ZPrAE Sp.z o.o.

SZAFY ZABEZPIECZEŃ DLA ENERGETYKI * POLSKA * ISO 9001 ZPrAE Sp.z o.o. 20-letnie doświadczenie

RD-50

SETS OF LOAD RESISTORS

1. Application of RD-50.

The sets of load resistors type RD-50 are used to assure appropriate operating conditions of measuring transformers (current and voltage).

Modern energy meters, in particular systems for tariff electricity metering class 0,2 and 0,5 consume very little power from the secondary winding of transformers. The current transformer cores guarantee accuracy class for loads of 25%-100% of the nominal power, which is usually 10 – 35 VA per phase. Sometimes, the nominal power may be greater, especially for modernised objects where older types of transformers are used.

In order to maintain appropriate accuracy class of the measuring system as a whole, it is necessary to verify whether the sum of loads of all elements in this system provides sufficient load for a measuring transformer core. If calculations (or tests) indicate that the transformer core is insufficiently loaded it is necessary to additionally load the system with a set of load resistors RD.

The increase of load of current transformer decreases their real overcurrent ratio, increasing safety parameters of the measuring system in a short-circuit current event.

Calculating of operating parameters of measuring systems, with a special focus on proper load of the measuring transformer, is facilitated by a manual provided by ZPrAE Sp. z o.o. named: *"Measuring system – ensuring proper operating conditions of transformers"*

The manual covers selected methods of calculations helpful for checking the following parameters:

- power loss in cables of the measuring system,
- load of the current transformer core, checking appropriateness of the load or necessity to increase load, calculating the needed additional load and selection of resistors to increase the load of the current circuit,
- load of the voltage transformer coil, checking appropriateness of load or necessity to increase load, calculating the needed additional load and selection of resistors to increase the load of the voltage circuit,
- voltage drop in a voltage circuit, and a selection of cross-sections of wires for a voltage measuring circuit with regard to voltage drop, for a compact circuit, ie. in situation where meters, load resistors and other supporting devices are located on one measuring board (in one cabinet),
- voltage drop in a voltage circuit, and a selection of cross-sections of wires for a voltage measuring circuit with regard to voltage drop, for a distributed circuit, ie. in situation where meters are located far away from transformers, supporting devices are located on a remote measuring board (in a cabinet) and the load resistors of voltage transformers are located closer (ex. in a cable cabinet),
- current flowing in the voltage circuit through relay controlling the circuit continuity.

The above manual contains also a special calculation spreadsheet RD50.2 automatically calculating the above parameters. The manual, together with the spreadsheet, can be provided to measuring specialists free of charge.

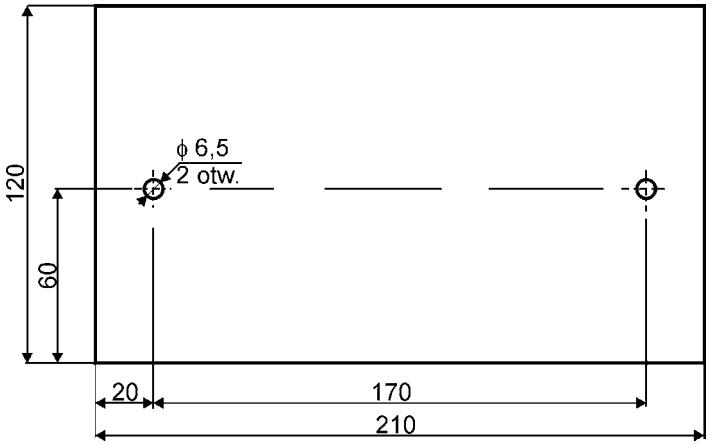
2. Construction of RD 50

The sets of resistors provided by ZPrAE Sp. z o.o., having a general type name of RD-50, are produced in a form of a set of 3 resistors (for 3-phase circuits) built in a special-purpose sealed housing, enabling free cooling air flow. The resistance and power of the resistors are individually selected for a specific measuring system.

The set is made of wire resistors using resistance wire (for current circuits) or thick-film resistors (for voltage circuits) with ceramic body and ceramic protection layer. They have sufficient nominal power, tolerance and temperature stability.

