

## ISOMETER® iso1065

Insulation monitoring device for unearthed AC, AC/DC and DC systems (IT system) up to 3(N)AC, AC 1000 V, DC 1000 V



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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)
- Automatic adaptation to the system leakage capacitance up to 150  $\mu\text{F}$
- Selectable start-up delay, response delay and delay on release
- Two separately adjustable response value ranges of 10...500 k $\Omega$  (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 a multi-functional LC display
- Fault memory can be activated
- Password protection to prevent unauthorised parameter changes

### iso1065

- RS-485 (galvanically separated) including the following protocols:
  - BMS interface (Bender measuring device interface) for data exchange with other Bender components
  - Modbus RTU
  - IsoData (for continuous data output)

### iso1065-M

- 0(4)...20 mA, 0...400  $\mu\text{A}$ , 0...10 V analogue output (galvanically separated)

## Certifications



## Product Description

The Bender ISOMETER® iso1065 is designed to be a plug-in replacement for the obsolete Bender IRDH1065 range of Line Insulation Monitors incorporating a Bender isoHV425 with AGH422 coupling device and a custom front fascia plate. It is intended for use in retrofit and replacement oil and gas subsea applications to monitor and provide alarm warning of the deterioration in insulation resistance in umbilical cables.

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...1000 V or DC 0...1000 V. The maximum permissible system leakage capacitance  $C_e$  is 150  $\mu\text{F}$ . DC components existing in AC systems do not influence the operating characteristics, when a minimum load current of DC 100 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 area of application indicated in the technical specifications. Any use other than that described in this manual is regarded as improper.

## Application

- AC main circuits up to 1000 V
- DC main circuits up to 1000 V
- Systems including switched-mode power supplies

## Variants

- iso1065 with a serial interface
- iso1065-M with an analogue output

## Function

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. From a minimum nominal system voltage, the ISOMETER® determines the faulty conductor L1/+ or L2/-, i.e. the distribution of the insulation resistance between the conductors L1/+ and L2/-, and indicates this by means of a positive or negative sign preceding the insulation resistance measurement. The value range of the faulty conductor is  $\pm 100\%$ .

## Standards

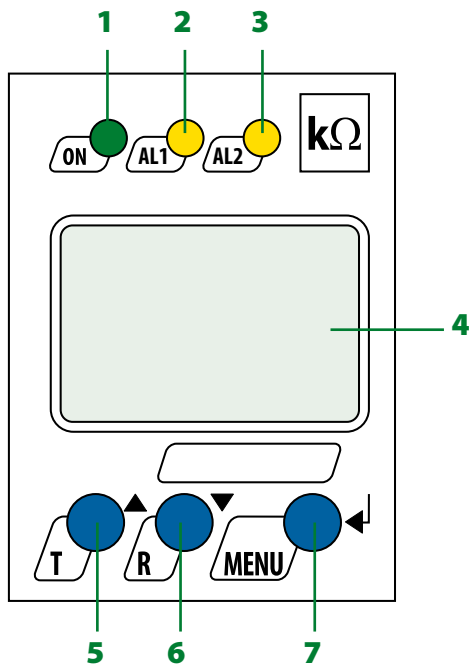
The ISOMETER® isoHV425 series meets the following device standards:

