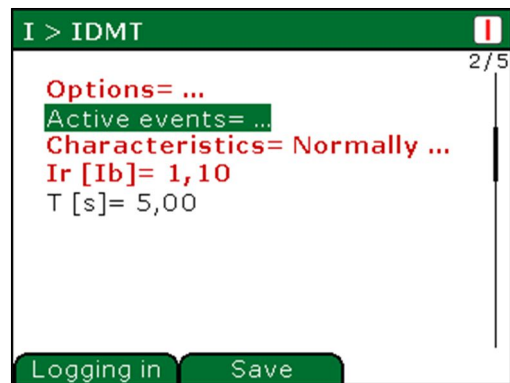
3.4. Bay view

Menu > Bay view

ELF software tool allows configuration of the bay view, customized to user's needs. There is no need therefore to visualize the whole bay, only its individual components, such as state of the CB. Bear in mind, however, that inserting in the bay view of e.g. earthing switch that is not present in the profile (logic scheme), shall result in displaying it as not monitored.

Control activates the mechanism of switch control. Activation of this option marks the main switch.

Another switch may be selected with the ⬇, ⬆ keys.

The switches which cannot be controlled may not be selected and marked.

After selection of the required switch and pressing the ⓞ key the **Control** window opens in which required switching operations may be selected from the list and confirmed with the ⓞ key.

After selection of the required operation it will be executed or "not available" message displayed.

*The switches may be operated also in the Switches window or by means of a **User command**.*

3.5. Diode description

LED   **Menu > Diode description**

Device MUPASZ 101 is fitted out with the set of freely programmable signal LEDs installed on device front panel. Diodes are configured by means of ELF program, in the tab **Logic**; configuration consists in assigning a signal from the system, algorithm or automatic function to specific LED. Descriptions of signalization diodes are defined by editing the text assigned to given diode and are shown on the display.

Leds description

☐ I >

☐ I >>

☐ I >>>

☐ I > IDMT

☐ EF >

☐ EF > IDMT
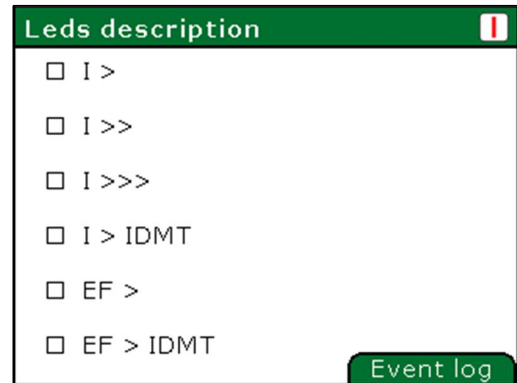
Event log

3.6. Event log

Menu > Event log

The **Event log** holds events generated in the device and allows their viewing. Any recorded event is characterized by:
1) type – see table below,
2) date and time – the events are tagged with 1 ms resolution time tags,
3) descriptive text – displayed in one or two lines,
4) up to 5 parameters, e.g. current value at protection stripping (the parameters may be accessed by selecting the ● **Details** context key)

Event log   1/1
2012-01-01 00:00:00 **(2)**
Earthing
Opened
(1)2012-01-01 00:00:00
Disconnector
Closed   **(3)**
2012-01-01 00:00:00
Device start   **(4)**
Filter   Details   Measuremen

The logged events may be filtered for displaying in regard of their types. Having selected the ● **Filter** context key a window opens in which event types to be displayed may be selected.

By means of the ● Select context key required positions may be selected or deselected. After confirmation your choice with the ⓞ key and returning to the **Event log** window only the event types selected in the **Filter** window will be displayed.

Filter
☒ Normal
◪ ☒ Start
◯ ☒ Alarm UP
◣ ☒ Release
◼ ☒ Tripping
▲ ☒ Lock
▢ ☒ Execution
Save   Select
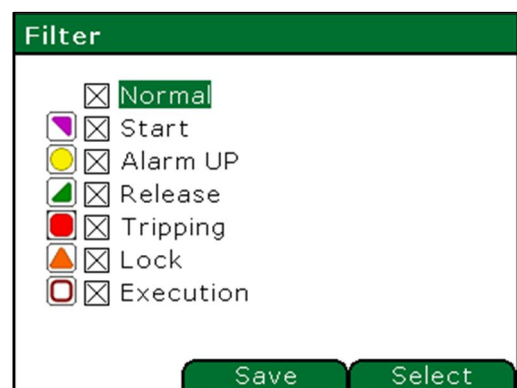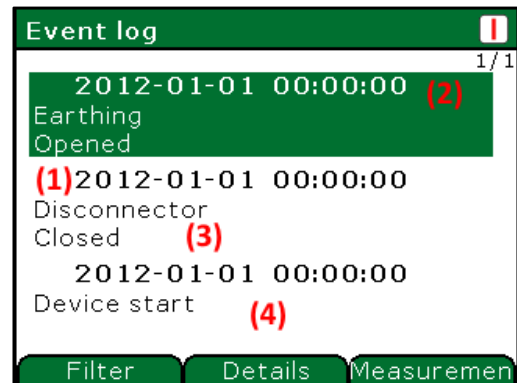
Tab. 3.6.1 Event types