The beginnings and ends of all 3 resistors are led to the terminal strip, made with UK 5 TWIN Phoenix contacts, enabling delta/star connection changing by appropriate changes of bridges. Access to the strip is possible only after removal of the seals and the cover. Additionally, the cover is equipped with a properly marked terminal enabling its effective grounding.

The current circuits are usually loaded with resistors ranging from 0,1 ÷ 20,0 Ω, whereas voltage circuits - with resistors ranging 100,0 ÷ 10000,0 Ω. All resistances from the above ranges are available. The most typical values with their power are given in a table below.



For RD-50/1 and RD-50/2 sets

For RD-50/3 sets.

Figure 1. Spacing between holes on a mounting plate.

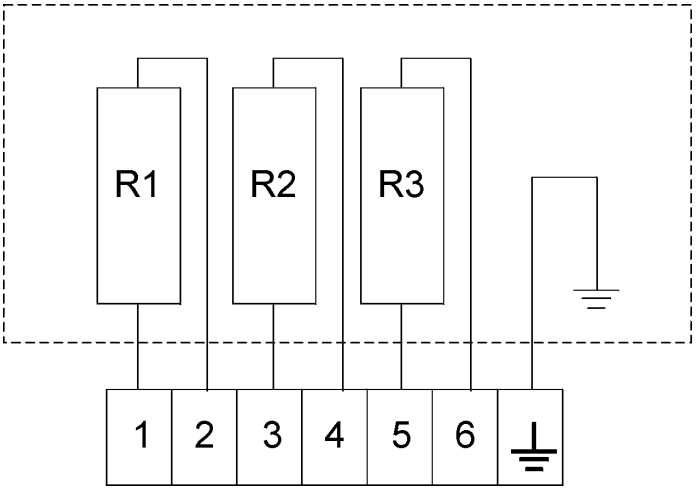


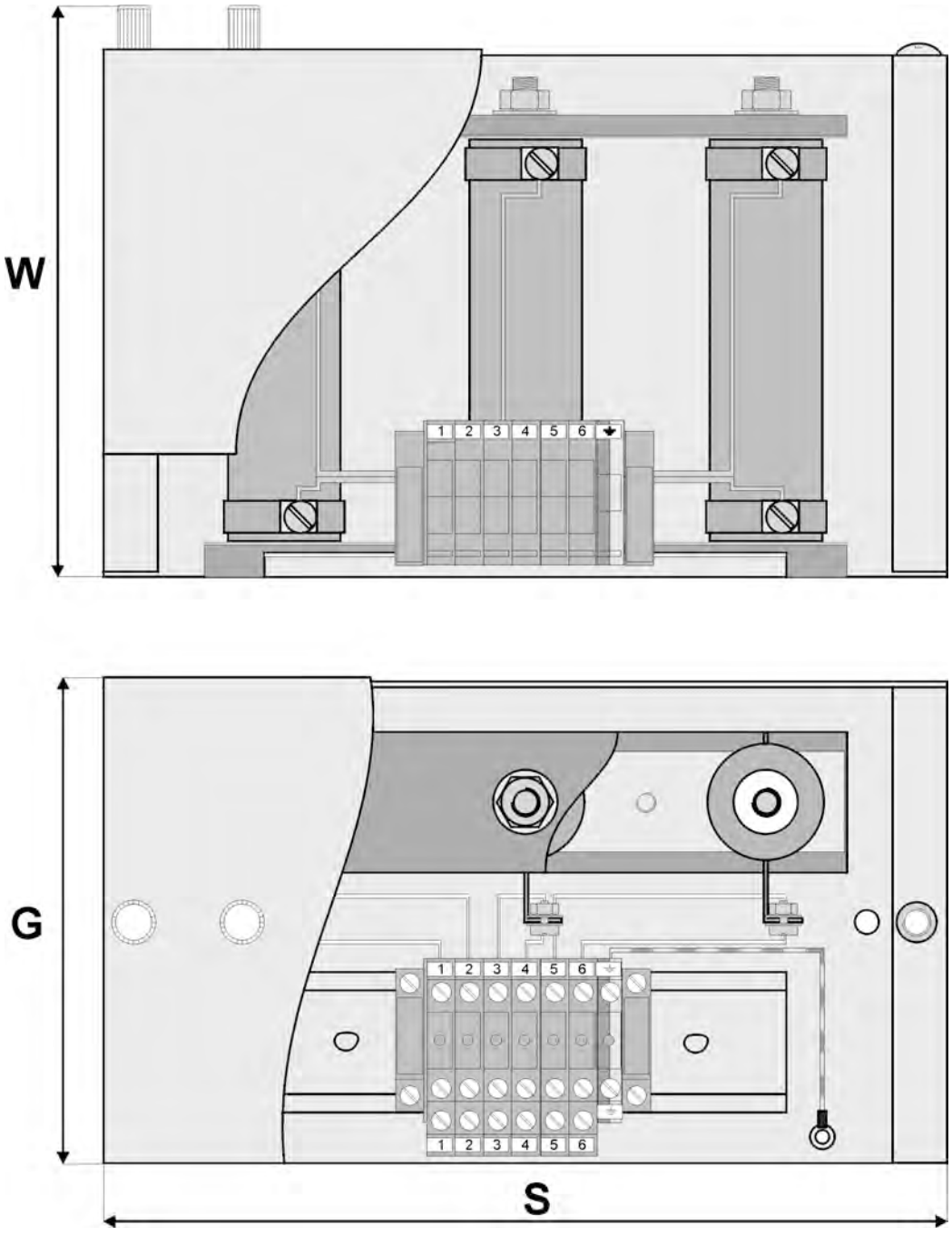
Figure 2. Terminal strip of RD-50 set

Depending on the value of required resistance, the power dissipated by a resistor, in nominal conditions, may differ from 1 VA/phase to 30 and more VA/phase. That is why we produce our resistors in 3 housing versions, differing in dimensions, tailored to the needed nominal power of the resistors, and providing appropriate heat dissipation – refer to figure 3.

Beside classical 3-resistor sets for 3-phase circuits, we offer RD-50 (2 × R) sets for transformers working in V-system, and resistors RD-50 (1 × R) for absorption of ferroresonance vibrations, designed for open delta system of voltage transformers.

3. Technical information of RD-50

Producer	ZPrAE Sp. z o.o. Siemianowice Śląskie
Type name	RD-50
Resistance and nominal power	as ordered
Resistance tolerance	5%
Rated insulation resistance	>100 MOhm
Electric strength of the insulation	2,5 kV 1 min.
Overload strength	2 In or 2 Un
