



RJT-3

TIME
CURRENT

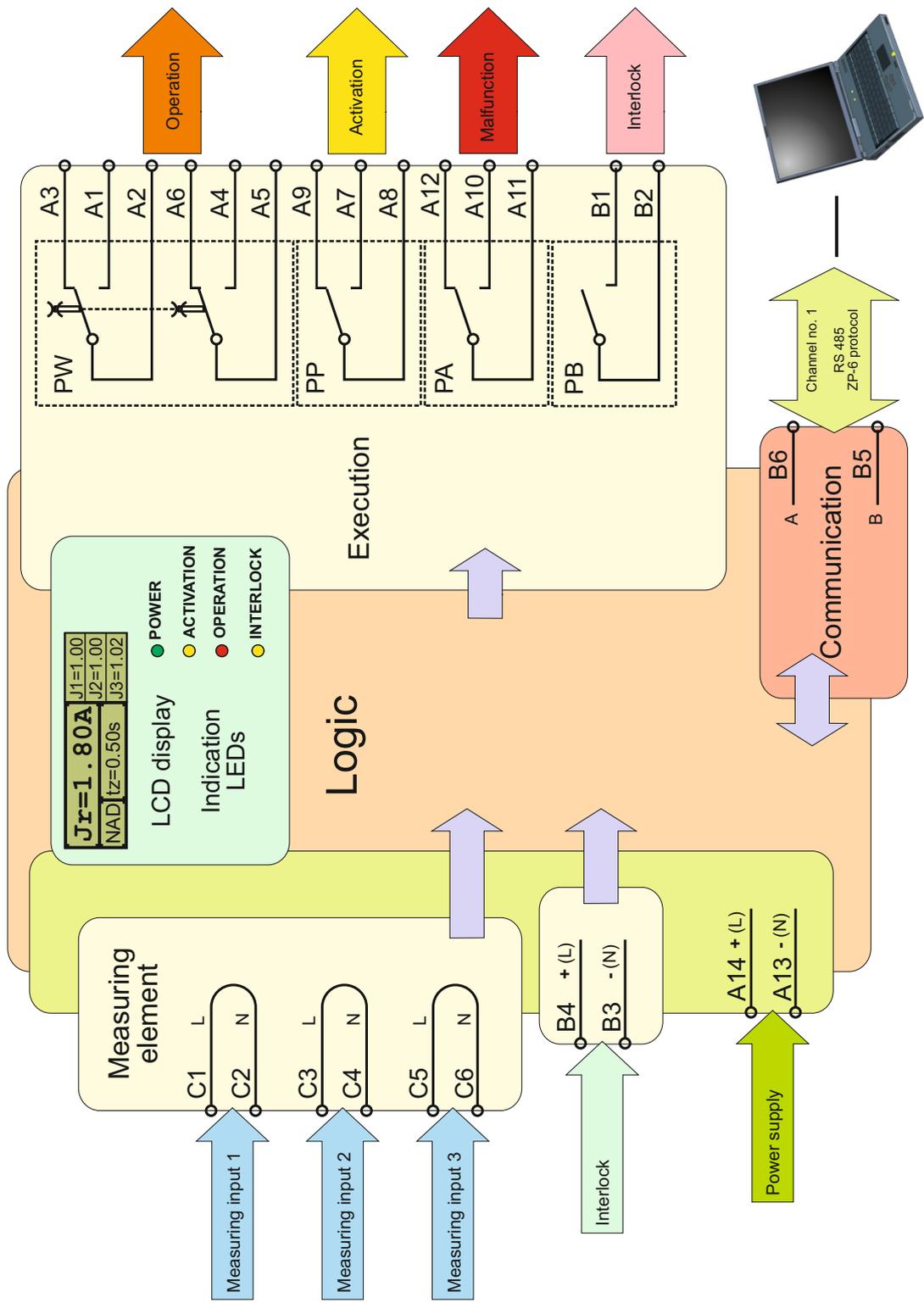


Fig 1. Structural scheme of the RJT-3 relay.

APPLICATION

The RJT-3 relays are meant for use in the automation and protection circuits as current control elements with a programmable delayed time to operate and programmable hysteresis (absolute value of a difference between pickup and release current). The relays provide following work modes:

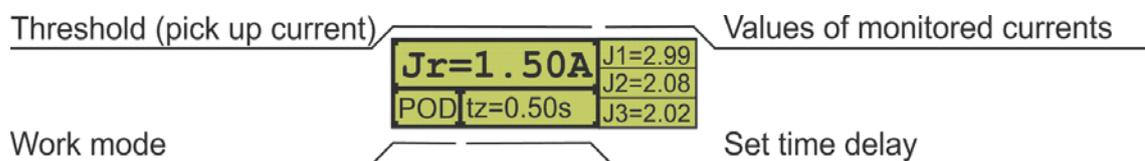
1. **POD-PRD** – operation after identifying decrease of controlled current flow below set value (Time-delay under-current protection);
2. **NAD-PRD** – operation after identifying increase of controlled current flow over set value (Time-delay over-current protection);
3. **KPW** – operation when controlled current is within a set range (Time-delay within-range protection),
4. **KPZ** – operation when controlled current is beyond a set range (Time-delay out of-range protection).

CONSTRUCTION

The RJT-3 type relay has three isolated measuring inputs, and controls up to three independent values of effective sinusoidal current 50Hz, with possibility to deactivate any of the inputs. Voltage level detector controls extreme values of effective current measured, and the steering system executes programmed functions basing on information from the detector, and state of the input blockade.

The relay has one instantaneous changeover contact of the starting relay (PP), two programmable time-delay changeover contacts of the final controlling relay (PW), one make contact of the relay signalling internal fault or lack of power supply (PA) and one make contact of a relay signalling activation of a blockade (PB). The RJT-3 relay is mounted in a housing, sizes 110 x 100 x 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 11.

