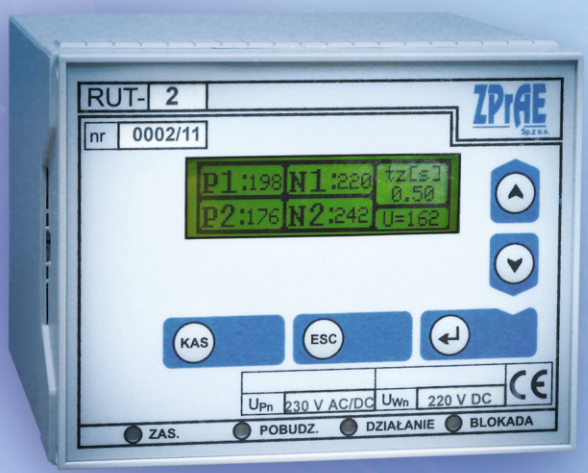
ZPrAE Sp.z o.o.

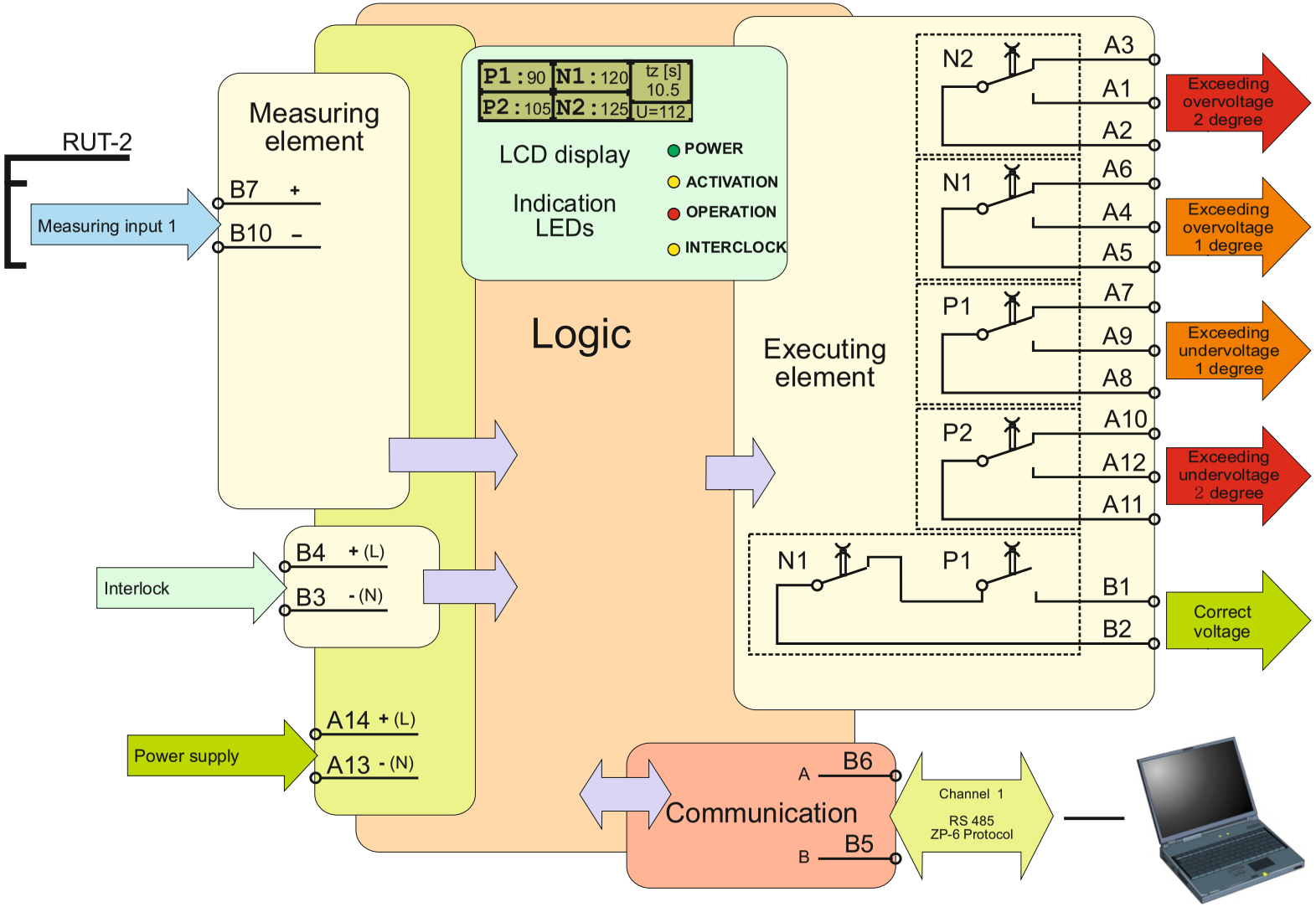
RE line®
ENERGETIC STANDARDS



RUT-2

TIME

VOLTAGE



Rys. 1. Structural scheme of the RUT-2 relay.