- DIN EN 61557-8 (VDE 0413-8):2015-12/Ber1:2016-12
- DIN EN 50155:2018-05
- EN 45545-2:2016
- IEC 61557-8:2014/COR1:2016

**Ordering information**

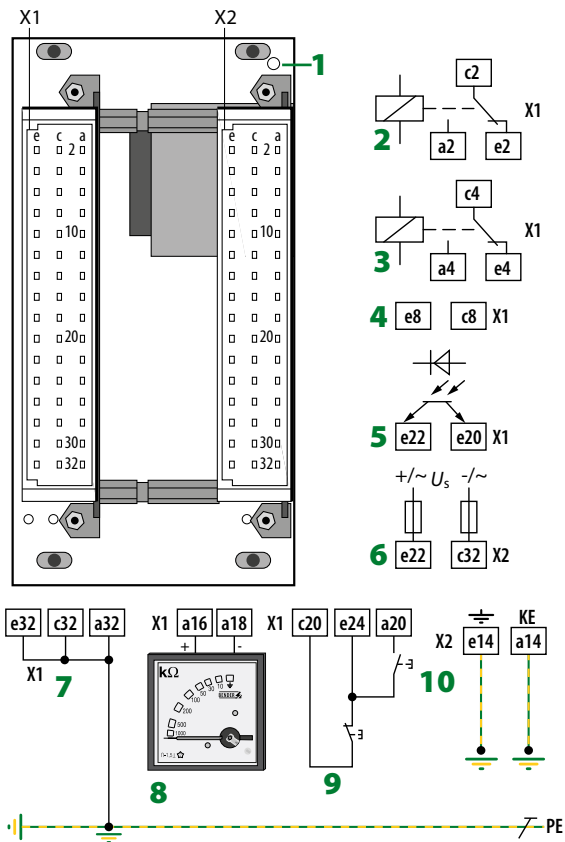
Supply voltage $U_s$		Nominal voltage $U_n$	Version	Type	Art. No.
AC	DC	AC-, 3(N)AC, DC			
100...240V, 47...63 Hz	24...240V	0...1000V	Serial interface	<b>iso1065</b>	<b>iso1065</b>
			Analogue output	<b>iso1065-M</b>	<b>iso1065-M</b>

**Operating elements**



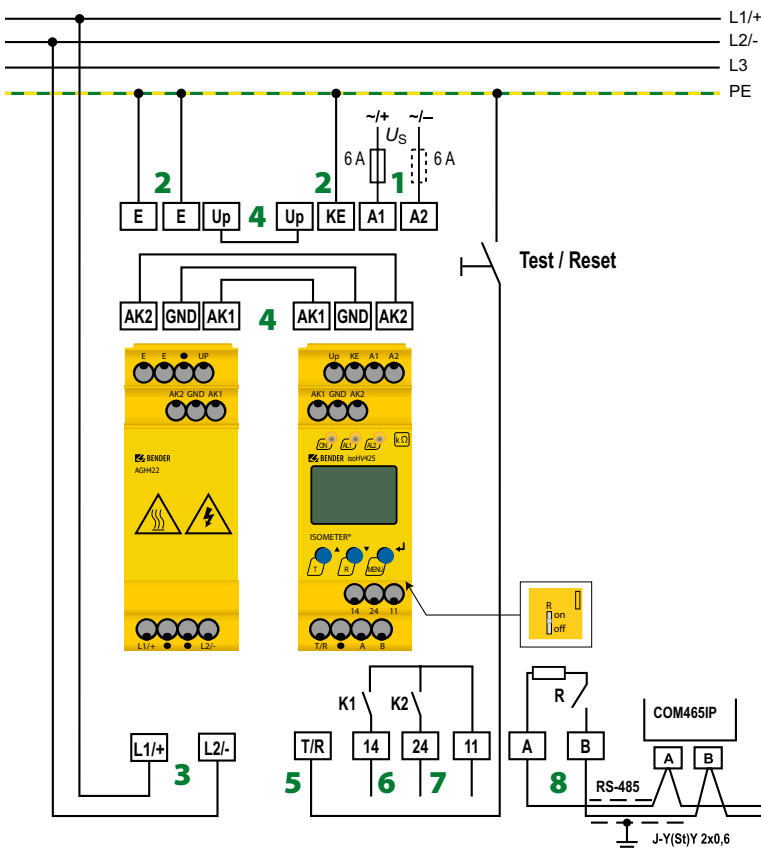
- 1 - Operation LED "ON" flashes in case of interruption of the connecting wires E/KE or L1(+)/L2(-) or system error.
- 2 - Alarm LED "AL1" lights when the values fall below the set response value of alarm 1 and flashes in case of interruption of the connecting wires E/KE or L1(+)/L2(-), in case of system errors as well as in case of overvoltage (can be activated).
- 3 - Alarm LED "AL2" lights when the values fall below the set response value of alarm 2 and flashes in case of interruption of the connecting wires E/KE or L1(+)/L2(-), in case of system errors as well as in case of 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 alarms  
Arrow-down button: Change parameters, move down in the menu
- 7 - Menu button "MENU": Call up the menu system  
Enter button: Confirm parameter changes

