Łukasiewicz
Instytut Tele–
i Radiotechniczny

VDIS–R VOLTAGE INDICATING DEVICE

VDIS

OPERATING MANUAL

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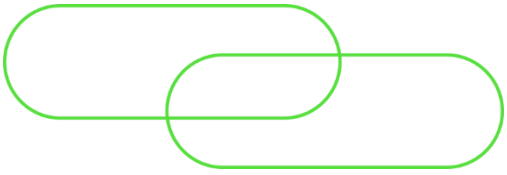


National and industry safety regulations must be observed during installation and operation.

Incorrect or improper use of the device can pose a threat to its operators and can also damage the device.

During operation, some parts of the device may carry an unsafe live voltage.

If the device is used improperly or contrary to its intended purpose, the user shall be fully responsible for any ensuing risks to safety and damage done to the device.

Use of a damaged device may result in improper operation of the monitored facility, which may result in a threat to life or health.

Correct and trouble-free functioning of the device requires proper transport, storage, mounting, installation and commissioning, as well as proper operation, maintenance and servicing.

The device may only be installed and operated by adequately trained personnel.

We reserve the right to introduce changes to the device.

The device is designed for supervision and monitoring of industrial facilities.

Other documents concerning the device are available from the manufacturer.

The devices have been manufactured in compliance with ROHS Directive 2011/65/EU, taking into account Commission Delegated Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU as regards the list of restricted substances.

End-of-life devices become recyclable electrical and electronic waste in accordance with Directive 2012/19/EU (WEEE) on waste electrical and electronic equipment.

Spis treści:

1. Introduction

1.1. Symbols

Electrical warning sign, indicating important information regarding the presence of a hazard that may cause an electrical shock.

Warning sign indicating important information about a hazard that may cause damage to the device or its malfunction.

Information sign marking important features and parameters of the device.

2. General

2.1. Intended purpose of the device

VDIS The VDIS device is designed for continuous indication of voltage on switchgear busbars.

Fig. 2.1.1. View of the VDIS device

VDIS is equipped with a **TEST** button for checking the functioning of the display.

The presence of voltage is signalled separately for each monitored phase, by means of displaying one of the following symbols: . The indicating device is constructed in accordance with the requirements of the IEC/PN-EN 62271-213:2022-03 standard. The indicating device is connected with current busbars via reactance insulators and it is compatible with the LRM interface outlined in the IEC 61243-5 standard.

The device is equipped with a protective flap, preventing direct access to its front panel. During normal operation, the protective flap should be closed. It should only be opened for the purpose of carrying out measurements. Once the measurements are completed, the flap should be re-closed.

2.2. Device characteristics

Diagnostics	Display function check
Enclosure	• Compact size: 96/48/66 mm. • Board mounting
User interface	• 3 symbols indicating the presence of voltage on each monitored phase • TEST button for starting a display check
Indication	• Presence of voltage on each monitored phase, indicated by one of the following symbols , , lit on the LCD display

2.3. Front panel

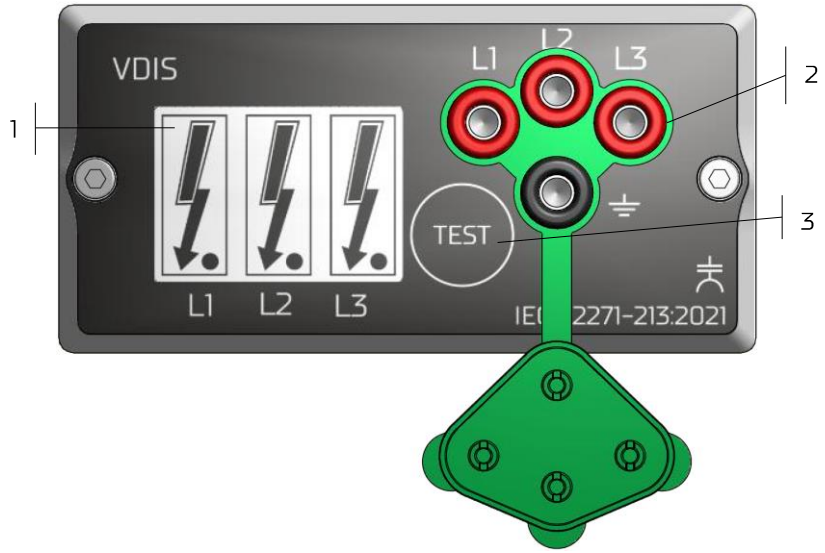


Fig. 2.3.1. Front panel view

The front panel features:

1) LCD display
2) LRM-compliant test connector
3) Button for starting a display function check

2.4. Visual signaling

Table 2.4.1. Meaning of pre-defined LEDs

Symbol/Name	Colour	Description
	Black	Indicates the presence of voltage on a given line, in the range of <10 – 45>% of the nominal voltage value
	Black	Indicates the presence of voltage on a given line, in the range of <45 – 120>% of the nominal voltage value
	Black	Indicates the presence of voltage on a given line, in the range of above 120 % of the nominal voltage value

3. Device operation

VDIS is designed for continuous indication of voltage on switchgear busbars. It monitors the three phase voltages and indicates the presence of each of them.

Table 3.1. Operation signaling

Voltage level on the selected line	LCD indication			LED indication		
	L1	L2	L3	L1	L2	L3
$U_N < 10\%$						
$10\% < U_N < 45\%$	⚡			•		
		⚡			•	
			⚡			•
	⚡	⚡		•	•	
	⚡	⚡	⚡	•	•	•
$45\% < U_N < 120\%$	⚡			•		
		⚡			•	
			⚡			•
	⚡	⚡		•	•	
	⚡	⚡	⚡	•	•	•
$U_N > 120\%$	⚡			•		
		⚡			•	
			⚡			•
	⚡	⚡		•	•	
	⚡	⚡	⚡	•	•	•

3.1. Diagnostics

Pressing the TEST button activates a display function check. During the check, all displayable elements are lit on the LCD display for a brief period of time. The user can thereby check the functioning of the device during normal operation in a switchgear bay regardless of the presence of voltage on the switchgear busbars.

If, after pressing the TEST button, the visual signalling functionality is not triggered, this means that the device is defective.

4. List of adopted standards

Table 4.1. General and harmonised standards

Standard number	Standard title
PN-EN 61000-6-2:2008	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments
PN-EN 61010-1:2011	Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements
PN-EN 61010-031:2015-10/A1:2022-04	Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 031: Safety requirements for hand-held probe assemblies for electrical measurement and test
PN-EN 62271-213:2022-03	High-voltage switchgear and controlgear – Part 213: Voltage detecting and indicating systems
PN-EN 60529:2003	Degrees of protection provided by enclosures (IP Code)

5. Technical parameters

5.1. Input circuits

Number of voltage circuits	3
Minimum voltage triggering the LCD display signalling	4 V RMS
Input capacitance	1500pF + adjustment capacitance
Maximum length of connection cables	3 m

5.2. Environmental conditions

Operating temperature	-25 °C ... +55 °C
Storage temperature	-35 °C ... +85 °C
Air humidity	No steam condensation and no frost formation
Post-installation insulation class	0
Installation category	III
Industrial environment class	B
Contamination degree	2
Mechanical resistance	
(Sinusoidal) vibration resistance	Class 1
Resistance to single and multiple shocks	Class 1
Resistance to seismic shocks	Class 0
Installation location	Indoor

5.4. Construction

Weight	< 0.3 kg
Size: width/height/depth	96/48/66 mm
Ingress protection	
from the face panel side	IP 54
from the connectors side	IP 30
Connectors	III
Type	Wieland 8213 BSP / 4 OB. (27.662.3453.0)
	The device's connector terminals must not be exposed to corrosive agents.
Cross-section of connection wires	0.129...3.31 mm^2 cable (ended with a sleeve) 0.129...3.31mm^2 wire
Insulation length	10...12mm
Enclosure	
mounting	board-mounted
Mounting hole dimensions: width/height	92/43 mm

