

# KDZ-3<sub>JM</sub>

## EARTH FAULT MONITORING RELAY

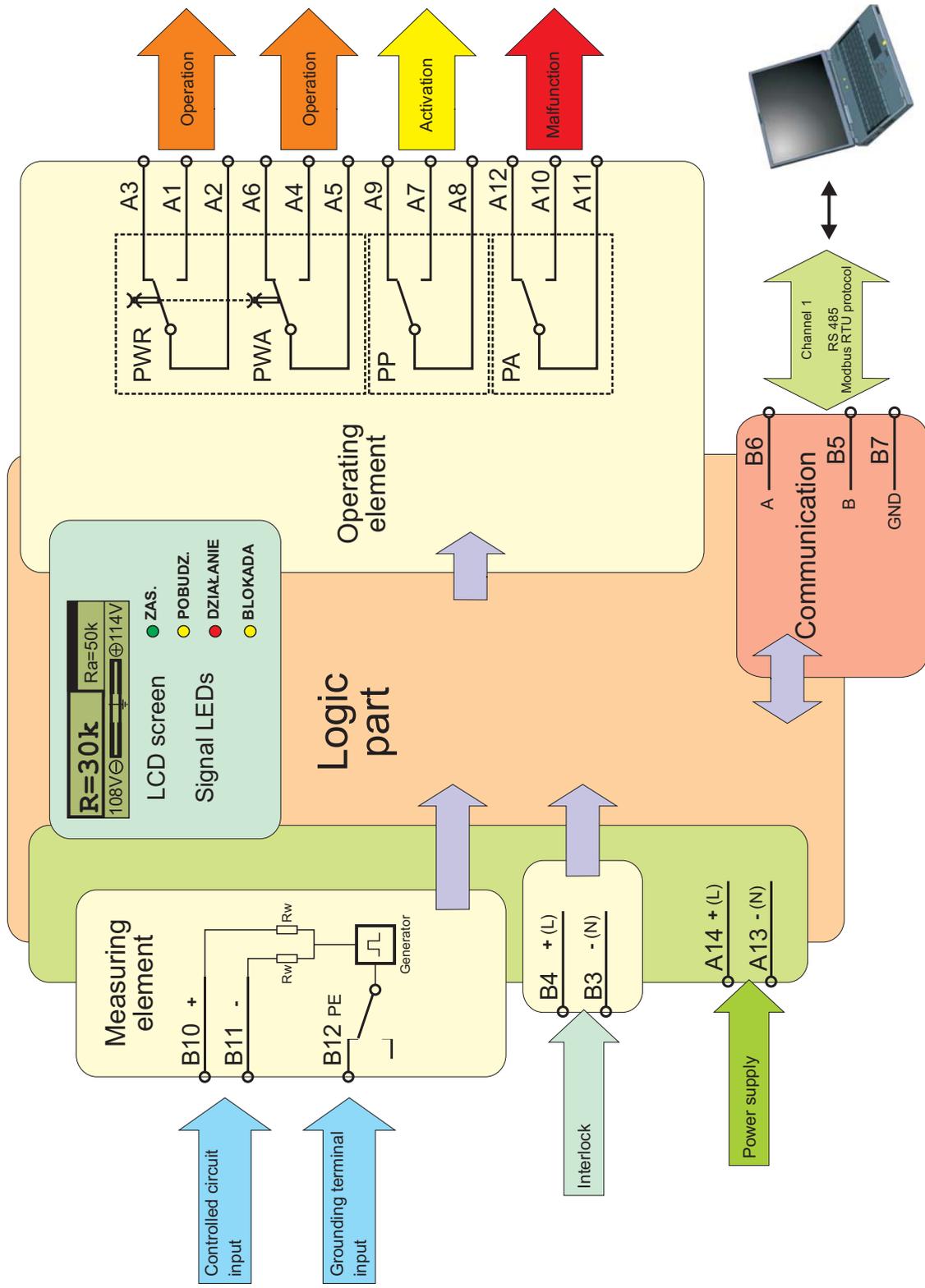


Fig. 1. Structural diagram of the measuring unit KDZ-3JM.

