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 440 V
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 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.

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 \( t_{\text{on}} \) starts. Once the response delay \( t_{\text{on}} \) 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® 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
• DIN EN 45545-2:2016
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 - A1, A2 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 - 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 3(N)AC, AC or DC system to be monitored
4 - T/R Connection for the external combined test and reset button.
5 - 11, 14 Connection to alarm relay K1
6 - 11, 24 Connection to alarm relay K2
7 - A, B RS-485 communication interface with connectable terminating resistance.

* For UL applications:
   Only use 60/75°C copper lines!
   For UL and CSA applications, it is mandatory to use 5 A fuses for the protection of the supply voltage.
Technical data

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

Definitions:
- Measuring circuit (IC1)
- Supply circuit (IC2)
- Output circuit (IC3)
- Control circuit (IC4)

Rated voltage: 440 V

Overvoltage category: III

Tolerance of Rated system voltage range: ± 5 %, at least ± 5 V

Response value (an): ± 5 %, at least ± 1 k

Relative uncertainty: ± 15 %, at least ± 2 μF

Overvoltage detection: 11…500 V (off)*

Undervoltage detection: 10…490 V (off)*

Hysteresis: ± 5 %, at least ± 5 V

Frequency range: 47…63 Hz

Supply voltage

Supply voltage Uₚ: AC 100…240 V/DC 24…240 V

Tolerance of Uₚ: ± 10 %

Frequency range of Uₚ: 47…63 Hz

Power consumption: ≤ 3 W, ≤ 9 VA

Time response

Response time tₚ of Rₜ = 0.5 x Rₘₚ and Cₙ = 1 μF according to IEC 61557-8 ≤ 10 s

Response time tₙ of Zₜ = 0.5 x Zₘₙ ≤ 5 s

Start-up delay τₚ: 0…10 s (0 s)*

Response delay τₙ: 0…99 s (0 s)*

Delay on release τₚ: 0…99 s (0 s)*

Access to display, memory

Display: LC display, multi-functional, not illuminated

Display range measured value insulation resistance (Rᵢ):
-0.15 %/Hz

Display range measured value impedance (Zᵢ):

Display range measured value nominal system voltage (Uₚ):

Display range measured value system leakage capacitance of Rₜ > 10 kΩ ≤ 300 μF

Display range measured value system leakage capacitance of Zₜ > 10 kΩ ≤ 1 nF

Display range measured value system leakage capacitance of Xₜ ≤ 1 μF

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: ≤ 1200 m

Cable: twisted pairs, shield connected to PE on one side

Min. J-Y(St)Y 2x0.6

Terminating resistor: 120 Ω

Cable length: ≤ 1200 m

Baud rate: BMS (9.6 kbit/s), Modbus RTU (selectable), isoData (115.2 kbit/s)

Interface protocol: RS-485/BMS, Modbus RTU, isoData

Environmental class acc. to IEC 60721-3-1

Ambient temperatures: -50…+85 °C

Climatic class acc. to IEC 60721:
- Stationary use (IEC 60721-3-3): 3K7
- Transport (IEC 60721-3-2): 3K7

Classification of mechanical conditions acc. to IEC 60721

Stationary use (IEC 60721-3-3): 3K7

Transport (IEC 60721-3-2): 3K7

Long-term storage (IEC 60721-3-1): 3K7

Long-term storage (IEC 60721-3-2): 3K7

Long-term storage (IEC 60721-3-3): 3K7
Technical data

Connection

<table>
<thead>
<tr>
<th>Connection type</th>
<th>Screw-type terminal or push-wire terminal</th>
</tr>
</thead>
</table>

Screw-type terminal:

<table>
<thead>
<tr>
<th>Nominal current</th>
<th>≤ 10 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tightening torque</td>
<td>0.5…0.6 Nm (5…7 lb-in)</td>
</tr>
<tr>
<td>Conductor sizes</td>
<td>AWG 24-12</td>
</tr>
<tr>
<td>Stripping length</td>
<td>8 mm</td>
</tr>
<tr>
<td>rigid/flexible</td>
<td>0.2…2.5 mm²</td>
</tr>
<tr>
<td>flexible with ferrules with/without plastic sleeve</td>
<td>0.25…2.5 mm²</td>
</tr>
<tr>
<td>Multi-conductor rigid</td>
<td>0.2…1.5 mm²</td>
</tr>
<tr>
<td>Multi-conductor flexible</td>
<td>0.2…1.5 mm²</td>
</tr>
<tr>
<td>Multi-conductor flexible with ferrules without plastic sleeve</td>
<td>0.25…1.5 mm²</td>
</tr>
<tr>
<td>Multi-conductor flexible with TWIN ferrules with plastic sleeve</td>
<td>0.25…1.5 mm²</td>
</tr>
</tbody>
</table>

Push-wire terminal:

<table>
<thead>
<tr>
<th>Nominal current</th>
<th>≤ 10 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductor sizes</td>
<td>AWG 24-14</td>
</tr>
<tr>
<td>Stripping length</td>
<td>10 mm</td>
</tr>
<tr>
<td>Rigid</td>
<td>0.2…2.5 mm²</td>
</tr>
<tr>
<td>flexible without ferrules</td>
<td>0.75…2.5 mm²</td>
</tr>
<tr>
<td>flexible with ferrules with/without plastic sleeve</td>
<td>0.25…2.5 mm²</td>
</tr>
<tr>
<td>Multi-conductor flexible with TWIN ferrules with plastic sleeve</td>
<td>0.5…1.5 mm²</td>
</tr>
<tr>
<td>Opening force</td>
<td>50 N</td>
</tr>
<tr>
<td>Test opening, diameter</td>
<td>2.1 mm</td>
</tr>
</tbody>
</table>

Ordering information

<table>
<thead>
<tr>
<th>Nominal system voltage $U_n$</th>
<th>Supply voltage $U_S$</th>
<th>System leakage capacitance $C_e$</th>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3(N)AC, AC/DC</td>
<td>AC</td>
<td>DC</td>
<td>≤ 300 μF</td>
<td>Screw-type terminal</td>
</tr>
<tr>
<td>0…440 V, 15…60 Hz</td>
<td>100…240 V, 47…63 Hz</td>
<td>24…240 V</td>
<td>isoRW425-D4W-4</td>
<td>B91037000W</td>
</tr>
</tbody>
</table>

Accessories

<table>
<thead>
<tr>
<th>Description</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting clip for screw mounting</td>
<td>(1 piece per device)</td>
</tr>
</tbody>
</table>

Other

<table>
<thead>
<tr>
<th>Operating mode</th>
<th>continuous operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting</td>
<td>cooling slots must be ventilated vertically</td>
</tr>
<tr>
<td>Degree of protection, built-in components (DIN EN 60529)</td>
<td>IP30</td>
</tr>
<tr>
<td>Degree of protection, terminals (DIN EN 60529)</td>
<td>IP20</td>
</tr>
<tr>
<td>Enclosure material</td>
<td>polycarbonate</td>
</tr>
<tr>
<td>DIN rail mounting acc. to</td>
<td>IEC 60715</td>
</tr>
<tr>
<td>Screw fixing</td>
<td>2 x M4 with mounting clip</td>
</tr>
<tr>
<td>Flammability class</td>
<td>UL94 V-0</td>
</tr>
<tr>
<td>Documentation number</td>
<td>D00052</td>
</tr>
<tr>
<td>Weight</td>
<td>≤ 150 g</td>
</tr>
</tbody>
</table>

( )* = factory setting

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).