AC/DC PV

ISOMETER® isoPV425 with AGH420

Insulation monitoring device for unearthed systems
(IT systems) in photovoltaic systems
up to 3(N)AC, AC 690 V / DC 1000 V

Image similar

BENDER

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Insulation monitoring device for unearthed systems (IT systems) in photovoltaic systems up to 3(N)AC, AC 690 V / DC 1000 V

Device features

- Monitoring for unearthed AC and DC systems with galvanically connected inverters or frequency converters
- 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
- Automatic adjustment to the system leakage capacitance C_e up to 1000 µF
- Two separately adjustable response value ranges 1…500 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/DC main circuits (IT systems) with nominal system voltages of 3(N)AC, AC/DC 0…690 V or DC 0…1000 V.

DC components existing in 3(N)AC, AC/DC 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.

The ISOMETER® is always used in conjunction with the coupling device AGH420.

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.

Functional description

The ISOMETER® measures the insulation resistance R_F and the system leakage capacitance C_e between the system to be monitored (L1/+, L2/–) and earth (PE). The RMS value of the nominal system voltage U_n between L1/+ and L2/– as well as the residual voltages U_{L1e} (between L1/+ and earth) and U_{L2e} (between L2/– and earth) are also measured.

Also from a minimum value of the nominal system voltage, the ISOMETER® determines the insulation resistance R_{UGF} from the residual voltages U_{L1e} and U_{L2e}. It is an approximate value for one-sided insulation faults and can be used as a trend indicator in cases where the ISOMETER® has to adapt to an R_F and C_e relation that varies considerably.

The determined fault can be assigned to an alarm relay via the menu. If the values R_F or U_n exceed 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' can be activated.

If the values R_F oder U_n do not exceed 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 the 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, for example by using the BMS Ethernet gateway (COM465IP) or Modbus RTU.

i The isoPV425 determines the system leakage capacitance C_e through an impedance measurement whose frequency is adjusted to the most accurate insulation measured value possible. The measurement signal is affected if it goes through a rectifier or inverter. This can lead to phase errors that may result in an incorrect system leakage capacitance value C_e.

Connection

Wiring diagram legend:

Terminal	Connections
A1, A2	Connection to the supply voltage U_s via fuse: If supplied from an IT system, both lines have to be protected by a fuse.*
E, E, KE	Connect each terminal separately to PE: Use the same wire cross section as for "A1", "A2".
L1/+, L2/–	Connection to IT system to be monitored
Up, AK1, GND, AK2	Connect the terminals of the AGH to the corresponding terminals of the ISOMETER®.
T/R	Connection for 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 selectable terminating resistance

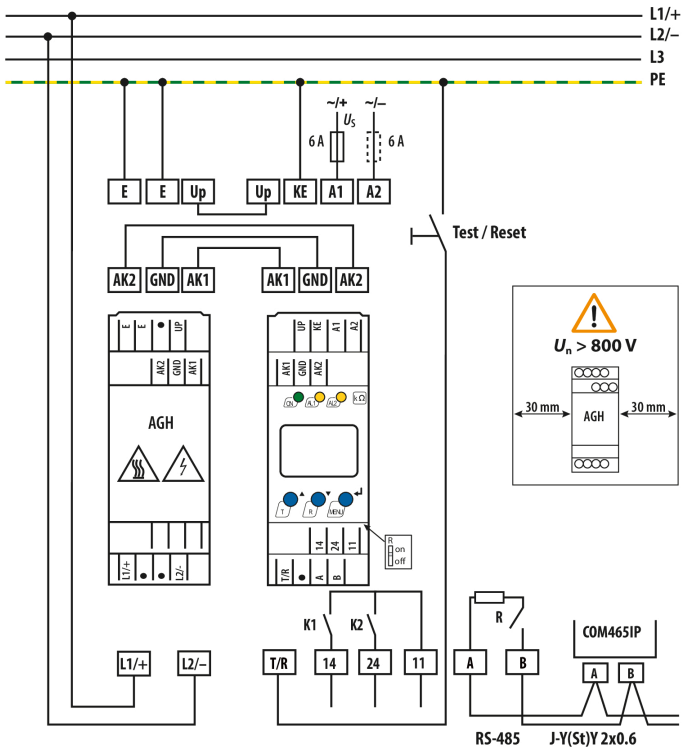
*** For UL and CSA applications:**

Feed the supply voltage U_s via 5 A back-up fuses.

For UL applications:

Only use 60/75 °C copper lines.