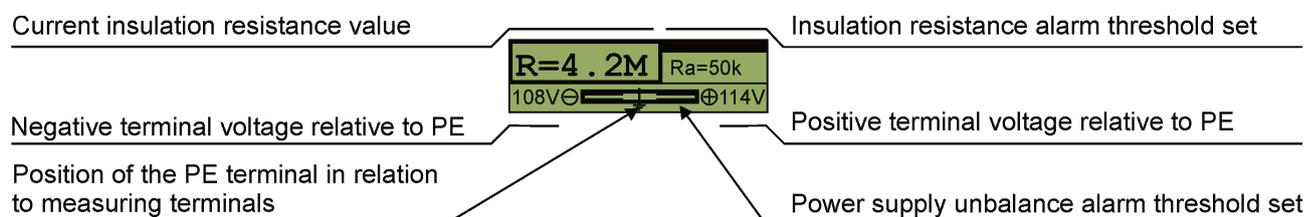
## APPLICATION.

The KDZ-3JM earth fault measuring unit is to be used in automation and protection circuits as an element monitoring condition of insulation in both DC and AC circuits. The digital KDZ-3JM measuring unit is a device designed based on many years of experience in production and installation of switchgears, as well as state of the art trends and technical capabilities. KDZ-3JM is capable of signalling when alarm levels at the relays' contact couplings are exceeded and transmitting data to a monitoring system via Modbus RTU protocol.

## CONSTRUCTION.

The KDZ-3JM earth fault measuring unit has an integral measuring signal generator allowing it to monitor condition of circuits' insulation independently of voltage in the monitored circuit. A level detector checks the level of measured resistance and power supply unbalance relative to earth, while a control system executes programmed functions following information from the detector and state of the interlock input. KDZ-3JM has an instantaneous change-over contact of an activation relay (PP) activated when a set alarm threshold is exceeded, a change-over contact with software programmable time delay of a relay activated when resistance alarm threshold is exceeded (PWR), a change-over contact with software programmable time delay of a relay activated when unbalance alarm threshold excess is exceeded (PWA) and a change-over contact of a relay signalling an internal defect or auxiliary power shortage (PA). The earth fault measuring unit is installed in a 77 × 100 × 110 mm unit, with 28 outputs with 2 plugs, for installation in standard GZ-14 sockets (on-board installation), GZ14U (installation in a 35mm bus) and GZ14Z - installation in a R8614Z unit. Dimension draft of the converter is shown in fig. 15.

The front panel includes an LCD for previewing operating status of the device and set configuration:



Five buttons are used for communication with the user. They enable:

	Settings preview (available in OPERATION mode)
	Setup of desired value (available in PROGRAMMING mode)
	Going one level back (exit)
	Going to the next level (confirmation) Confirming settings (available in PROGRAMMING mode)
	Resetting (confirmation of operation)

# KDZ-3JM earth fault monitoring relay

The front panel also contains four LEDs with the following functions:

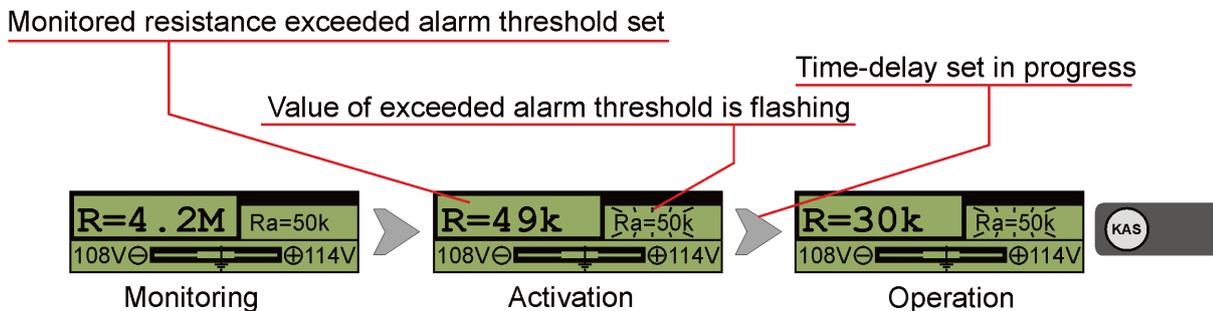
LED	Turned off	Continuous light	Blinking light
 <b>ZAS.</b> (green)	KDZ-3JM is not powered by auxiliary power supply	KDZ-3JM is powered by auxiliary power supply	-----
 <b>POBUDZ.</b> (yellow)	KDZ-3JM is not and was not activated, and the PP relay is not and was not in operation since the last resetting or loss of auxiliary power supply	KDZ-3JM is activated, and the PP relay is in operation	KDZ-3JM is not activated, but the PP relay was activated. The ACTIV. LED will be blinking until reset or auxiliary power is lost
 <b>DZIAŁANIE</b> (red)	KDZ-3JM is not and was not in operation, and the PWR or PWA relays are not and were not in operation since the last resetting or loss of auxiliary power supply	KDZ-3JM is or was activated and was in operation, and the PWR or PWA relays are in operation	KDZ-3JM is not activated, but the PWR or PWA relays were in operation. The OPERATION LED will be blinking until reset or auxiliary power is lost
 <b>BLOKADA</b> (yellow)	KDZ-3JM is not blocked	KDZ-3JM is powered and locked by an interlock input signal	KDZ-3JM is powered and remotely blocked

