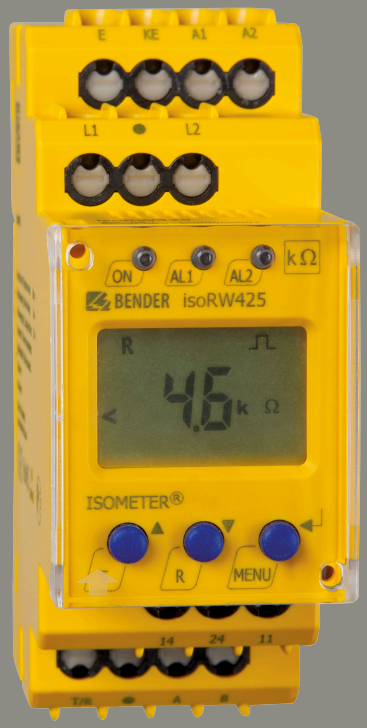
AC/DC

ISOMETER® isoRW425

Insulation monitoring device for unearthed AC-, AC/DC and DC systems in railway applications up to 3(N)AC, AC/DC 440 V



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Insulation monitoring device for unearthed AC-, AC/DC and DC systems in railway applications up to 3(N)AC, AC/DC 440 V

Device features

- Monitoring of the insulation resistance R_F (R mode) or of the insulation impedance Z_F (Z mode) for unearthed 3(N)AC, AC and DC systems with galvanically connected rectifiers or frequency converters
- Insulation impedance Z_F (Z mode) for 50 Hz or 60 Hz
- 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 300 µF in R mode and 1 µF in Z mode
- Two separately adjustable response value ranges 1…990 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 (R mode) or the insulation impedance (Z mode) of unearthed AC/DC main circuits (IT systems) with nominal system voltages of 3(N)AC, AC, AC/DC or DC 0…440 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 maximum permissible system leakage capacitance is 300 µF in R mode and 1 µF in Z mode.

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). Z mode (selectable in the “SEt” menu) calculates the insulation impedance Z_F from R_F and C_e with a system frequency parameter f_n = 50 Hz or f_n = 60 Hz. 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 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 detected fault is assignable to an alarm relay via the menu. If the values R_F, Z_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, Z_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 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

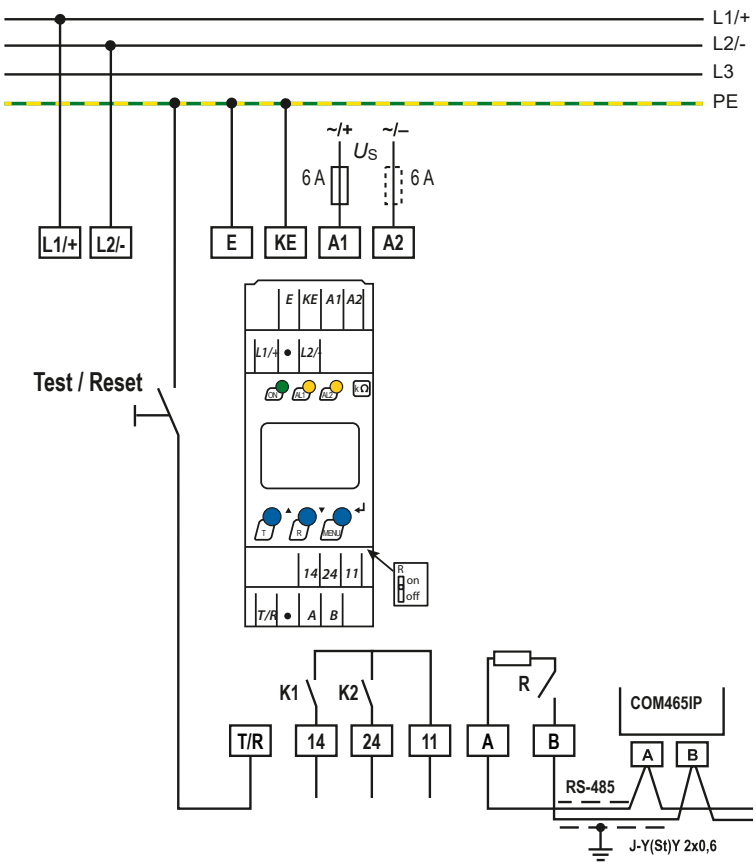
For UL applications:

Only use 60/75 °C copper lines.

For UL and CSA applications: Connect the supply voltage via 5 A fuses.

For details about the conductor cross sections required for wiring, refer to chapter Technical data.

Wiring diagram



Terminal	Connections
A1, A2	Connection to the supply voltage U_s via fuse (line protection): If supplied from an IT system, protect both lines by a fuse.
E, KE	Connect each terminal separately to PE: Use same wire cross section as for “A1”, “A2”.
L1/+, L2/–	Connection to the system to be monitored
T/R	Connection for the 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 connectable terminating resistor Example: Connection of a BMS Ethernet gateway COM465IP

Technical data isoRW425

( )* = factory setting

Insulation coordination acc. to IEC 60664-1/-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, A, B
Rated voltage	440 V
Overvoltage category	III

Rated impulse voltage

IC1/(IC2-4)	6 kV
IC2/(IC3-4)	4 kV
IC3/(IC4)	4 kV

Rated insulation voltage

IC1/(IC2-4)	500 V
IC2/(IC3-4)	250 V
IC3/(IC4)	250 V
Pollution degree	3

Protective separation (reinforced insulation) between

IC1/(IC2-4)	Overvoltage category III, 500 V
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

