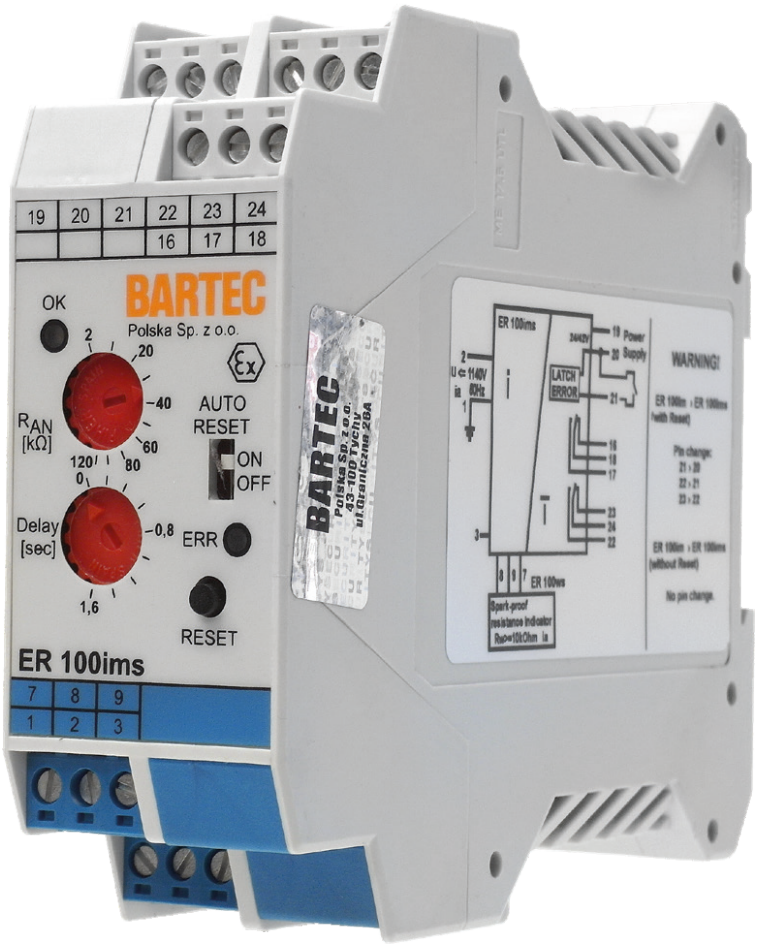
Central-Interlocking Leakage Safety Device ER 100ims type

Operation Manual nr BP/IO/21/16

EXPROTEC



EXPROTEC Sp. z o.o.
43-100 Tychy
ul. Graniczna 26A
tel: +48 32 326 44 00
email: biuro@exprotec.pl

21st March 2023
Edition 5.2.4

Contents

List of Figures

List of Tables

1 Introduction

The Operation and Safety Manual, no. BP/IO/21/16 is intended to provide the users of the ER 100ims safety device (also referred to as „the product") with the product design, operating principle and procedures of safe and correct operation.

1.1 Copyright

1.2 Warranty terms and conditions

The warranty terms and conditions are specified in EXPROTEC's „General Terms and Conditions of Sale and Delivery".

All warranty claims and/or claims for material or personal damage will be rejected whenever caused by:

- non-intended use of the product,
- improper transport, handling, storage, installation, wiring, commissioning, servicing, maintenance, repairs, removal and/or recycling,
- non-compliance with this Manual,
- unauthorized modifications in the connection layout of the product,
- improper inspection of wearing parts of the product,
- emergency caused by contact with foreign bodies or other causes.

2 Safety of operation

The product shall only be installed by qualified personnel trained in operation of Ex-rated electrical equipment.

During operation, observe the requirements for maintaining the efficiency of the device, in accordance with the documentation.

The protection features shall be calibrated according to their operating manuals approved for use by the mine operations manager or another competent authority.

All repairs and maintenance of the ER 100ims shall be attempted with the live supply voltage isolated and locked out from the equipment unit it is integrated with.

3 Identification of hazards

3.1 Hazards

The Operation Manual specifies sufficiently the correct maintenance of the product. However, the personnel attempting maintenance shall hold valid electrical licenses.

WARNING: Read this Operation Manual prior repairing or maintaining this product.

WARNING: Do not attempt to repair the product if you do not have the required qualifications. Only EXPROTEC is authorized for the repairs. Improper or careless repair can lead to serious accidents or death.

WARNING: Modification of the product or use of any spare part which does not comply with EXPROTEC's engineering conditions may result in severe injury and/or death hazards and will result in loss of warranty rights and product approval.

3.2 Application restrictions

The field installation of the product shall follow the Operation Manual.

RESTRICTION: Do not attempt any makeshift installation of the product.

RESTRICTION: The use of the ER 100ims central-interlocking device is only possible in conjunction with ED 100 or ED 100i chokes (or suitably rated wire resistors).

RESTRICTION: The installation shall be done with the required separation distances from the external terminals of the product in compliance with EN 60079-11 Section 6.2.1

RESTRICTION: The ambient temperature limits are: $-20°C \leq Ta \leq +70°C$.