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



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



Settings preview (available in „PRACA” mode)



Setting up values (available in „PROGRMOWANIE” mode)



One step back (exit)



Entering another level (confirmation)
Confirmation of settings (available in „PROGRMOWANIE” mode)



Erase (confirmation of operation)

Time – current relay RJT-3

Four LED diodes are located on the front panel, signalling the following:

LED	Turned off	Continuous Light	Blinking Light
 ZAS. (green)	RJT-3 has no power supply	RJT-3 has power supply	-----
 POBUDZ. (yellow)	RJT-3 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.	RJT-3 is activated, and the PP relay is operating	RJT-3 is not activated, but the PP relay was operating. The POBUDZ diode is blinking till manual reset or loss of power supply.
 DZIAŁANIE (red)	RJT-3 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.	RJT-3 is or was activated and operating, and the PW relay is operating	RJT-3 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)	RJT-3 is not locked	RJT-3 has power voltage and is locked	-----

The structural scheme of the RJT-3 is presented on Figure 1.

OPERATION

When supply voltage is applied the relay is ready for work accordingly to work mode set. Execution of all four work modes is ensured by independent set up of working parameters:

For work modes **POD-PRD** (time-delay under-current protection), and **NAD-PRD** (time-delay over-current protection) the following parameters can be configured:

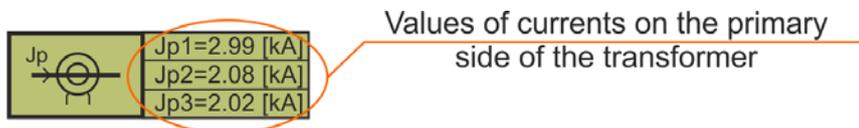
- Pick-up current **Jr** (current to operate),
- hysteresis **Jh** (depth of the current hysteresis)
- delay time **tz** (delay time to operate)
- work mode of PW relay (operation of the PW relay with hold up **ZP**, and without hold up **BP**)
- averaging filter (elimination of random interferences)
- activation of inputs (choice of activated measuring inputs)

For work modes **KPW** (time-delay within-range protection), and **KPZ** (time-delay out-of-range protection) the following parameters can be configured:

- upper threshold **G** (upper pick-up current to operate),
- bottom threshold **D** (bottom pick-up current to operate)
- hysteresis **Jh** (depth of the voltage hysteresis)
- delay time **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)
- activation of inputs (choice of activated measuring inputs)

PRIMARY CURRENT PREVIEW

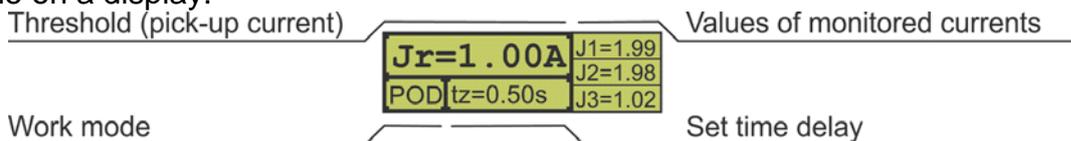
In order to activate preview of the primary currents of the transformer push button  while being in the main menu view. The LDC display presents values representing the monitored currents multiplied by the transformation ratio "K" set-up in the parameters of the relay. In order to exit to main menu push  or wait for 25 seconds. Window with the primary current preview:



AVAILABLE WORK MODES

POD-PRD – time-delay under-current protection

The relay controls values of currents flowing through the measuring inputs and activates after detecting decrease of controlled current on any of the inputs below set value, and operates with a specified time delay. Information on chosen work mode, pick-up current J_r set, and time delay t_z as well as present values of effective input currents are presented in real time on a display.



The below diagram presents working algorithm of the relay after detecting decrease of controlled voltage below set value.

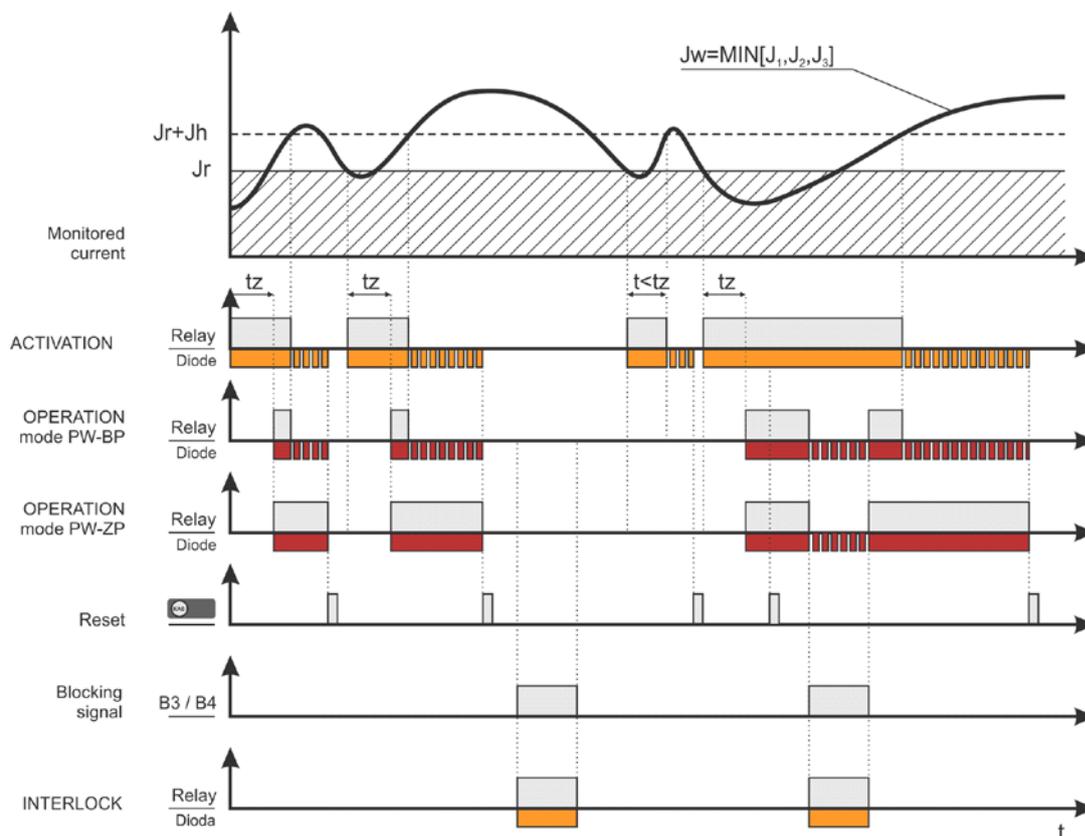
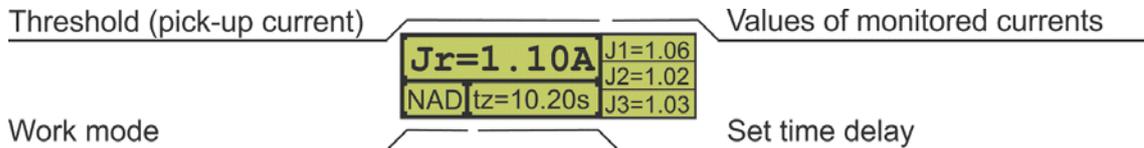