APPLICATION

The RUT-2 relay is meant for use in the direct current circuits of a power substation as a voltage monitoring element equipped with four independent operating relays each of which with regulated parameters (pick-up threshold, time delay, hysteresis, operating mode of the operating relays, averaging filter)

CONSTRUCTION

The RUT-2 type relay has isolated measuring inputs meant for connecting the monitored direct current voltage. Each of the four detectors has one operating relay assigned. The changeover contacts of those relays are led out to the terminal of the relays socket. Two of the detectors are under-voltage (P1, P2), and the other two – over-voltage (N1, N2). The levels of first degree alarms (P1, N1) and second degree alarms (P2, N2) are determined by pick-up thresholds saved into the relays memory. Additional blocking input enables blocking the final controlling relays. Thanks to combination of P1 and N1 contacts an input terminal described as “correct voltage” was obtained on terminals B1 - B2 (contacts made in case the monitored voltage is within a defined range).

State of connections between contacts for particular alarms is following:

- Alarm P2 – terminals A10-A11 shorted (NC), terminals A11-A12 not shorted (NO)
- Alarm P1 – terminals A7-A8 shorted (NC), terminals A8-A9 not shorted (NO)
- Alarm N1 – terminals A4-A5 shorted (NO), terminals A5-A6 not shorted (NC)
- Alarm N2 – terminals A1-A2 shorted (NO), terminals A2-A3 not shorted (NC)

The P2 final controlling relay additionally functions as control of proper operation of the RUT-2 relay. Internal fault of the logic part is signalled with operation of the P2 relay. The RUT-2 relay is mounted in a housing, sizes 110 × 100 × 77 mm, with 28 terminations in a form of 2 plugs, suitable to be mounted in typical GZ-14 sockets (plate-mounting), GZ-14U (bus-mounting) or GZ14Z – to be mounted in a relay chassis R8614Z. Dimensions of the relay are presented on figure 10.

An LCD display, enabling preview of status and configuration, is located on the front panel of the relay.

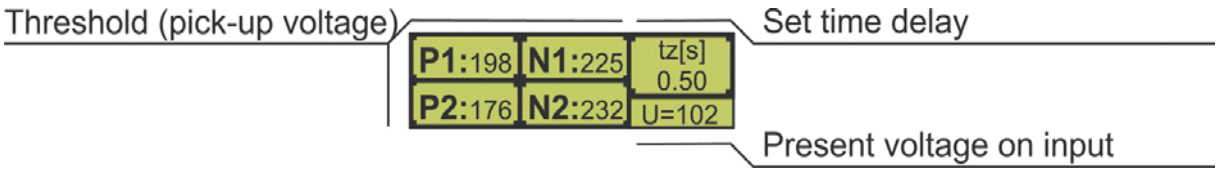


Figure 2. Wain view of the display

Communication with the user is ensured with five buttons, enabling:

	Settings preview (available in „OPERATE” mode) Setting up values (available in „PROGRMMING” mode)
	Return to one level up (exit)
	Entering into another level (confirmation) Confirmation of settings (available in „PROGRMMING” mode)
	Reset (confirmation of operation)

Four LEDs are located on the front panel, signalling following:

LED	Turned off	Continuous Light	Blinking Light
ZAS. (green)	RUT-2 has no power supply	RUT-2 has power supply	----------
POBUDZ. (yellow)	RUT-2 is not and has not been activated, and the PP relay is not and has not been operating since the last reset or loss of power supply.	RUT-2 is activated, and the PP relay is operating	RUT-2 is not activated, but the PP relay was operating. The POBUDZ diode is blinking till manual reset or loss of power supply.
DZIAŁANIE (red)	RUT-2 is not and has not been activated, and the PW relay is not and has not been operating since the last reset or loss of power supply.	RUT-2 is or was activated and operating, and the PW relay is operating	RUT-2 is not activated, but the PW relay has been in operation. The D diode is blinking till manual reset or loss of power supply.
BLOKADA (yellow)	RUT-2 is not locked	RUT-2 has power voltage and is locked	----------

The structural scheme of the RUT-2 is presented on figure 1.

OPERATION

When supply voltage is applied the relay is ready for work accordingly to parameters set:

- POD P2 Pick-up voltage (“lower” threshold of the under-voltage detector),
- POD P1 Pick-up voltage (“higher” threshold of the under-voltage detector),
- NAD N1 Pick-up voltage (“lower” threshold of the over-voltage detector),
- POD N2 Pick-up voltage (“higher” threshold of the over-voltage detector),
- hysteresis Uh (depth of voltage hysteresis)
- time delay tz (delay time to operate)
- work mode of PW relay (operation of the PW relay with hold up (ZP), and without hold up ((BP))
- averaging filter (elimination of random interferences)

The RUT-2 relay monitors value of direct current voltage. In case of detection of voltage exceeding set range a POBUDZ. LED lights up signalling activation of the relay. At the same moment begins countdown of the set time delay. The time delay for each of the triggering thresholds is counted independently. If exceeding of a set threshold lasts longer than the delay time the final controlling relay is activated. A field representing value of the threshold starts blinking on the display and the LED marked DZIAŁANIE turns on.

