ISOMETER® isoPV425 with coupling device AGH420

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

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Device characteristics

- Monitoring for unearthed AC and DC systems with galvanically connected rectifiers or inverters
- Measurement of the nominal system voltage (r.m.s.) with undervoltage and overvoltage detection
- Measurement of DC voltages system to earth (L+/PE and L-/PE)
- Automatic adaptation to the system leakage capacitance up to 500 µF
- Automatic device self-test with connection monitoring
- Selectable start-up delay, response delay and delay on release
- Two separately adjustable response value ranges of 1…500 kΩ (Alarm 1, Alarm 2)
- Alarm signalling via LEDs (AL1, AL2), a display and alarm relays (K1, K2)
- N/C operation or N/O operation selectable
- 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® of the isoPV425 series monitors the insulation resistance of unearthed AC/DC main circuits (IT systems) with nominal voltages of 3(N)AC, AC, AC/DC 0…690 V or DC 0…1000 V.

DC components existing in AC/DC systems do not influence the operating characteristics. A separate supply voltage allows deenergised systems to be monitored as well. The maximum permissible system leakage capacitance is 500 µF.

The isoPV 425 determines the leakage capacitance 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, and this can lead to phase errors that may result in an incorrect leakage capacitance value.

Application

- AC, DC or AC/DC main circuits
- Solar systems with directly connected inverters
- Solar systems with high system leakage capacitances
- Solar systems with high but slow voltage fluctuations
- Systems including switch-mode power supplies

Function

The currently measured insulation resistance is indicated on the LC display. The response value of the ISOMETER® is factory-set to AL1 10 kΩ and AL2 5 kΩ. When the value falls below the preset response values, the response delay "t_{on}" starts. Once the response delay "t_{on}" has elapsed, the alarm relays "K1/K2" switch and the alarm LEDs "AL1/AL2" light up. By means of two separately configurable response values/alarm relays, the messages can be evaluated separately. If the insulation resistance exceeds the release value (response value plus hysteresis), the alarm relays return to their initial position. The point of fault L+, L- or the symmetrical insulation resistance is indicated on the display. In the menu, the alarm relays can also be assigned to the point of fault.
If the fault memory is enabled, the alarm relays remain in the alarm state until the reset button is pressed or until the supply voltage is switched off. The device functions can be checked using the test button. Device parameters are assigned via the LCD and the control buttons on the front of the device, as well as the RS-485 interface (BMS or Modbus RTU).

Connection monitoring

The connections to the electrical system (L1/+ / L2/-) and earth (E/KE) as well as the connecting wires from the insulation monitor to the coupling device are periodically monitored every 24 hours after pressing the test button and connecting the supply voltage. In case of line interruption, the alarm relay K2 switches, the LEDs ON/AL1/AL2 flash and a message appears on the LC display:

"E.0x" for a fault in the connecting wires between both devices or system fault,

"E.02" for a fault in the connection to the system,

"E.01" for a fault in the connecting wires to PE.

After eliminating the fault, the alarm relays switch back automatically or by pressing the reset button.

Measurement method

The ISOMETER® isoPV425 uses the AMP and PCP measurement method.

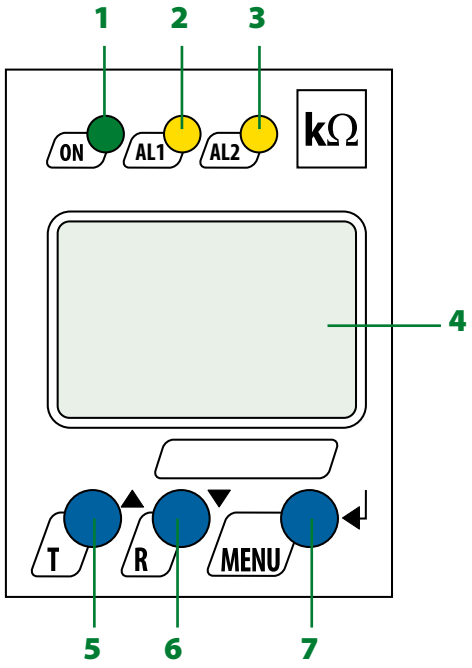
Standards

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

AC/DC PV

Operating elements



1 - LED “ON” (operation LED) flashes in case of interruption of the connecting wires E/KE or L1/+ / L2/- or system fault.