Symbol	Event type	Description
	Normal	Standard event type, such as user login.
	Activation	Activation of an algorithm, e.g. protection
	Alarm	Execution of algorithm, e.g. protection set to UP signalization - "UP signalization" item selected in Options
	Release	Deactivation of an algorithm, e.g. protection
	Tripping	Execution of algorithm, e.g. protection set to opening of the main switch - "Tripping" selected in Options
	Lock	Execution of an algorithm, e.g. protection set to lock - "Lock" or "Temporary lock" selected in Options
	Executed	Execution of an algorithm, e.g. protection

3.7. Measurements

Menu > Measurements

The resource stores and provides access to all measurements carried out by the device. Measurements have flags assigned to them that represent their state and validity status (see table below).

By pressing the ● **All / Selected** keys either all available or only user selected measurements will be displayed.

Pressing the ● **Clearing** key opens the window for clearing counters, e.g. work time or energy counters.

Measurements
```
Measurements
 I1[A] = 100
 I2[A] = 100
 I3[A] = 100

 I0[A] = 1,0

   All   Clearing   Alarms
```

Clearing
```
Clearing                    4/4
   Cumulated current counters
      Energy counters
   Counter of bay operation time
         Cancel
```
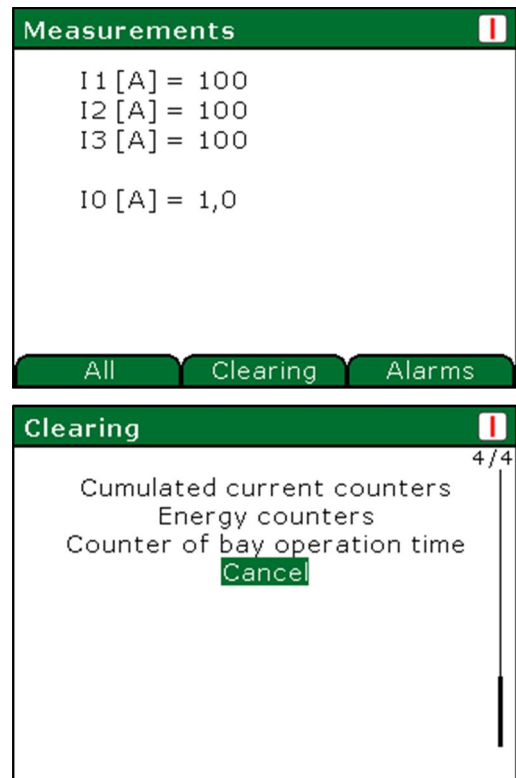
*Configuration of **Selected measurements** is also possible via the ELF software tool.*

Tab. 3.7.1 Flags of measurements

Symbol	Flaga pomiaru	Opis
>	Above the range	Measured value exceeds upper measuring limit
×	Not available	No measurement, e.g. no measurement channel
<	Below the range	Measured value exceeds lower measuring limit
≈	Unsure	Measurement value is calculated basing on incomplete information, e.g. the power is calculated for one line-to-line voltage

3.8. Alarms

Menu > Alarms

MUPASZ 710 *plus* implements a series of switch bay protection algorithms. In order to facilitate reading of operating state of algorithms, the software of MUPASZ 710*plus* device is fitted with the function of displaying aggregated information on states of all algorithms implemented in the active profile.

In the **Alarms** window aggregated information on alarms, locks and tripping is displayed.
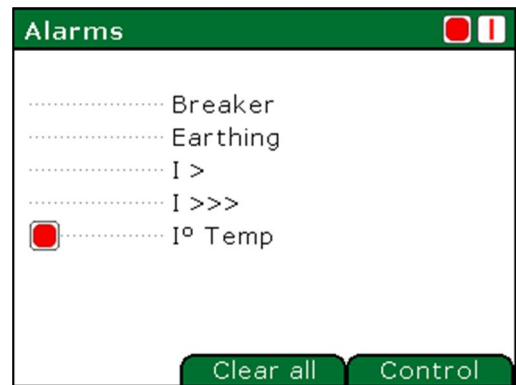
The ⊙ **DELETE** key deletes all signaling and displays a relevant message.
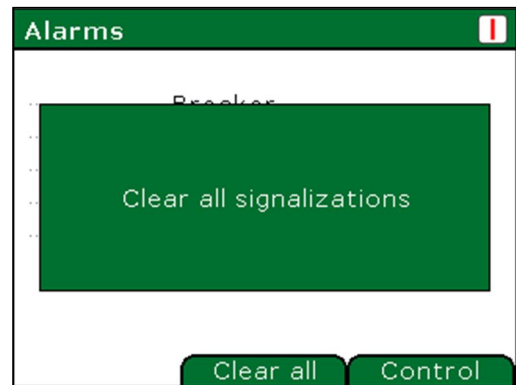
⚠ If the cause of signaling is still active it will not be cancelled. First the cause should be removed and then the signaling cancelled.*.*

ℹ *After adaptation an adequate **User command** on the logic scheme may be used to cancel signalization.*.*

3.9. Control mode

3.9.1. Selection of control mode

L/R   **Menu > Control > Control Local/Remote**

One of four control modes may be selected in the **Selection of control** window:

- **Local** – via device interface,
- **Remote** – via communication system,
- **Local and remote** – via device interface / communication system,
- **Autonomous control** – control without participation of the device (CB is controlled by external devices).