The final controlling relays are activated for as long as the triggering threshold is exceeded. If during countdown of time “t_z” the activation decays the LED marked POBUDZ. turns light into blinking. The final controlling relays may operate in two programmed operating modes – with or without hold up. In the hold-up mode (PW-ZP) the PW relay is activated until manually reset with a button marked KAS, in the non-hold up mode (PZ-BP) the PW relay is energised only for as long as the activation lasts. If the activation is lost after operation of the final controlling relay the diodes marked DZIAŁANIE and POBUDZ. turn light-mode into blinking. At the same time the field representing triggering threshold stops pulsing. The only pulsing element on the display is a symbol “:” separating field description from value set. This state lasts till moment of manual reset. The difference between pick-up voltage and drop-out voltage is called hysteresis (Uh) and is programmable.

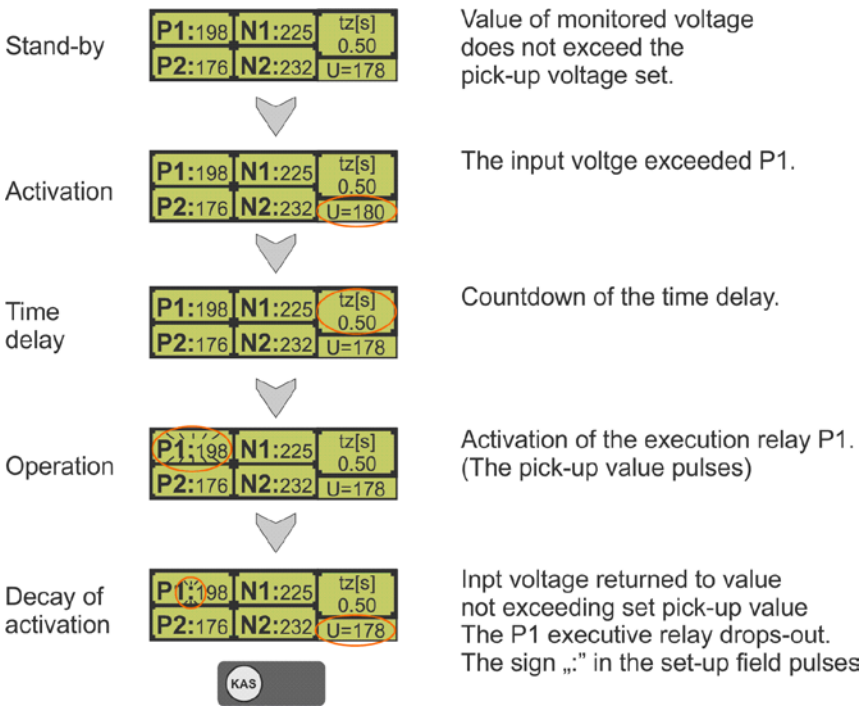


Figure 3. Exemplary sates of the relay

In any moment of time it is possible to block the final controlling relays PW by application of voltage on terminals B3/B4. The blocked status is signalled with a continuous light of diode marked BLOKADA.

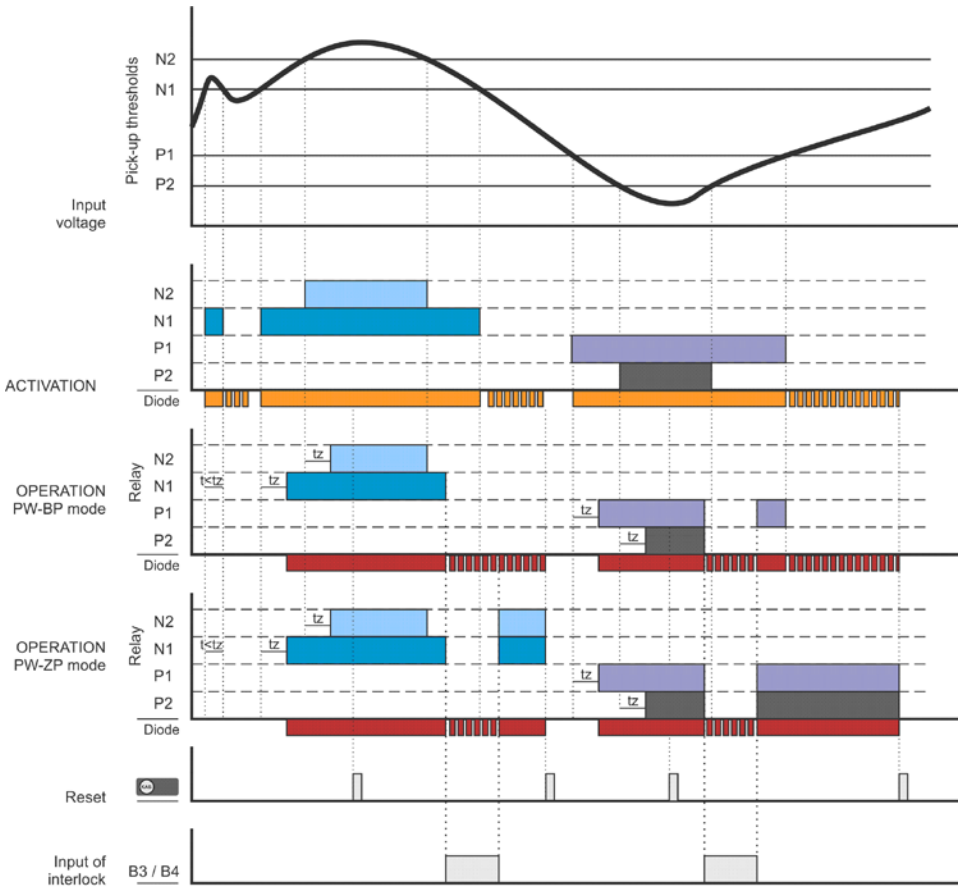


Figure. 4 Operation of the RUT-2 relay (without hysteresis)

