

# ISOMETER® isoHV525

Insulation monitoring device for  
unearthed AC, AC/DC and DC systems (IT systems)  
up to 3(N)AC, AC/DC 0...1000V or DC 0...1000 V



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## Device features

### isoHV525-M4-4

- Monitoring the insulation resistance for unearthed AC/DC systems
- Automatic adaptation to the system leakage capacitance up to 150 µF
- Two separate response values for Alarm 1 and Alarm 2
- Alarms are signalled via alarm relays (K1, K2)
- 10 V analogue output (galvanically separated)

### isoHV525-S4-4

- Monitoring the insulation resistance for unearthed AC/DC systems
- Measurement of the mains 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 µF
- Two separate response values for Alarm 1 and Alarm 2
- Alarms are signalled via alarm relays (K1, K2)
- Selectable N/C or N/O relay operation
- Selectable start-up delay, response delay and delay on release
- Fault memory can be activated
- 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)

## Approvals and certifications



## Product description

The isoHV525 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 µF.

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.

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.

The isoHV525 is contained in an enclosure filled with polyurethane and can therefore be used under extreme environmental conditions such as shock, vibration and temperature.

## Application

- AC main circuits up to 1000 V
- DC main circuits up to 1000 V
- Systems including switched-mode power supplies
- High shock and vibration requirements
- High temperature requirements

## Variants

- isoHV525-M4-4 with an analogue output
- isoHV425-S4-4 with a serial interface

## Function

### isoHV525-M4-4

The ISOMETER® measures the insulation resistance  $R_F$  between the system to be monitored (L1/+, L2/-) and earth (PE) and outputs a voltage between 0...10 V depending on the measured value. If the value  $R_F$  exceeds the set response value, this will be indicated by the relays K1 and K2. If the value  $R_F$  exceeds the respective release value (response value plus hysteresis), the alarm relays switch back to their initial position. The device function can be tested using the external Test/Reset button.

### isoHV525-S4-44

The ISOMETER® measures the insulation resistance  $R_F$  and the leakage capacitance  $C_e$  between the system to be monitored (L1/+, L2/-) and earth (PE). The r.m.s. value of the mains voltage  $U_n$  between L1/+ and L2/-, as well as the DC voltages between L1/+ and earth ( $U_{L1e}$ ) and between L2/- and earth ( $U_{L2e}$ ) are also measured.

From a minimum value of the DC system voltage, the ISOMETER® determines the fault location "R %", which shows the distribution of the insulation resistance between conductors L1/+ and L2/-.

The value range of the fault location is  $\pm 100$  %:

Display	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:

$$\text{Fault on conductor L1/+} \rightarrow R_{L1F} = (200 \% * R_F) / (100 \% - R \%)$$

$$\text{Fault on conductor L2/-} \rightarrow R_{L2F} = (200 \% * R_F) / (100 \% + R \%)$$

If the values  $R_F$  or  $U_n$  exceed the set response values, this will be indicated by the relays K1 and K2.

If the values  $R_F$  or  $U_n$  exceed their release value (response value plus hysteresis) uninterrupted for no longer than the period  $t_{off}$ , then the alarm relays will switch back to their initial position. If the fault memory is enabled, the alarm relays remain in the alarm state until the external Test/Reset button is pressed or until the supply voltage is switched off.

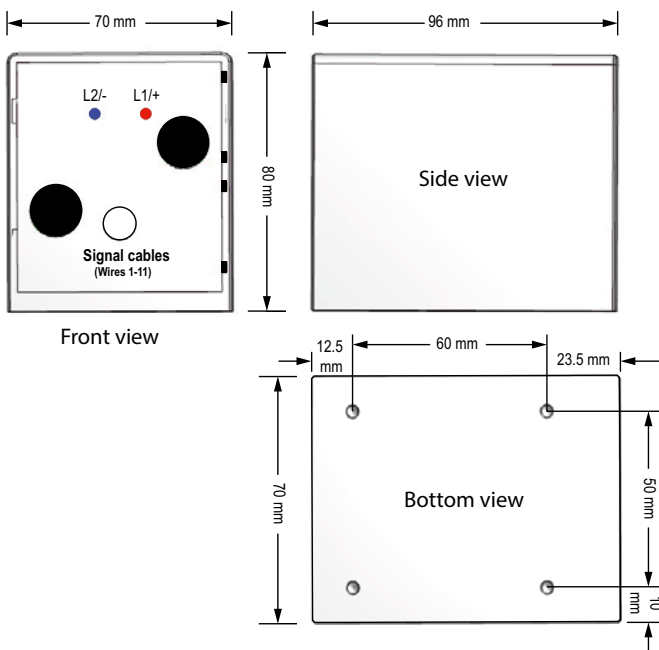
The device function can be tested using the external Test/Reset button. Device parameters are initially assigned by Bender. Parameterisation of the ISOMETER® isoHV525-S4-4 is also possible via the BMS bus, for example by means of a BMS-Ethernet gateway (COM460IP) or Modbus RTU.

