AC/DC

ISOMETER® isoGEN423

Insulation monitoring device for unearthed AC, AC/DC, and DC systems up to 3(N)AC, AC 400 V, DC 400 V
Suitable for the application of generators
acc. to standard DIN VDE 0100-551

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BENDER

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Device features

- Monitoring of the insulation resistance R_F for unearthed AC/DC systems
- Measuring the system voltage U_n (True-RMS) with undervoltage/ overvoltage detection
- Measuring the DC residual voltages U_{L1e} (L1/+ to PE) and U_{L2e} (L2/– to PE)
- Selectable start-up delay, response delay and delay on release
- Alarm output via LEDs (“AL1”, “AL2”), display, and alarm relays (“K1”, “K2”)
- Automatic device self test with connection monitoring
- Selectable n/c or n/o relay operation
- Measured value indication via multi-functional LC display
- Activatable fault memory
- Two operating modes: GEn and dc
- Automatic adjustment to the system leakage capacitance C_e up to 5 µF
- Two separately adjustable response value ranges 5…200 kΩ (prewarning, alarm)
- Password protection against unauthorised changing of parameters
- RS-485 (galvanically isolated) including the following protocols:
  - BMS (Bender measuring device interface) for the data exchange with other Bender devices
  - Modbus RTU
  - IsoData (for continuous data output)

Intended use

The ISOMETER® monitors the insulation resistance R_F of unearthed AC, AC/DC and DC systems (IT systems) with nominal system voltages of 3(N)AC, AC/DC 0…400 V or DC 0…400 V. The maximum permissible system leakage capacitance C_e is 5 µF. DC components existing in AC systems do not influence the operating characteristics when a minimum load current of DC 10 mA flows. The separate supply voltage U_s allows de-energised systems to be monitored as well.

In order to meet the requirements of the applicable standards, customised parameter settings must be made on the equipment in order to adapt it to local equipment and operating conditions. Please heed the limits of the range of application indicated in the technical data.

Any other use or a use that goes beyond this constitutes improper use.

i To ensure that the ISOMETER® functions correctly, an internal resistance of ≤ 1 kΩ must exist between L1/+ and L2/– via the source (e.g. PSU) or the load.

i If the ISOMETER® is installed inside a control cabinet, the insulation fault message must be audible and/or visible to attract attention.

GEn and dc operating modes

The **GEn mode** is used in AC/DC or DC systems. In this mode, the device complies with the maximum response time ≤ 1 s for C_e ≤ 1 µF and R_F ≤ R_{an}/2.

The **dc mode** is only used in DC systems. In this mode, the device complies with the maximum response time of ≤ 1 s for C_e ≤ 2 µF and R_F ≤ R_{an}/2 in the event of asymmetrical insulation faults. In case of symmetrical insulation faults, response times of ≤ 10 s for C_e ≤ 5 µF and RF ≤ R_{an}/2 are complied with. The system leakage capacitance C_e is also measured in this mode.

The operating mode can be changed in the menu 'SEt'.

General measuring functions

The ISOMETER® measures the r.m.s. value of the nominal system voltage U_n between L1/+ and L2/– as well as the residual voltages between L1/+ and earth (U_{L1e}) and between L2/– and earth (U_{L2e}).

When it is connected to a **DC supply system** and when a minimum system voltage has been reached, the device determines the faulty conductor L1/+ or L2/–. The fault is indicated by a '+' or '–' sign preceding the measured value.

When the ISOMETER® is coupled to an **AC system**, the faulty conductor can only be determined in a connected DC system, and the faulty conductor is detected either on L1/ + (+100 %) or L2/– (–100 %).

The detected fault can be assigned to a relay. If the values R_F or U_n violate the response values activated in the 'AL' menu for the duration t_{on} without interruption, the LEDs and relays 'K1' and 'K2' will respond according to the alarm assignment set in the 'out' menu. In addition, the mode of operation of the relay (n.o./n.c.) can be set, and the fault memory 'M' is activated in this menu.