The RUT-2 relay is equipped with an averaging filter with a programmable averaging time T, which eliminates accidental pick-up resulting from interferences in controlled inputs lasting shorter than 0,5T. Turing on the averaging filter results with a longer response time of the relay by 0,5T+ 20ms.

The RUT-2 relay may be supplied from the monitored voltage, by application of it on the measuring inputs and the power supply inputs. In such case the decrease of monitored voltage below acceptable power supply level may result with shortening of the delay time of the final controlling relays.

SETTINGS PREVIEW AND PROGRAMING

SOFTWARE VERSION

When the relay has power supply it is possible to check software version of the device. In order to do so, push buttons simultaneously. The LCD shows information on type of device, software version, producer, and a serial number. To exit to the main menu push the button marked (ESC) or wait 25 seconds.

Figure 5. Display - type of device, software version, producer, and a serial number

SETUP PREVIEW

During work of the relay it is possible to preview set parameters. Pushing buttons or results with change of the main view into setting preview accordingly to diagram presented on Figure 6. To Exit to the main menu press the button marked (ESC) or wait 25 seconds.

SETUP OF THE PARAMETERS

Pushing buttons marked or changes the main view into the setup preview, as described above. To enter editing of the setup push (enter) on the chosen preview. The parameter displayed on the screen starts blinking. Pushbuttons or enable changing setup of displayed parameter. Pressing the (enter) button confirms changes made to the setup. After confirming new setup the system requires entering password. To choose values of selected input figures push buttons or . Pressing the (enter) button confirms each digit and moves to the next one. After entering correct password the relay saves new setup, and confirms this by presenting “ZAPISANO UST.” on the screen. In case wrong password was given the screen will display „BŁĘDNE HASŁO” communicate, and return to entering the password menu. To exit entering the password menu press (ESC) button or wait 25 seconds.

Attention: Default password is **0 0 0 0.** Changing the password is possible only from the front panel of the relay. In case of losing the new password please contact the producer.

