

ISOMETER® isoRW425

Insulation monitoring device for unearthed

AC, AC/DC and DC systems (IT systems)

for railway applications up to 3(N)AC, AC/DC 400 V



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Device characteristics

- Monitoring of the insulation resistance (R mode) or the insulation impedance (Z mode) of unearthed 3(N)AC, AC and DC systems (IT systems) with galvanically connected rectifiers or inverters
- Insulation impedance (Z mode) for 50 Hz or 60 Hz
- Measurement of the nominal system voltage (RMS) 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 300 µF in R mode and 1 µF in Z mode
- Automatic device self test with connection monitoring
- Selectable start-up delay, response delay and delay on release
- Two separately adjustable response ranges of 1...990 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) interface 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 changes of parameters

Approvals



Product description

The ISOMETER® monitors the insulation resistance (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...400 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. Due to the separate supply voltage, de-energised systems can also be monitored. The maximum permissible system leakage capacitance C_e is 300 µF in R mode and 1 µF in Z mode.

Application

- AC control circuits in rolling stock according to EN 50155
- AC, DC or AC/DC circuits
- Systems including switched-mode power supplies
- Small AC-IT systems e. g. lighting systems

Function

The latest measured insulation resistance is indicated on the LC display. This way any changes, for example when outgoing circuits are connected to the system, can be recognised easily. When the value falls below the preset response value, 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 adjustable 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 switch back to their initial position.

The fault location, shown on the display as a percentage, indicates the distribution of the insulation resistance between conductors L1/+ and L2/-. The alarm relays can be assigned to a detected fault or the faulty conductor in the menu. 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. The device is configured via the LC display and the buttons on the front, or via the RS-485 interface (BMS or Modbus).

Connection monitoring

There are 3 options to monitor the connections to the system (L1(+)/L2(-)) and earth (E/KE): automatically every 24 h, by pressing the test button and when the supply voltage is applied. In case of a line interruption, the alarm relay K2 switches, the LEDs ON/AL1/AL2 flash and a message appears on the LC display:

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

"E.01" for a fault in the connection to PE

"E.0x" for a system fault.

After eliminating the fault, the alarm relays switch back to their initial position either automatically or by pressing the reset button.

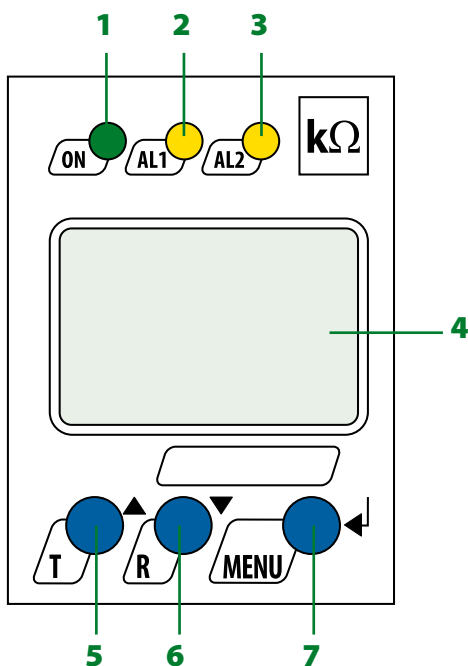
Measurement method

The ISOMETER® isoRW425 uses the AMP and PCP measurement methods.