*See chapter **View and edition of parameters***

⚠️ *Before setting the control mode one should check if the intended mode is allowed in settings. - **Menu > Management > Settings > Settings X > Control group > Selection of control.***

ℹ️ *If in the bay operation logic scheme the control mode selection is done via binary inputs then selection of the control mode via the user interface is disabled.*

3.9.2. User commands

L/R   **Menu > Control > User commands**

ELF software tool allows the user to define own commands which activate logic functions from the device menu level.

Commands are configured by means of ELF program, in the tab **Logic**; configuration consists in entering the CMD_USER block and connecting its output signal to the block of the function it is to activate. Selecting the command from device menu shall activate the instruction resulting from the logic.

ℹ️ ***User commands** may be used to control the switches, cancel signaling, activation of algorithms or execution of any user designed function present on the device logic scheme..*

3.9.3. Switches

L/R **Menu > Control > Switches**

In this window all switches included in the device active profile and their states are displayed. After selection of a particular switch and pressing the (OK) key the **Control** window opens.

ℹ️ *In case the selected switch is not intended for control via the interface the message **Lack of control** is displayed.*

If the selected operation is allowable it will be executed or a message will be displayed that the operation is not allowable. Additionally, a relevant event will be logged in the Event log.
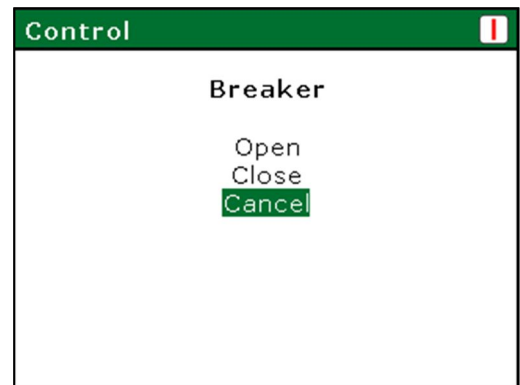
ℹ️ *In order for the operation selected from the **Switches** submenu to be executed the control mode **Local** or **Local and remote** must be selected.*

3.10. Management

3.10.1. Settings

Menu > Control > Settings

The **Settings** submenu allows selecting active bay type (profile) and reviewing and editing parameters of settings.

*Settings may be modified by a user with adequate level of privileges (see chapter **Users**).*

Modified parameters are memorized.

Algorithms of protections and automatic functions, control and monitoring functions and nominal values are grouped in separate menu branches.

After pressing the ⦿ **Default** context key all parameters may be restored to factory values. The command will be executed or information displayed that the command cannot be executed. Additionally, a relevant event will be logged in the **Event** log.
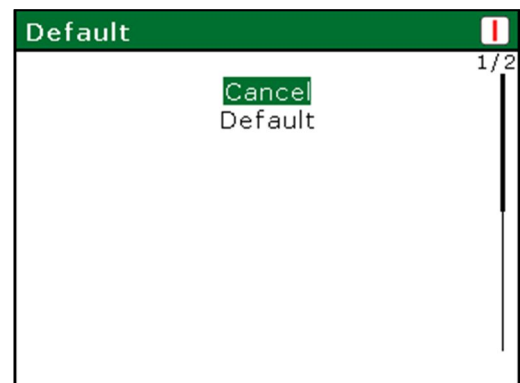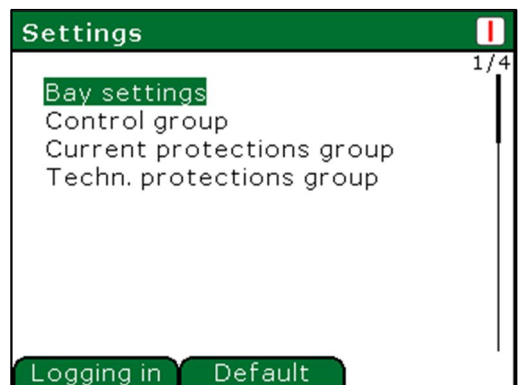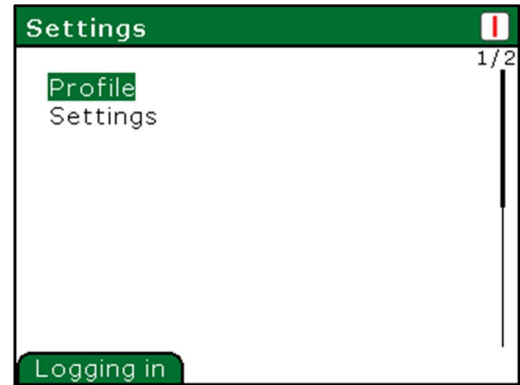
An exemplary window with current protections implemented in device profile being edited contains:

- One instance of **I >**
- One instance of **I >>**
- One instance of **I >>>**
- One instance of **I > IDMT**
- One instance of **I0 >**
- One instance of **I0 > IDMT**
- One instance of **I2f >**
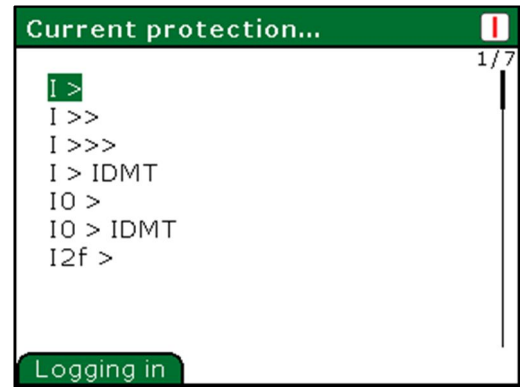
If more than one instance of a given algorithm may be implemented in the device than the number of the instance is displayed in round brackets.

An exemplary window with the **I > IDMT (1)**.
Parameters, depending on their type, are edited as in the examples below. **Options** and **Active events** are *multilist* type, **Characteristic** is *monolist* type; **Ir** and **T** are *number* type.
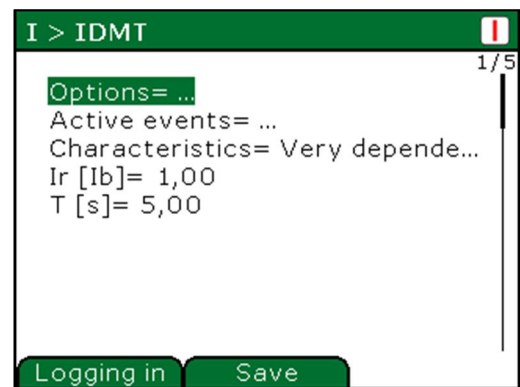
*When starting edition of settings one should first set the nominal values (**Bay settings > Nominal values**) because their values may influence the way the protections and automatic functions operate and their operating ranges*

3.11. Supervision

3.11.1. Users

Menu > Management> Supervision > Users

The application controls and identifies access by 14 users to device functions, e.g.: changing set points, editing configuration parameters, controlling switches, operating fault recorder, etc.
Currently logged-in user is displayed In red.
The device has 5 access levels with different user privileges.

- **User not logged-in**
- **10 users to be defined**
- **Administrator**
- **Service**
- **Producer**

Return – opens the window in which **Logging in** was lately used

Producer and Service users have privileges allowing servicing of the devices; these privileges are not granted to the operating personnel.

*Activation of the **Auto login** function results in keeping the latest logged-in user in memory and thus the user is not changed after device restart.*

*If the **Auto login** function is not active the user is logged in for **Password activity time [h:m],** after that time automatic logging out takes place (switching to User not logged-in).*

Administrator has full privileges. He may grant privileges (see figure) to defined users (also to not logged-in user).

*User may be defined in the **User manager** window by granting him a password. This operation results in adding the new user to the list in the **Users** window.*
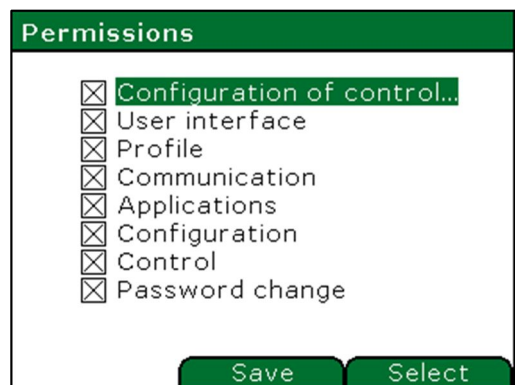
Each user may log in by entering a 4-digit password defined by the Administrator.

The password is entered by means of the ⬇, ⬆, ⦿ < and ⦿ > keys (in the same way as the NUMBER parameter).

In order to log in the correct password must be entered and the ⬤ᵒᵏ key pressed.

Service

Enter password:

▮***

< >
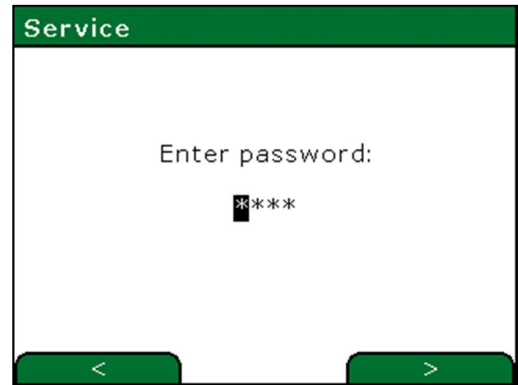
ℹ Factory password of the Administrator: **1111**

3.11.2.   Digital inputs and outputs

Menu > Control >Supervision> Digital Inputs/outputs

In this window current states of device binary inputs and outputs are displayed.