6. Description of connection sockets

Table 6.1. X1 socket description

Terminal No	Designation	Description/Intended use
1	PE	Common for L1, L2, L3 (Protective Earthing, PE)
2	L1	Phase L1
3	L2	Phase L2
4	L3	Phase L3

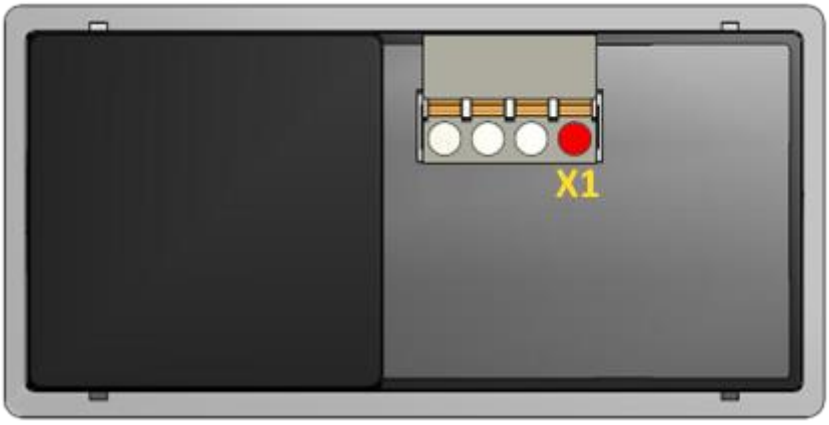


Fig. 6.1. View of the device from the connectors side

The red point on the connector indicates its first pin.