Structural schematics of the KDZ-3JM relay are shown in fig. 1.

## OPERATING PRINCIPLE.

The KDZ-3JM measuring unit is functional as soon as it is provided with auxiliary voltage. If there is no blocking signal present at the blocking input and the unit has not been locked remotely, the circuit monitored is added to the earthing terminal by the measuring generator. Input measuring systems monitor generated signal based on which the resistance between measuring system and PE earthing terminal is determined. Simultaneously, the level of effective voltage between positive and negative terminals of the monitored circuit and earthing terminal is measured continuously, which enables unbalance detection of power supply poles in relation to earth.

If the set value of resistance alarm or power supply unbalance are exceeded PP relay is activated and a  **POBUDZ.** LED is lit continuously signalling activation of the unit. Simultaneously, the set time delay starts ( $t_{zr}$  – time-delay of resistance alarm,  $t_{za}$  – time-delay of unbalance alarm).



Insulation resistance, pole voltage relative to PE terminal and graphical indication of unbalance are displayed on LCD screen constantly. Resistance alarm threshold set as well as the unbalance alarm threshold symbol are displayed on LCD screen and start flashing when it is exceeded. Alarms continue flashing until the activation stops and the  button is pressed or till remote resetting.

PP relay is sustained as long as the activation lasts (due to exceeded resistance or unbalance alarm threshold set). If the activation stops while “ $t_{zr}$ ” or “ $t_{za}$ ” time is elapsing, the  LED starts flashing and PP relay is deactivated. If the activation lasts longer than “ $t_{zr}$ ” or “ $t_{za}$ ” the relevant PWR or PWA operating relay is turned on and the  LED is lit. PWR and PWA operating relay can work in two operating modes that are selected from the software, a sustained or an unsustained mode. In a sustained operating mode (PW-ZP) the operating relays (PW) are sustained until they are reset using the  button. In unsustained operating mode (PW-BP) the relays are active as long as activation lasts. If activation stops after PW operating relay actuation, the  LED as well as the  LED starts flashing. Such state lasts until resetting. Activation of the KDZ-3JM stops when the monitored power supply resistance and unbalance stop exceeding the value set.

It is possible to block the operation of the KDZ-3JM measuring unit at any time by supplying voltage to B3/B4 terminals or sending the remote command. Interlocked state is signalled by a flashing LED (for remote command) or continuous light of the  LED (for blocking signal). Locking of the measuring unit causes simultaneous galvanic disconnection of measuring generator from the earthing terminal and deactivation of all output relays.