**Ordering information**

Supply voltage <sup>1)</sup> $U_S$		Nominal voltage $U_n$	Version	Type	Art. No.
AC	DC	AC-, 3(N)AC			
100...240V, 47...63 Hz	24...240V	0...1000V	Analogue output	isoHV525-M4-4	B91036530
			Serial interface	isoHV525-S4-4	B91036531

<sup>1)</sup> Absolute values

**Dimension diagram**

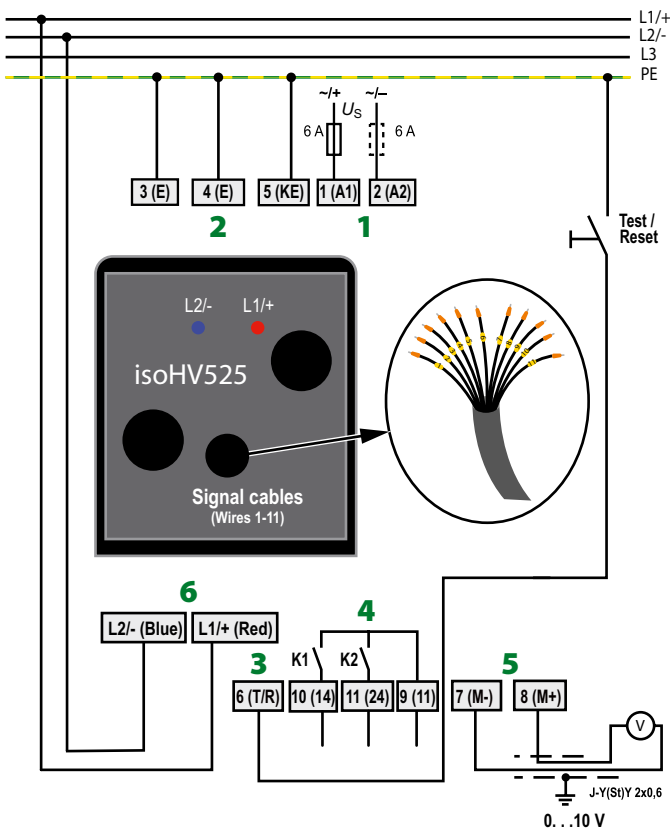


**Standards**

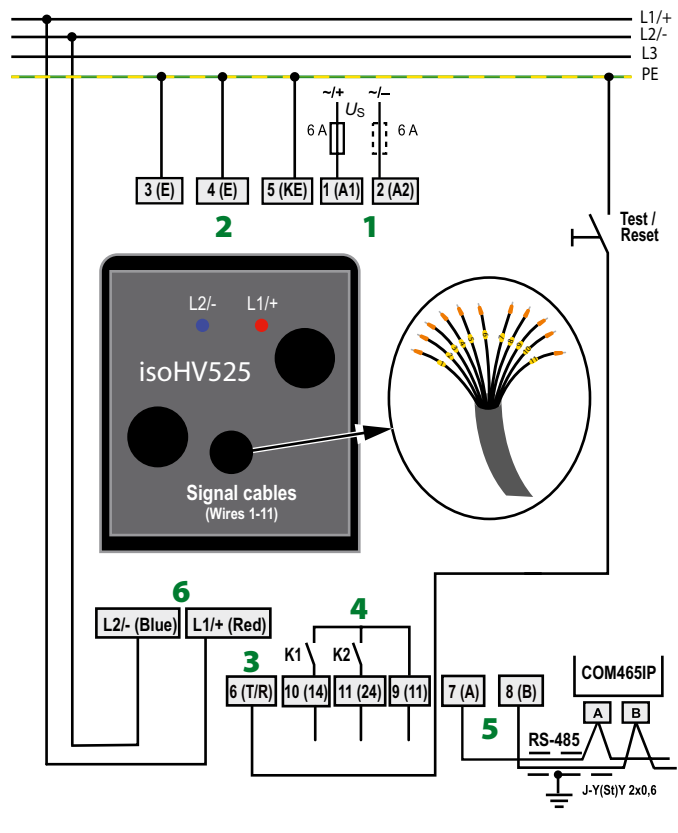
The ISOMETER® has been developed in compliance with the following standards:

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

Wiring diagram isoHV525-M4-4



Wiring diagram isoHV525-S4-4



	Wire number	Terminal	Connections
<b>1</b>	1	A1	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	A2	
<b>2</b>	3 and 4	E	Connect each terminal separately to PE
	5	KE	
<b>3</b>	6	T/R	Connection for the external combined Test/Reset button
<b>4</b>	9	11	Common connection for K1 and K2
	10	14	Connection to alarm relay K1
	11	24	Connection to alarm relay K2
<b>5</b>	7	M-	Analogue communication interface
	8	M+	
<b>6</b>	Red	L1/+	Connection to the system to be monitored
	Blue	L2/-	