3.3 Directions for safe use

1. Prior to operating the product, read and understand this Operation and Safety Manual. Refer also to the documentation of the system in which the product is operated.
2. Compliance with the Operation Manual and the guidelines and parameters listed in the system documentation will guarantee reliable operation of the product. The user shall strictly comply with the rules of operation. Non-compliance may result in loss of warranty right, damage of the product or create operating hazards.
3. The management in the product user's organisation is required to provide adequate training for prospective operators of the product.
4. The only operators authorized to work with the product shall be properly qualified.
5. Follow all applicable health and safety regulations and this Manual.
6. Do not modify the product or use it with any spare parts which do not meet EXPROTEC's specifications for genuine spare parts. Unauthorized attempts at repairs of the product may result in severe hazards to the operators and other personnel, and void the warranty, certification and/or approvals.
7. All test instrument used for servicing of electrical equipment components shall comply with applicable regulations.
8. Troubleshoot and maintain the product in witness of a trained assistant capable of isolating the main power supply and providing first aid as necessary.
9. Any attempt at starting failed electrical equipment may result in hazards to operator's health or life and failure to other equipment.

4 Intended use

Annex 3 to the OBAC 06 ATEX 059U certificate introduces a number of changes in the structure of ER 100ims leakage protection, which are designed to adapt to the current standards and to change the method for processing the measurement signal. In addition, two variants (with and without reset button) were replaced with one universal design. The manual reset function is activated by means of the switch on the front of the unit. In this way, backward compatibility has been maintained. The new version replaces previous versions of the device.

The ER 100ims type safety device is used to control the insulation state in insulated low voltage electricity networks. Depending on the method of safety device connection to the controlled network it may fulfil the following functions:

- Central leakage protection of three-phase alternating voltage network. In this case it is preferable to connect the device through three chokes which ED 100i are connected with one end to three phases of the network and with second end are connected in one point creating „artificial zero" layout to which the measuring relay ER 100ims of the protection is connected or directly to the N terminal of the transformer. It is possible to connect by one choke connected at one end to the neutral point of the transformer (alternative connection).
- Central leakage safety device of a single phase voltage network. In this case it is preferable to connect the device through two ED 100i chokes are connected by one end to phase conductors of the network and by the other end are connected in one point, to which the measuring relay ER 100ims of the safety device is connected or directly to the N terminal of the transformer. It is possible to connect by one choke connected at one end to the neutral point of the transformer (alternative connection).
- Interlocking leakage safety device in three- and single phase networks.

The measuring circuit of the measuring relay ER 100ims can work with the network controlled only through chokes ED 100i or ED 100.

The following functions are fulfilled in the applications specified:

- Signalling and/or disconnecting at deterioration of the insulation state below the preset reference value, at the same time a controlled dropout time relay is released, which by its contacts signals the operation and/or disconnects a circuit breaker or relay.
- Measurement and indication of the insulation state, where the spark-proof analogue input may be connected with a spark-proof voltage indicator (0÷10 V) rescaled to the insulation resistance reading, e.g. ER 100ws and/or spark-proof voltage transducer to another analogue signal to transmit this information to other control and monitoring systems.

A non-spark-proof circuit consists of relay contacts and coil and also of safety device power supply. The analogue output may be connected to spark-proof circuits of the ia protection level (e.g. ER 100ws or spark-proof signal separator), while its measuring circuit, through the system of ER 100i chokes, sends a spark-proof signal of ia protection level to the controlled network.

WARNING: For connecting the ER 100ims in place of the previous version without reset button, terminals connection of the device remains unchanged. In the case of installing the ER 100ims in place of the previous version with reset button, change the connections of the terminals (tab. 1).

Table 1: Change of leads

Terminal ER 100im	Terminal ER 100ims
21	20
22	21
23	22

RESTRICTION: The device is designed to work in networks of alternating current with a nominal frequency of 50Hz. Due to its structure of working principle (measuring DC), the device CANNOT BE installed within the networks with receivers transforming AC power into DC power directly, without additional separating transformer. It relates mainly to rectifiers and receivers with DC intermediary circuits of inverters supplied directly from the protected network.

5 Operating conditions

For explosion hazard zones, the product is intended for operation if confined to an external flameproof enclosure marked with the Ex d making or in non-hazardous areas if confined to an enclosure with a minimum ingress protection rating IP54 (IP65).