**Wiring diagram IRDH1065**



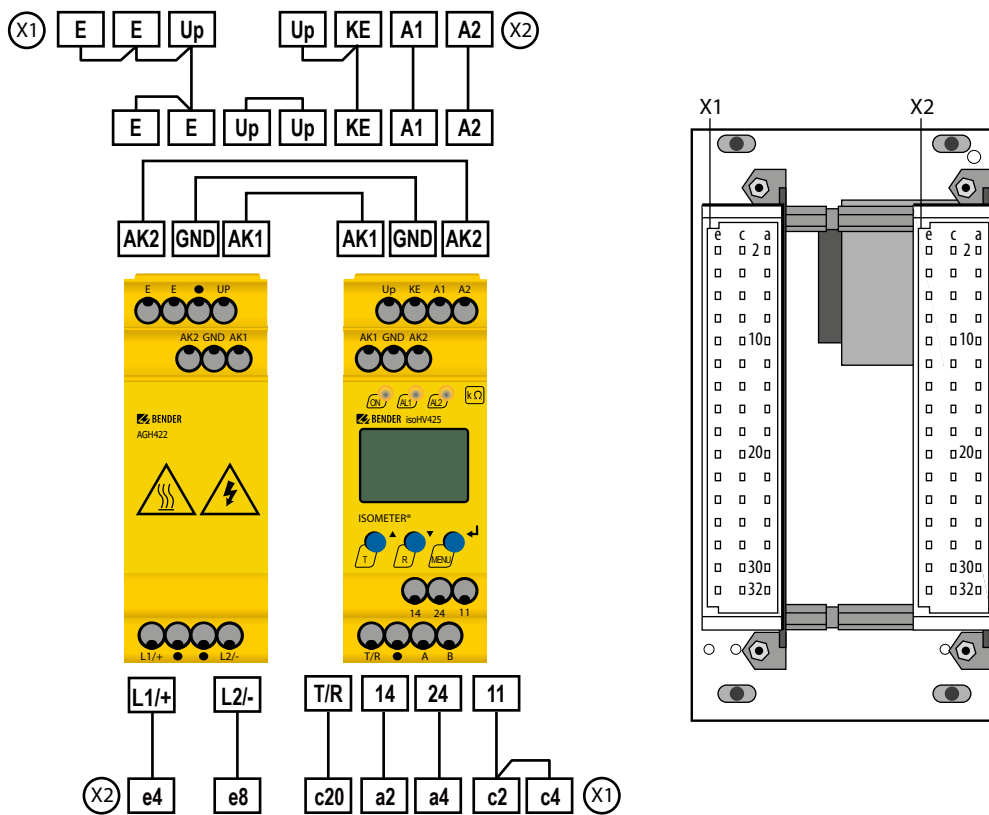
- 1 - Rear view IRDH1065
- 2 - c2, a2, e2 Alarm relay  $R_{an1}$  (ALARM 1) (X1)
- 3 - c4, a4, e4 Alarm relay  $R_{an2}$  (ALARM 2) (X1)
- 4 - e8, c8 RS-485 interface (electrically isolated) (X1)
- 5 - e22, e20 Optocoupler output (X1)
- 6 - e22, e20  $U_s$  see ordering details, 6 A fuse (X2)
- 7 - e32, c32, a32 Connection to alarm relay K2 (X1)
- 8 - a16, a16 Current output 0(4)...20 mA, 0...400  $\mu$ A (X1)
- 9 - c20, e24, a20 External RESET button (NC contact or wire jumper), when the terminals LT are open, the fault message will not be stored (X1)
- 10 - e14, a14 External TEST button, if required (X1)

**Wiring diagram isoHV425-D4-4**



- 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, 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 - Up, AK1, GND, AK2 Connect the terminals of the AGH422 to the corresponding terminals of the ISOMETER®.
- 5 - T/R Connection for the external combined test/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 connectable terminating resistor.

