

## ISOMETER® isoGEN423

Insulation monitoring device for unearthed AC, AC/DC and DC systems (IT 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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## Device features

- Monitoring the insulation resistance for unearthed AC/DC systems
- Measurement of the system voltage (true r.m.s.) with undervoltage and overvoltage detection
- Measurement of DC system voltages to earth (L1+/PE and L2-/PE)
- Two operating modes: GEn and DC
- Automatic adaptation to the system leakage capacitance up to 5 µF
- Selectable start-up delay, response delay and delay on release
- Two separately adjustable response value ranges of 5...200 kΩ (Alarm 1, Alarm 2)
- Alarm signalling via LEDs (AL1, AL2), a 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 LCD
- Fault memory can be activated
- RS-485 (galvanically isolated) including the following protocols:
- BMS interface (Bender measuring device interface) for data exchange with other Bender components
- Modbus RTU
- IsoData (for continuous data output)
- Password protection to prevent unauthorised parameter changes

## Certifications



## Product description

The ISOMETER® monitors the insulation resistance 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. A separate supply voltage allows de-energised systems to be monitored, too.

In order to meet the requirements of 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 use other than that described in this manual is regarded as improper.

## Application

- AC main circuits up to 400 V
- DC main circuits up to 400 V
- Generators according to DIN VDE 0100-551

## Function

The ISOMETER® measures the insulation resistance  $R_F$ . It features two operating modes: GEn und DC. The two operating modes can be switched in the menu "SEt".

### GEn mode

The GEn mode is used in AC/DC or also in DC systems. The device complies with the maximum response time  $\leq 1s$  für  $C_e \leq 1 \mu F$  and  $R_F \leq R_{an/2}$ .

### DC mode

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

### General measuring functions

The ISOMETER® measures the RMS value of the system voltage  $U_n$  between L1/+ and L2/- as well as the DC voltages between L1/+ and earth ( $U_{L1e}$ ) and between L2/- and earth ( $U_{L2e}$ ).

When coupled to a **DC system**, the ISOMETER® determines from a minimum value of the DC system voltage the fault location "R %", which shows the distribution of the insulation resistance between conductors L1/+ and L2/-. The distribution is indicated by a "+" or "-" sign preceding the insulation resistance measurement. The value range of the fault location is  $\pm 100\%$ :

Indication	Meaning
-100 %	One-sided fault on conductor L2/-
0 %	Symmetrical fault
+100 %	One-sided fault on conductor L1/+

The partial resistances can be calculated from the total insulation resistance  $R_F$  and the fault location (R %) using the following formula:

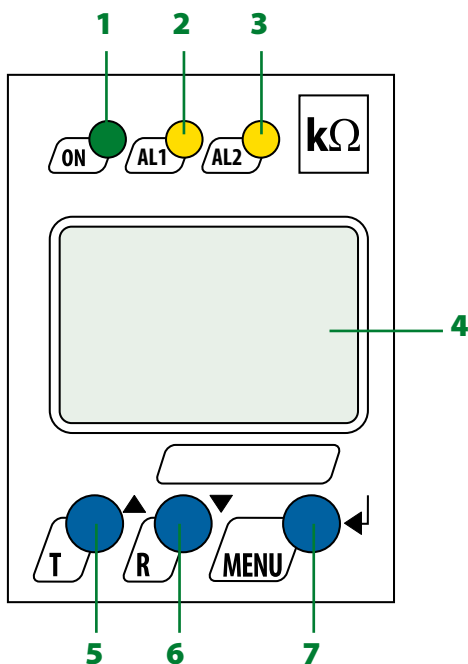
- Fault on conductor L1/+  $\rightarrow R_{L1F} = (200\% * R_F) / (100\% + R\%)$
- Fault on conductor L2/-  $\rightarrow R_{L2F} = (200\% * R_F) / (100\% - R\%)$

When the ISOMETER® is coupled to an **AC system**, the fault location can only be determined in a connected DC system and the fault is detected either on L1/+ (100 %) or L2/- (-100 %). Calculating the fault distribution is not possible in this case.

It is possible to assign the detected fault or the faulty conductor to an alarm relay via the menu. If the values  $R_F$  oder  $U_n$  violate the response values activated in the "AL" menu, this will be indicated by the LEDs and relays K1 and K2 according to the alarm assignment set in the "out" menu. In addition, the operation of the relay (n.o./n.c.) can be set and the fault memory "M" is activated.

If the values  $R_F$  or  $U_n$  do not violate their release value (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 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 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, for example by using the BMS Ethernet gateway (COM465IP) or the Modbus RTU.