Table 2: Enclosure technical specifications

Enclosure technical specifications		
Oveall dimensions (width x height x depth)	112 × 100 × 35	mm
Weight	0,27	kg

Table 3: Operating conditions

Operating conditions		
Maximum installation elevation	≤1000	m
Ambient temperature	−20…+70	°C
Relative humidity (non-condensing) at 40°C	≤95	%
Transport temperature	−20…+60	°C
Transport relative humidity	≤95	%
Mechanical exposure – frequency	10…55	Hz
Mechanical exposure – amplitude	0,35	mm
Vibration resistance (10…55Hz)	5	g
Impact strength	7	Nm
Operating orientation	any	—
Duty	continuous	—

6 Technical parameters

Table 4: Technical parameters

Technical parameters		
DC/AC input power	1	W/VA 50Hz
Rated DC/AC supply voltage	24/42	V
Permitted AC supply voltage	17…53	V
Permitted DC supply voltage	19…75	V
Contacts	2 change-over contacts	
Relay mechanical strength	$3 \cdot 10^7$	
Rated load	 250VAC 5A 120VAC 3A 240VAC 1,5A 30VDC 4A 120VDC 0,22A 250VDC 0,1A	AC1 AC15 AC15 DC1 DC13 DC13
Open contact insulation strength	1000	V AC/DC
Coil-to-contact insulation strength	5	kV
Ingress protection rating	IP20	
Measuring voltage	18 ± 5%	V
Rated network voltage	≤ 1140	V AC
Rated frequency of the protected network	50	Hz
Settings range	2…120	kΩ
Leakage stage tripping time (preferred connection layout, see Fig. 4a-4d, with incremental change of leakage resistance from infinity to 1kΩ ref. PN–G–42040)	≤ 100	ms
Leakage stage tripping time (preferred connection layout, see Fig. 4e-4h, ref. PN-EN 50628)	≤ 200	ms
Additional time delay	0…1,5	s
Return value	min. 30% above the response threshold	
Measuring output (analogue spark-proof)[1]	0…10	V

[1] at Ri_{min} = 100kΩ

7 Identification

7.1 Type

ER 100*
└→*(protection and resistance indicator):*
- **im** – device according to Annex 2 [2, 3]
- **m** – non ATEX version of ER 100im type [2, 3, 4]
- **ims** – device according to Annex 3 [5]
- **ms** – non ATEX version of ER 100ims type [4, 5]
- **w** – resistance indicator according to Annex 2 [3]
- **ws** – resistance indicator according to Annex 3

ED 100*
└→*(dławik):*
- **i** – choke for the measuring circuit for
- **i.2p** – double choke for the measuring circuit for protection [6]
- **i.3p** – triple choke for the measuring circuit for protection [6]

WARNING: The ER 100im, ER 100w can be replaced by ER 100ims, ER 100ws. It is not permissible to connect devices made according to the Annex no. 3 with devices made according to the earlier version.

7.2 Ex-proof protection rating identification

Ⓔx I (M1) [Ex ia Ma] I – ER 100ims
Ⓔx I M1 Ex ia Ma I – ER 100ws
OBAC 06 ATEX 059U
The certificate with annexes can be downloaded from www.exprotec.pl.

7.3 Marking

Each safety device should have a rating plate, fixed to the enclosure and contain the following data:

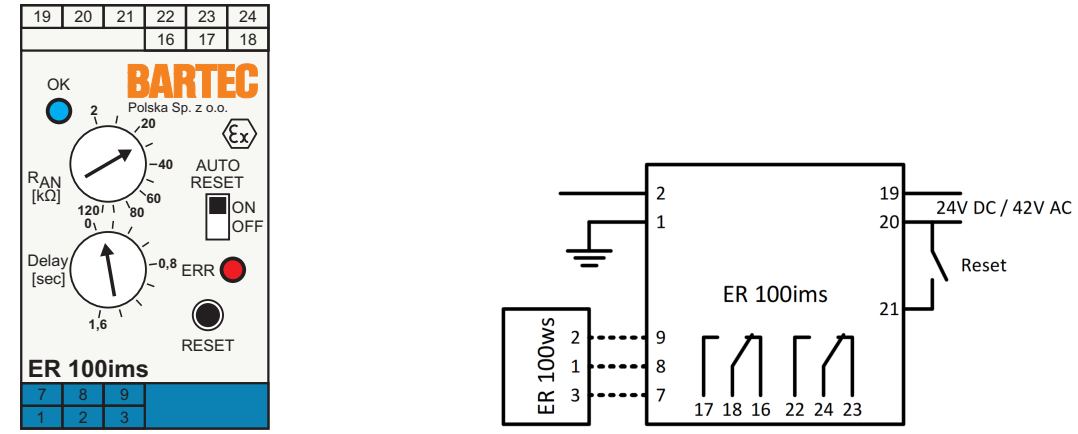
1. Manufacturer name
2. Protection degree
3. Type
4. Marking of explosion-proof execution
5. Serial No
6. Year of manufacture

[2] The version with reset button is marked by adding „**R**" to the serial number
[3] For this version, the instruction manual no. BP/IO/04/05 applies
[4] However, the measurement output energy is limited and will not cause ignition
[5] Additional designation „**/J**" means the version with external connection of the measuring stage (terminal no. 3) with the executive stage (terminal no. 9)
[6] For central leakage protection, it can be used for networks with nominal voltage up to 500V

On a safety device side there is an information plate with permissible parameters of spark-proof circuits and a simplified diagram facilitating the connection.

