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

isoGEN423_D00221_03_D_XXEN/02.2022

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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 Ce 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 RF. 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 ≤ 1s für C_e ≤ 1 µF 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 ≤ 1s for C_e ≤ 2 µF and $R_F \leq R_{an/2}$ in the event of asymmetrical insulation faults. In case of symmetrical insulation faults, response times of ≤ 10 s for C_e ≤ 5 µF and $R_F \leq R_{an/2}$ are complied with. The leakage capacitance Ce 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 (UL1e) 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 ±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/+ -> R_{L1F} = (200 % * R_F)/(100 % + R %)
- Fault on conductor L2/- -> 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 RF oder Un 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.

AC/DC

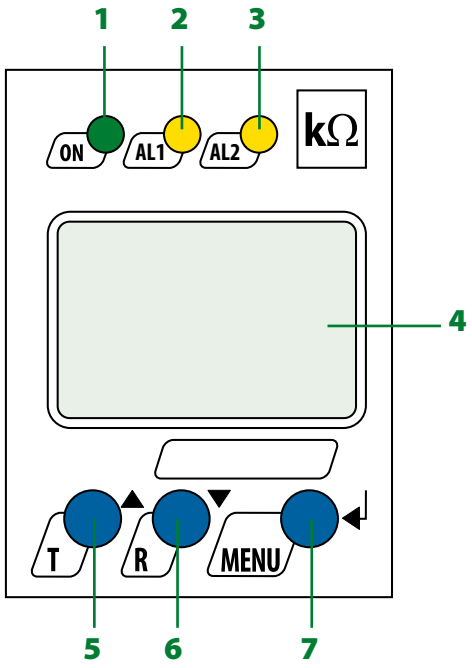
If the values R_F or U_n do not violate their release value (response value plus hysteresis) for the period toff without interruption, the alarm relays will switch back to their initial position and the alarm LEDs AL1/AL2 stop lighting. If the fault memory is activated, the alarm relays remain in alarm 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.

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

Operating elements



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).

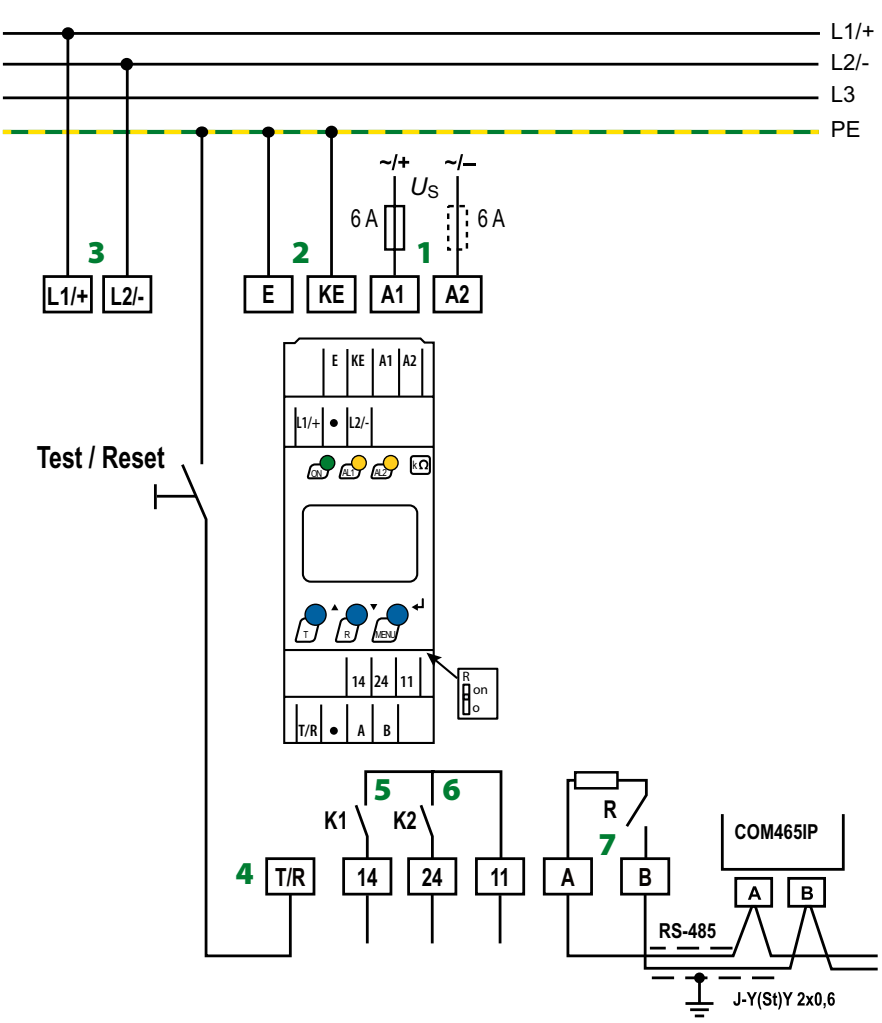
4 - LC display

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}…200 kΩ (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 $R_F = 0,5$ x R_{an} and C_e=1 µF 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 kΩ (only "dc" mode)	0…17 µF
Operating uncertainty of RF ≥ 20 kΩ and C_e ≤ 5 µF	±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
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)	3K24 (without condensation and formation of ice)
Transport (IEC 60721-3-2)	2K11 (without condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K22 (without condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M11
for option W	3M12
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12

Connection

Connection type	screw-type terminal or push-wire terminal
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

Technical data (continued)

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	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
Documentation number	D00221
Weight	≤ 150 g

( )* = factory setting

Ordering information

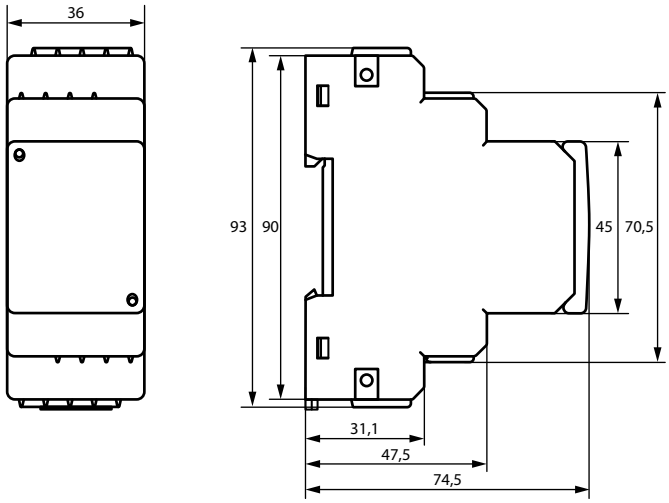
Nominal voltage U_n AC-, 3(N)AC, DC	Type	Art. No. Screw-type terminal	Art. No. Push-wire terminal
0…400 V	isoGEN423-D4-4	B91036325	B71036325
	isoGEN423-D4W-4	–	B71036325W

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

Dimension diagram XM420

Dimensions in mm



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