High state of input/output is marked with the ▮ symbol, low state with the _ symbol.

Digital inputs/outputs

Inputs	Outputs
1 2 3 4 5 6	1 2 3 4 5 6
_ _ _ _ _ _	_ _ ▮ _ _ _
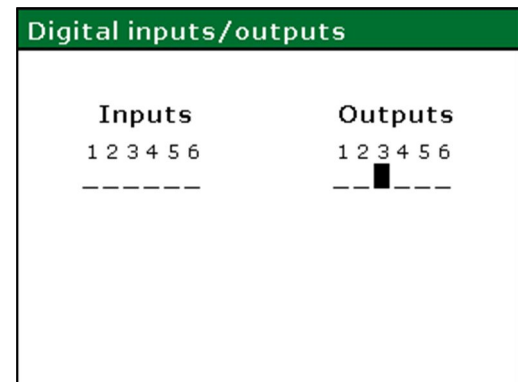
3.12. Configuration

3.12.1.   Communication

Menu > Management > Configuration > Communication

Window is used for configuration of transmission parameters for particular communication ports. Configuration parameters displayed in the window depend on transmission protocol available for the given COM port. Particular parameters are edited in accordance with their type, as in the edition examples.

ℹ *See chapter   **View and edition of parameters***

COM 1   1/7

Protocol= MODBUS RTU
Speed [bits/s]= 115200
Length of data [bit]= 8
Parity bit= None
Stop bit= 1
Address= 1
Timeout [s]= 5,00

Logging in   Save   Default

3.12.2. User interface

 Menu > Management > Configuration > User interface

User interface menu branch allows modification of the device menu appearance, selection of language and setting display blanking time. Particular parameters are edited in accordance with their type, as in the edition examples.

 See chapter ***View and edition of parameters***
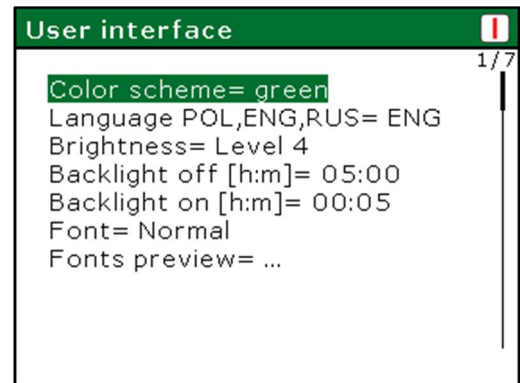
3.12.3. Clock

 Menu > Management > Configuration > Clock

After entering the **Clock** window in the first line current date and time is displayed, and in the second line date and time to edit.

 See chapter ***View and edition of parameters***
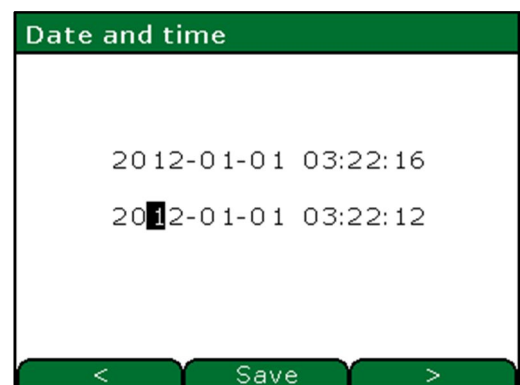
 Confirmation of date and time results in automatic zeroing of milliseconds.

 Menu > Management > Configuration > Clock options

In the **Clock options** window **Automatic time change** option may be activated (it results in automatic change between standard and summer time). The second option allows to log time change event in the Event log.
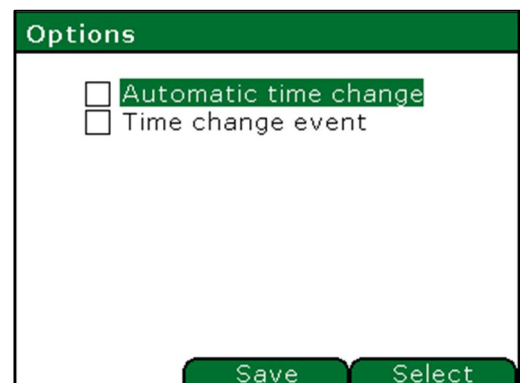
3.13. Extensions

3.13.1. SLOG – System Log

System log stores information with date and time stamp, referring to logins of individual users, last change in set points, last cancelling of signalization, changes in profiles, bay view, parameters of communication ports, user commands. The log is accessible via SCADA system and ELF software tool. Detailed information may be found in "SLOG – System log. Instruction manual"

3.14. Diagnostics

3.14.1. SC - Self-check

Subject to self-check are: voltages (supply, reference, battery), memory (program and data), correctness of internal module-to-module communication, calibration factors of measurement channels and device set points. Following detection of damage that could pose threat to safe operation of the switchgear, device operation is stopped, AL relay contacts are opened, optical signalization on the front panel is activated. Such a state requires servicing.