Figure 2. Operation of the relay for the POD-PRD working mode

NAD-PRD time-delay over-current protection

The relay controls values of currents flowing through measuring inputs and activates after detecting increase of controlled currents on any of the inputs over set value, and operates with a specified time delay. Information on chosen work mode, pick-up current J_r set, and time delay t_z as well as present values of effective input current are presented in real time on a display.



The below diagram presents working algorithm of the relay after detecting increase of controlled current over set value.

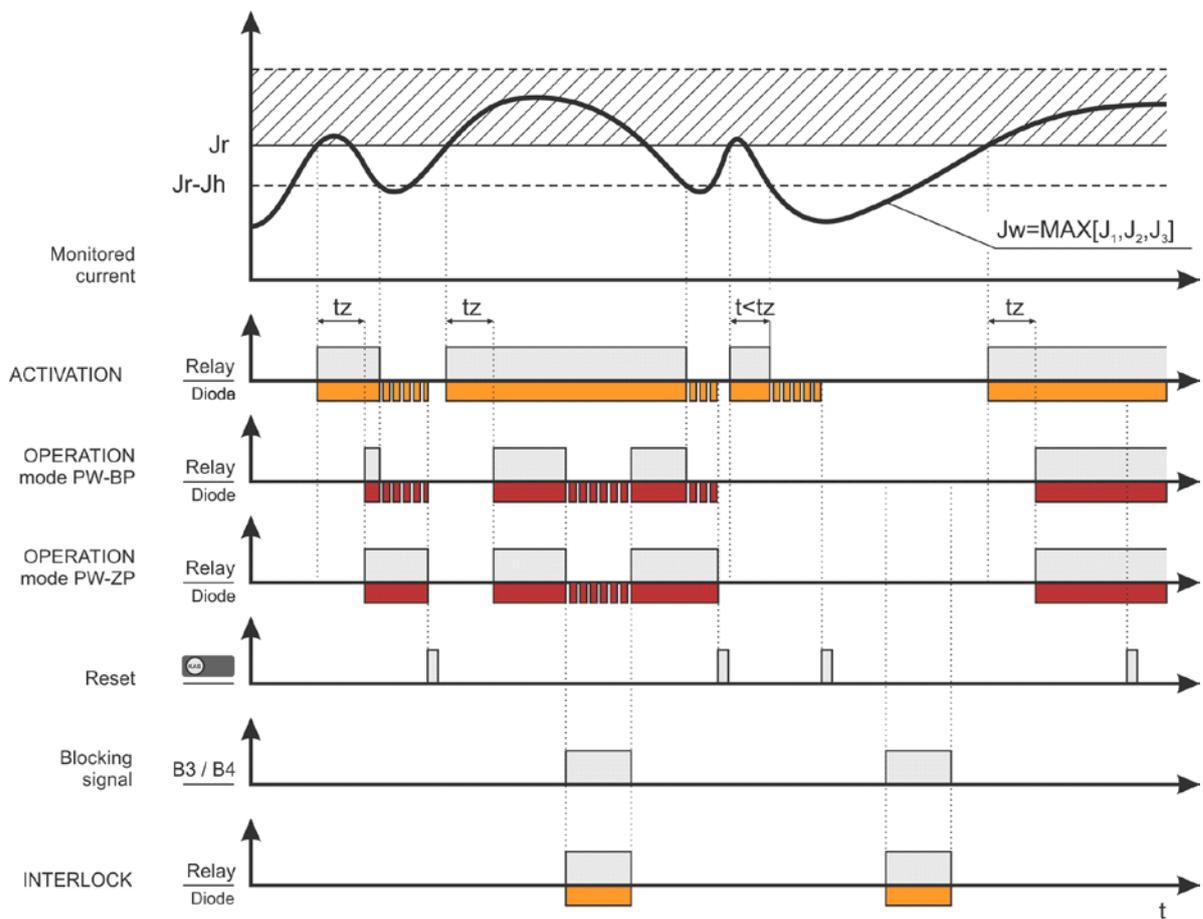
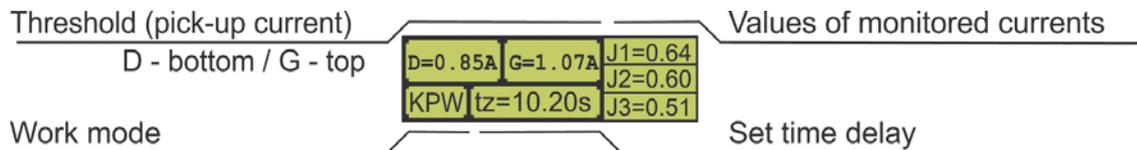


Figure 3. Operation of the relay for the NAD-PRD working mode

KPW –time-delay within-range protection

The relay controls values of currents flowing through measuring inputs and activates when effective values of all input currents are within a defined range, and operates with a specified time delay. Information on chosen work mode, set values of pick-up currents D (bottom threshold), G (upper threshold), and time delay t_z as well as present values of effective input current are presented in real time on a display.