Dimensions	As in figure 3
Weight	2 ÷ 4 kg
Ambient temperature: working storage and transportation	 -5 ÷ 40°C -20 ÷ 70°C
Humidity	<75%



Housing type	Dimensions (S×W×G)
RD-50/1	210 × 145 × 120
RD-50/2	210 × 195 × 120
RD-50/3	320 × 195 × 120

Figure 3. Dimensions of the housing of RD-50 resistor set.

4. Application of RD-50-30

The sets of load resistors are used to ensure proper operating conditions of measuring transformers. The RD-50-30 set of resistors is dedicated mainly for secondary circuits of current transformers of 5A rated current, to operate with semi-direct energy measuring system. The RD-50-30 set of resistors may also be applicable for any other measuring circuit where the required additional value of load does not exceed 4VA per phase.

Modern electronic energy meters have very small power consumption from the transformer's secondary winding. The current transformer core has a guaranteed accuracy class for loads of 25%-100% of nominal power which is usually 10 – 15 VA per phase.

In order to maintain appropriate accuracy class of the metering system it is necessary to verify whether the sum of loads of all elements in this system provide sufficient load of the current transformer core. Usually, the simple semi-direct systems with one electronic energy meter provide very small load (short distances resulting with very small resistance of wiring) which results in insufficient load of the transformer's core. That is why it is necessary to increase load of the transformer, with special purpose sets of load resistors. The sets of resistors RD-50-30 are designed especially for the above purpose. Standard resistance of 3x0,15 Ohm, increase the load of each phase by 3,75 VA, for 5A nominal current.

