ISOMETER® iso415R-1

Insulation monitoring device
for unearthed 3(N)AC, AC and DC systems (IT systems)

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Insulation monitoring device
for unearthed 3(N)AC, AC and DC systems (IT systems)

Device features

- Monitoring of the insulation resistance for unearthed 3(N)AC, AC and DC systems with galvanically connected rectifiers
- Automatic adaptation to the system leakage capacitance up to 25 µF
- Response time ≤ 10 s at C_e = 1 µF and R_f = R_{an} / 2
- Automatic and manual device self test with connection monitoring
- Two separately adjustable response value ranges (5…1000 kΩ)[1]
- Alarm output via LEDs (AL1, AL2) and alarm relay
- Selectable n/c or n/o relay operation[1]
- Selectable start-up delay, response delay and delay on release[1]
- Fault memory activatable [1]
- RS-485 interface with Modbus RTU protocol
- NFC interface

1 via Bender Connect app or Modbus RTU

Intended use

The iso415R-1 is used in unearthed systems to monitor the insulation fault R_F and to locate the R_F fault (positive or negative conductor) in DC systems. In addition to the limit value comparison, functions for connection monitoring, detection internal faults and the exceeding of the maximum permissible leakage capacitance C_e are available.

The DC components existing in AC/DC systems can have an influence on the response behaviour if an insulation fault occurs downstream of rectifiers with an electrolytic capacitor.

The separate supply voltage of the iso415R-1 also enables monitoring of a de-energised system.

Any other use than that described in this manual is regarded as improper.

Do not make any unauthorised changes to the device. Only use spare parts and optional accessories sold or recommended by the manufacturer.

Intended use also includes

- the observation of all information in the operating manual and
- compliance with test intervals.

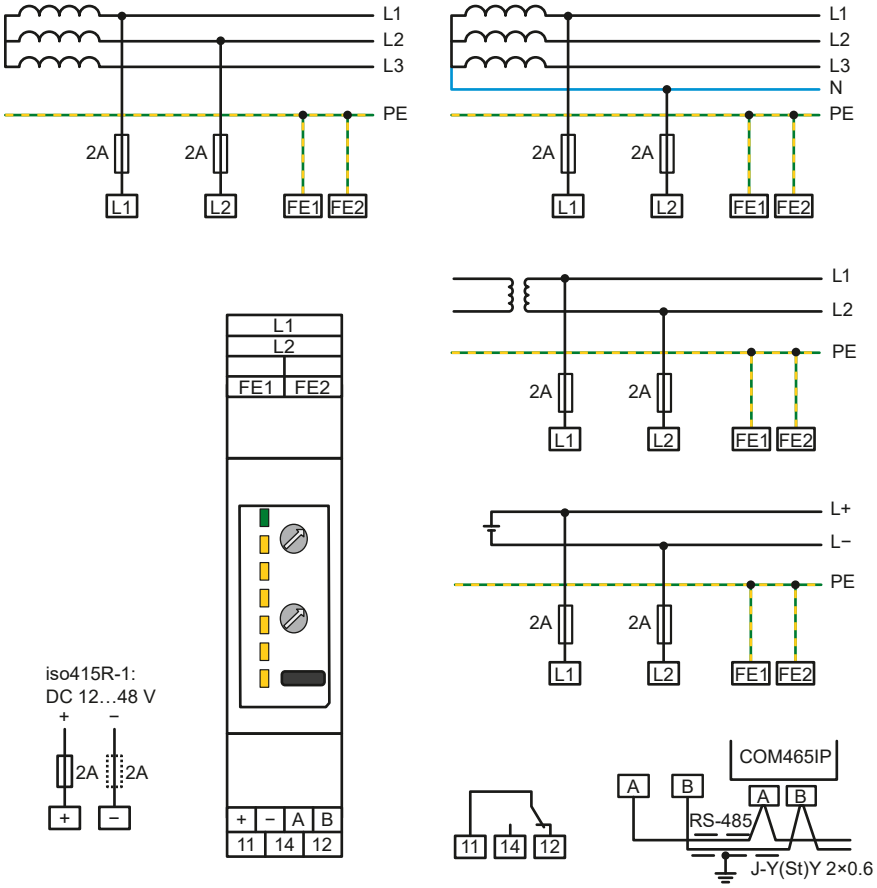
To comply with the applicable standards, the device must be configured for the local system and operating conditions. Observe the operating limits specified in the technical data.