3.14.2. CBD - Circuit Breaker Diagnostics

Menu > Management > Diagnostics > CBD – Circuit breaker diagnostics

The **CBD – Circuit breaker diagnostics** determines the circuit breaker parameters during normal exploitation without disconnecting it from the network. Basing on the acquired information the comprehensive breaker diagnostics is carried out including its wear and possible future malfunction. The CB state report is available through the communication channels and user interface.

Items analyzed:

- CB opening events number irrespective of the cause and value of current in the disconnecting circuit,
- CB opening events number caused by the over current protection,

Detailed information may be found in "CBD – Circuit Breaker Diagnostics. Instruction manual".
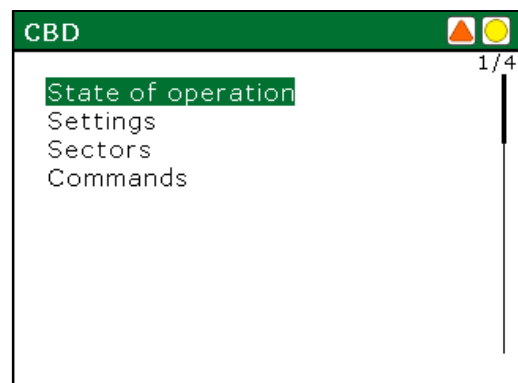
4. Remarks of manufacturer

4.1. Maintenance, inspections, repairs

The device implements programmed operation of protection, control and automatic functions algorithms, and it was fitted with autotest systems responding to internal damage during device operation.

The manufacturer recommends that correctness of device operation is verified:

    a) each time - during commissioning,
    b) at least once a year - in mine face installations,
    c) at least once every 5 years in installations other than front face.

The following are subject to periodic inspections (if used):

- correct operation of measurement channels of phase currents and voltages, earth-fault currents and voltages, at rated values;
- correct operation of control circuits;
- correct operation of communication channels, in line with the implemented protocol;
- integrity of device protection earthing.

It is recommended that the internal battery is replaced at least once every 10 years. The battery should be replaced by service personnel as indicated by manufacturer.

Differences observed during checks, or in measurement readings, or in device operation, should be notified to the service center as indicated by manufacturer.

Also inspections resulting from branch regulations should be undertaken.

Changes in protections set points during operation do not require verification of their correctness.

4.2. Storage and transport

Devices are packed in transport packages and secured against damage during transport and storage. Devices should be stored in transport packages, indoors, in places free from vibrations and direct effects of weather conditions, dry, well ventilated, free from harmful vapors and gases. Ambient air temperature should be between −55°C and +70°C, and relative humidity should not exceed 80%. All shipped devices are attached with complete set of connectors, grounding braid, warranty card and quality certificate.

Do wysyłanych urządzeń dołączone są: komplet wtyków, plecionka do uziemienia sterownika, oraz karta gwarancyjna i świadectwo kontroli.

4.3. Place of installation

MUPASZ 101 is designed for erection in switchgears, acc. to drawings in IU_M101_SPECIFICATION.

*Connection of device earthing pin with metallic section of the switching bay should be executed with **WAD_6140 grounding braid**, delivered with the device.*

Length of single cable connected to device sockets cannot exceed 3 m.

4.4. Disposal

Devices are made mostly from recyclable materials, or materials that can be processed again or disposed of in environmentally sound manner. Decommissioned devices can be collected for recycling, provided that their condition is that of normal wear and tear. All components that are not recyclable shall be disposed of in environmentally sound manner.

4.5. Guarantee

Regular 36-month guarantee period; may be extended to 60 or 120 months. Had the sale been preceded by execution of an Agreement between the Buyer and the Seller, provisions of such Agreement shall apply. Guarantee covers remedying of defects, free of charge, provided that instructions specified in the Warranty Card are adhered to. Detailed guarantee conditions may be found at energetyka.itr.org.pl in the „Sale Regulations".
- The guarantee period is counted from the date of sale.
- The warranty is extended by a period of residence of the product in the repair.
- Unauthorized tampering with the product will void the warranty.
- Warranty does not cover damage resulting from improper use of the product.

4.6. Service

Servicing includes:
- guarantee and after guarantee inspections,
- assistance in commissioning our devices or switchgears with our devices both in the country and abroad,
- device configuration (if requested by the customer):
  - algorithms set points,
  - communication ports,
- training courses covering operating skills and programming of the devices; in the manufacurer's site in Warsaw, Poland
- designing logical schemes based on documentation delivered by the customer.

The engineers team of Tele and Radio Research Institute, with long professional experience in the field of power protection relays, will answer questions regarding operation of the bay controllers, communication and implemented algorithms.

4.7. Accessories

A range of accessories can ordered for the device, such as: protective caps, mounting components, hardware security key, grounding copper braid, mini USB cable.
Detailed description of the accessories can be found at energetyka.itr.org.pl.
The availability of individual accessories depends on the specifications of the device.