7. Connection diagram

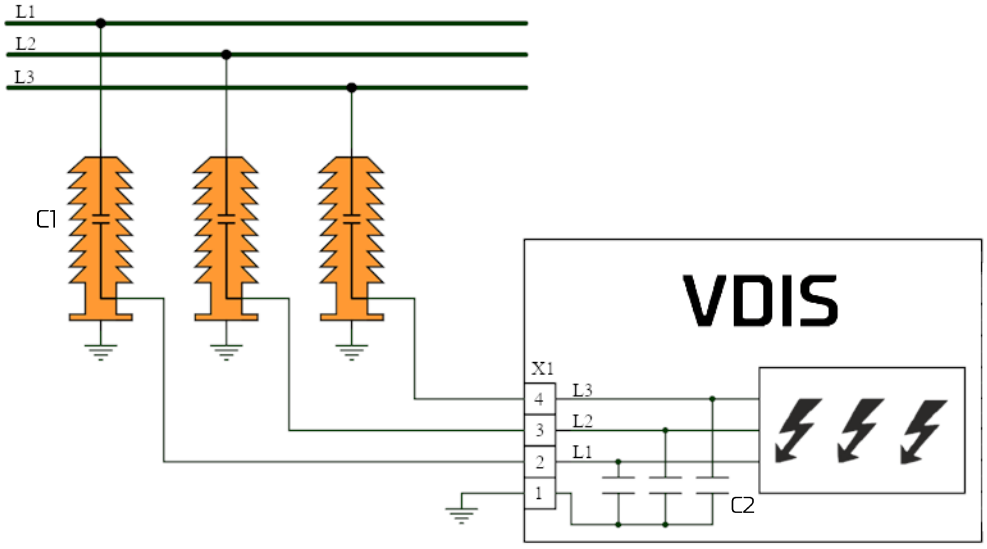
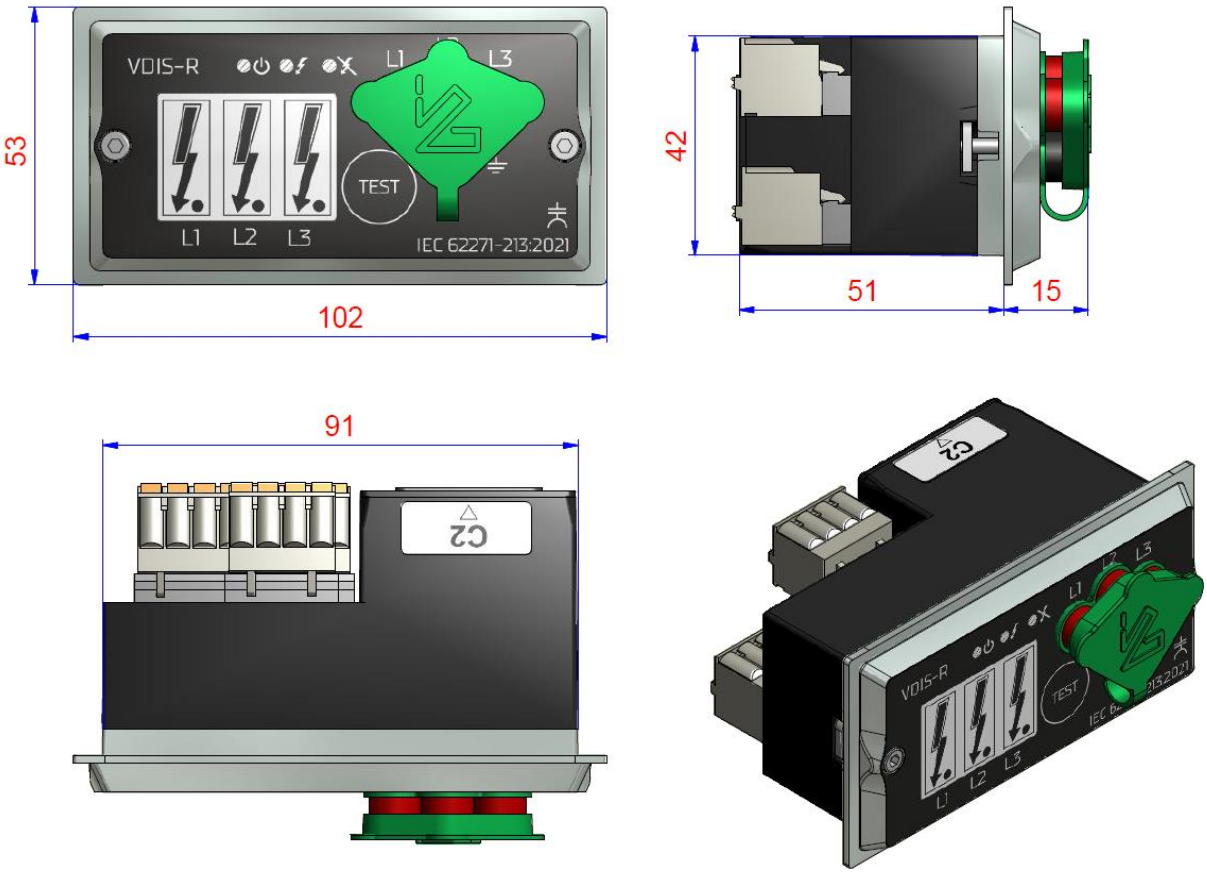