### Operating elements



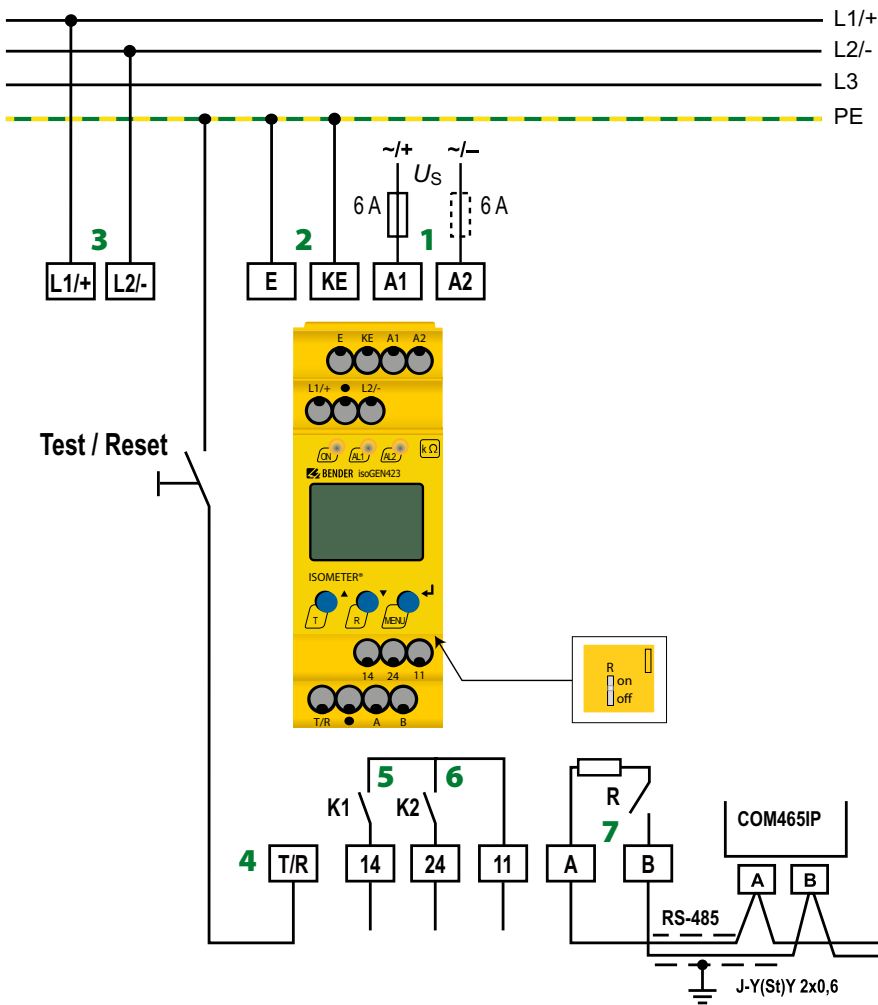
### Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8): 2015-12/Ber1: 2016-12
- IEC 61557-8: 2014/COR1: 2016

- 1 - LED "ON" (operation LED) flashes in case of interruption to the connecting wires E/KE, L1(+)/L2(-) or system faults.
- 2 - Alarm LED "AL1" lights when the values fall below the set response value Alarm 1 and flashes in case of interruption to the connecting wires E/KE, L1(+)/L2(-) or system faults as well as in the case of overvoltage (can be activated).
- 3 - Alarm LED "AL2" lights when the values fall below the set response value Alarm 2 and flashes in case of interruption to the connecting wires E/KE, L1(+)/L2(-) or system faults as well as in the case of undervoltage (can be activated).
- 4 - LC display
- 5 - Test button "T": to call up the self test  
Arrow up button: to change parameters, to move upwards in the menu
- 6 - Reset button "R": to delete stored insulation fault alarms  
Down button: to change parameters, to move downwards in the menu
- 7 - Menu button "MENU": to call up the menu system  
Enter button: to confirm parameter changes

**Wiring diagram**



- 1 - A1, A2** Connection to the supply voltage via fuse (line protection).  
If supplied from an IT system, both lines have to be protected by a fuse.\*
- 2 - E, KE** Connect each terminal separately to PE:  
The same wire cross section as for A1, A2 is to be used.
- 3 - L1/+, L2/-** Connection to the IT system to be monitored
- 4 - T/R** Connection for the external combined test and reset button.
- 5 - 11, 14** Connection to alarm relay K1
- 6 - 11, 24** Connection to alarm relay K2
- 7 - A, B** RS-485 communication interface with connectable terminating resistance.