Wiring diagram iso1065



Comparison Table

Feature	IRDH1065	iso1065
AC/DC systems	✓	✓
Additional overvoltage and undervoltage protection	✗	✓
Measurement of DC voltage to earth	✗	✓
Maximum system leakage capacitance	max. 150 µF (version -4..) max. 500 µF (version -3..) max. 50 µF (version -6..)	150 µF
Selectable start-up/response/release delay	✗	✓
Two separately adjustable response value ranges	180 kΩ / 40 kΩ (version -4..) 40 kΩ / 10 kΩ (version -3..) 1.8 MΩ / 400 kΩ (version -6..)	10...500 kΩ (Alarm 1, Alarm 2)
Alarm signalling via LEDs	✓	✓
Measured value indication via a multifunctional LC display	✓	✓
Selectable N/C or N/O relay operation	via termination	via termination/user interface
Password protection	✓	✓
Analogue output	0 (4) – 20 mA	iso1065-M variant • Voltage output DC 0...10 V, load ≥ 20 kΩ • Current output DC 0/4...20 mA, load ≤ 130 Ω • Current output DC 0...400 µA, load ≤ 3 kΩ
RS485	✓	iso1065 variant only
Optocoupler output	✓	✗

## Technical data ISOMETER® isoHV425

### 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)	Up, KE, T/R, A, B, AK1, GND, AK2, M+, M-
Rated voltage	240 V
Overvoltage category	III
Rated impulse voltage:	
IC2/(IC3-4)	4 kV
IC 3/IC4	4 kV
Rated insulation voltage:	
IC2/(IC3-4)	250 V
IC 3/IC4	250 V
Pollution degree	3
Protective separation (reinforced insulation) between:	
IC2/(IC3-4)	overvoltage category III, 300 V
IC 3/IC4	overvoltage category III, 300 V
Voltage tests (routine test) acc. 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	$\leq 3$ W, $\leq 9$ VA

### IT system being monitored

Nominal system voltage $U_n$ with AGH422	AC 0...1000 V/DC 0...1000 V
Tolerance of $U_n$	AC +10 %, DC +10 %
Frequency range of $U_n$	DC, 15...460 Hz

### Measuring circuit

Permissible system leakage capacitance $C_e$	$\leq 150$ $\mu$ F
Permissible extraneous DC voltage $U_{fg}$	$\leq 1600$ V

### Response values

Response value $R_{an1}$	11...500 k $\Omega$ (50 k $\Omega$ )*
Response value $R_{an2}$	10...490 k $\Omega$ (25 k $\Omega$ )*
Relative uncertainty $R_{an}$	$\pm 15$ %, at least $\pm 3$ k $\Omega$
Hysteresis $R_{an}$	25 %, at least 1 k $\Omega$
Undervoltage detection	30...1.09 kV (off)*
Overvoltage detection	31...1.10 kV (off)*
Relative uncertainty $U$	$\pm 5$ %, at least $\pm 5$ V
Relative uncertainty depending on the frequency $\geq 200$ Hz	-0.075 %/Hz
Hysteresis $U$	5 %, at least 5 V

### Time response

Response time $t_{an}$ at $R_F = 0.5 \times R_{an}$ and $C_e = 1$ $\mu$ F acc. to IEC 61557-8	$\leq 20$ 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 k $\Omega$ ...4 M $\Omega$
Operating uncertainty	$\pm 15$ %, at least $\pm 3$ k $\Omega$
Display range measured value nominal system voltage ( $U_n$ )	30...1.15 kV <sub>RMS</sub>
Operating uncertainty	$\pm 5$ %, at least $\pm 5$ V
Display range measured value system leakage capacitance for $R_F > 20$ k $\Omega$	0...200 $\mu$ F
Operating uncertainty	$\pm 15$ %, at least $\pm 2$ $\mu$ F
Password	off/0...999 (0, off)*
Fault memory alarm messages	on/(off)*