The increase of current transformers load decreases their real overcurrent ratio, increasing safety parameters of the measuring system in a short-circuit current situation.

Power drawn by load resistors designed for current circuits of 3 x 5A		
Resistance	Power drawn by resistors at nominal current	Housing type
3 × 0,15 Ω	3 × 3,75 W	RD-30

5. Construction of RD 50-30

The RD-50-30 sets of resistors are produced for 3-phase circuits, as a set of 3 resistors, built in a special-purpose sealed housing, enabling free cooling air flow.

The high-power resistors used for production of RD-50-30 have ceramic body and ceramic protection layer providing sufficient nominal power as well as temperature tolerance and stability.

The beginnings and ends of all 3 resistors are led out to the terminal strip, but the access to the strip is possible only after removal of the seals and the cover. Additionally, the housing is equipped with a properly marked terminal enabling its effective grounding.

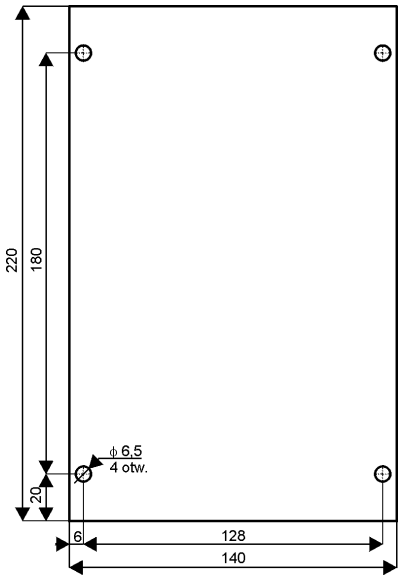


Figure. 4. RD-50-30 set, spacing between holes on a mounting plate.

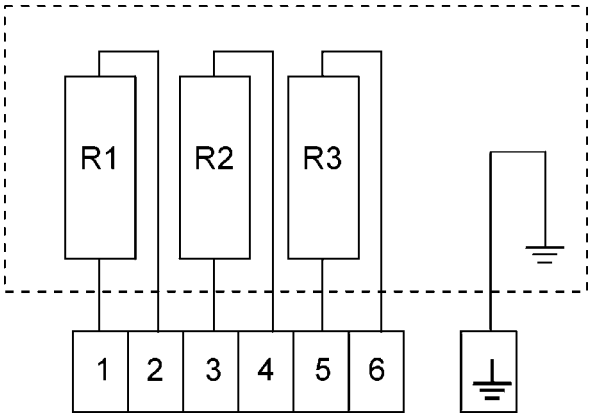
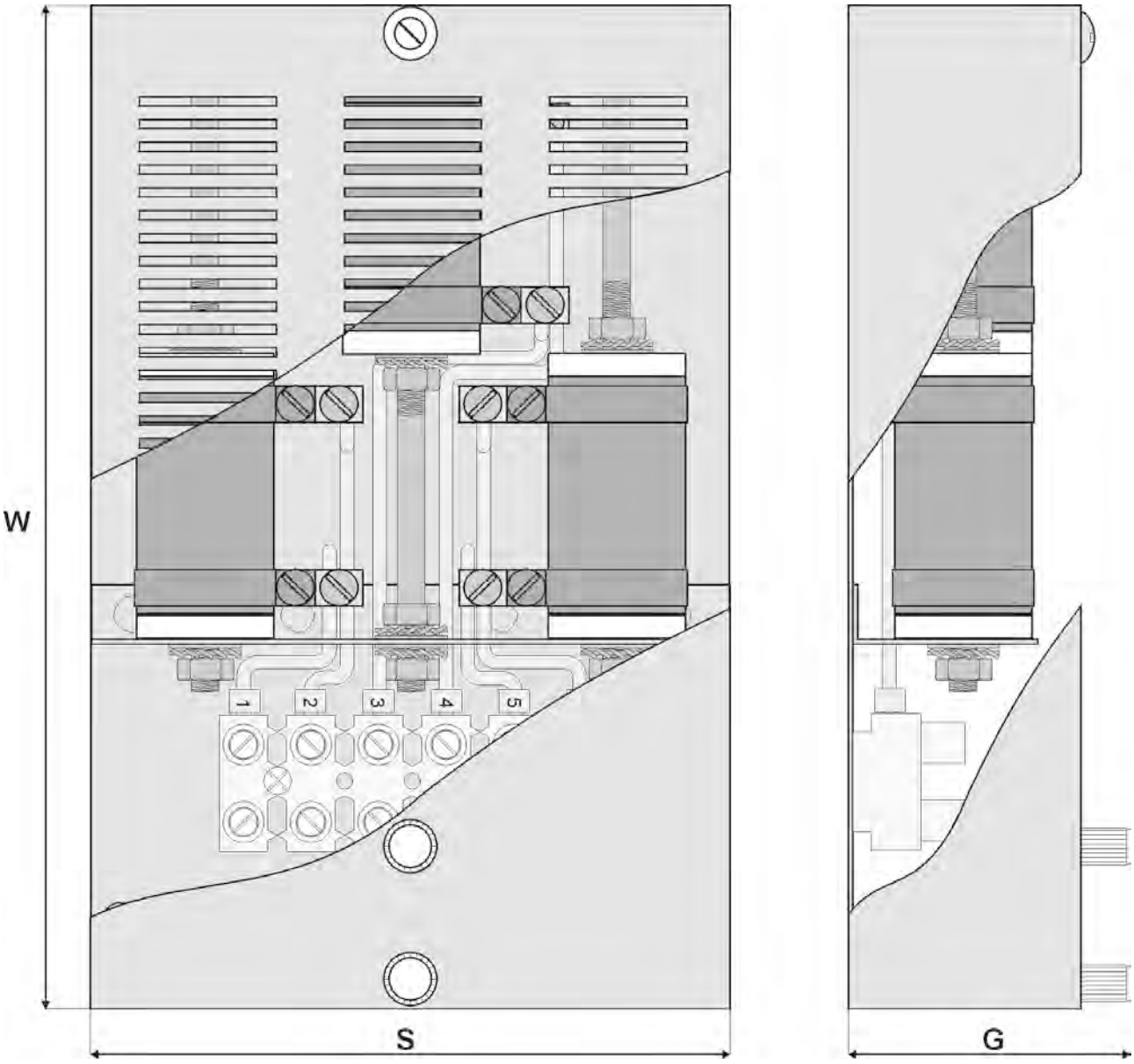