If the values R_F or U_n no longer violate their respective release values (response value plus hysteresis) for the period t_{off} without interruption, the alarm relays will switch back to their initial position and the alarm LEDs 'AL1'/'AL2' will stop lighting. If the fault memory is activated, the alarm relays remain in alarm condition and the LEDs light until the reset button 'R' is pressed or the supply voltage U_s is interrupted.

The device function can be tested using the test button 'T'. Parameters are assigned to the device via the LCD and the control buttons on the front panel; this function can be password-protected. Parameterisation is also possible via the BMS bus, e.g. by using the BMS Ethernet gateway (COM465IP) or Modbus RTU.

Connection

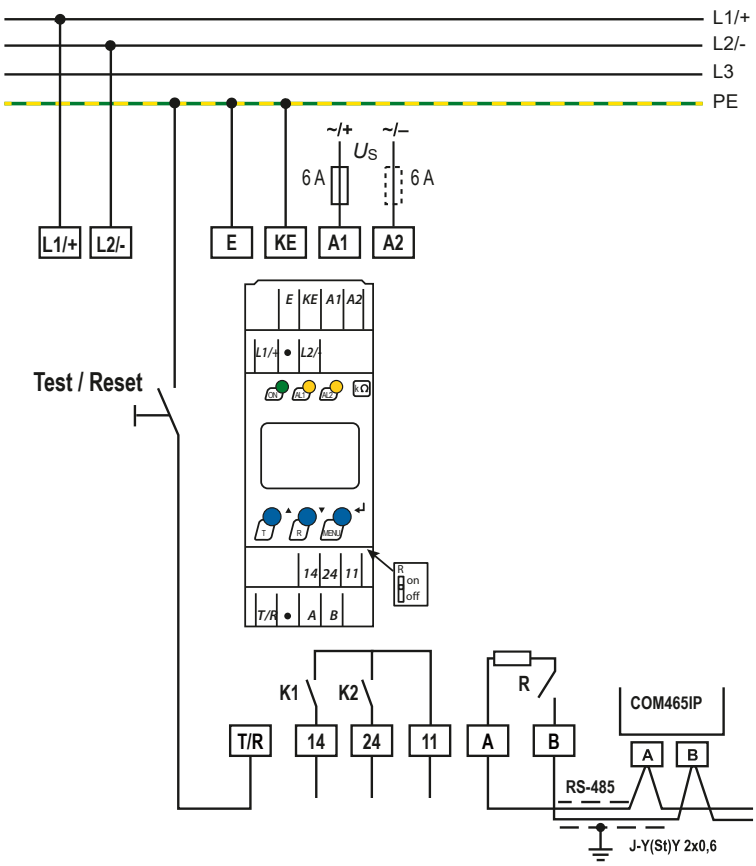
For UL applications:

Only use 60/75 °C copper lines.

For UL and CSA applications: Connect the supply voltage via 5 A fuses.

For details about the conductor cross sections required for wiring, refer to chapter Technical data.

Wiring diagram



Terminal	Connections
A1, A2	Connection to the supply voltage U_s via fuse (line protection): If supplied from an IT system, protect both lines by a fuse.
E, KE	Connect each terminal separately to PE: Use same wire cross section as for “A1”, “A2”.
L1/+, L2/–	Connection to the system to be monitored
T/R	Connection for the external combined test and reset button
11, 14	Connection to alarm relay “K1”
11, 24	Connection to alarm relay “K2”
A, B	RS-485 communication interface with connectable terminating resistor Example: Connection of a BMS Ethernet gateway COM465IP

Technical data

( )* = Factory settings

Insulation coordination acc. to IEC 60664-1/IEC 60664-3

Definitions

Measuring circuit (IC1)	L1/+, L2/–
Supply circuit (IC2)	A1, A2
Output circuit (IC3)	11, 14, 24
Control circuit (IC4)	E, KE, T/R, A, B
Rated voltage	400 V
Overvoltage category III	III