8 Construction and principle of operation

8.1 Mechanical structure



(a) Front of the device (b) Terminal layout

Figure 1: Protection ER 100ims

All electronic components are placed on two printed circuits in an ME 35 UT enclosure mounted on a TS35 bus. Terminals (terminals 1, 2, 3, 7, 8, 9) of spark-proof circuits are located on one side of the enclosure, while the power supply (terminals 19, 20) and non-spark-proof outputs (terminals 16, 17, 18, 22, 23, 24), resetting the response state (terminals 20, 21) are located on the opposite side. Such arrangement ensures proper separation between the spark-proof and non-spark-proof sides.

The measuring circuit consists of one to three ED100i chokes waterproofed by a fill in a plastic enclosure, bolted to the circuit board or it is made by direct connection to the neutral point of the transformer. The relay and appropriate connection of measuring chokes make one inseparable whole.

8.2 Electrical equipment

8.2.1 Scheme of connections

The ER 100ims safety device is connected to the power supply through terminals 19, 20 of the connection port. An integrated pulse power supply with a separating transformer and a spark-proof barrier feeds a spark-safe voltage to electronic components and to the measuring circuit, which through terminals 1 and 2 is connected to the controlled network. The output relay is activated at properly operating network and drops out in the event of disturbance. It has two contacts with terminals 16, 17, 18 and 22, 23, 24. A spark-proof analogue measuring output is allocated to terminals (3) 9, 8. A spark-proof measuring instrument may be connected to the aforementioned terminals, e.g. resistance indicator ER 100ws or spark-proof signal separator to work with another control or transmission system. As standard, terminals 3 and 9 are internally connected. For „/J” variant, terminals 3 and 9 should be

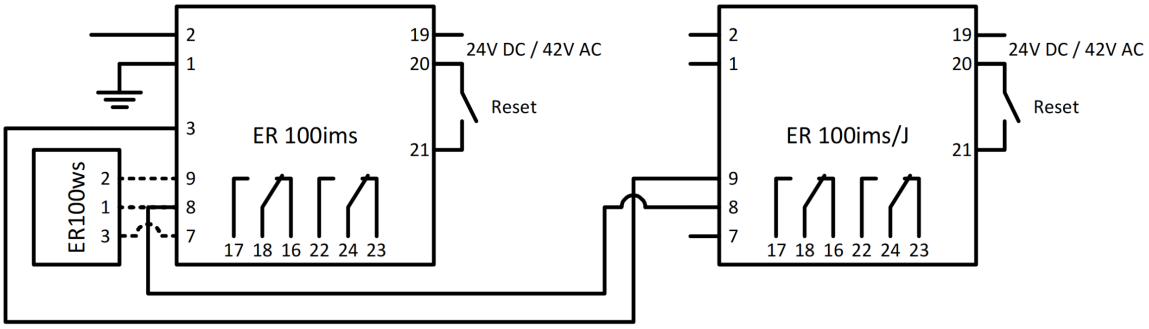


Figure 2: Implementation of the warning signal

connected from the outside of the unit. It is possible to control the executive stage from the other device, which allows for additional warning signal (Fig. 2). Resetting of the fault state is accomplished by shorting the terminals 20 and 21.

8.2.2 Principle of operation

The ER 100ims works by measuring the resistance between terminals 1 and 2. When the measured resistance falls below the value set with the potentiometer on the front of the device, the output relay is deactivated. If the automatic reset function is activated after the resistance has been increased, the relay is switched on again. When this function is inactive, it must be reset using the RESET button on the front of the unit or by shorting the terminals 20 and 21. The blue OK LED indicates the correct insulation status. While, the red ERR LED indicates the latching information of the leakage fault state.

Between terminals 8 and 9 may be connected to external spark-proof devices (ia) of total internal resistance ≥ 100 kΩ, i.e.:

– Resistance indicator, e.g. ER 100ws.
– Spark-proof separator for work with other systems.

8.2.3 Additional equipment

For single- or three-phase coupling of the safety device with the insulated controlled network two or three inviolable ED 100i or ED 100 type coupling chokes are necessary to create artificial zero point or by directly or with single choke to the neutral point of the transformer. The ED 100i choke was made by winding a high-inductance coil on one core in a filled plastic encapsulation. Possible connections are shown in Figure 4 and 5.

The ER 100ims safety device may operate with a spark-proof resistance indicator ER 100ws, which is optional equipment.

9 Resistance indicator ER 100ws

Resistance indicator ER 100ws is a spark-proof device connected and supplied from the spark-proof part of ER 100ims relay. It consists of a measuring circuit interpreting the measuring signal received from ER 100ims and displays the result in the form of insulation resistance on the display installed. The power supply is drawn from ER 100ims and it is 18V DC ± 5%. The resistance indicator draws a current below 1,5mA.