Figure. 5. Terminal strip of RD-50-30

6. Technical information of RD-50-30

Producer	ZPrAE Sp. z o.o. Siemianowice Śląskie
Type name	RD-50-30
Resistance and nominal power	3 x 0,15 Ohm (or other as ordered)
Resistance tolerance	5%
Rated insulation resistance	>100 MOhm
Electric strength of the insulation	2,5 kV 1 min.
Overcurrent strength	2 In
Dimensions	As in figure 6
Weight	app. 1,2 kg
Ambient temperature: working storage and transportation	 -10 ÷ 50°C -20 ÷ 70°C
Humidity	<75%



Housing type	Dimensions (S×W×G)
RD-50-30	140 × 220 × 62

Figure. 6. External dimensions of the RD-50-30 resistors set housing.

Power drawn by load resistors dedicated for voltage circuits 3 × 100/√3			
Resistance (exemplary values)	Power dissipated by resistors		Housing type
	Connected in ⅄	Connected in △	
3 × 5 kΩ 3 × 2 kΩ 3 × 1,2 kΩ	3 × 0,67 W 3 × 1,68 W 3 × 2,77 W	3 × 2,0 W 3 × 5,0 W 3 × 8,33 W	RD-50/1
3 × 1 kΩ 3 × 670 Ω	3 × 3,36 W 3 × 5,0 W	3 × 10,0 W 3 × 14,9 W	RD-50/2
3 × 400 Ω 3 × 300 Ω 3 × 240 Ω	3 × 8,4 W 3 × 11,1 W 3 × 14,0 W	3 × 25,0 W --- ---	RD-50/3
3 × 100 Ω	3 × 33,3 W	---	RD-50/3-2 Special version
3 × 300 Ω	---	3 × 33,3 W	RD-50/3-2 Special version
3 x 65 Ω	3 × 1 × 51 W	---	3 × RD-50/3 1 × 65 Ω Special version