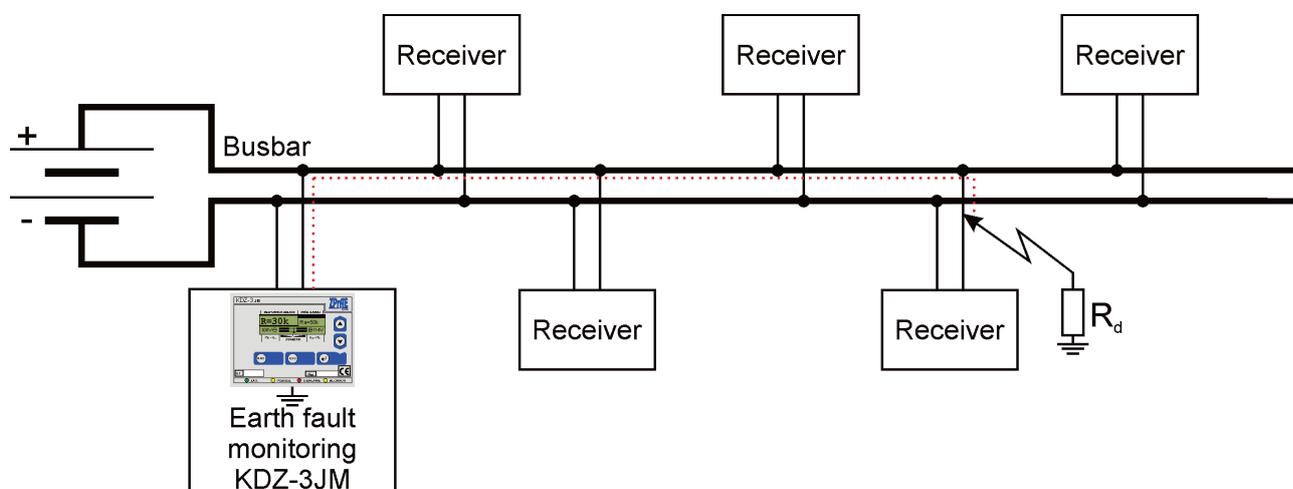


Fig. 2. Incorporating earth fault monitoring relay into a substation circuit.

### SETUPS PREVIEW AND PROGRAMMING.

#### Software version.

When the KDZ-3JM unit is powered by auxiliary power supply, it is possible to check the software version. To do this, press   buttons simultaneously. Information about device type, software version, manufacturer and serial number will be shown on the LCD display. To return to the main menu press  or wait 25 seconds (to leave automatically).

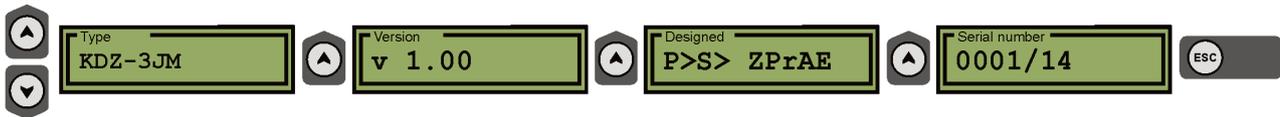


Fig. 3. Display – relay type, software versions, manufacturer, serial number.

#### Preview of parameters set.

It is possible to view set parameters during operation. When  or  is pressed the main screen is switched to setting preview screens according to the flowchart presented in fig. 11. To return to the main screen press  (ESC) button or wait 25 second (to leave automatically).

#### Configuration of parameters.

As described above, when  or  is pressed, the main screen is switched to setting preview screens. To activate configuration option of a displayed parameter press  (enter) button. Configured parameter that is displayed on the screen will start flashing. Use  or  to change the value of a given parameter to a desired value. To confirm the value press the  (enter) button. A password screen will then be displayed. Use  and  button to change the values of entered digit in a given item and confirm each time the current digit by pressing  (enter) before going to the next one. After entering the correct password the relay will save new values of parameters and confirm it by displaying “Settings saved” information. If the password is incorrect, a message “Incorrect password” will be displayed and the user will be returned to password screen. To exit the password screen press  (ESC) button or wait 25 seconds (to leave automatically).