Fig. 7.1. Connection diagram

8. Dimensions of the device



Figs. 8.1. Dimensions of the VDIS enclosure

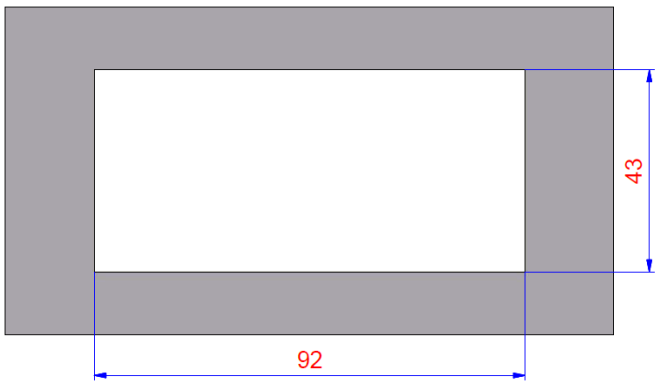


Fig. 8.2. Mounting hole dimensions

9. RC interchangeable adjustment capacitance module

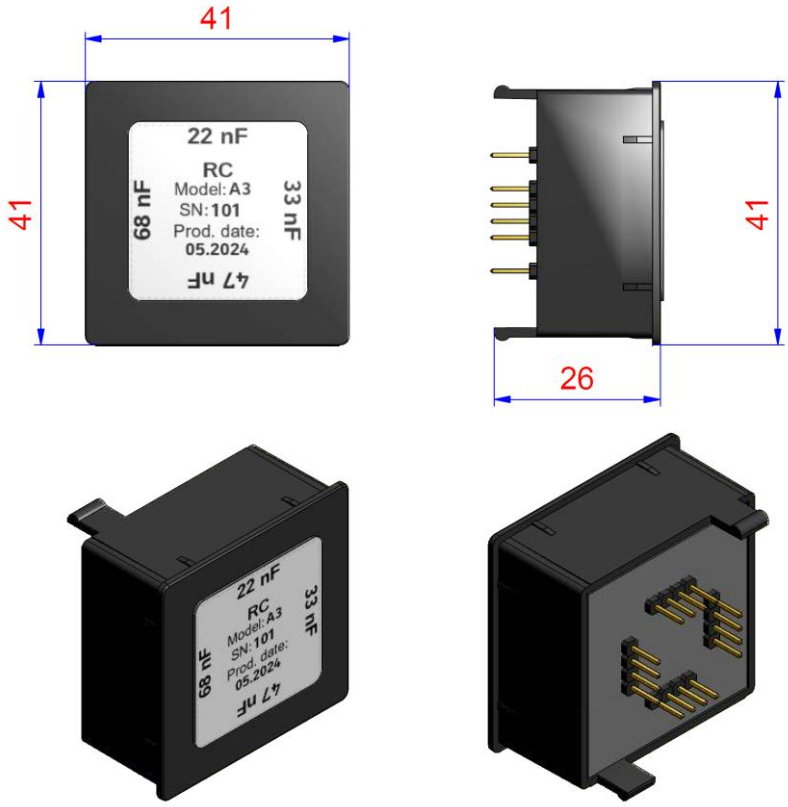


Fig. 9.1. Dimensions of the RC interchangeable adjustment capacitance module

The device comes with an additional accessory in the form of an RC interchangeable adjustment capacitance module. The module is used to create the capacitive voltage divider shown in the connection diagram in Fig. 7.1. It limits the maximum current in the C1–C2 serial circuit, which must not exceed 1 mA. C1 is the capacitance of the reactance isolator, while C2 is the adjustment capacitance, selectable via the RC interchangeable adjustment capacitance module.

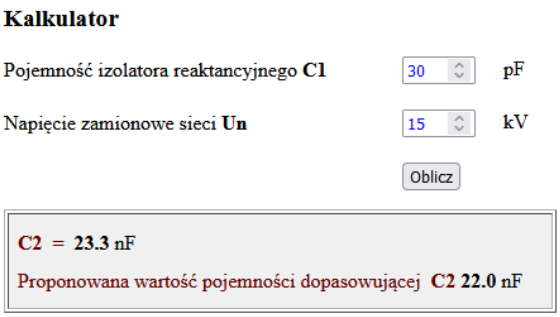


Fig 9.2. Adjustment capacitance calculator view

Kalkulator	Calculator
Pojemność izolatora reaktancyjnego C1	Reactance insulator capacitance C1
30	30
pF	pF
Napięcie zamionowe sieci Un	Rated mains voltage Un
15	15
kV	kV
Oblicz	Calculate
C2 = 23.3 nF	C2 = 23.3 nF
Proponowana wartość pojemności dopasowującej C2 22.0 nF	The proposed value of adjustment capacitance C2 is 22.0 nF

The adjustment capacitance calculator is available at www.energetyka.itr.org.pl. Enter the reactance insulator capacitance (C1) and rated mains voltage (Un), then click "Calculate". The calculator will display the exact value of C2, as well as the proposed value of adjustment capacitance that is available in the RC module.