Rated impulse voltage

IC1/(IC2-4)	6 kV
IC2/(IC3-4)	4 kV
IC3/(IC4)	4 kV

Rated insulation voltage

IC1/(IC2-4)	400 V
IC2/(IC3-4)	250 V
IC3/(IC4)	250 V
Pollution degree	3

Safe isolation (reinforced insulation) between

IC1/(IC2-4)	Overvoltage category III, 600 V
IC2/(IC3-4)	Overvoltage category III, 300 V
IC3/(IC4)	Overvoltage category III, 300 V

Voltage test (routine test) according to IEC 61010-1

IC2/(IC3-4)	AC 2.2 kV
IC3/(IC4)	AC 2.2 kV

Supply voltage

Supply voltage U_s	AC 100…240 V / DC 24…240
Tolerance of U_s	–30 …+15 %
Frequency range of U_s	47…63 Hz
Power consumption	≤ 3 W, ≤ 9 VA

Monitored IT system

Nominal system voltage U_n	3(N)AC, AC, DC 0…400 V
Tolerance of U_n	+25 %
Frequency range of U_n	DC, 35…460 Hz

Measuring circuit

Measuring voltage U_m	±12 V
Measuring current I_m at R_F, $Z_F = 0$ Ω	≤ 110 µA
Internal resistance R_i, Z_i	≥ 115 kΩ
Permissible system leakage capacitance C_e	≤ 5 µF
Permissible extraneous DC voltage U_{fg}	≤ 700 V

Response values

Response value R_{an1}	R_{an2} … 250 kΩ (46 kΩ)*
Response value R_{an2}	5 kΩ … R_{an1} (23 kΩ)*
Relative uncertainty of R_{an}	±15 %, at least ±2 kΩ
Hysteresis R_{an}	25 %, at least 1 kΩ
Undervoltage detection U<	10 V … U > (off/10 V)*
Overvoltage detection U>	U < … 500 V (off/500 V)*
Relative uncertainty of U	±5 %, at least ±5 V
Relative uncertainty depending on the frequency ≥ 400 Hz	–0.015 %/Hz
Hysteresis U	5 %, at least 5 V

Time response

Response·time t_{an} at $R_F = 0.5 \times R_{an}$ and C_e=1 µF in accordance with IEC 61557-8	≤ 1 s
Start-up delay t	0…10 s (0 s)*
Response delay t_{on}	0…99 s (0 s)*
Delay on release t_{off}	0…99 s (0 s)*

Displays, memory

Indication	LC display, multi-functional, not illuminated
Display range, measured value, insulation resistance (R_F)	1 kΩ … 2 MΩ
Operating uncertainty	±15 %, at least ±2 kΩ
Display range, measured value, nominal system voltage (U_n)	0…500 V_{RMS}
Operating uncertainty	±5 %, at least ±5 V
Display range, measured value, system leakage capacitance at R_F > 10 kΩ ('dc' mode only)	0…17 µF
Operating uncertainty at R_F ≥ 20 kΩ and C_e ≤ 5 µF	±5 %, at least ± 0.1 µF
Password	off / 0…999 (0, off)*
Fault memory alarm messages	on / (off)*

Interface

Interface/protocol	RS-485/BMS, Modbus RTU, isoData
Baud rate	BMS: 9.6 kbit/s | Modbus RTU: selectable | isoData: 115.2 kbits/s
Cable length (9.6 kbits/s)	≤ 1200 m
Cable: shield connected to PE on one side [alternative: twisted pairs, shield connected to PE on one side]	Recommended: CAT6/CAT7 min. AWG23 [min. J-Y(St)Y 2 x 0.8]
Terminating resistor	120 Ω (0.25 W), internal, can be connected
Device address, BMS bus, Modbus RTU	3…90 (3)*

Switching elements

Switching elements	2 x 1 N/O contacts, common terminal 11
Relay mode	NC operation/NO operation (NO operation)*
Electrical endurance at rated operating conditions	10,000 operating cycles