Functions

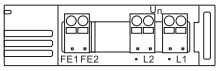
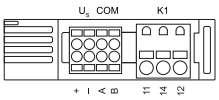
The iso415R-1 is an insulation monitoring device in accordance with IEC 61557-8 for IT systems.

The measured value R_F as well as all messages and alarms are displayed via LEDs and can be read out via the Modbus RTU and NFC interfaces. Furthermore, the messages and alarms are also output via the relay **K1**, depending on the message assignments that can be set via the interfaces.

Wiring diagram



Connections overview

		Terminal	Connection
top	 iso415R-1 top	FE1, FE2	Functional Earth
		L1, L2	Monitored system
		•	Not in use
bottom	 iso415R-1 bottom	A, B	RS-485 interface
		+, –	Supply voltage DC 12…48 V
		11, 14, 12	Relay

Technical data

iso415R-1: Insulation coordination acc. to IEC 61010-1 and IEC 61010-2-30

Definitions

Measuring circuit (IC1)	L1/+, L2/–
Supply circuit (IC2)	+, –
Output circuit (IC3)	11, 14, 12
Control circuit (IC4)	FE1, FE2
Control circuit (IC5)	A, B
Pollution degree	2
Definition of circuits according to IEC 61010-1, section 6.7.1.5	
IC1	Measuring circuit, CAT III, 600 V
IC2	60 V (Secondary circuit, derived from primary circuit < AC 300 V, OVC II) [1]
IC3	Mains circuit, OVC III, 300 V
IC4 / IC5	≤30 V, not dangerously active
Protective separation (reinforced insulation) between the circuits	
IC1 / (IC2-IC5)	protective impedance
IC3 / (IC2, IC4-IC5)	
Voltage tests (routine test) according to IEC 61010-1	
IC1 / IC4	AC 510 V
IC3 / (IC1, IC2, IC4, IC5)	AC 2.2 kV
IC2 / (IC1, IC4, IC5)	AC 350 V
IC4 / IC5	AC 200 V

1 Operation with SELV or PELV also possible

Supply voltage

iso415R-1: *(+/–)*	
Supply voltage U_s	DC 12…48 V
Tolerance of U_s	–20…+25 %
Power consumption	≤ 1.1 W
Inrush current (< 5 ms)	< 10 A

Monitored IT system

iso415R-1

Nominal system voltage U_n	3(N)AC, AC, DC 0…400 V
Tolerance of U_n	+15 %
Frequency range of U_n	42…460 Hz

Measuring circuit

Measuring voltage U_m	±16 V
Measuring current I_m at R_F, Z_F = 0 Ω	≤ 90 µA
Internal resistance R_i, Z_i	
iso415R-1	≥ 178 kΩ
Permissible system leakage capacitance C_e	≤ 25 µF
Permissible extraneous DC voltage U_{fg}	
iso415R-1	≤ 650 V

Response values

Response value R_{an1}	10…1000 kΩ (40 kΩ)*
Response value R_{an2}	5…700 kΩ (10 kΩ)*
Relative uncertainty R_{an}	±15 %, ±3 kΩ
Hysteresis R_{an}	25 %, minimum 1 kΩ

Time response

Relative uncertainty t_{an} at $R_F = 0.5 \times R_{an}$ and C_e = 1 µF acc. to IEC 61557-8	≤ 10 s
Start-up delay t [1]	0…1800 s (0 s)*
Response delay t_{on} [1]	0…1800 s (0 s)*
Delay on release t_{off} [1]	0…1800 s (0 s)*
Recovery time	< 5 s

1 Can be parameterised via Bender Connect app and Modbus

Displays, memory

Display	Status LED incl. LED bargraph (7 LEDs)
Display range insulation resistance (R_F)	1…1000 kΩ
Measuring range insulation resistance (R_F) [1]	1…10000 kΩ
Operating uncertainty	± 15 % ± 3 kΩ
Fault memory alarm messages [2]	on/off (off)*