**\* For UL applications:**  
Only use 60/75°C copper lines!  
For UL and CSA applications, it is mandatory to use 5 A fuses for the protection of the supply voltage.

**Technical data**
**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
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
Polution degree	3
Protective separation (reinforced insulation) between:	
IC1/(IC2-4)	Overvoltage category III, 600 V
IC2/(IC3-4)	Overvoltage category III, 300 V
IC 3/IC4	Overvoltage category III, 300 V
Voltage test (routine test) according to IEC 61010-1:	
IC2/(IC3-4)	AC 2,2 kV
IC 3/IC4	AC 2,2 kV

**Supply voltage**

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

**IT system being monitored**

Nominal system voltage $U_n$	3(N)AC, AC 0...400 V/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 $R_f, Z_f = 0$	≤ 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 $R_{an1}$	$R_{an2} \dots 200 \text{ k}\Omega$ (46 kΩ)*
Response value $R_{an2}$	5 kΩ... $R_{an1}$ (23 kΩ)*
Relative uncertainty $R_{an}$	±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 $U$	±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 $t_{an}$ of $R_f = 0,5 \times R_{an}$ and $C_e = 1 \mu\text{F}$ according to 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**

Display	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 VRMS
Operating uncertainty	±5 %, at least ±5 V
Display range measured value system leakage capacitance of $R_f > 10 \text{ k}\Omega$ (only "dc" mode)	0...17 μF
Operating uncertainty of $R_f \geq 20 \text{ k}\Omega$ and $C_e \leq 5 \mu\text{F}$	±15 %, 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: twisted pairs, shield connected to PE on one side	min. J-Y(St)Y 2 x 0,6
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 contacts, common terminal 11
Operating principle	N/C operation/N/O operation (N/O operation)*
Electrical endurance, number of cycles	10 000
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
Minimum contact rating	1 mA at AC/DC ≥ 10 V

**Environment/EMC**

EMC	IEC 61326-2-4
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**Ambient temperatures:**

Operation	-40...+70 °C
Transport	-40...+85 °C
Storage	-40...+70 °C

**Climatic class acc. to IEC 60721:**

Stationary use (IEC 60721-3-3)	3K7 (without condensation and formation of ice)
Transport (IEC 60721-3-2)	2K4 (without condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K5 (without condensation and formation of ice)

**Classification of mechanical conditions acc. to IEC 60721:**

Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-term storage (IEC 60721-3-1)	1M3

**Connection**

<b>Connection type</b>	<b>push-wire terminal</b>
Nominal current	≤ 10 A
Conductor sizes	AWG 24 -14
Stripping length	10 mm
rigid	0.2...2.5 mm <sup>2</sup>
flexible without ferrules	0.75...2.5 mm <sup>2</sup>
flexible with ferrules with/without plastic sleeve	0.25...2.5 mm <sup>2</sup>
Multi-conductor flexible with TWIN ferrules with plastic sleeve	0.5...1.5 mm <sup>2</sup>
Opening force	50 N
Test opening, diameter	2.1 mm

## Technical data (continued)

### Other

Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically
Degree of protection, built-in components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
DIN rail mounting acc. to	IEC 60715
Screw fixing	2 x M4 with mounting clip
Weight	≤ 150 g

( ) \* = factory setting

## Ordering information

Version	Type	Art. No.
Push-wire terminal	isoGEN423-D4-4	B71036325

## Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B 9806 0008

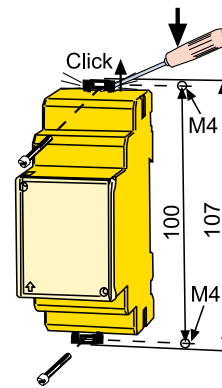
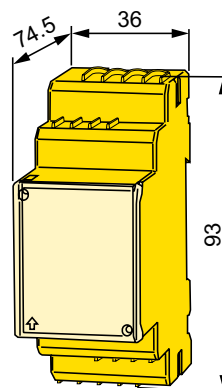
## Dimension diagram XM420

Dimensions in mm

Open the front plate cover in direction of arrow!

### Screw mounting

Note: The upper mounting clip must be ordered separately (see ordering information).



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Distributed in Australia by:

**Captech Pty Ltd**

Phone: 1300 280 010

Email: sales@captech.com.au

**BENDER**  
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### Bender GmbH & Co. KG

P.O. Box 1161 • 35301 Gruenberg • Germany  
Londorfer Strasse 65 • 35305 Gruenberg • Germany  
Tel.: +49 6401 807-0 • Fax: +49 6401 807-259  
E-Mail: info@bender.de • www.bender.de



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