The below diagram presents working algorithm of the relay when values of controlled current are within a defined range.

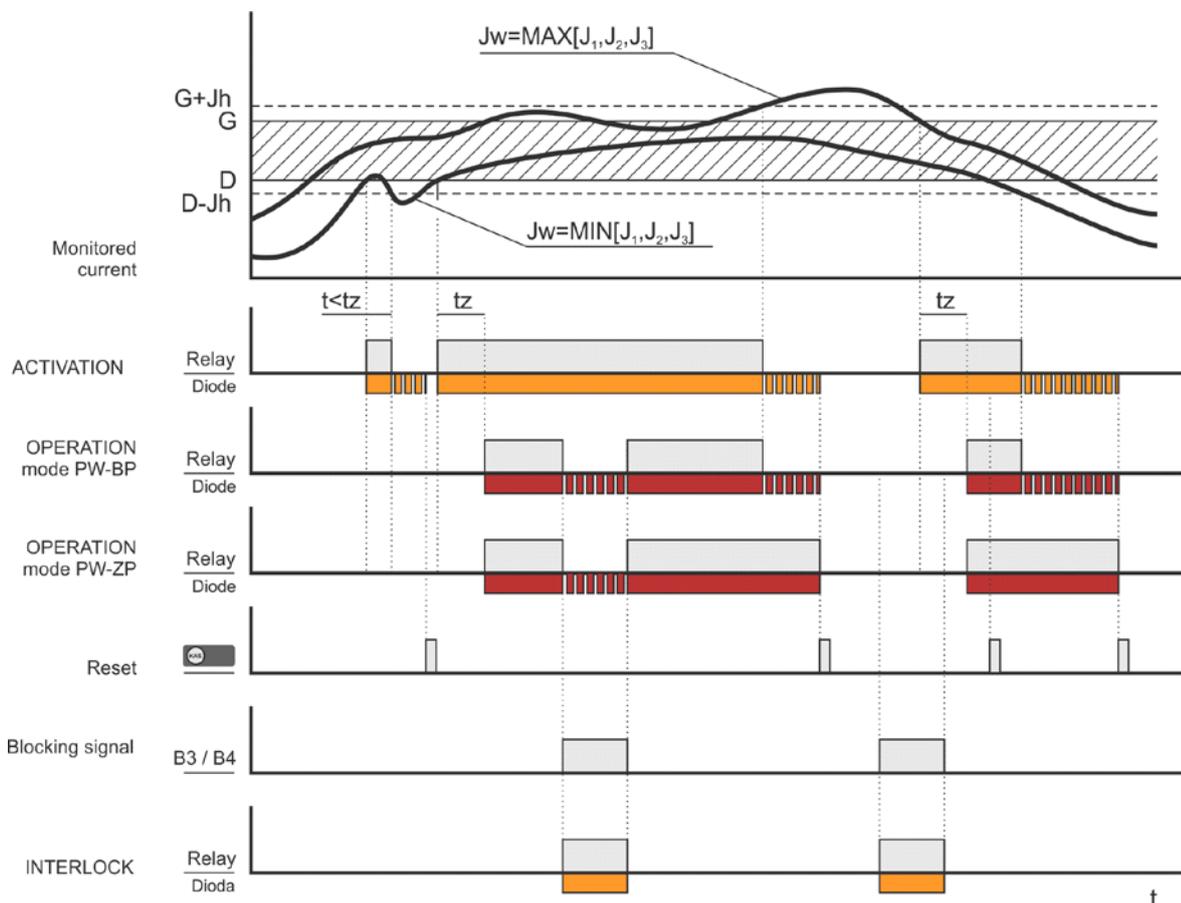
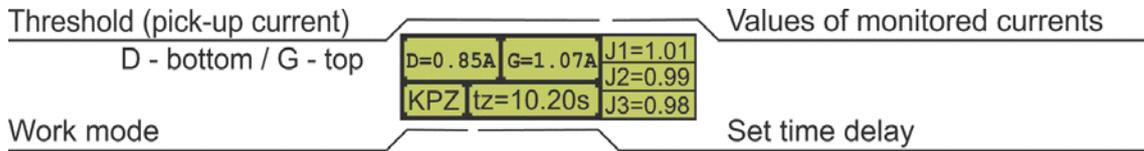


Figure 4. Operation of the relay for the KPW working mode

KPZ time-delay out-of-range protection

The relay controls values of currents flowing through measuring inputs and activates when effective values of all input currents are outside of a defined range, and operates with a specified time delay. Information on chosen work mode, set values of pick-up current D (bottom threshold), G (upper threshold), and time delay tz as well as present values of effective input currents are presented in real time on a display.



The below diagram presents working algorithm of the relay when values of controlled current are outside a defined range.