The RD50/3 are suitable for maximal power of 26W per phase. It means minimal resistance of 130 Ohm for star connection of resistors or 400 Ohm for delta connection of resistors. All sets having resistance below 400 Ohm are dedicated only for star connection.
In cases, where greater load is needed the RD-50-/3-2 are offered. They enable maximal load per phase of 33,3W, meaning minimal resistance of 100 Ohm for star connection of resistors or 300 Ohm for delta connection of resistors.
For specific systems, where it is necessary to load the circuit with greater power it is recommended to use separate resistors for each phase. The single-phase resistors enable load of 90W per phase. This 3-phase set is labelled as 3xRD50/2 (or 3) 1×XX Ohm. Those sets are produced only to special order.
We recommend consulting feasibility of chosen specification before ordering.

Power drawn by load resistors dedicated for current circuits 3 × 1A		
Resistance (exemplary values)	Power dissipated by resistors for nominal current	Housing type
3 × 1 Ω 3 × 5 Ω	3 × 1 W 3 × 5 W	RD-50/1
3 × 10 Ω 3 × 20 Ω	3 × 10 W 3 × 20 W	RD-50/2

Power drawn by load resistors dedicated for current circuits 3 × 5A		
Resistance (exemplary values)	Power dissipated by resistors for nominal current	Housing type
3 × 0,5 Ω	3 × 12,5 W	RD-50/2
3 × 0,2 Ω	3 × 5 W	RD-50/1
3 × 0,1 Ω	3 × 2,5 W	RD-50/1

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CENTRUM BADAŃ I CERTYFIKACJI

CERTYFIKAT ZGODNOŚCI
Nr 3173/2014

Nazwa i adres dostawcy:	**Zakład Produkcyjny Aparatury Elektrycznej Sp. z o.o.** **ul. M. Konopnickiej 13, 41-100 Siemianowice Śląskie**
Nazwa i adres producenta:	**Zakład Produkcyjny Aparatury Elektrycznej Sp. z o.o.** **ul. M. Konopnickiej 13, 41-100 Siemianowice Śląskie**
Nazwa wyrobu:	**Zestaw rezystorów dociążających obwody wtórne przekładników pomiarowych**
Typ (odmiany):	**RD-50**
Podstawowe parametry:	**Rezystancja 0,1-20 Ω oraz 100-10000 Ω** **Moc maks. 50 W**
Wyrób spełnia wymagania zawarte w	**PN-EN 140200:2002** Specyfikacja grupowa – Rezystory stałe mocy p. 2.2.2, p. 2.2.3, p. 2.3.2, p. 2.3.5, p. 2.3.6 **PN-EN 60664-1:2011** Koordynacja izolacji urządzeń elektrycznych w układach niskiego napięcia. Część 1: Zasady, wymagania i badania, p. 6.1.3.4.
Zgodnie ze sprawozdaniem z badań wykonanych przez	1. Centrum Badań i Certyfikacji Instytutu Technik Innowacyjnych EMAG 2. Zakład Pomiarowo-Badawczy Energetyki „Energopomiar-Elektryka" Sp. z o.o.
Nr i data sprawozdania:	1. 2167-ZLK/2011 z 27 kwietnia 2011 r. 2. EE/322/02 z sierpnia 2002 r.
Certyfikat ważny do:	bezterminowo

Certyfikat wydany w systemie 1b wg PKN-ISO/IEC Guide 67

Prawo do wykorzystywania certyfikatu dotyczy wyłącznie egzemplarzy wyrobów posiadających identyczne właściwości (parametry) i produkowanych według tych samych specyfikacji jak przedstawione do badań wzory, które jednostka certyfikująca podczas badań początkowych uznała za zgodne z wymaganiami powyżej powołanych dokumentów normatywnych.

Instytut Technik Innowacyjnych EMAG
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Katowice, dnia 07.03.2014

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RD-50

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- RKO-3 - power supply circuit continuity monitoring
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- 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
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- Energy measurement system and event recorder ZRZ-28
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