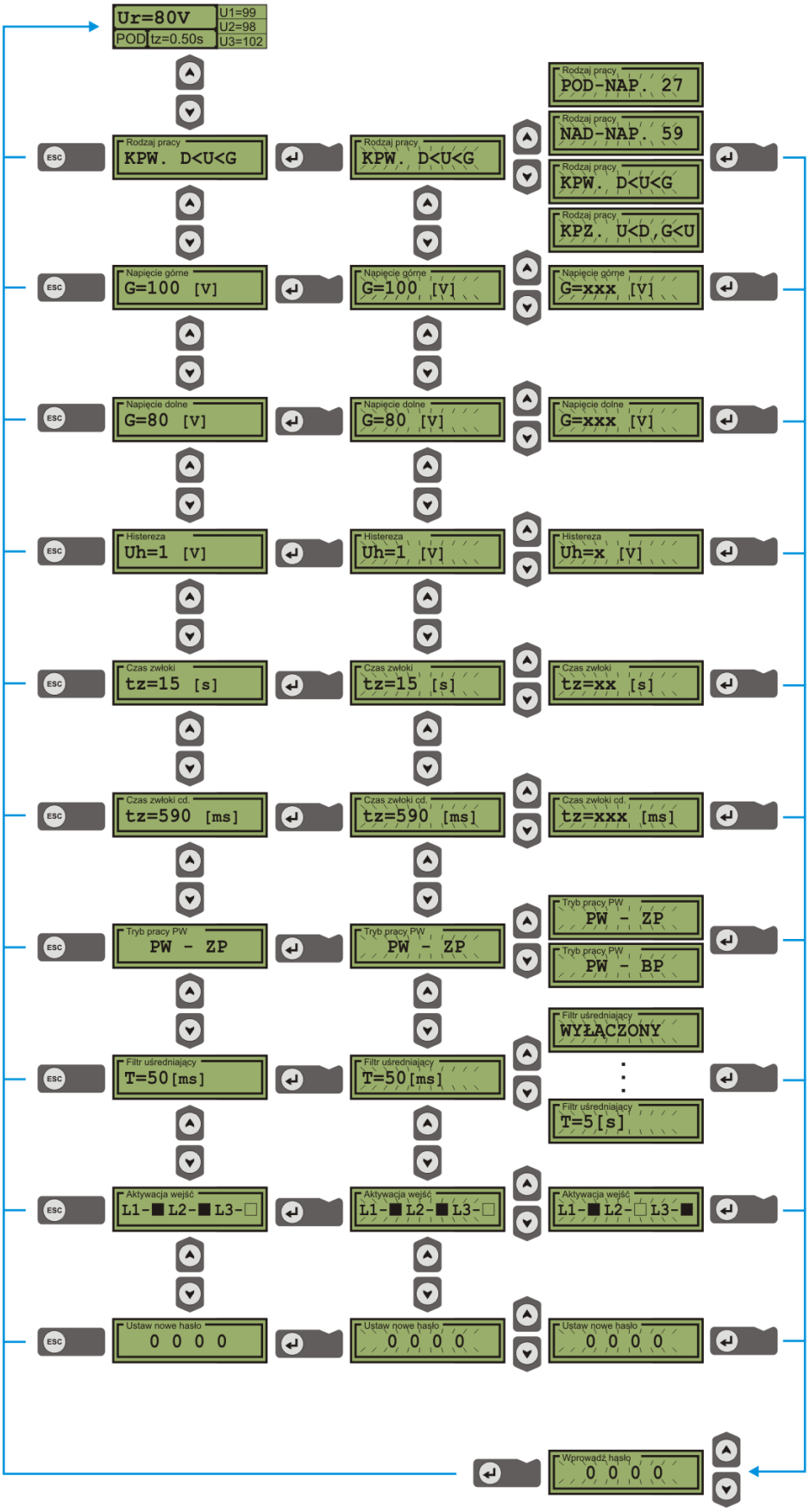


Figure 6. Diagram of preview and editing the setup

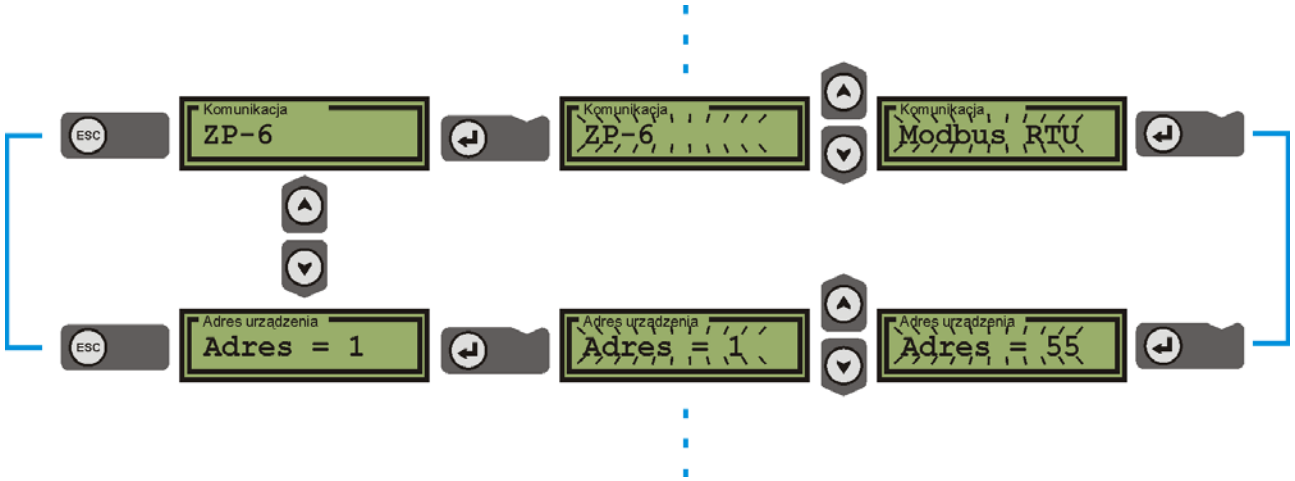


Fig 6b. Diagram of preview and editing the setup – options available in relays version v2.xx and later.

FUNCTIONAL SOFTWARE

Installation and launching the software.

Along with the relay, user receives software enabling its setup and use. The installation pack is delivered on a CD. In order to start the installing process launch SETUP.EXE file, and then follow the instructions displayed by the installing programme. All files required for the programme to operate will be copied to the computer. After installing the software a shortcut to ZPrAE–EDIT will be added in the Programmes menu / ZPrAE Sp. z o.o. folder.

Starting work with ZPrAE-EDIT application.

The programme can be launched from the START menu ZPrAE Sp. z o.o. folder ZPrAE-EDIT file, or by launching the execution file ZPrAE-EDIT.exe (located in the installation folder). Starting the programme opens the main window, and allows entering further windows with preview of the status and setup of the relay. Connect the relay to the computer with a RS-485 link. Initiating work the programme should be proceeded by successful configuration the connection, unless the programme was used before, and the configuration was saved. In order to input changes choose OPCJE/PARAMETRY POŁĄCZENIA from the main menu. A window with choice of port and transmission speed will appear on the screen. For the RUT relay, standard speed is 9600 bps and no parity.