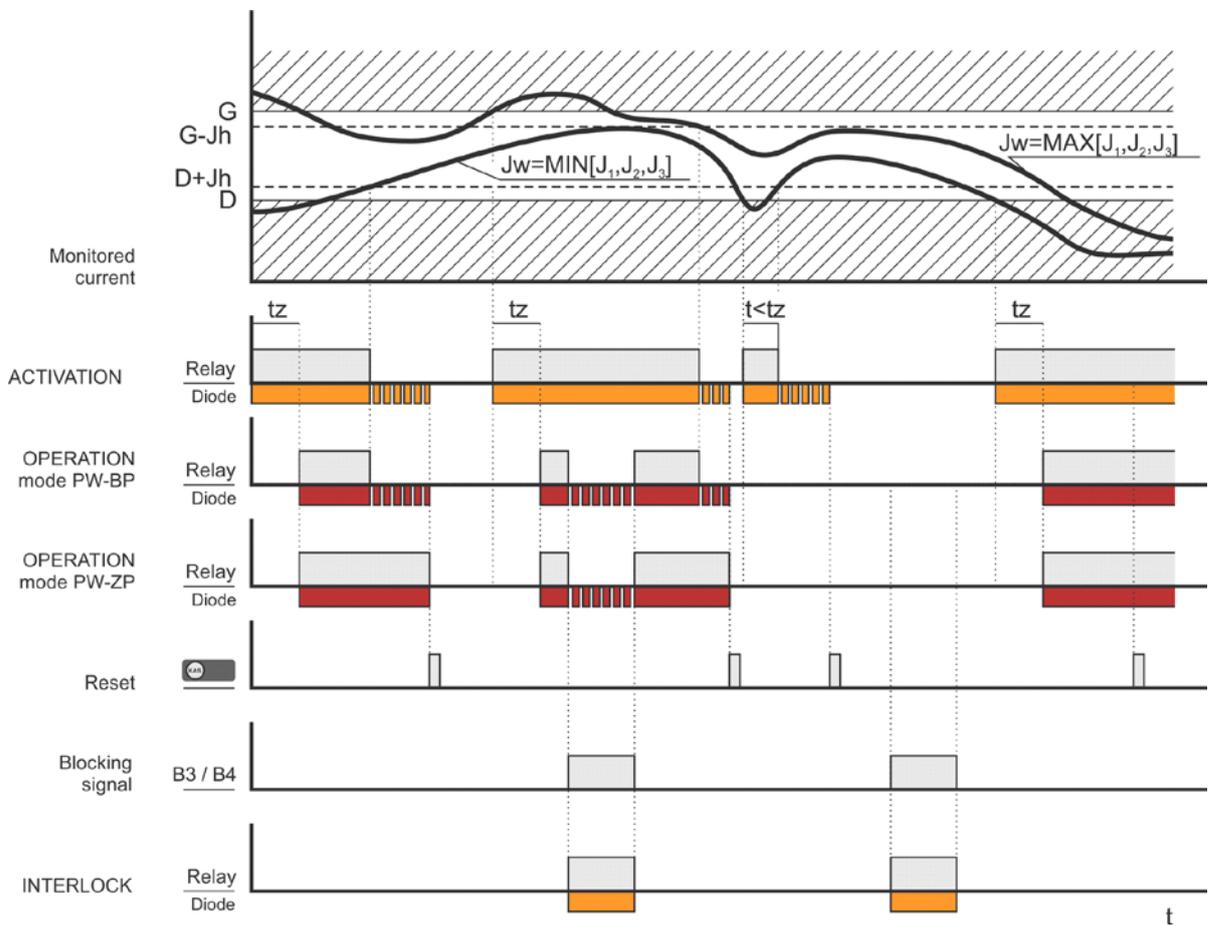


Figure 5. Operation of the relay for the KPZ working mode

SETUP 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 serial number. Exit to the main menu is done by pressing the  (ESC) button or automatically after 25 seconds.



Figure 6. Display - type of device, software version, producer, and 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 setup preview accordingly to diagram presented on Figure 7. Exit to the main menu is done by pressing the  (ESC) button or automatically after 25 seconds.

SETUP OF THE PARAMETERS

Pushing buttons  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. Buttons  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 the 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 mode 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.

