AC/DC

ISOMETER® isoMIL425HV

Insulation monitoring device with coupling device AGH421
for unearthed AC, AC/DC and DC systems
for military applications up to 3(N)AC, AC 690 V, DC 1000 V

Image similar

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Insulation monitoring device with coupling device AGH421 for unearthed AC, AC/DC and DC systems for military applications up to 3(N)AC, AC 690 V, DC 1000 V

Device features

- Monitoring of the insulation resistance R_F for unearthed 3(N)AC, AC and DC systems with galvanically connected rectifiers or frequency converters
- Measuring the system voltage U_n (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 700 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® isoMIL425HV 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, 15…460 Hz.

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 maximum permissible system leakage capacitance is 700 µF.

The ISOMETER® is always used in conjunction with the coupling device AGH421.

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 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 voltage, the ISOMETER® determines the insulation resistance 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 detected fault is assignable to an alarm relay via the menu. If the values R_F or 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 signalling assignment set in the “out” menu. In addition, the menu offers the setting of the relay operation and the activation of the fault memory “M”.

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 stop lighting. If the fault memory is activated, the alarm relays remain in alarm position and the LEDs are lit until the reset key “R” is pressed or the supply voltage U_s is interrupted.

The ISOMETER® features a stop switch. When the stop switch is closed, the ISOMETER® is in operation. If the stop switch is opened, the ISOMETER® enters stop mode, i.e. the coupling L1/+ and L2/– is connected with high resistance (approx. 20 MΩ) to the system to be monitored. In stop mode, if the memory function “M” is activated (reset function), the fault memory is cleared. The stop function can also be triggered via an interface command. In this case it can only be reset via the interface. When starting the device or leaving the stop mode, no device test is run.

The device function can be checked with 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. using a BMS Ethernet gateway (COM465IP) or Modbus RTU.

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

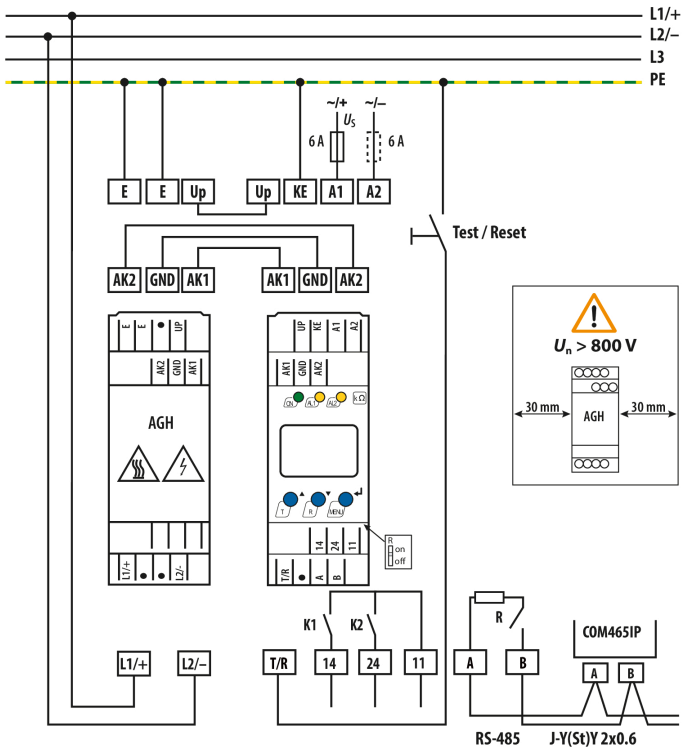
*** For UL and CSA applications:**

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 isoMIL425HV

( )* = 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 AGH421	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 AGH421 (UL 508)	AC/DC 0…600 V
Frequency range of U_n	DC, 15…460 Hz

Measuring circuit

Permissible system leakage capacitance C_e	≤ 700 µF
Permissible extraneous DC voltage U_{fg}	≤ 1150 V

Response values

Response value R_{an1}	2…500 kΩ (140 kΩ)*
Response value R_{an2}	1…490 kΩ (45 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
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 … 5 MΩ
Operating uncertainty at R_F ≤ 1 MΩ	±15 %, at least ±1 kΩ
Operating uncertainty at R_F ≥ 1 MΩ	typically ±25 % max. ±45 %
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…700 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/o)*
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	–50…+85 °C
Storage	–55…+80 °C

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

Stationary use (IEC 60721-3-3)	3K24
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K23

Classification of mechanical conditions acc. to IEC 60721

Stationary use (IEC 60721-3-3)	3M12
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 AGH421

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	AC/DC 0…1000 V
Tolerance of U_n	AC/DC +10 %

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	–50…+85 °C
Storage	–55…+80 °C

Classification of climatic conditions acc. to IEC 60721

Stationary use (IEC 60721-3-3)	3K24
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Classification of mechanical conditions acc. to IEC 60721

Stationary use (IEC 60721-3-3)	3M12
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)

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:

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

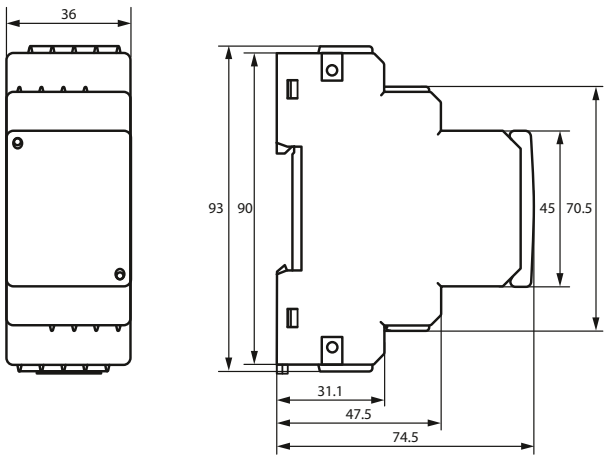
Ordering data

Type	Supply voltage U_s	Article number	
		Push-wire terminals	Screw-type terminals
isoMIL425HV-D4W-4 + AGH421-W	AC 100…240 V; 47…63 Hz DC 24…240 V	B71036305W	–

Accessories

Description	Article number
Mounting clip for screw mounting	B98060008

Dimensions



Dimension diagram (in mm)

Bender GmbH & Co. KG

Londorfer Straße 65
35305 Grünberg
Germany

Tel.: +49 6401 807-0
info@bender.de
www.bender.de