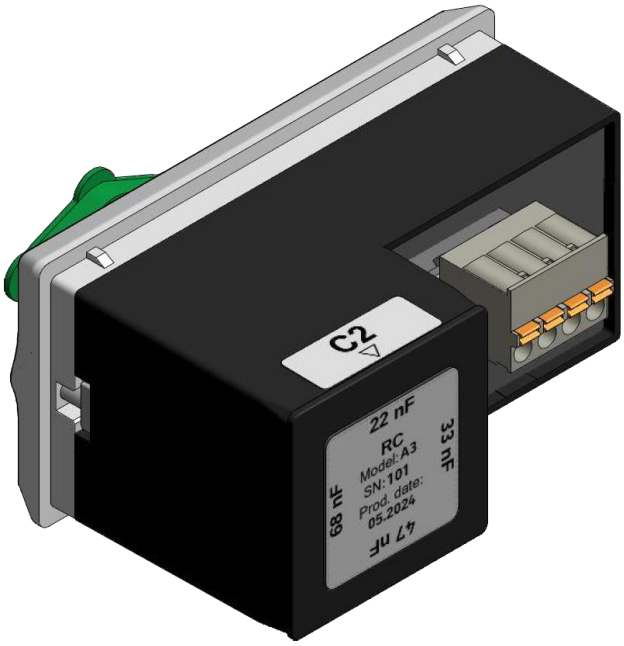


Fig. 9.3. How to instal the RC module in the VDIS device

The RC module is installed at the back of the VDIS-R device. Each RC module has a set of four different adjustment capacitances. To select the desired capacitance, rotate the RC module and place it in the VDIS-R device so that the sticker with the arrow and "C2" caption points to the expected capacitance. Fig. 9.3 presents the VDIS-R device with the selected adjustment capacitance of 22 nF.

10. Order specification

	A
Variant of the RC module with adjustment capacitances	
4,7 nF; 6,8 nF; 10 nF; 15 nF	1
10 nF; 15 nF; 22 nF; 33 nF	2
22 nF; 33 nF; 47 nF; 68 nF	3
47 nF; 68 nF; 100 nF; 150 nF	4

Example of an order

VDIS	Variant of the adjustment capacitance chip
	A
	22 nF; 33 nF; 47 nF; 68 nF

VDIS with an RC module with adjustment capacitances of 22 nF; 33 nF; 47 nF; 68 nF

11. Manufacturer's comments

11.1. Maintenance, inspections, repairs

The manufacturer recommends that the device be checked for correct operation:

- each time – during commissioning;
- at least once a year – in mine face facilities
- at least every 5 years – in environments other than mine face facilities.

It is also necessary that checks provided for by industry regulations be carried out.

11.2. Storage and transport

The devices are packaged in transport packaging in a manner that protects them from damage during transport and storage.
The devices should be stored in transport packaging, in spaces that are: enclosed, free from vibrations, not directly exposed to atmospheric conditions, dry, ventilated and free from harmful vapours and gases. The ambient air temperature should not be lower than –35°C or higher than +85°C; the relative humidity should not exceed 80%. If the devices are stored at low temperatures, make sure that no steam condensation has formed on the system components.

11.3. Installation location

The VDIS device is designed to be mounted in the door of an indoor switchgear bay. The total length of cables connected to the input and output supply ports must not exceed 3 m.
The device is installed in the switchgear bay door in stages described in the following bullet-points:

- insertion of the VDIS device into the mounting hole on the switchgear bay
- tightening of the fastening screws to the door surface

11.4. Disposal

The devices have been manufactured predominantly from materials that can be recycled or disposed of without causing any risk to the environment. End-of-life devices may be collected for re-processing, provided that their condition corresponds to normal wear and tear. Any components that are not refurbished will be disposed of in an environmentally friendly manner.

11.5. Warranty and service

The product is covered by a 36-month warranty. If the sale was preceded by a contract signed by the Buyer and the Seller, the provisions of that contract shall apply. The warranty covers the free removal of defects revealed during use, subject to the terms and conditions specified in the warranty card. Detailed terms and conditions of the warranty can be fount at energetyka.itr.org.pl in "General Terms and Conditions of Sale of "Łukasiewicz – ITR" products:

- the warranty period is counted from the date of sale;
- the warranty is extended by the period during which the product is under repair;
- unauthorised tampering with the product will render the warranty void'
- the warranty does not cover damage resulting from improper use of the product.

12.Contact us

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