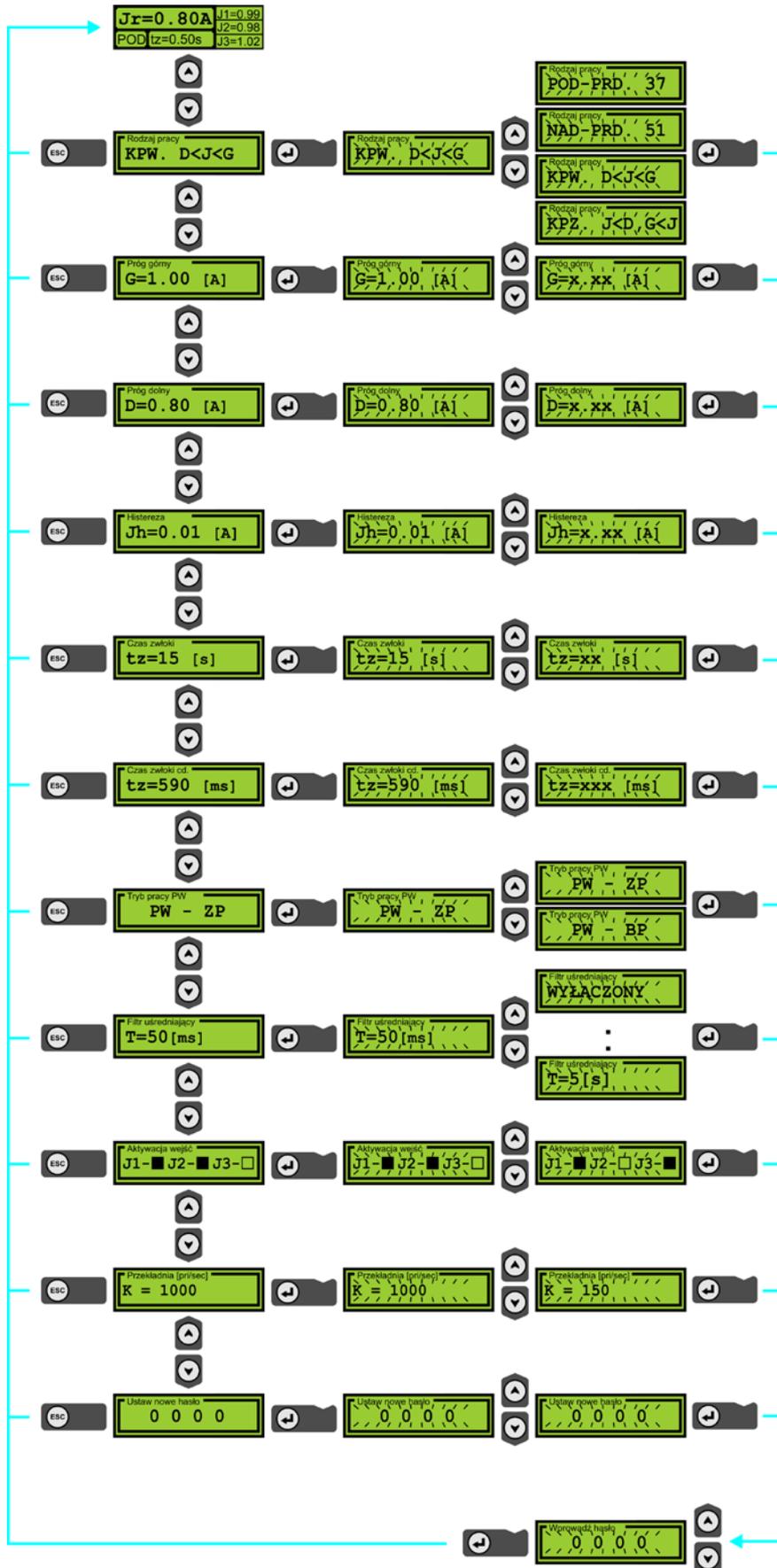


Figure 7. Diagram of preview and editing the setup

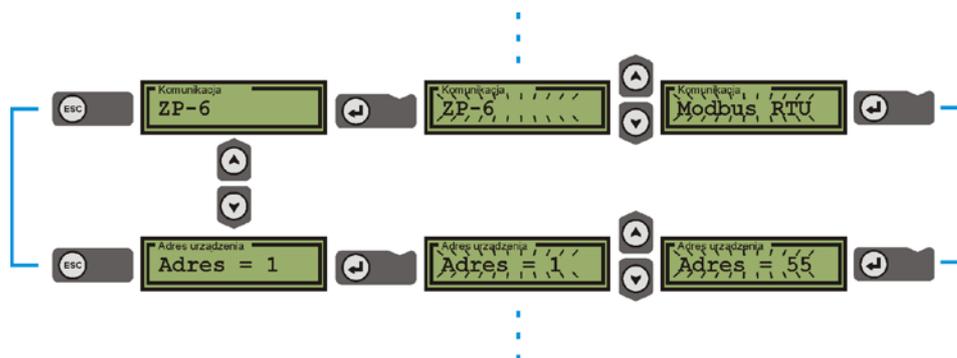


Figure7b. Diagram of preview and editing the setup – options available in relays version v2.xx and later.

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 catalogue). Starting the programme opens the main window, and allows entering further windows enabling 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 RJT relay, standard speed is 9600 bps and no parity.

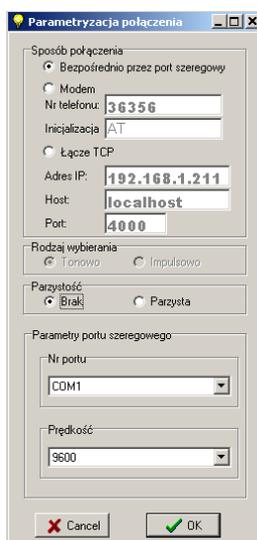


Figure 8. Window of parameterisation of the connection

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 RJT-3 relays with software version 1.xx have fixed address being a result of operation: number of the relay modulo 255 ($[Adr] = [Nr] \text{ mod } [255]$). Address of the RJT-1 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.

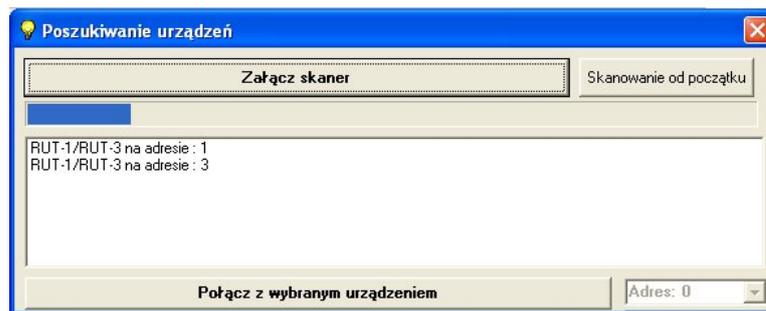


Figure 9. Window of search for connected devices.

The programme displays window showing elevation of the relay and its configuration. The view is divided into two parts. The left hand side of the Figure represents elevation of the RJT relay, on which the following data is displayed: current settings, state of the relay, values of currents on measuring inputs, values of currents registered during the last activation as well as basic information describing the relay like type of the relay, serial number, rated current 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 buttons: “ODŚWIEŻ” (reading current setup from the relay) and „WYŚLIJ” (enabling saving the new set up after entering correct password). The Figure of the elevation of the relay has an active “KAS” button enabling remote erasing the relay after operation.