2 - Alarm LED “AL1” lights when the values fall below the set response value Alarm 1 and flashes in case of interruption of the connecting wires E/KE or L1/+ / L2/-, in the case of system faults as well as 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 of the connecting wires E/KE or L1/+ / L2/-, in the case of system faults as well as undervoltage (can be activated).

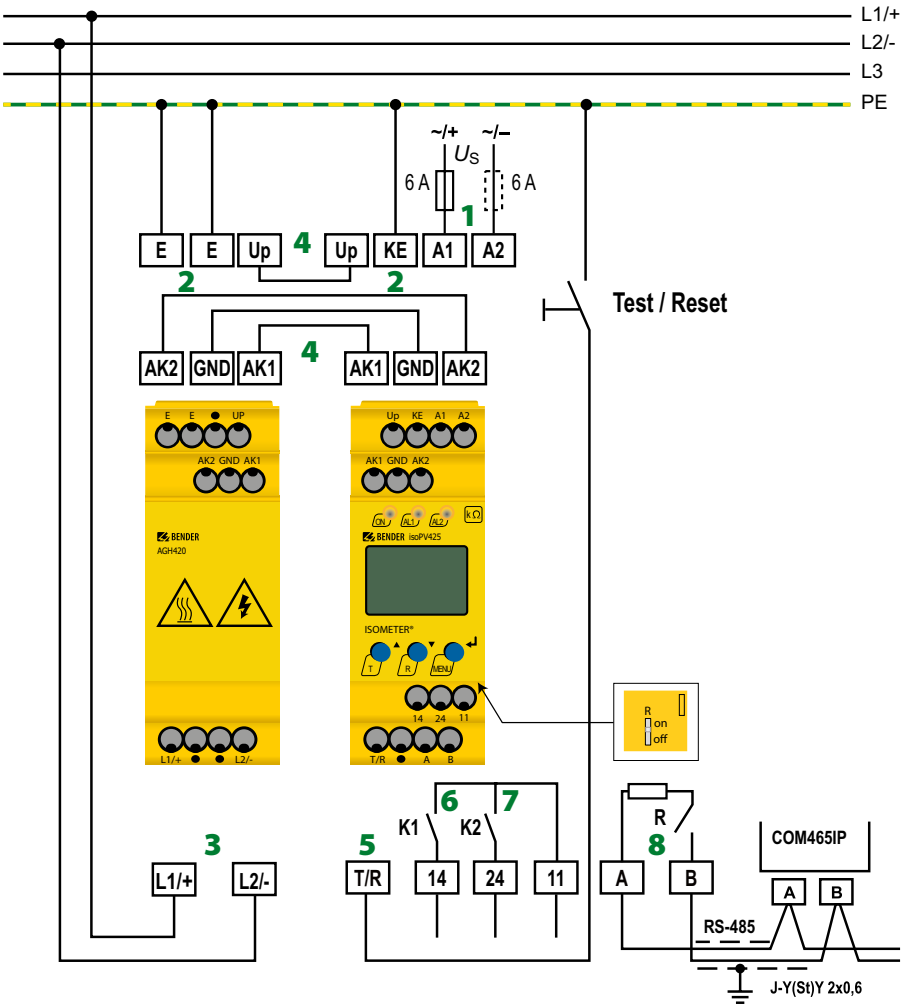
4 - LC display

5 - Test button “T”: Call up self-test
Arrow up button: Change parameters, move upwards in the menu

6 - Reset button “R”: Delete stored insulation fault alarms
Arrow down button: Parameter change, move downwards in the menu

7 - Menu button “MENU”: Call up the menu system
Enter button: Confirm parameter changes

Wiring diagram



1 - A1, A2 — Connection to the supply voltage via fuse (line protection). If being supplied from an IT system, both lines have to be protected by a fuse.*

2 - E, E, KE — Connect each terminal separately to PE: The same wire cross section as for A1, A2 must be used.