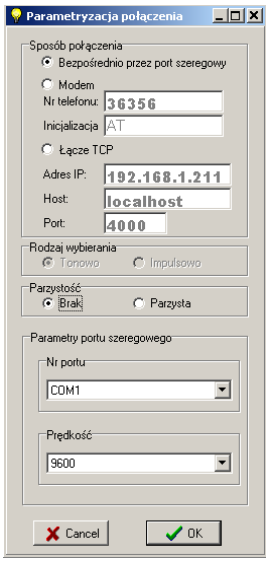


Figure 7. Window of parameterisation of the connection

After correct configuration of the connection the START button on the main menu opens window enabling search for connected relays. Search for devices begins after pushing button “Załącz skaner”. The scanning result is presented as list of devices, their types and addresses. In order to connect to a relay with chosen address, pick it on the list and push button „Połącz z wybranym urządzeniem”. The RUT-2 relay with software version 1.xx have fixed address being a result of operation: number of the relay modulo 255 ([Adr] = [Nr] mod [255]). Address of the RUT-2 relay in version 2.xx and later can be set up from the front panel of the relay. While connecting a larger number of relays into one RS485 system it is crucial that addresses of the relays are not repeated.

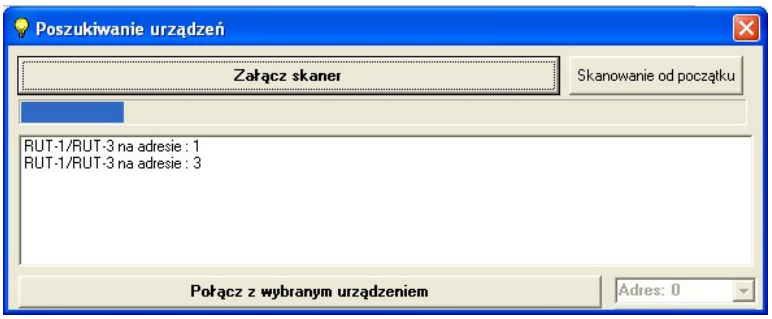


Figure 8. Window of search for connected devices.

The programme enables displaying window showing front panel of the relay and its configuration. The view is divided into two parts. The left hand side of the window represents elevation of the RUT relay, on which the following data is displayed: current settings, state of the relay, values of voltages on measuring inputs, values of voltages registered during the last activation as well as basic information describing the relay like type of the relay, serial number, rated voltage of measuring inputs, rated auxiliary voltage. The right hand side of the window represents a panel dedicated for configuration of the relay. The panel contains editable fields enabling setup of new values of specific parameters, and two pushbuttons: “Odśwież” (reading current setup from the relay) and „Wyślij” (enabling saving the new set up after entering correct password). The picture of the elevation of the relay has an active “KAS” button enabling remote erasing the relay after its operation.

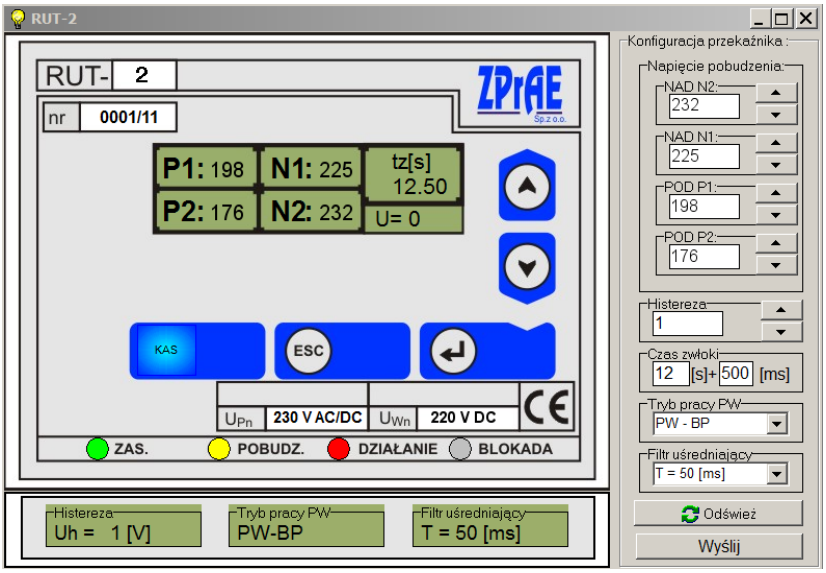


Figure. 9. Window of the ZPrAE-Edit programme for RUT-2

REMOTE COMMUNICATION – RTU MODBUS in version 2.xx and later

Records and functions

The RUT-3 relay in version 2.xx and later has a RTU MODBUS communication protocol implemented. It enables remote setup of alerts, resetting and preview of current voltages. In order to enable remote change of setup a command with actual password shall be sent to the device. Such command activates remote setup for 60s. Address of the device can be set up from the front panel of the relay in range from 1 to 254.