5. Additional information

5.1. Description of communication interfaces

MUPASZ 101 is fitted with RS 422/485 interface which allows communication with the device using the MODBUS-RTU protocol.
The following control and monitoring functions may be executed via the MODBUS-RTU communication protocol:

- logging-in,
- writing and reading logic functions and device set points,
- control of switches: circuit breaker,
- reading event log,
- reading actual measurement results and bay states.

To connect the RS485 communication interface MUPASZ 101 <- > master controller , especially at longer distances and higher transmission speeds (> 38400 , > 10 m) it is recommended to use two-wire shielded twisted pair CAT 4. The MUPASZ 101 device is equipped with a terminating resistor RT , which according to the assumed configuration of the data communications network should be attached to the line B-.
MUPASZ 101 allows communication with Master devices of reading / writing speed not higher than 50 frames / second for baud rate 57600 bps .

Each version of the device is accompanied by documentation which allows to design visualization and to control objects in the power system.

5th1st1st Modem RS-485 (2-wire/ 4-wire connection)

Depending on the connection point of the device within the network, following types of connections are used:

    Type I – intermediate position – without RT resistor matching wave impedance of the line;
    Type II – extreme position – with RT resistor matching wave impedance of the line.
Above connection types are implemented in the by means of suitable wiring of 10-pin WAGO type 734-110 connector.

Depending on device position in RS-485 network, following types of wiring of communication ports are used:
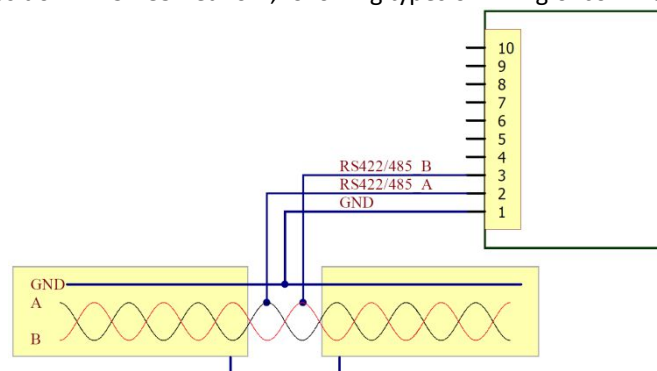

Fig. 5.1.1.1. Intermediate position of the device in 2-wire communication network
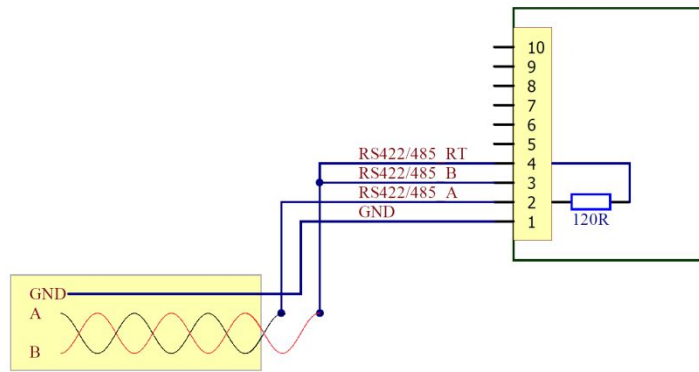
Fig. 5.1.1.2. Extreme position of the device in 2-wire communication network

It is also possible to connect devices to 4-wire RS-485 communication network. In this case pins 2, 3, 4 of WAGO connector refer to direction of data transmission, pins 5, 6, 7 direction of data reception by the device. Recommendations concerning wiring method for communication ports of devices installed at various locations of communication network, are the same as for 2-wire version.
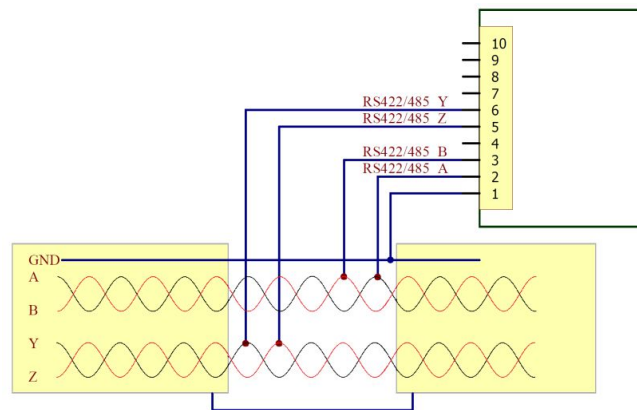

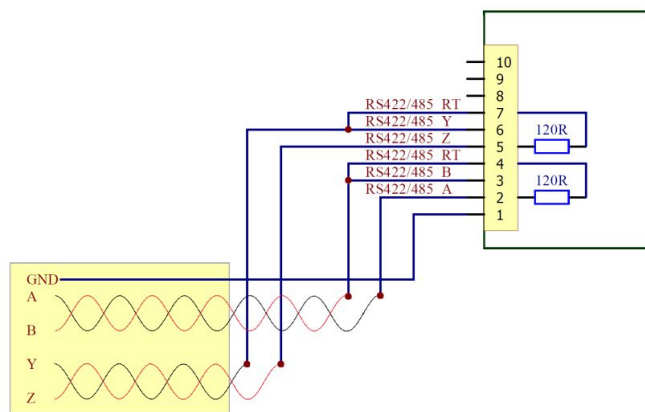*Fig. 5.1.1.3. Intermediate position of the device in 4-wire communication network*