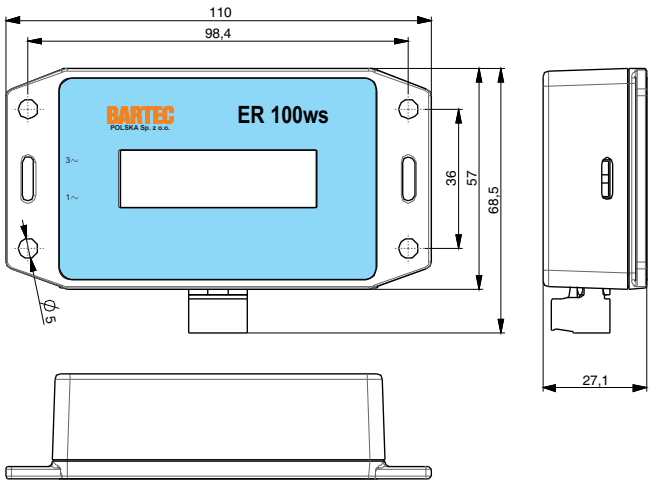


Figure 3: Resistance indicator ER 100ws

Resistance indicator ER 100ws is intended for operation in additional enclosure of IP54(65) protection level.

Resistance indicator ER 100ws is adapted to operation in the following conditions:

- ambient temperature from −20°C to +70°C
- relative humidity up to 95% at 70°C
- working position any

Table 5: Connection of resistance indicator ER 100ws to relay ER 100ims

Terminal ER 100ims	Terminal ER 100ws
7	3
8	1
9	2

The indicator has a switch that is suited to subtract from the displayed value typical resistance for used ED 100i chokes connection. When connecting 2 or 3 chokes, set the switch to „~3”. If the connection is applied through one choke, set the switch to „~1”. Setting the switch in the middle position disables this function

10 Intrinsically-safe line specifications

10.1 Parameters of ER 100ims

Full device:

$U_m = 250V$

For terminals 1 and 2 (measuring input):

$U_o = 18{,}9V$ $I_o = 0{,}42mA$ $P_o = 2mW$ $L_o = 1000H$

$C_o = 9{,}07\mu F$ $L_i = 404H$ $C_i \approx 0$ (negligible) $R_i = 47k\Omega$

For terminals 7 and 8 (power supply for ER 100ws):

$U_o = 18{,}9V$ $I_o = 19{,}9mA$ $P_o = 94mW$

$L_o \approx 0$ (negligible) $C_o \approx 0$ (negligible)

For terminals 8 and 9 (measuring stage output):

$U_o = 18{,}9V$ $I_o = 4mA$ $P_o = 20mW$

$L_i \approx 0$ (negligible) $C_i \approx 0$ (negligible)

For terminals 3 and 8 (execution stage input):

$U_i = 18{,}9V$ $I_i = 4mA$ $P_i = 20mW$

$L_i \approx 0$ (negligible) $C_i \approx 0$ (negligible)

10.2 Parameters of ER 100ws

$U_i = 18{,}9V$ I_i – any $L_i \approx 0$ (negligible) $C_i \approx 0$ (negligible)

$I_n \leq 1{,}5$mA (nominal current drawn by the resistance indicator).

11 Service and operation

11.1 Installation

The ER 100ims safety device is connected to the power supply through terminals 19, 20. The measuring circuit is connected to the controlled network through terminals 1 and 2. For single- or three-phase coupling of the safety device with the network one, two or three inviolable ED 100i or ED 100 type coupling chokes are necessary.

The output relay is activated at properly operating network and drops out in the event of disturbance. It has two changeover contacts with terminals 16, 17, 18 and 22, 23, 24. Spark-proof measuring output is allocated to terminals 3, 8, 9. The above terminals may be connected to a spark-proof resistance indicator, e.g. ER 100ws and/or spark-proof signal separator for operation with another control or transmission system.

Relay operating as interlocking protection should be disconnected from protected outflow when network voltage is switched on. Protection should be reconnected to the protected outflow after switching off the voltage.

11.2 Electric shock protection

Due to the fact that dangerous voltages may occur on the protection's terminals the safety regula-tions and general rules of proceeding in such conditions should be observed.

11.3 Storage and transport conditions

Protection ER 100ims, indicator ER 100ws and chokes ED 100i should be stored in closed warehouses at temperatures −20…+40°C and at relative humidity up to 75%, free from harmful vapours and gases.

The device should be transported using covered means of transport in the factory packaging that prevents damage at ambient temperature of −20…+40°C and relative humidity of up to 93%. During transport, secure the load against shifting.

11.4 Inspections and maintenance principles

It is recommended to perform quarterly inspections of safety device functionality and electric connections correctness. Check the security settings according to the legal acts applicable in a specific country.

In case of need the settings may be adjusted in accordance with the protected network.

11.5 Repairs

Repairs of type ER 100ims relay security by users are prohibited. EXPROTEC reserves the exclusive right to remanufacture and repair type ER 100ims protection. Any design changes made by the user of the ER 100ims relay will void the warranty and the user will be liable for any consequential losses.

11.6 Disposal

After passing of the operational period the device must be disposed in accordance with applicable regulations regarding the environment protection.

In case when user does not have an appropriate knowledge in this scope he should obtain information from a proper office of local authorities.

Electrical or electronic equipment contains components, materials or components that should be removed from waste equipment and which may have potentially negative effects on the environment and human health.