**WARNING:** Default password is 0 0 0 0. If the new password is lost, please contact the manufacturer.

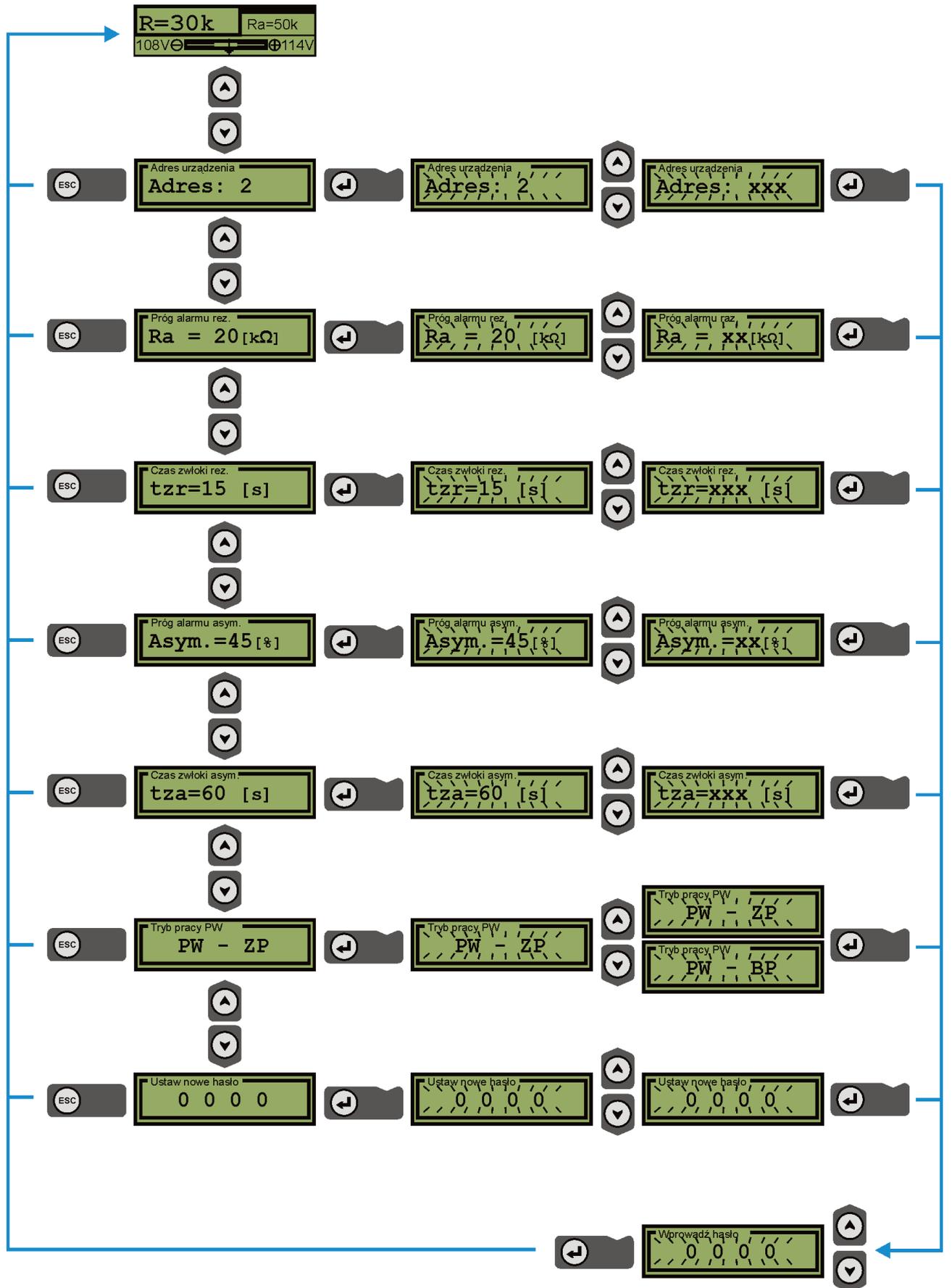


Fig. 4. Flowchart of parameter preview and configuration.

## REMOTE COMMUNICATION – MODBUS RTU.

### Registers and functions.

A Modbus RTU communication protocol is implemented in the KDZ-3JM measuring unit, which enables remote setting of alarms, locking of the unit, resetting and previewing current resistance and voltage values. Address of the device can be set from the front panel of the device only. To remotely change the setting of the device a recording function has to be blocked by sending a proper command with current password. Sending the command enabling remote saving of settings enables saving function for 60s.

### 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

<b>Report Slave ID:</b>	
	Functions available: 0x11 The 0x11 function returns: Slave ID: 0x03 Run Indicator Status: 0xFF = ON Additional Data: "KDZ-3JM version v X.XX" (X.XX – specifies software version)

### Addressing:

<b>Discrete State:</b>	Functions available: 0x02				
<b>Address:</b>	<b>Parameter description:</b>	<b>Data type:</b>	<b>Value:</b>	<b>Range:</b>	<b>Attribute:</b>
1	Resistance alarm	Bit	Off=0, On=1	0-1	read
2	Unbalance alarm	Bit	Off=0, On=1	0-1	read
3	PP relay output	Bit	Off=0, On=1	0-1	read
4	PP relay was activated	Bit	Off=0, On=1	0-1	read
5	PWR relay output	Bit	Off=0, On=1	0-1	read
6	PWR relay was activated	Bit	Off=0, On=1	0-1	read
7	PWA relay output	Bit	Off=0, On=1	0-1	read
8	PWA relay was activated	Bit	Off=0, On=1	0-1	read
9	Interlock active	Bit	Off=0, On=1	0-1	read
10	Malfunction	Bit	Off=0, On=1	0-1	read