Fig. 5.1.1.4. Extreme position of the device in 4-wire communication network

5.1.2. Modem 2 x RS-485, CANBUS PPM2

Depending on device position in RS-485 network, following types of wiring of communication ports are used:
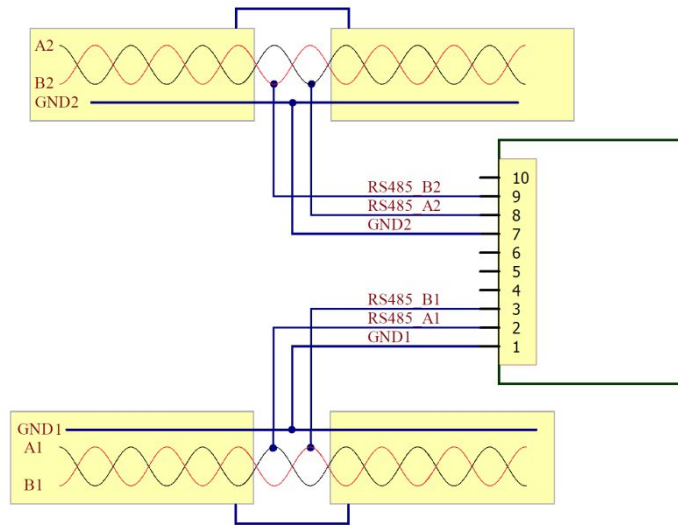
Type I (2-wire)

Fig. 5.2.1 Intermediate position of the device in 2-wire communication network
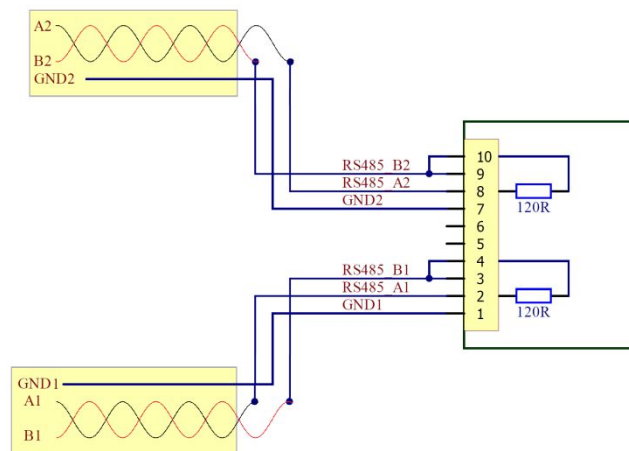
Type II (2-wire)

Fig. 5.2.2. Extreme position of the device in 2-wire communication network

It is recommended that shielded twisted pair is used, with characteristic impedance 120 Ω and low wire-to-wire capacity, with additional wire equalizing potentials of individual transmission modules. One end of shielding wire should be connected with protective potential of the system.

5.1.3. Twisted Pair RJ Ethernet Modem

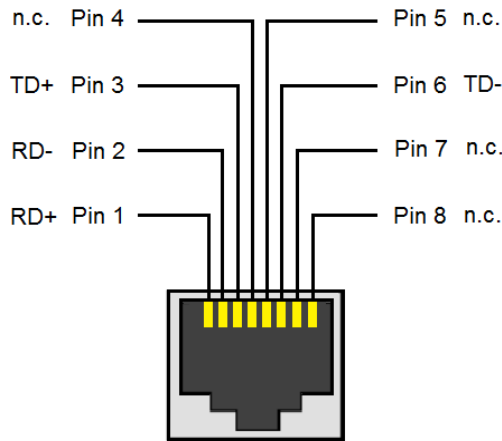The device may be fitted with an optional Ethernet module with MODBUS-TCP and IEC 61850 protocols.

Fig.5.1.3.1. RJ-45 female connector.

5.1.4. ST Optical Fibre

Connection of optical signals consists in plugging ST plugs in relevant sockets paying particular attention to proper matching Tx and Rx transmission directions.

During transportation and when cables are not connected optical sockets should be protected with sealing caps. If the optical sockets get dirty or covered with dust they should be cleaned with compressed air before connecting ST plugs.

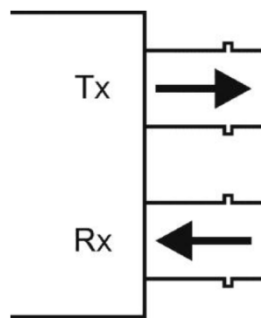| Name	Function
Tx	Optical signal transmit output (to the Rx socket in the cooperating device)
Rx	Optical signal receive input (to the Tx socket in the cooperating device)

Fig.5.1.4.1. ST fibre optic connector desription.

6. Contact

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www: energetyka.org.pl