3 - L1/+, L2/– — Connection to the 3(N)AC, AC or DC system to be monitored.

4 - Up, AK1, GND, AK2 — Connect the terminals of the AGH420 to the corresponding terminals of the isoPV425

5 - T/R — Connection for external combined test and reset button

6 - 11, 14 — Connection to alarm relay K1

7 - 11, 24 — Connection to alarm relay K2

8 - A, B — RS-485 communication interface with selectable 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 ISOMETER® isoPV425

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

Definitions:	
Supply circuit (IC2)	A1, A2
Output circuit (IC3)	11, 14, 24
Control circuit (IC4)	E, KE, T/R, A, B, AK1, GND, AK2
Rated voltage	240 V
Overvoltage category	III
Rated impulse voltage:	
IC2/(IC3-4)	4 kV
IC 3/(IC4)	4 kV
Rated insulated voltage:	
IC2/(IC3-4)	250 V
IC 3/(IC4)	250 V
Polution degree	3
Protective separation (reinforced insulation) between:	
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 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 (UL508)	AC/DC 0…600 V
Frequency range of U_n	DC, 15…460 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…1.14 kV (off)*
Overvoltage detection	31…1.15 kV (off)*
Relative uncertainty U	± 5 %, at least ± 5 V
Relative uncertainty depending on the frequency ≥ 200 Hz	-0.03 %/Hz
Hysteresis U	5 %, at least 5 V

Time response

Response time t_{an} at R_F = 0.5 x 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 ≤ 1 MΩ	± 15 %, at least ±1 kΩ
Display range measured value nominal system voltage (U_n)	30…1.15 kV r.m.s.
Operating uncertainty	± 5 %, at least ± 5 V
Relative uncertainty depending on the frequency ≥ 200 Hz	-0.03 %/Hz
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 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 2x0.6
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 operation/N/O operation (N/O operation)*
Electrical endurance, number of cycles	10000

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

Stationary use (IEC 60721-3-3)	3K7 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K4 (except condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K5 (except 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

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	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

Technical data ISOMETER® isoPV425 (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
Wiring of the terminals Up, AK1, GND, AK2	refer to technical data AGH420 under the heading “Connection”

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

Technical data coupling device AGH420

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

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	AC/DC 0…1000 V
Tolerance of U_n	AC/DC +10 %
Nominal system voltage range U_n (UL508)	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:

Stationary use (IEC 60721-3-3)	3K7 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K4 (except condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K5 (except 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

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	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, diameter	2.1 mm
Connection type	terminals Up, AK1, GND, AK2

Single cables for terminals Up, AK1, GND, AK2:

Cable lengths	≤ 0.5 m
Connection properties	≥ 0.75 mm²

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

Ordering information

Supply voltage U_S		Nominal voltage U_n		System leakage capacitance	Type	Art. No.	
AC	DC	AC	DC			Screw-type terminal	Push-wire terminal
100…240 V, 47…63 Hz	24…240 V	0…690 V	0…1000 V	≤ 500 µF	isoPV425-D4-4 with AGH420	B91036303	B71036303

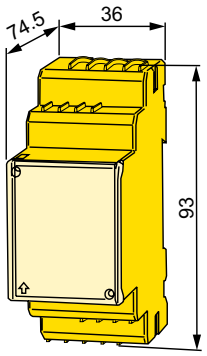
Accessories

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

Dimension diagram XM420

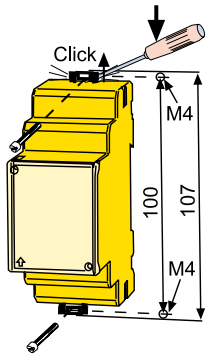
Dimensions in mm

Open the front plate cover in direction of arrow!



Screw mounting

Note: The above mounting clip is an accessory and must be ordered separately (see accessories).



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

BENDER Group