Standards

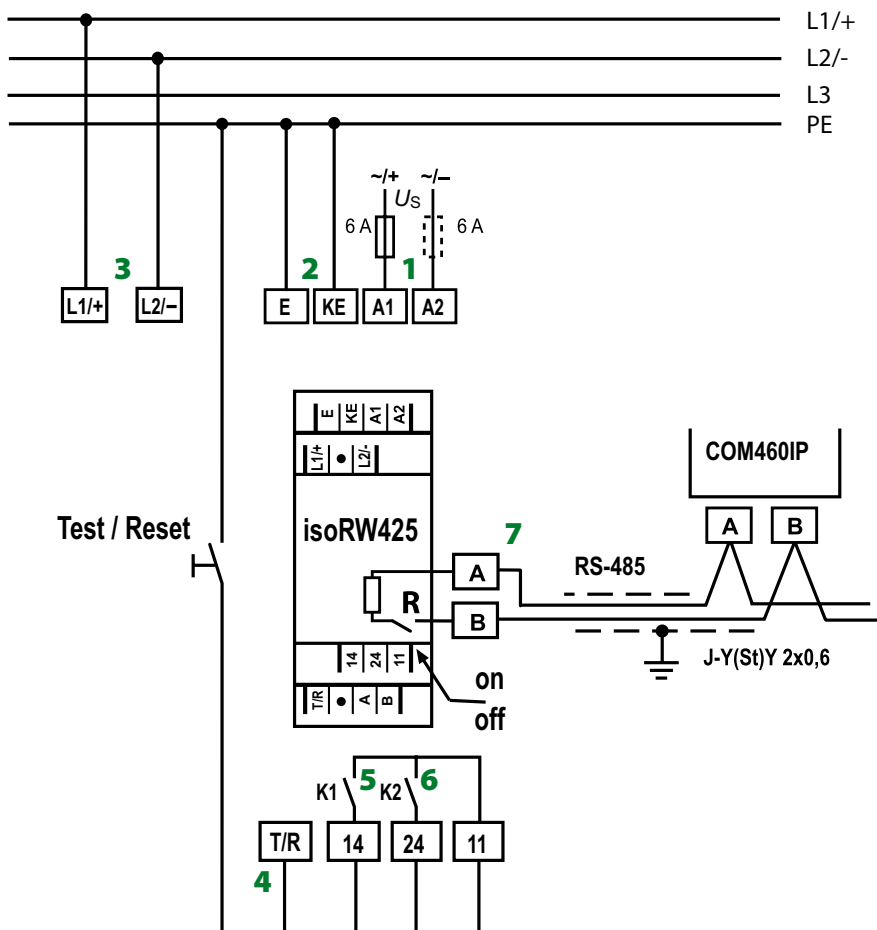
The ISOMETER® isoRW425 series complies with the requirements of the device standards: DIN EN 61557-8 (VDE 0413-8), IEC 61557-8 and EN 50155

Operating elements



- 1 - LED "ON" (operation LED) flashes in case of interruption to the connecting wires E/KE, L1(+)/L2(-) or system faults.
- 2 - Alarm LED "AL1" lights when the values fall below the set response value Alarm 1 and flashes in case of interruption to the connecting wires E/KE, L1(+)/L2(-) or system faults as well as in the case of 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 to the connecting wires E/KE, L1(+)/L2(-) or system faults as well as in the case of undervoltage (can be activated).
- 4 - LC display
- 5 - Test button "T": to call up the self test
Arrow up button: to change parameters, to move upwards in the menu
- 6 - Reset button "R": to delete stored insulation fault alarms
Down button: to change parameters, to move downwards in the menu
- 7 - Menu button "MENU": to call up the menu system
Enter button: to confirm parameter changes

Wiring diagram



- 1 - 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 - Connect each terminal separately to PE: The same wire cross section as for A1, A2 must be used.
- 3 - Connection to the 3(N)AC, AC or DC system to be monitored
- 4 - Connection for the external combined test and reset button.
- 5 - Connection to alarm relay K1
- 6 - Connection to alarm relay K2
- 7 - RS-485 communication interface with connectable terminating resistance.
Example: Connection of a BMS-Ethernet gateway COM460IP.

Technical data

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

Rated voltage (A1, A2) - (11, 14, 24)	300 V
Rated impulse withstand voltage	4 kV
Rated voltage (L1/+, L2/-, E, KE, T/R, A, B)	400 V
Rated impulse withstand voltage	6 kV
Overvoltage category	III
Pollution degree	3
Protective separation (reinforced insulation) between (A1, A2) - (L1/+, L2/-, E, KE, T/R, A, B) - (11, 14, 24)	
Voltage tests according to IEC 61010-1	2.2 kV

Supply voltage

Voltage tests according to 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	3(N)AC, AC/DC 0...400 V
Tolerance of U_n	+25 %
Frequency range of U_n	DC, 15...460 Hz