<b>Coils:</b>	Functions available: 0x01, 0x05				
<b>Address:</b>	<b>Parameter description:</b>	<b>Data type:</b>	<b>Value:</b>	<b>Range:</b>	<b>Attribute:</b>
100	Resetting	Bit	Off=0, On=1	0-1	read/write
101	Remote interlock	Bit	Off=0, On=1	0-1	read/write

<b>Holding Register:</b>	Functions available: 0x03, 0x06				
<b>Address:</b>	<b>Parameter description:</b>	<b>Data type:</b>	<b>Value:</b>	<b>Range:</b>	<b>Attribute:</b>
3000	Record permission	Unsigned 16	0-9999	0 – 9999	write / current password
3001	KDZ-3JM new password setting	Unsigned 16	0-9999	0 – 9999	Write
3002	Resistance alarm threshold	Unsigned 16	0-9990	0k – 9990k	read/write
3003	PWR delay time	Unsigned 16	0-300	0s – 300s	read/write
3004	Unbalance alarm threshold	Unsigned 16	5-100	5%-100%	read/write
3005	Unbalance alarm threshold	Unsigned 16	0-300	0s – 300s	read/write
3006	Relays sustained	Unsigned 16	0-1	0= Off / 1= On	read/write

<b>Input Register:</b>	Functions available: 0x04				
<b>Address:</b>	<b>Parameter description:</b>	<b>Data type:</b>	<b>Value:</b>	<b>Range:</b>	<b>Attribute:</b>
4000	Insulation resistance	Unsigned 16	0-10000	0k – 10M	read
4001	Unbalance level	Signed 16	-100 -100	-100% – 100%	read
4002	Voltage value U <sub>1</sub> -PE	Unsigned 16	0-320	0V – 320V	read
4003	Voltage value PE- U <sub>1</sub>	Unsigned 16	0-320	0V – 320V	read

**TECHNICAL DATA.**

<b>Auxiliary power supply</b>	
Rated voltage $U_{pn}$	DC 220 V / AC 230 V or different, as agreed
Allowable voltage range	DC (85 ÷ 370) V / AC (85 ÷ 265) V
Power consumption $P_p$	≤ 3.5 W / ≤ 4.0 VA
<b>Measurement input</b>	
Range of measured input voltage $U_{i+}$ , $U_{i-}$ relative to PE	DC (0 ÷ 320) V / AC (0 ÷ 264) V
Resolution of input voltage measurement	1 V
Accuracy of voltage measurement	DC: ± (2% + 1c) / AC: ± (5% + 1c)
Range of resistance measurement	0 kΩ ÷ 10 MΩ
Resolution of resistance measurement	1 kΩ for $R_m < 200$ kΩ 10 kΩ for $R_m ≥ 200$ kΩ
Maximum allowable capacitance of measured circuit	50 μF
Accuracy of resistance measurement	± (10% + 1c) (for $C_e < 10$ μF, $R_m < 200$ kΩ) ± (20% + 1c) (for $C_e < 10$ μF, $R_m ≥ 200$ kΩ)
Resistance of $U_+$ terminal relative to $U_-$ terminal	1.2 MΩ
Resistance between $U_+$ , $U_-$ terminals and PE terminal	300 kΩ
Measurement voltage $U_m$	26 V
Maximum measurement current $I_m$	90 μA
Range of resistance alarm setting	0 kΩ ÷ 9.99 MΩ
Resolution of resistance alarm setting	1 kΩ for $R_{alarm} < 200$ kΩ 10 kΩ for $R_{alarm} ≥ 200$ kΩ
Hysteresis of resistance alarm	± (5% of value set + 2 kΩ)
Range of power supply unbalance measurement for $U_{i+} > 10$ V and $U_{i-} > 10$ V	0 % ÷ 100 %
Resolution of unbalance measurement	1 pp
Range of unbalance alarm setting	5 % ÷ 100 %
Hysteresis of unbalance alarm	3 pp
<b>Blocking input</b>	
Rated voltage $U_{bn}$	DC 220 V / AC 230 V or different, as agreed
Activation threshold	DC: 0.7 $U_{bn}$ / AC: 0.6 $U_{bn}$
Power consumption	≤ 0.3 W
<b>Time-delay of operating relays</b>	
Setting range	0 s ÷ 300 s
Setting resolution	1 s
Accuracy of time set	± 100 ms
<b>Relay contacts</b>	
Limiting capacity of contacts	AC 3 A / 250 V DC 0.15 A / 250 V; L/R = 40 ms
Current-carrying capacity of contacts	4 A
<b>Insulation</b>	
Rated voltage of insulation	250 V
Rated impulse voltage	4 kV (1.2/50 μs)
Overvoltage protection category	III
Electric strength of insulation	2.5 kV; 50 Hz; 1 min
Electric strength of contact gap insulation	1 kV; 50 Hz; 1 min