Monitored IT system

Nominal system voltage U_n	3(N)AC, AC 0…440V/DC 0…440 V
Nominal system voltage range U_n (UL508)	AC/DC 0…400 V
Tolerance of U_n	+15 %
Frequency range of U_n	DC, 15…460 Hz

Measuring circuit

Measuring voltage U_m	±12 V
Measuring current I_m at R_F, $Z_F = 0\ \Omega$	≤ 110 µA
Internal resistance R_i, Z_i	≥ 115 kΩ
Permissible system leakage capacitance C_e	R mode: ≤ 300 µF Z mode: ≤ 1 µF
Permissible extraneous DC voltage U_{fg}	≤ 700 V

Response values

Response value R_{an1}	2…990 kΩ (40 kΩ)*
Response value R_{an2}	1…980 kΩ (10 kΩ)*
Relative uncertainty R_{an} (R mode or $Z_F \approx R_F$)	±15 %, at least ±1 kΩ
Hysteresis R_{an}	25 %, at least 1 kΩ
Response value Z_{an1}	11…500 kΩ (off)*
Response value Z_{an2}	10…490 kΩ (off)*
Relative uncertainty Z_{an}	±15 %, at least ±1 kΩ
Hysteresis Z_{an}	25 %, at least 1 kΩ
Undervoltage detection	10…499 V (off)*
Overvoltage detection	11…500 V (off)*
Relative uncertainty U	±5 %, at least ±5 V
Relative uncertainty depending on the frequency ≥ 400 Hz	–0,015 %/Hz
Hysteresis U	5 %, at least 5 V

Time response

Response time t_{an} of $R_F = 0.5 \times R_{an}$ and C_e= 1 µF acc. to IEC 61557-8	≤ 10 s
Response time t_{an} of $Z_F = 0.5 \times Z_{an}$	≤ 5 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 … 4 MΩ
Display range measured value impedance (Z_F) with f_n = 50/60 Hz	1 kΩ … 1 MΩ
Operating uncertainty R_F in R mode, Z_F in Z mode	±15 %, at least ±1 kΩ
Display range measured value system voltage (U_n)	0…500 V_{RMS}
Operating uncertainty	±5 %, at least ±5 V
Display range measured value system leakage capacitance of R_F > 10 kΩ	0…300 µF
Operating uncertainty	±15 %, at least ±2 µF
Display range measured value system leakage capacitance of Z_F > 10 kΩ	1 nF … 1 µF
Operating uncertainty ($Z_F \approx X_c$)	±15 %, at least ±2 nF
Password	off / 0…999 (off, 0)*
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: shield connected to PE on one side	recommended: CAT6/CAT7 min. AWG23
alternative: twisted pairs, shield connected to PE on one side	J-Y(St)Y min. 2 × 0.8
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 × 1 n/o contacts, common terminal 11
Operating principle	n/c, 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
Necessary minimum contact load (relay manufacturer's reference)	10 mA / DC 5 V

Environment/EMC

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

Ambient temperatures

Operation	–40…+70 °C
Transport	–50…+85 °C
Storage	–55…+80 °C

Climatic class acc. to IEC 60721

Stationary use (IEC 60721-3-3)	3K24
Transport (IEC 60721-3-2)	2K11
Long-time 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-time 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
Flammability class	UL 94V-0
DIN rail mounting acc. to	IEC 60715
Screw mounting	2 × M4 with mounting clip
Weight	≤ 150 g

Connection

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

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
- DIN EN 50155: 2018-05
- EN 45545-2:2016
- IEC 61557-8: 2014/COR1: 2016

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

If the distance to neighbouring components that do not comply with the requirement of DIN EN 45545-2 table 2 is <20 mm horizontally or <200 mm vertically, these components shall be considered grouped.

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

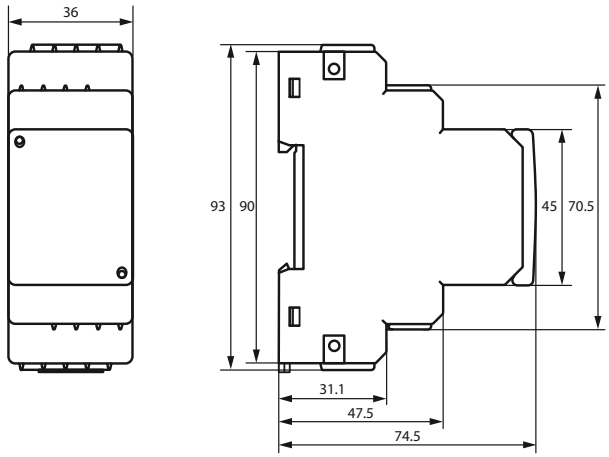
Type	Supply voltage U_s	Article number	
		Push-wire terminals	Screw-type terminals
isoRW425-D4W-4[1)]	AC 100…240 V DC 24…240 V	B71037000W	B91037000W

1) Option W: Increased shock and vibration resistance 3K23; 3M12; –40…+70 °C

Accessories

Description	Article number
Mounting clip for screw mounting	B98060008
XM420 mounting frame	B990994

Dimensions



Dimension diagram (in mm)

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