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

Records and functions

The RJT-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: „RJT-3 230 [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	RJT-3 activated	Bit	Off=0, On=1	0-1	read
2	RJT-3 operated	Bit	Off=0, On=1	0-1	read
3	RJT-3 interlocked	Bit	Off=0, On=1	0-1	read
4	RJT-3 was_activated	Bit	Off=0, On=1	0-1	read
5	RJT-3 was_operated	Bit	Off=0, On=1	0-1	read
6	RJT-3 malfunction	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 - aktualne haslo
3001	New password setup	Unsigned 16	0-9999	0 – 9999	write
3002	Operation mode	Unsigned 16	0-4	0-4	read/write
3003	Upper current threshold	Unsigned 16	*1)	0.01In – 4.00In	read/write
3004	Start-up / Bottom current threshold	Unsigned 16	*1)	0.01In – 4.00In	read/write
3005	Hysteresis	Unsigned 16	*1)	0.00In – 4.18In	read/write
3006	Delay time of relays	Unsigned 16	0-30099	0ms – 300,99s	read/write
3007	Operating mode of PW	Unsigned 16	0-1	0= Off / 1= On	read/write
3008	Averaging filter	Unsigned 16	0-5	0-5	read/write
3009	Active inputs	Unsigned 16	1-7	1-7	read/write
3010	Transformation ratio	Unsigned 16	1 - 10000	1 - 10000	read/write

Input Register:		Functions supported: 0x04			
Address:	Parameter	Data type:	Value:	Range:	Attribute:
4000	Current I-1	Unsigned 16	*1)	(0In – 4.2In)	Read (0In – 4.2In)
4001	Current I-2	Unsigned 16	*1)	(0In – 4.2In)	Read (0In – 4.2In)
4002	Current I-3	Unsigned 16	*1)	(0In – 4.2In)	Read (0In – 4.2In)
4003	I-1 current in the moment of operation	Unsigned 16	*1)	(0In – 4.2In)	Read (0In – 4.2In)
4004	I-2 current in the moment of operation	Unsigned 16	*1)	(0In – 4.2In)	Read (0In – 4.2In)
4005	I-3 Input current in the moment of operation	Unsigned 16	*1)	(0In – 4.2In)	Read (0In – 4.2In)