<b>Communication</b>	
Protocol	Modbus RTU
Operating mode	Slave
Physical connector	RS-485 2-wire
Transmission speed	9600 bps
Data bit number	8
Parity bit	even
Start bit number	1
Stop bit number	1
Network address range	10 ÷ 100
<b>General data</b>	
Allowable range of storage temperature	248 K ÷ 343 K (from -25 °C up to +70 °C)
Allowable range of operating temperature	263 K ÷ 328 K (from -10 °C up to +55 °C)
Allowable ambient air humidity (without steam condensation or ice)	95 %
Mechanical strength acc. to PN-EN 60255-21-(1,2,3); PN-EN 61557-1	Class 1
Electromagnetic compatibility acc. to PN-EN 60255-26	Zone A
Enclosure protection rating	IP40
Relay operating state signalling	Four LEDs
Terminals (socket/plug)	2 × GZ14
External dimensions (without socket)	77 mm × 100 mm × 110 mm (H×W×D)

## RELAY APPEARANCE AND DIMENSIONS.

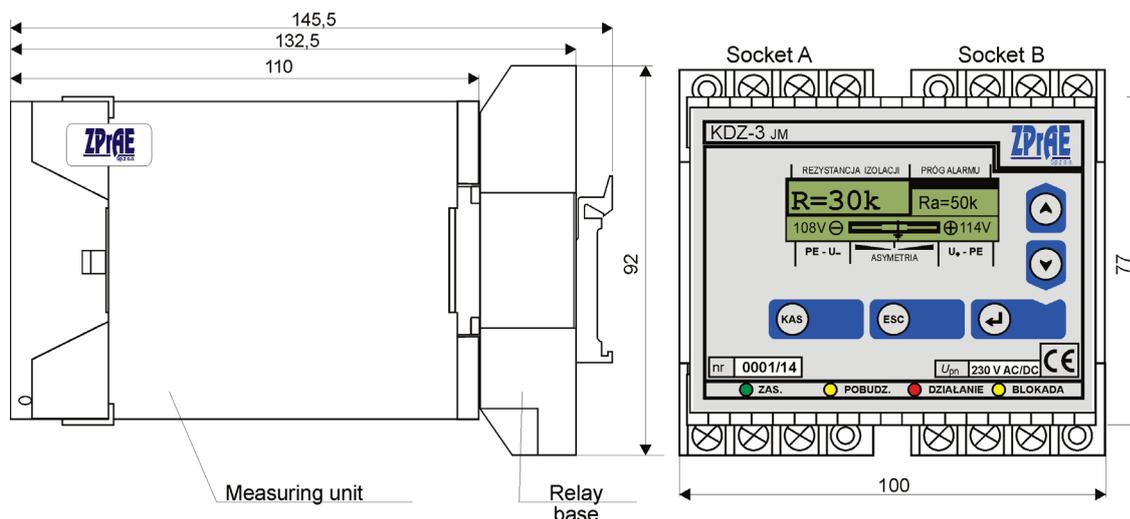


Fig. 5. Dimension drawing of KDZ-3JM measuring unit.

### NOTICE:

To install our relays we recommend using auxiliary equipment (units, sockets, plugs) which are designed based on customer's suggestions and many years of experience. For more information see the "Units and sockets of R-8614/R8614Z, GZ-14/GZ-14Z relays" folder available at [www.zprae.pl](http://www.zprae.pl).



# KDZ-3<sub>JM</sub>



## 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



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