11.7 PN-G-42040 setting resistance

The earth leakage central trip shall feature a system for testing its operating performance and connection to the operating earth. This is done by simulating a single-line insulation failure of the mains with a breakdown resistance equal to 0.8 times the setting resistance and a tolerance of −20%. The setting resistance values are listed in Tables 6a and 6b.

11.8 Central/interlocking trip settings

Wire the measuring leads of the trip module to the monitored mains in one of the configurations shown in Fig. 4 and 5. The alternative wiring configuration of the central trip will extend the trip trigger delay.

Next, decade resistor should be connected between terminal 1 of the protection and any phase. Set minimum value of operation resistance (2kΩ) using potentiometer on the protection. Set proper value of operation resistance acc. to the tables 6a and 6b on decade resistor.

Switch on supply voltage of the protection (if necessary unlock central interlocking using button) and gradually increase resistance value on potentiometer of the protection until executory relay is activated. Leave potentiometer of the protection in this position.

Next, increase significantly set value of resistance of decade resistor, e.g. to 100kΩ. When central protection is set it should be unlocked with button. Decrease set value of resistance of decade resistor until activation of the executory relay to check the set value of operation resistance. Read out and/or measure value of resistance on decade resistor. Its

Table 6: PN-G-42040 setting resistance of the earth leakage trip

(a) Central trip

Mains / wiring system rated voltage (U) [V AC]	Resistance value [kΩ]	
	Three-phase mains	Single-phase mains
U ≤ 127 (133)	4	4
127 (133) < U ≤ 220 (230)	7	7
220 (230) < U ≤ 500	15	15
500 < U ≤ 1000	30	30
1140	60	60

(b) Interlocking trip

Mains / wiring system rated voltage (U) [V AC]	Resistance value [kΩ]
U ≤ 42	7
42 < U ≤ 220 (230)	15
220 (230) < U ≤ 500	25
500 < U ≤ 1000	50
1140	100

value cannot differ by more than ±20% with respect to this given in the tables of operation resistance.

In case of system protected by ER 100ims the terminal no. 1 of the protection should be connected to protective terminal PE.

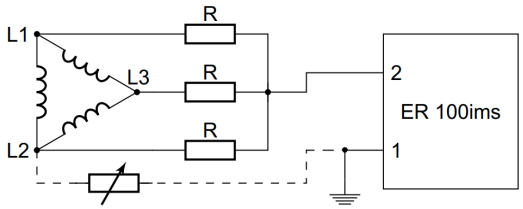
It is also possibile to set the device by direct connection of the decade resistance to terminals 1 and 2 of the protection:

When configuring the earth leakage central trip settings (Fig. 4)), remember that alternative (injected) resistance of the wired chokes or resistors. The value of this resistance depends on the wiring configuration of the monitored mains. The resistance of a single ED 100i choke is 7,1-7,5 kΩ ± 20%. Example: the wiring configuration shown in Fig. 4e features a parallel connection of three resistors (and where constant component transformer provides the short-circuit); the wiring configuration shown in Fig. 4g provides a single functional choke (the mains phases are not interconnected).

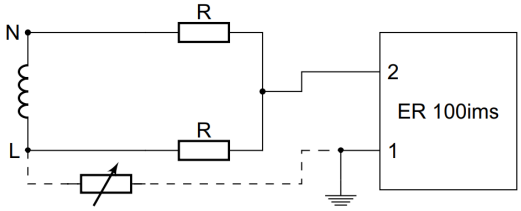
For a interlocking trip (see Fig. 5), two scenarios can exist. First, no load is connected, as shown in Fig. 5a and 5b. In this scenario the mains phases are not interconnected and the injected resistance is equal to the resistance of a single choke. Second, a load is connected to the outlet line, as shown in Fig 5c and 5d. Here, the phases are shorted (via a motor for the constant component) and the injected resistance is equal to the resistance of the chokes wired in parallel.

To determine the injection resistance for the central and earth leakage trip with loads other than an electric motors, each case must be considered individually.

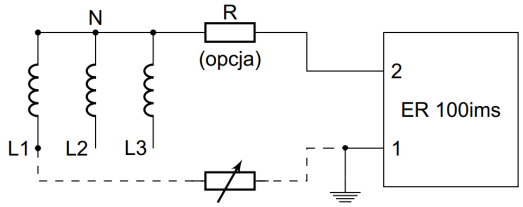
WARNING: Only one earth leakage trip can be operated in the given section of the supply mains. The interlocking trips must be isolated from the monitored mains when the outlet is online – the interlocking trips must not be online with the supply voltage connected to the load.