Measuring circuit

Measuring voltage U_m	± 12 V
Measuring current I_m at $R_F, Z_F = 0 \Omega$	$\leq 110 \mu$ A
Internal resistance R_i, Z_i	≥ 115 k Ω
Permissible system leakage capacitance C_e (R mode)	$\leq 300 \mu$ F
Permissible system leakage capacitance C_e (Z mode)	$\leq 1 \mu$ F
Permissible extraneous DC voltage U_{fg}	≤ 700 V

Response values

Response value R_{an1}	2...990 k Ω (40 k Ω)*
Response value R_{an2}	1...980 k Ω (10 k Ω)*
Relative uncertainty R_{an} (R mode or $Z_F \approx R_F$)	± 15 %, at least ± 1 k Ω
Hysteresis R_{an}	25 %, at least 1 k Ω
Response value Z_{an1}	11...500 k Ω (off)*
Response value Z_{an2}	10...490 k Ω (off)*
Relative uncertainty Z_{an}	± 15 %, at least ± 1 k Ω
Hysteresis Z_{an}	25 %, at least 1 k Ω
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} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu$ F acc. to IEC 61557-8	≤ 10 s
Response time t_{an} at $Z_F = 0.5 \times Z_{an}$	≤ 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, multifunctional, not illuminated
Display range measured value insulation resistance (R_F)	1 k Ω ...4 M Ω
Display range measured value impedance (Z_F) with $f_n = 50/60$ Hz	1 k Ω ...1 M Ω
Operating uncertainty (R_F in R mode, Z_F in Z mode)	± 15 %, at least ± 1 k Ω
Display range measured value nominal system voltage (U_n)	0...500 V RMS
Operating uncertainty	± 5 %, at least ± 5 V
Display range measured value system leakage capacitance $R_F > 10$ k Ω	0...300 μ F
Operating uncertainty	± 15 %, at least $\pm 2 \mu$ F
Display range measured value system leakage capacitance $Z_F > 10$ k Ω	1 nF...1 μ F
Operating uncertainty ($Z_F \approx X_C$)	± 15 %, at least ± 2 nF
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 (can be set), isoData (115.2 kbit/s)
Cable length (9.6 kbit/s)	≤ 1200 m
Cable (twisted pair, one end of shield connected to PE) :	min. J-Y(St)Y 2x0.6 (recommended)
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 contact, common terminal 11
Operating principle	N/C operation or N/O operation (N/C operation)*
Electrical endurance in rated operating conditions	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, DIN EN50121-3-2
Ambient temperatures:	
Operation	-40...+70 $^{\circ}$ C
Transport	-50...+80 $^{\circ}$ C
Storage	-55...+80 $^{\circ}$ C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (no condensation, no formation of ice)
Transport (IEC 60721-3-2)	2K3
Long-term storage (IEC 60721-3-1)	1K4
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	push-wire terminal
Connection properties:	
rigid	0.2...2.5 mm ² (AWG 24...14)
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

Other

Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically
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
Documentation number	D00052
Weight	≤ 150 g

(*) = Factory setting

Ordering information

Nominal system voltage U_n		Supply voltage ¹⁾ U_s		System leakage capacitance C_e	Type	Art. No.
3(N)AC, AC/DC	DC	AC	DC			
0...400 V	15...460 Hz	100...240 V, 47...63 Hz	24...240 V	< 300 µF	isoRW425-D4W-4	B 7103 7000W

Device version with screw terminals on request.¹⁾ Absolute values

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B 9806 0008

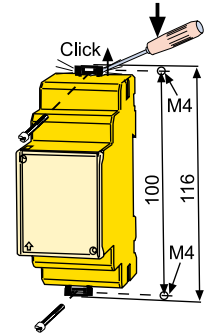
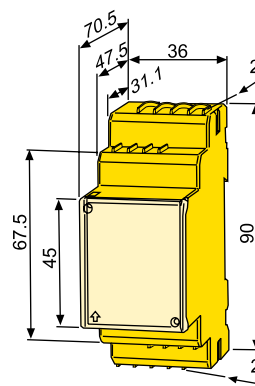
Dimension diagram XM420

Dimensions in mm

Open the front plate cover in direction of arrow!

Screw mounting

Note: The upper mounting clip must be ordered separately (see ordering information).





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