ISOMETER® isoEV425/isoEV425HC
with coupling device AGH420
Insulation monitoring device for unearthed DC circuits (IT systems) for charging electric vehicles
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Insulation monitoring device for unearthed DC circuits (IT systems)
for charging electric vehicles

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Product description
The ISOMETER® of the isoEV425 or isoEV425HC series monitors the insulation resistance of unearthed AC/DC main circuits (IT systems) with nominal system voltages of 3(N)AC, AC/DC 0...690 V or DC 0...1000 V. The main application areas are unearthed DC charging stations (mode 4 acc. to IEC 61851-23) for electric vehicles (IT systems) with nominal voltages of DC 0...1000 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. A separate supply voltage allows deenergised systems to be monitored as well. The maximum permissible system leakage capacitance $C_e$ is 5 μF (for isoEV425) and 20 μF (for isoEV425HC).

The ISOMETER® is always used in conjunction with the coupling device AGH420.

Application
• DC charging stations for electric vehicles according to IEC 61851-23

Function
The currently measured insulation resistance is indicated on the LC display. The ISOMETER®s are factory-set to two response values 100/500 kΩ. If the reading is below the selected response value, the response delay $t_{on}$ begins. 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 the two isolated response values/alarm relays, 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 point of fault L+, L- or the symmetrical insulation resistance is indicated on the display. In the menu, the alarm relays can also be assigned to the point of fault. By activating the fault memory, the alarm relays and alarm LEDs remain in alarm state until the reset button is pressed or the supply voltage is disconnected. The device functions can be checked using the test button. Parameters are assigned to the device via the LCD and the control buttons on the front panel, as well as the BMS or Modbus RTU Interface.

Connection monitoring
The connections to the electrical system (L1+/L2/-) and earth (E/KE) as well as the connecting wires from the Isometer® to the coupling device are periodically monitored every 24 hours after pressing the test button and connecting the supply voltage. In case of interruption of a connecting wire, the alarm relay K2 switches, the LEDs ON//AL1//AL2 flash and a message appears on the LC display as follows:

“E.0x” for a fault in the connecting wires between both devices or system fault,
“E.02” for a fault in the connecting wires to the system,
“E.01” for a fault in the connecting wires to PE.

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

Measurement method
The ISOMETER® isoEV425 works with different measurement methods adapted to the application with a maximum response time of 10 s.

Standards
The ISOMETER® has been developed in compliance with the following standards:
• DIN EN 61557-8 (VDE 0413-8):2015-12/Ber1:2016-12
• IEC 61557-8 -8:2014/COR1:2016
### Operating elements

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

### Wiring diagram

1. **Connection to the supply voltage via a fuse. If 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 is to be used.**
3. **Connection to the 3(N)AC, AC or DC system to be monitored.**
4. **Connect the terminals of the AGH420 to the corresponding terminals of the ISOMETER*.**
5. **Connection for external combined test and reset button.**
6. **Connection to alarm relay K1**
7. **Connection to alarm relay K2**
8. **RS-485 communication interface with selectable terminating resistance.**

*For UL applications:
Only use 60/75°C copper lines! UL and CSA applications require the supply voltage to be protected via 5 A fuses.
Technical data ISOMETER® isoEV425

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

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

Rated voltage: 240 V
Overvoltage category: III
Rated impulse voltage:
  - IC2/(IC3-4): 4 kV
  - IC3/(IC4): 4 kV
Rated insulated voltage:
  - IC2/(IC3-4): 250 V
  - IC3/(IC4): 250 V
Polution degree: 3

Protective separation (reinforced insulation) between:
- 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) Overvoltage category III, 300 V

Supply voltage:
- Supply voltage $U_s$: AC 100…240 V/DC 24…240 V
- Tolerance of $U_s$: -30…+15 %
- Frequency range $f_s$: 47…63 Hz
- Power consumption: $\leq 3$ W, $\leq 9$ VA

IT system being monitored
- Nominal system voltage $U_n$: 3(N)AC, AC 0…690 V/DC 0…1000 V
- Tolerance of $U_n$: AC + 15 %, DC + 10 %
- Nominal system voltage range $U_n$ with AGH420 (UL508): AC/DC 0…600 V
- Frequency range of $f_n$: DC, 40…460 Hz

Measuring circuit
- Permissible system leakage capacitance $C_{p}$ (isoEV425): $\leq 5$ μF
- Permissible system leakage capacitance $C_{p}$ (isoEV425HC): $\leq 20$ μF
- Permissible extraneous DC voltage $U_{q}$: $\leq 1150$ V