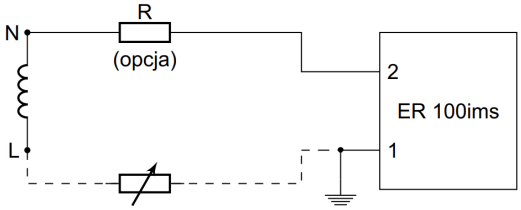
(a) Central protection for 3-phase mains
(preferred connection layout no. 1, ≤ 230V)



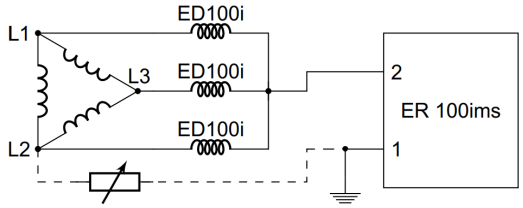
(b) Central protection for 1-phase mains
(preferred connection layout no. 1, ≤ 230V)



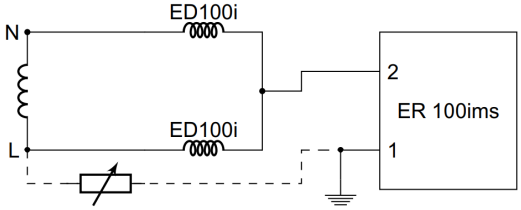
(c) Central protection for 3-phase mains
(preferred connection layout no. 2, ≤ 230V)



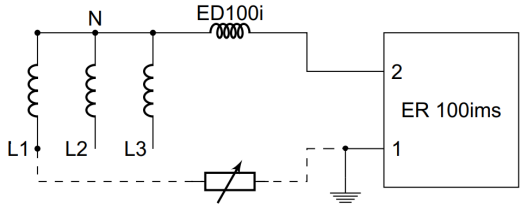
(d) Central protection for 1-phase mains
(preferred connection layout no. 2, ≤ 230V)



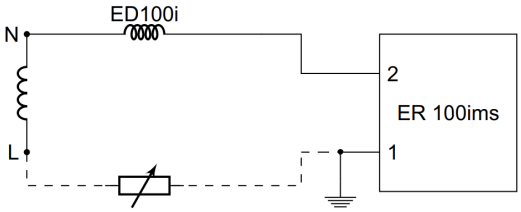
(e) Central protection for 3-phase mains
(alternative connection layout no. 1)



(f) Central protection for 1-phase mains
(alternative connection layout no. 1)



(g) Central protection for 3-phase mains
(alternative connection layout no. 2)



(h) Central protection for 1-phase mains
(alternative connection layout no. 2)

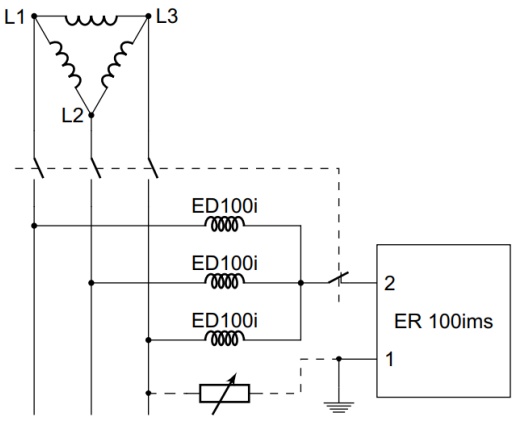
Figure 4: Wiring connection layout of the earth leakage central trip
(the broken line shows the wiring of a decade resistance box during the configuration of the settings; for a-d systems, wire resistors of suitable ratings shall be applied)

11.9 Setting of indication of ER 100ws display

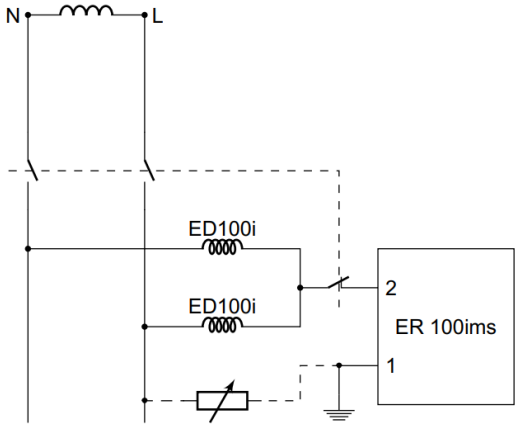
The indicator is factory calibrated and displays the correct value of the measured resistance. However, if for some reason it is necessary to correct the indicated value, it can be done with the potentiometer built into the indicator.

Indications should be set only after completing settings executed according to the point 11.8. Settings should be made when voltage of network controlled by relay is switched on.

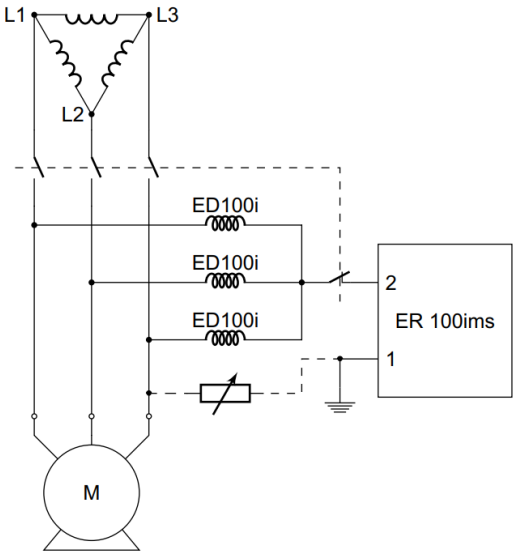
When relay ER 100ims is already correctly set, then resistance should be connected (e.g. decade resistor) simulating ground fault with value close to resistance of operation but slightly higher in a way preventing operation of the relay. Then using potentiometer available near