MODBUS functions supported

0x01	Read Coils
0x02	Read Discrete Inputs
0x03	Read Holding Registers
0x04	Read Input Registers
0x05	Write Single Coil
0x06	Write Single Register
0x11	Report Slave ID

Report Slave ID:	
	Functions supported: 0x11 In response for function 0x11 we obtain: Slave ID: 0x04 Run Indicator Status: 0xFF = ON Additional Data: „RUT-2 230 [VAC] P>S> ZPrAE v X.XX” (X.XX – describes software version)

Addressing

Discrete State:	Functions supported: 0x02				
Address:	**Parameter**	**Data type:**	**Value:**	**Range:**	**Attribute:**
1	RUT-2 alerting threshold exceeded	Bit	Off=0, On=1	0-1	read
2	RUT-2 PW activated	Bit	Off=0, On=1	0-1	read
3	RUT-2 interlocked	Bit	Off=0, On=1	0-1	read
4	RUT-2 malfunction	Bit	Off=0, On=1	0-1	read
5	Triggering voltage POD1 exceeded	Bit	Off=0, On=1	0-1	read
6	Triggering voltage POD2 exceeded	Bit	Off=0, On=1	0-1	read
7	Triggering voltage NAD1 exceeded	Bit	Off=0, On=1	0-1	read
8	Triggering voltage NAD 2 exceeded	Bit	Off=0, On=1	0-1	read
9	POD1 relay activated	Bit	Off=0, On=1	0-1	read
10	POD2 relay activated	Bit	Off=0, On=1	0-1	read
11	NAD1 relay activated	Bit	Off=0, On=1	0-1	read
12	NAD2 relay activated	Bit	Off=0, On=1	0-1	read
13	POD1 alert	Bit	Off=0, On=1	0-1	read

14	POD2 alert	Bit	Off=0, On=1	0-1	read
15	NAD1 alert	Bit	Off=0, On=1	0-1	read
16	NAD2 alert	Bit	Off=0, On=1	0-1	read

Coils:	Functions supported: 0x01, 0x05				
Address:	**Parameter**	**Data type:**	**Value:**	**Range:**	**Attribute:**
100	Reset	Bit	Off=0, On=1	0-1	read/write

Holding Register:	Functions supported: 0x03, 0x06				
Address:	**Parameter**	**Data type:**	**Value:**	**Range:**	**Attribute:**
3000	Permission for writing	Unsigned 16	0-9999	0 – 9999	write – act. password
3001	New password setup	Unsigned 16	0-9999	0 – 9999	write
3002	POD P1 alert threshold	Unsigned 16	176-264V (88-132V)	0,8 Un - 1,2 Un	read/write
3003	POD P2 alert threshold	Unsigned 16	176-264V (88-132V)	0,8 Un - 1,2 Un	read/write
3004	NAD P1 alert threshold	Unsigned 16	176-264V (88-132V)	0,8 Un - 1,2 Un	read/write
3005	NAD P2 alert threshold	Unsigned 16	176-264V (88-132V)	0,8 Un - 1,2 Un	read/write
3006	Hysteresis level	Unsigned 16	0-22 (0-11V)	0,0 Un – 0,1 Un	read/write
3007	Delay time of relays	Unsigned 16	0-30099	0ms – 300,99s	read/write
3008	Hold-up of relays	Unsigned 16	0-1	0=Off / 1= On	read/write
3009	Averaging filter	Unsigned 16	1-5		read/write – RUT-3

Input Register:	Functions supported: 0x04				
Address:	**Parameter**	**Data type:**	**Value:**	**Range:**	**Attribute:**
4000	Input Voltage	Unsigned 16	0-286V (0-143V)	0Un – 1,3Un	Read
4001	Output samples	Unsigned 16	0-2048	0-2048	Read

*1) – Value depending on rated voltage of the relay

TECHNICAL INFORMATION (for Un = 220 V DC)

Auxiliary power supply	
Rated voltage	Un = 220 V or other as ordered
Operate range	0,8 ... 1,1 Un
Power consumption	P ≤ 2,5 W
Control input	
Number of inputs	1
Rated voltage	U_{Wn} = 100 V DC; 230 V DC
Measuring accuracy of the input voltage	± 1% U_{Wn};
Impedance of the input	> 5 MΩ
Maximal measured voltage	1,3 U_{Wn}
Response time without averaging filter	≤ 20 ms
Blocking input	
Rated Voltage	U_n = 220 V DC (230 V AC) or other as ordered.
Power consumption	≤0,3 W
Setup range for the alerts	
Triggering voltage POD P2	(0,8 ÷ 0,9) U_{Wn}
Triggering voltage POD P1	(0,9 ÷ 1,0) U_{Wn}
Triggering voltage NAD N1	(1,0 ÷ 1,1) U_{Wn}
Triggering voltage NAD N2	(1,1 ÷ 1,2) U_{Wn}
Hysteresis of the measuring circuits	
Maximal depth of the hysteresis	Uh ≤ 0,1 U_{Wn}
Resolution of the hysteresis setup	1V
Delay time of the controlling relay	
Setup range	0 ÷ 300,99 s
Resolution of the setup	10 ms
Accuracy of the set time	±10 ms
Averaging filter	
Time constant T (adjustable)	OFF, 50 ms, 100 ms, 500 ms, 1 s, 5 s
Response time with averaging filter	0,5 T ±20 ms
Contacts of the relay	
Maximal breaking capacity DC	I = 0,2 A for U = 220 V; L/R = 40 ms
Maximal continuous current	I = 5 A
Time to operate of the P1, N1, N2 relays	<10 ms
Time to operate of the P2 relay	<300 ms
Insulation	
Rated insulation voltage	250 V
Overvoltage category	III
Proof voltage between the coil and the contacts	2 kV; 50 Hz; 1 min
Proof voltage of the contact gap	1 kV; 50 Hz; 1 min