### Interface (valid for isoHV425-D4-4 only)

Interface/protocol	RS-485/BMS, Modbus RTU, isoData (BMS)*
Baud rate	BMS (9.6 kbit/s), Modbus RTU (selectable), isoData (115.2 kbit/s)
Cable length (9.6 kbit/s)	$\leq 1200$ m
Cable: twisted pairs, shield connected to PE on one side	min. J-Y(St)Y 2x0.6
Terminating resistor	120 $\Omega$ (0.25 W), internal, can be connected
Device address, BMS bus, Modbus RTU	3...90 (3)*

### Analogue output (valid for isoHV425-D4M-4 only)

Operating mode	mid-scale $R$ or full-scale $U$ ( $R = 120$ k $\Omega$ )*
Functions	insulation value $R_F$ or mains voltage $U_n$ ( $R_F$ )*
Max. no load voltage (open terminals)	DC 12 V
Max. short-circuit current	25 mA short-circuit proof
Voltage output	DC 0...10 V, load $\geq 20$ k $\Omega$ *
Current output	DC 0/4...20 mA, load $\leq 130$ $\Omega$
Current output	DC 0...400 $\mu$ A, load $\leq 3$ k $\Omega$

### Switching elements

Switching elements	2 x 1 N/O contact, common terminal 11
Operating principle	N/C operation/N/O operation (N/C operation)*
Electrical endurance under rated operating conditions, 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 $\geq 10$ V				

### Environment/EMC

EMC	IEC 61326-2-4, EN 50121-3-2
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### 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)	3K23 (except condensation and formation of ice)
for W variant	3K24
Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K22 (except condensation and formation of ice)

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

Stationary use (IEC 60721-3-3)	3M11
for W variant	3M12
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12

(\*) = Factory setting

**Technical data coupling device AGH422**
**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 insulation voltage:	
IC1/IC2	1000 V
Pollution degree	3
Protective separation (reinforced insulation) between:	
IC1/IC2	Overvoltage category III, 1000 V

**IT system being monitored**

Nominal system voltage range $U_n$	AC 0...1000 V/DC 0...1000 V
Tolerance of $U_n$	AC +10%/DC +10%

**Measuring circuit**

Measuring voltage $U_m$	$\pm 45$ V
Measuring current $I_m$ for $R_F$	$\leq 120$ $\mu$ A
Internal resistance $R_i$	$\geq 390$ k $\Omega$

**Environment/EMC**

EMC	IEC 61326-2-4, EN 50121-3-2
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**Ambient temperatures:**

Operation	
$U_n < 700$	-40...+70 °C
$U_n > 700$	-40...+55 °C
Transport	-40...+85 °C
Storage	-40...+70 °C

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

Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice)
for W variant	3K24
Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K22 (except condensation and formation of ice)

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

Stationary use (IEC 60721-3-3)	3M11
for W variant	3M12
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12

**Connection**

Connection type	push-wire terminal
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**Push-wire terminals:**

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 ferrule with/without plastic sleeve	0.25...2.5 mm <sup>2</sup>
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.5...1.5 mm <sup>2</sup>
Opening force	50 N
Test opening, diameter	2.1 mm

**Single cables for terminals Up, AK1, GND, AK2 –**
**Requirement for connecting cables between isoHV425xx and AGH422**

Cable length	$\leq 0.5$ m
Wire cross-section	$\geq 0.75$ mm <sup>2</sup>

**Other**

Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically
Distance to adjacent devices from $U_n > 800$ V	$\geq 30$ mm
Minimum horizontal distance between the devices (DIN EN 45545)	see note *
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 mounting	2 x M4 with mounting clip
Weight	150 g

\*\* Application in rail vehicles / DIN EN 45545-2:2016!

If the distance to neighbouring components that do not meet the requirements of the DIN EN 45545-2 Table 2 standard is  $< 20$  mm horizontally or  $< 200$  mm vertically, these are to be regarded as grouped. See DIN EN 45545-2 Chapter 4.3 Grouping rules.



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