Wiring diagram



Technical data isoPV425

( )* = factory setting

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

Definitions

Supply circuit (IC2)	A1, A2
Output circuit (IC3)	11, 14, 24
Control circuit (IC4)	Up, KE, T/R, A, B, AK1, GND, AK2
Rated voltage	240 V
Overvoltage category	III

Rated impulse voltage

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

Rated insulated voltage

IC2/(IC3-4)	250 V
IC3/IC4	250 V
Polution degree	3

Protective separation (reinforced insulation) between

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 V
Tolerance of U_s	–30…+15 %
Frequency range of U_s	47…63 Hz
Power consumption	≤ 3 W, ≤ 9 VA

IT system being monitored

Nominal system voltage U_n with AGH420	3(N)AC, AC 0…690 V / DC 0…1000 V
Tolerance of U_n	AC +15 %, DC +10 %
Nominal system voltage range U_n with AGH420 (UL 508)	AC/DC 0…600 V
Frequency range of U_n	DC 50/60 Hz ±1 Hz

Measuring circuit

Permissible system leakage capacitance C_e at insulation value ≤ 300 kΩ	≤ 1000 µF
Permissible system leakage capacitance C_e at insulation value ≥ 300 kΩ	≤ 500 µF
Permissible extraneous DC voltage U_{fg}	≤ 1150 V

Response values

Response value R_{an1}	2…500 kΩ (10 kΩ)*
Response value R_{an2}	1…490 kΩ (5 kΩ)*
Relative uncertainty R_{an}	±15 %, at least ±1 kΩ
Hysteresis R_{an}	25 %, at least 1 kΩ
Undervoltage detection	30…1140 V (off)*
Overvoltage detection	31…1150 V (off)*
Relative uncertainty*U*	±5 %, at least ±5 V
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 acc. to IEC 61557-8	≤ 10 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 … 1 MΩ
Operating uncertainty at $R_F \leq 1$ MΩ	±15 %, at least ±1 kΩ
Display range measured value system voltage (U_n)	30…1150 V_{RMS}
Operating uncertainty	±5 %, at least ±5 V
Display range measured value system leakage capacitance at $R_F > 10$ kΩ	0…1000 µF
Operating uncertainty	±15 %, at least ±2 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 kbit/s)
Cable length (9.6 kbit/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 n.o. contacts, common terminal 11
Operating principle	n/c or n/o (n/c)*
Electrical endurance	10,000 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
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

Classification of 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

Classification of 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, 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

Technical data AGH420

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

Definitions

Measuring circuit (IC1)	L1/+, L2/–
Control circuit (IC2)	AK1, GND, AK2, Up, E
Rated voltage	1000 V
Overvoltage category	III

Rated impulse voltage

IC1/IC2	8 kV

Rated insulated voltage

IC1/IC2	1000 V
Polution degree	3

Protective separation (reinforced insulation) between

IC1/IC2	Overvoltage category III, 1000 V

Monitored IT system

Nominal system voltage range U_n	3(N)AC, AC 0…690 V / DC 0…1000 V
Tolerance of U_n	AC +15 %, DC +10 %
Nominal system voltage range U_n (UL 508)	AC/DC 0…600 V

Measuring circuit

Measuring voltage U_m	±45 V
Measuring current I_m at R_F	≤ 400 µA
Internal resistance DC R_i	≥ 120 kΩ

Environment/EMC

EMC	IEC 61326-2-4

Ambient temperatures

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

Classification of climatic conditions acc. to IEC 60721 (related to temperature and rel.humidity)

Stationary use (IEC 60721-3-3)	3K22
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Classification of 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
Distance to adjacent devices from U_n > 800 V	≥ 30 mm
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

Connection (for ISOMETER® and AGH)

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	0.2…1.5 mm²
Multi-conductor flexible	0.2…1.5 mm²
Multi-conductor flexible with ferrules without plastic sleeve	0.25…1.5 mm²
Multi-conductor flexible with TWIN ferrules with plastic sleeve	0.25…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	Ø 2.1 mm

Single cables for terminals Up, AK1, GND, AK2
Requirement for connecting cables between ISOMETER® and AGH

Cable lengths	≤ 0.5 m
Connection properties	≥ 0.75 mm²

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

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

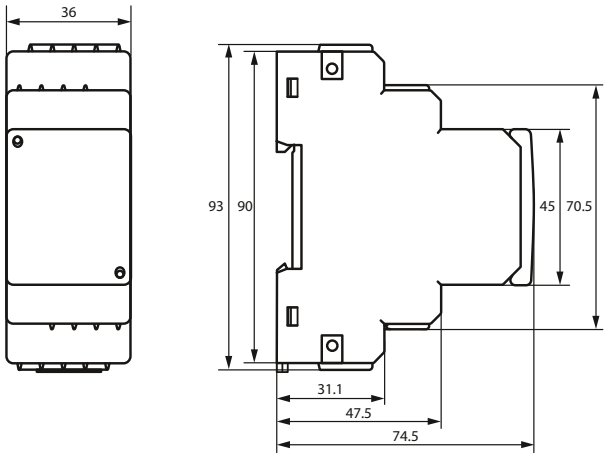
Ordering data

Type	Supply voltage U_s	Article number	
		Push-wire terminals	Screw-type terminals
isoPV425-D4-4 mit AGH420	AC 100…240 V; DC 24...240 V	B71036303	B91036301

Accessories

Description	Article number
Mounting clip for screw mounting	B98060008

Dimensions



Dimension diagram (in mm)

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