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

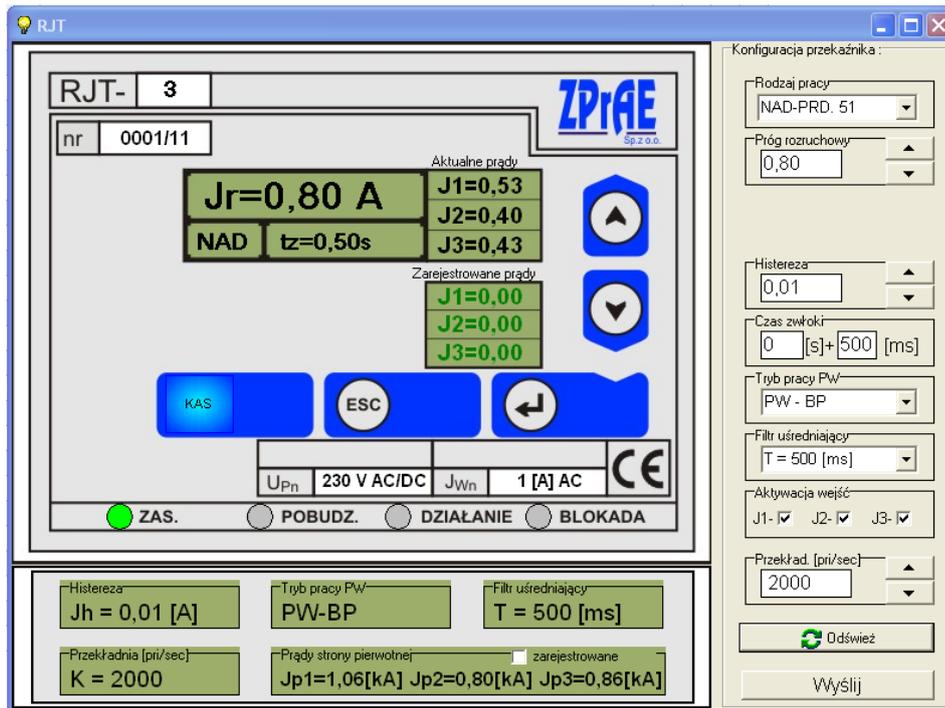


Figure. 10. Window of the ZPrAE-Edit programme for RJT-3

TECHNICAL INFORMATION

Auxiliary power supply		
Rated voltage	$U_n = 220 \text{ V}$ or other as ordered	
Operate range	0,8 ... 1,1 U_n	
Power consumption	$P \leq 2,5 \text{ W}$	
Measuring inputs		
Number of inputs	3 (galvanic insulated)	
Rated Current	$J_{Wn} = 1 \text{ A AC}; 50\text{Hz}$ or $5 \text{ A AC}; 50\text{Hz}$	
Measuring accuracy of the input voltage	$\pm 5\% J_{Wn}$	
Resistance of the measuring circuits	$\leq 50 \text{ m}\Omega$ for $J_{Wn}=1 \text{ A}$; $\leq 10 \text{ m}\Omega$ for $J_{Wn}=5 \text{ A}$	
Power consumption of the measuring circuits	$< 0,25 \text{ W / input}$	
Current-carrying (continuous) capacity of the measuring circuits	$4,2 J_{Wn}$	
Temperature strength of the current circuits (1s)	$100 J_{Wn}$	
Dynmic strength of the current circuits	$200 J_{Wn}$	
Maximal measured current	$4,2 J_{Wn}$	
Maximal programmable pick-up current	$4,0 J_{Wn}$	
Resolution of the setup	0,01 A for $J_{Wn}=1 \text{ A}$; 0,1A for $J_{Wn}=5\text{A}$	
Response time without averaging filter	$\leq 20 \text{ ms}$	
Blocking input		
Rated Voltage	$U_n = 220 \text{ V DC (230 V AC)}$ or other as ordered.	
Operation threshold	$0,7 U_n \text{ DC (0,5 } U_n \text{ AC)}$	
Power consumption	$\leq 0,3 \text{ W}$	
Available working modes of the relay		
Time-delay under-current protection	POD-PRD. 37 (IEEE Standard C37.2-1996)	
Time-delay over-current protection	NAD-PRD. 51 (IEEE Standard C37.2-1996)	
Time-delay within-range current protection	KPW. $D < J < G$	
Time-delay outside-range current protection	KPZ. $J < D, G < J$	
Hysteresis of the measuring circuits		
Maksymalna głębokość histerezy	POD-PRD	$J_h < (4,2 J_{Wn} - J_r)$
	NAD-PRD	$J_h < J_r$
	KPW	$J_h < \min(D; (4,2 J_{Wn} - G))$
	KPZ	$J_h < (G-D)/2$
Resolution setup of the hysteresis	0,01 A for $J_{Wn}=1 \text{ A}$; 0,1A for $J_{Wn}=5\text{A}$	
Delay time of the controlling relay		
Setup range	$0 \div 300,99 \text{ s}$	
Resolution of the setup	10 ms	
Accuracy of the pre-set time	$\pm 10 \text{ ms}$	
Averaging filter		
Time constant T (adjustable)	OFF, 50 ms, 100 ms, 500 ms, 1 s, 5 s	
Response time with averaging filter	$0,5 T \pm 20 \text{ ms}$	

Contacts of the relay	
Maximal breaking capacity DC	$I = 0,2 \text{ A}$ for $U = 220 \text{ V}$; $L/R = 40 \text{ ms}$
Maximal continuous current	$I = 5 \text{ A}$
Response time of the relay	$<10 \text{ ms}$
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	from $-5 \text{ }^\circ\text{C}$ to $+40 \text{ }^\circ\text{C}$
Ambient protection	RT II
Signalisation of Operation	Green LED diode "ZAS"
Terminations (socket / plug)	GZ14
Dimensions	77 x 55 x 110 mm (WxSxG)

DESIGN and DimEnsions of the relay

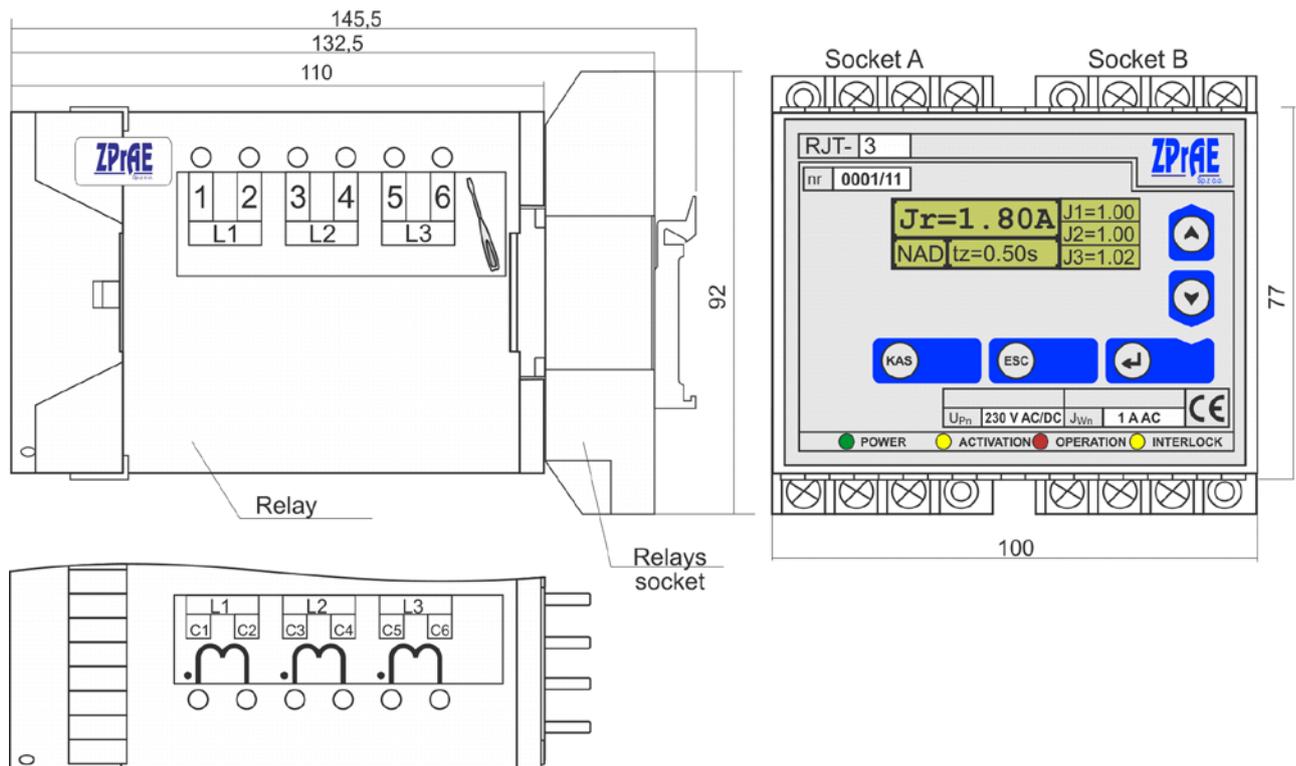


Figure 11. Dimensions of the RJT-3 relay

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

RJT-3



OFFER



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

ZPrAE
Sp. z o.o.

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