	Wire number	Terminal	Connections
<b>1</b>	1	A1	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	A2	
<b>2</b>	3 and 4	E	Connect each terminal separately to PE
	5	KE	
<b>3</b>	6	T/R	Connection for the external combined Test/Reset button
<b>4</b>	9	11	Common connection for K1 and K2
	10	14	Connection to alarm relay K1
	11	24	Connection to alarm relay K2
<b>5</b>	7	A	Serial communication interface (external terminating resistor include) Example: Connection of a BMS Ethernet gateway COM465IP
	8	B	
<b>6</b>	Red	L1/+	Connection to the system to be monitored
	Blue	L2/-	

**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, M+(A), M-(B)
Rated voltage	1000 V
Overvoltage category	III
Rated impulse voltage:	
IC1/(IC2-4)	8 kV
IC2/(IC3-4)	4 kV
IC3/(IC4)	4 kV
Rated insulation voltage:	
IC1/(IC2-4)	1000 V
IC2/(IC3-4)	250 V
IC3/(IC4)	250 V
Pollution degree	3
Safe isolation (reinforced insulation) between:	
IC1/(IC2-4)	Overvoltage category III, 1000 V
IC2/(IC3-4)	Overvoltage category III, 300 V
IC3/(IC4)	Overvoltage category III, 300 V
Voltage tests (routine test) acc. 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 $U_s$	47...63 Hz
Power consumption	≤ 3 W, ≤ 9 VA

**IT system being monitored**

Nominal system voltage $U_n$	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 $C_e$	≤ 150 μF
Permissible extraneous DC voltage $U_{fg}$	≤ 1600 V

**Response values**

**ISOMETER® isoHV525-S4-4:**

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

**ISOMETER isoHV525-M4-4:**

Response value $R_{an1}$	(for customized variant refer to the name plate) 50 kΩ*
Response value $R_{an2}$	(for customized variant refer to the name plate) 25 kΩ*
Relative uncertainty $R_{an}$	±15 %, at least ±3 kΩ
Hysteresis $R_{an}$	25 %, at least 1 kΩ

**Time response (valid for isoHV525-S4-4 only)**

Response time $t_{an}$ for $R_f = 0.5 \times R_{an}$ and $C_e = 1 \mu F$ acc. to IEC 61557-8	≤ 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)*

**Measured values, storage**

**ISOMETER isoHV525-S4-4:**

Insulation resistance measured value range ( $R_f$ )	1 kΩ...4 MΩ
Operating uncertainty	±15 %, at least ±3 kΩ
Nominal system voltage measured value range ( $U_n$ )	30...1.15 kV r.m.s
Operating uncertainty	±5 %, at least ±5 V
System leakage capacitance measured value range for $R_f > 20 k\Omega$	0...200 μF
Operating uncertainty	±15 %, at least ±2 μF
Password	off/0...999 (0, off)*
Fault memory alarm messages	on/(off)*

**ISOMETER isoHV525-M4-4:**

Insulation resistance measured value range ( $R_f$ )	1 kΩ...4 MΩ
Operating uncertainty	±15 %, at least ±3 kΩ

**Serial interface (valid for isoHV525-S4-4 devices only)**

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)*

**Analogue output (valid for isoHV525-M4-4 only)**

Operating mode	mid-scale 120 kΩ
Functions	Insulation value
Voltage	0...10 V (≥ 20 kΩ)
Tolerance	±10 %, +2 % of the full scale value

**Switching elements**

Switching elements	2 x 1 N/O contact, common terminal 11
Operating principle	N/C operation/N/O operation (N/O 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 ≥ 10 V				

## Technical data (continuation)

### Environment/EMC

EMC IEC 61326-2-4, EN 50121-3-2

### Ambient temperatures:

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

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

Stationary use (IEC 60721-3-3)	3K8
Transport (IEC 60721-3-2)	2K4
Long-term storage (IEC 60721-3-1)	1K6

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

Stationary use (IEC 60721-3-3)	3M7
Transport (IEC 60721-3-2)	2M2
Long-term storage (IEC 60721-3-1)	1M3

### Connection type

isoHV525-M4-4	0.5 m cable
isoHV525-S4-4	3 m cable

### Other

Operating mode	continuous operation
Degree of protection, built-in components (DIN EN 60529)	IP65
Enclosure material	polycarbonate (filled with Wevo PUR403FL)
Screw mounting	4 x M4 (screw depth max. 7 mm)
Tightening torque	max. 3 Nm (26 lb-in)
Weight	≤ 1100 g

(\*) = Factory setting



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