1 Step size: 1 kΩ

2 Can be parameterised via Bender Connect app and Modbus

RS-485 interface

Protocol	Modbus RTU
Baud rate [1]	max. 115.2 kbit/s (19.2 kbit/s)* max. 9.6 kbit/s for 1200 m cable length
Parity [1]	even, no, odd (even)*
Stop bits [1]	1 / 2 / auto (auto)*
Device address, Modbus RTU [2]	1…247 (100 + SN)*
Cable length	≤1200 m
Cable type	min. J-Y(St)Y 2 × 0.6
Termination resistor (external)	120 Ω (0.25 W)

1 Can be parameterised via Bender Connect app and Modbus

2 Factory setting: 100 + last two digits of serial number

Switching elements

Switching elements	1 changeover contact
Operating principle [1]	n/c / n/o (n/c)*
Electrical endurance	10,000 cycles

1 Can be parameterised via Bender Connect app and Modbus

Contact data acc. to IEC 60947-5-1

Utilisation category	AC-12 / AC-14 / DC-12 / DC-12 / DC-12
Rated op. voltage	250 V / 250 V / 24 V / 110 V / 220 V
Rated op. current	5 A / 2 A / 1 A / 0.2 A / 0.1 A
Minimum contact rating [1]	10 mA at AC/DC ≥ 10 V

1 refers to relays that have not been operated with high contact currents

Connection

iso415R-1

Connection type	Push-in plug connector
Nominal current	≤ 5 A
Connection properties for grid dimension 3.5 mm	
rigid	0.2…1.5 mm² (AWG 24…16)
flexible	0.2…1.5 mm² (AWG 24…16)
with ferrule with plastic sleeve	0.25…0.5 mm²
with ferrule without plastic sleeve	0.25…1.5 mm²
Connection properties for grid dimension 5.08 mm (relay switching contacts)	
rigid	0.2…1.5 mm² (AWG 24…16)
flexible	0.2…1.5 mm² (AWG 24…16)
with ferrule with plastic sleeve	0.25…1.5 mm²
with ferrule without plastic sleeve	0.25…1.5 mm²

Environment/EMC

EMC	IEC 61326-2-4
Operating altitude	≤ 2000 AMSL

Ambient temperatures

Operation	–25…+55 °C
Transport	–40…+85 °C
Storage	–40…+70 °C

Climatic conditions acc. to IEC 60721 (related to temperature and relative humidity)

Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22

Mechanical conditions acc. to IEC 60721

Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12

Other

Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
DIN rail mounting acc. to	IEC 60715
Flammability class	UL 94 V-0
Weight	≤ 100 g

( )* Factory setting

Standards and certificates

Marks

CE UK CA

Standards

Devices in the iso415R-1 series have been developed in accordance with the following standards.

- IEC 61557-8

Licences

For a list of the open-source software used see our Website.

Declarations of conformity

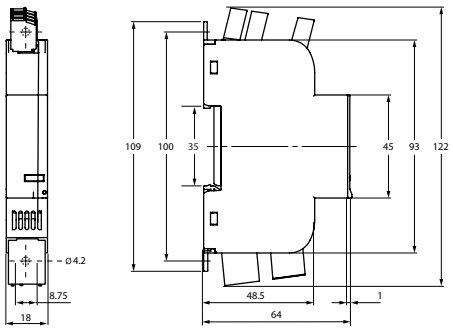
Bender GmbH & Co. KG hereby declares that the device covered by the Radio Equipment Directive complies with Directive 2014/53/EU.

The complete EU and UK declarations of conformity are available in the download area:

https://www.bender.de/en/service-support/download-area/

Dimension Diagram

Pluggable push-in terminals



Maße in mm

Ordering information

Type	Supply voltage U_s	Nominal system voltage U_n	Art. No.
iso415R-1	DC 12…48 V	3(N)AC, AC, DC 0…400 V	B81604000

Accessories

Description	Art. No.
SMARTDETECT ISO41xR connector kit for push-in terminals	B80609102
SMARTDETECT 41x sealable cover	B80609199

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