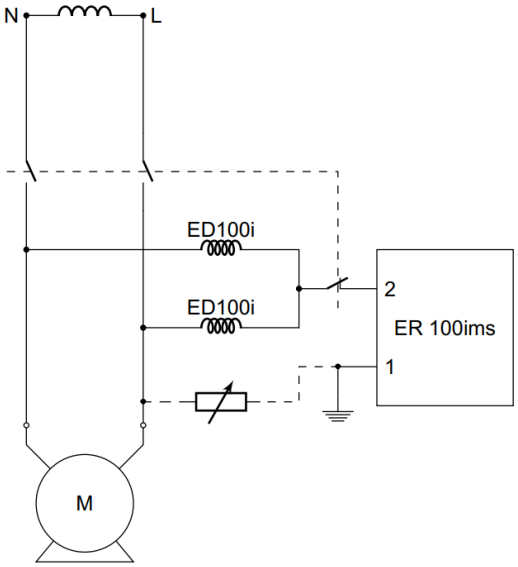
(a) Interlocking trip for a 3-phase outlet *(no load)*



(b) Interlocking trip for a 1-phase outlet *(no load)*



(c) Interlocking trip for a 3-phase outlet *(loaded)*



(d) Interlocking trip for a 1-phase outlet *(loaded)*

Figure 5: Wiring connection layout of an earth leakage interlocking trip
(the broken line shows the wiring of a decade resistance box during the configuration of the settings)

the socket of ER 100ws display indications of values presented on the LCD display should be corrected to the value equal to the value of connected simulated resistance of ground fault.

If replacement on one device from previously calibrated pair ER 100ims and ER 100ws is necessary then displayed value of resistance should be rechecked and corrected if necessary.

12 Reference standards

The design engineering of this product was based on the standards listed in Table 7:

Table 7: Reference standards

Standardization document	Description
Directive 2014/34/EU[7]	**Equipment and protective systems intended for use in potentially explosive atmospheres (ATEX)**
PN-EN IEC 60079-0:2018-09 *(EN IEC 60079-0:2018)*	Explosive atmospheres. Part 0: Equipment. General requirements.
PN-EN 60079-11:2012 *(EN 60079-11:2012)*	Explosive atmospheres. Part 11: Equipment protection by intrinsic safety „i".
PN-EN 50303:2004 *(EN 50303:2000)*	Group I, Category M1 equipment intended to remain functional in atmospheres endangered by firedamp and/or coal dust.
Directive 2014/35/EU[8]	**Low Voltage Directive (LVD)**
PN-EN 60529:2003/A2:2014-07 *(EN 60529:1991/A2:2013)*	Degrees of protection provided by enclosures (IP Code).
Directive 2014/30/EU	**Electromagnetic Compatibility (EMC)**
PN-EN IEC 61000-6-2:2019-04 *(EN IEC 61000-6-2:2019)*	Electromagnetic compatibility (EMC). Part 6-2: Generic standards. Immunity for industrial environments.
PN-EN IEC 61000-6-4:2019-12 *(EN IEC 61000-6-4:2019)*	Electromagnetic compatibility (EMC). Part 6-4: Generic standards. Emission standard for industrial environments.
Other	
PN-G-50003:2003 *(Polish mining standard)*	Occupational protection in mining. Electrical mining equipment. Requirements and testing.
PN-G-42040:1996 *(Polish mining standard)*	Protection and safety measures in mining power engineering. Earth leakage protection. Requirements and testing.
PN-EN 50628:2016-10 *(EN 50628:2016)*	Erection of electrical installations in underground mines.

13 End notes

EXPROTEC is the manufacturer of this product and reserves the right to changes and modifications as a result of technical progress and to use equivalent replacement parts.

This product has been manufactured in compliance with good engineering practices.

[7] Only ATEX versions.
[8] Only non-ATEX versions.

14 Orders and service

The orders should be sent to the following address:

EXPROTEC Sp. z o.o.
43-100 Tychy, ul. Graniczna 26A
Poland
Phone/fax:
+48 32 326 44 00
+48 32 326 44 03
Internet:
biuro@exprotec.pl
www.exprotec.pl

The housing components are replaced by the manufacturer or a company authorized by the manufacturer.

The manufacturer is not responsible for the device quality in case of repairs or components replacement made by the customer itself.

The manufacturer reserves the right to make changes in this specification in any time, without the necessity to inform about it.

EXPROTEC

EXPROTEC company protects people and environment by the safety of its components, systems and devices.

EXPROTEC company develops and produces the innovative components and systems which are controlled in accordance with international standards and are applied in areas endan-gered by explosion as well as in the field of environment pro-tection, radioactive protection and industry.