Contact data acc. to IEC 60947-5-1

Utilisation category	AC-12 / AC-14 / DC-12 / DC-12 / DC-12
Rated operational voltage	230 V / 230 V / 24 V / 110 V / 220 V
Rated operational current	5 A / 2 A / 1 A / 0.2 A / 0.1 A
Necessary min. contact load (relay manufacturer's reference)	1 mA at AC/DC ≥ 10 V

Environment/EMC

EMC	IEC 61326-2-4

Ambient temperatures

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

Climatic classes acc. to IEC 60721

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

Classification of mechanical conditions acc. to IEC 60721

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

Connection

Screw-type terminals

Nominal current	≤ 10 A
Tightening torque	0.5…0.6 Nm (5…7 lb-in)
Conductor sizes	AWG 24-12
Stripping length	8 mm
Rigid/flexible	0.2…2.5 mm²
Flexible with ferrules with/without plastic sleeve	0.25…2.5 mm²
Multi-conductor	
rigid /flexible	0.2…1.5 mm²
flexible with ferrules without plastic sleeve	0.25…1.5 mm²
flexible with TWIN ferrules with plastic sleeve	0.5…1.5 mm²

Push-wire terminals

Nominal current	≤ 10 A
Conductor sizes	AWG 24-14
Stripping length	10 mm
Rigid	0.2…2.5 mm²
Flexible without ferrules	0.75…2.5 mm²
Flexible with ferrules with/without plastic sleeve	0.25…2.5 mm²
Multi-conductor flexible with TWIN ferrules with plastic sleeve	0.5…1.5 mm²
Opening force	50 N
Test opening, diameter	2.1 mm

Other

Operating mode	continuous operation
Mounting direction	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
Screw mounting	2 x M4 with mounting clip
Weight	≤ 150 g
Option W	isoGEN423-D4W-4 for use in special climatic conditions

Standards and certifications

The ISOMETER® was developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8): 2015-12/Cor1: 2016-12
- IEC 61557-8: 2014/COR1: 2016
- DIN VDE 0100-551:2017

EU Declaration of Conformity

The EU Declaration of Conformity is available at the following Internet address:

https://www.bender.de/fileadmin/content/Products/CE/CEKO_isoXX425.pdf

UKCA Declaration of Conformity

Die UKCA-Konformitätserklärung ist unter folgendem Link verfügbar:

https://www.bender.de/fileadmin/content/Products/UKCA/UKCA_isoXX425.pdf

Ordering data

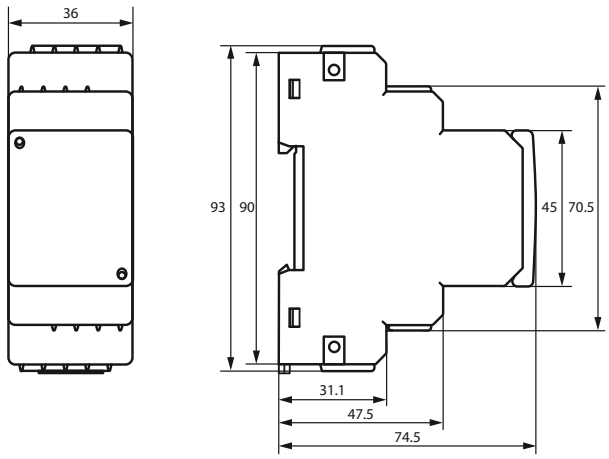
Type	Nominal system voltage U_n	Article number	
		Push-wire terminals	Screw-type terminals
isoGEN423-D4-4	3(N)AC, AC/DC 0…400 V	B71036325	B91036325
isoGEN423-D4W-4 [1]		B71036325W	–

[1] Option W: Increased shock and vibration resistance 3K23; 3M12; –40…+70 °C

Accessories

Description	Article number
Mounting clip for screw mounting	B98060008
XM420 mounting frame	B990994

Dimensions



Dimension diagram (in mm)

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