General Data	
Ingress Protection of the housing (IP)	IP40
Ambient temperature	od -5 °C do +40 °C
Ambient protection	RT II
Signalisation of Operation	Green LED „ZAS”
Terminations (socket / plug)	2 x GZ14
Dimensions	77 × 55 × 110 mm (H×W×D)

DESIGN AND DIMENSIONS OF THE RELAY

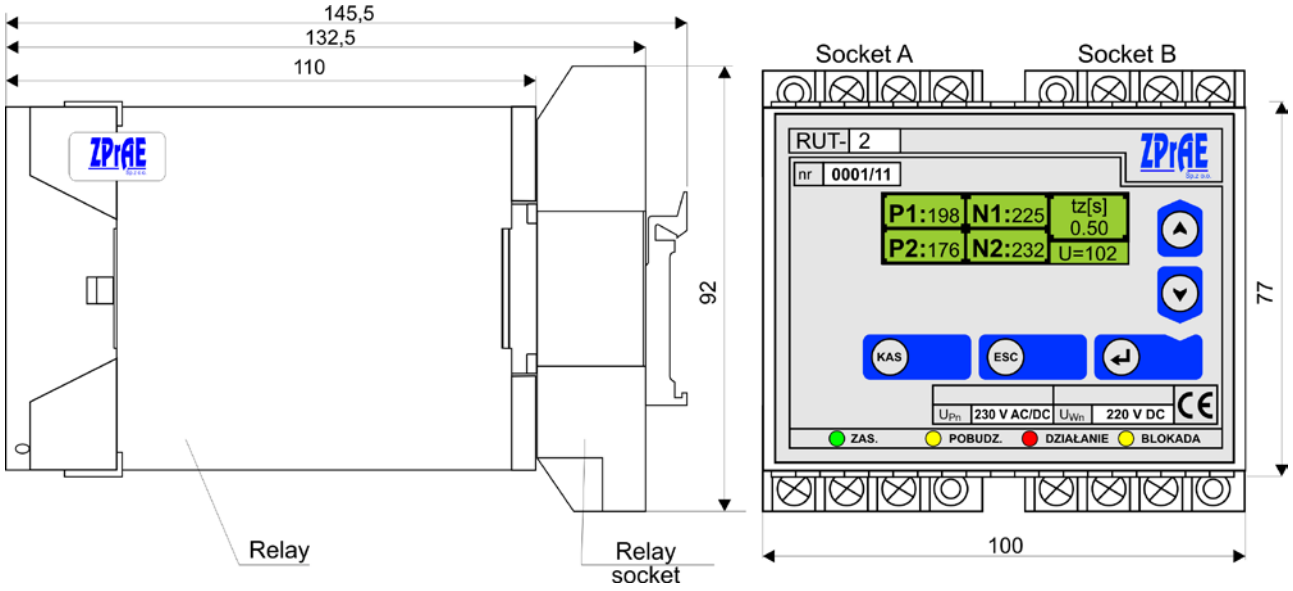


Figure 11.Dimensions of the RUT-2 relay

Attention*:*

We have prepared a vast offer of auxiliary equipment in order to support mounting of our relays (cases, sockets, plugs). The auxiliary equipment is designed based on our clients suggestions and many years of our own experience. More information can be found in catalogue: “GZ-14/GZ-14Z, R-8614/R8614Z, ZAS-55, ZAS-70, plugs, sockets and relay-chassis” available at www.zprae.pl

RUT-2

OFFER

RE line® ENERGETIC STANDARDS

- RSH-3, RSH-3S - tripping
- RS-6, RPD-2, RPP-4, RPP-6 - interposing
- RMS-2 - signalling
- RCW-3, RCDW-1 - circuit continuity monitoring
- RKO-3 - power supply circuit continuity monitoring
- RB-1, RBS-1, RBS-2 - bistable
- RT-22 - time
- RUT-2, RUT-3 - time-voltage
- RJT-1, RJT-3 - time-current
- RKU-1, RKS-1 - final controlling
- LZ-1, LZ-2 - operation counters
- RPZ-1 - supply source switching
- GPS-1 - time synchronisation
- MDD-6, MDS-12 - Diode modules
- PH-XX, PS-XX - Modules of switches, pushbuttons and control lamps
- Relay racks

- Busbar protections and breaker failure protections type TSL-9r, TSL-11
- Auxiliary and signalization relays
- Reserve Central Signalling System type MSA-9, MSA-12, MSA-24
- Protection relays type AZT-9, APP-9
- Disturbance recorder RZS-9
- Energy measurement system and event recorder ZRZ-28
- Load Resistors for measuring transformers
- DC and AC auxiliary power supply switchgears
- Cubicle-contained sets of control and supervision protections
- Modular power supplies, measuring suitcases, measuring and registering system RFQ-8
- PROFIL-L cubicles
- Periodical and post-failure tests, as well as repairs and overhauls of busbar protections TSL
- Servicing, strting-up and post assembly tests

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