Response values
- Response value $R_{\text{min}}$ (isoEV425): 2…500 kΩ (500 kΩ)*
- Response value $R_{\text{min}}$ (isoEV425HC): 2…500 kΩ (200 kΩ)*
- Response value $R_{\text{min}}$ (isoEV425): 1…490 kΩ (100 kΩ)*
- Operating uncertainty $R_{\text{op}}$ (≤ 5 μF): $\pm 15$ %, at least ± 1 kΩ
- Operating uncertainty $R_{\text{op}}$ (> 10 kΩ): $\pm (5 \% R_{\text{op}}/100$ kΩ $+$ 10%)
- Hysteresis $H_{\text{res}}$: 25 %, at least 1 kΩ
- Undervoltage detection: $30…11.4$ V (off)*
- Overvoltage detection: $31…11.5$ V (off)*
- Relative uncertainty $U$: $\pm 5$ %, at least ± 5 V
- Relative uncertainty depending on the frequency $\geq 200$ Hz: $-0.03$ %/Hz
- Hysteresis $H_{\text{res}}$: 5 %, at least ± 5 V

Time response
- Response time $t_{\text{res}}$ at $R_{\text{f}} = 5$ x $R_{\text{min}}$ and $C_{\text{res}} = 1$ μF acc. to IEC 61557-8: $\leq 10$ s
- Start-up delay $t_{\text{start}}$: $0…10$ s (0 s)*
- Response delay $t_{\text{res}}$: $0…99$ s (0 s)*
- Delay on release $t_{\text{off}}$: $0…99$ s (0 s)*

Displays, memory
- Display: LC display, multi-functional, not illuminated
- Display range measured value insulation resistance $R_{\text{f}}$: 1 kΩ…1 MΩ
- Operating uncertainty $R_{\text{op}}$ (≤ 5 μF): $\pm 15$ %, at least ± 1 kΩ
- Operating uncertainty $R_{\text{op}}$ (> 10 kΩ, isoEV425HC): $\pm (5 \% R_{\text{op}}/100$ kΩ $+$ 10%)
- Display range measured value nominal system voltage $U_n$: 30…11.5 kV r.m.s.
- Operating uncertainty: $\pm 5$ %, at least ± 5 V
- Relative uncertainty depending on the frequency $\geq 200$ Hz: $-0.03$ %/Hz
- Display range measured value system leakage capacitance $R_{\text{f}} > 10$ kΩ (isoEV425): $0…10$ μF
- Display range measured value system leakage capacitance $R_{\text{f}} > 10$ kΩ (isoEV425HC): $0…25$ μF
- Operating uncertainty: $\pm 15$ %, at least ± 2 μF
- 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 (selectable), isoData (115.2 kBit/s)
- Cable length: 1200 m
- Cable: twisted pairs, shield connected to PE on one side
- Terminal 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 contacts, common terminal
- Operating principle: N/C operation/N/O operation (N/O operation)*
- Electrical endurance, number of cycles: 10000

Contact data acc. to IEC 60947-5-1:
- Utilisation category: AC-12, AC-14, DC-12, DC-12, DC-12, DC-12
- Rated operational voltage: 230 V, 240 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
- 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 60721-3-1): 3K7 (except condensation and formation of ice)
- Transport (IEC 60721-3-2): 3K4 (except condensation and formation of ice)
- Long-term storage (IEC 60721-3-3): 1K5 (except condensation and formation of ice)

Classification of mechanical conditions acc. to IEC 60721
- Stationary use (IEC 60721-3-1): 3M4
- Transport (IEC 60721-3-2): 2M2
- Long-term storage (IEC 60721-3-1): 1M3

Connection
- Connection type: screw-type terminal or push-wire terminal

Screw-type terminals:
- Nominal current: $\leq 10$ A
- Tightening torque: 0.5…0.6 Nm (5…7 lb-in)
- Conductor sizes: AWG 24-12
- Stripping length: 8 mm
- Flexible:
  - Rig/Rigid: 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
  - 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: 0.5…1.5 mm²
Technical data ISOMETER® isoEV425 (continued)

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, diameter: 2.1 mm

Wiring of the terminals Up, AK1, GND, AK2 refer to technical data AGH420 under the heading “Connection”

Technical data coupling device AGH420

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 insulated voltage:
  - IC1/(IC2): 1000 V
- Pollution degree: 3
- Protective separation (reinforced insulation) between:
  - IC1/(IC2): Overvoltage category III, 1000 V

Monitored IT system
- Nominal system voltage range: U
- Nominal system voltage range: U
- Tolerance of U: AC/DC +10 %
- Measuring circuit:
  - Measuring voltage: U
  - Measuring current: I
  - Measuring resistance: R
  - Power voltage: U
  - Power current: I
  - Power resistance: R
  - Internal resistance: DC R
  - ± 45 V
  - ≤ 400 μA
  - ≥ 120 kΩ

Environment/EMC
- EMC: IEC 61326-2-4

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): K37 (except condensation and formation of ice)
- Transport (IEC 60721-3-2): K24 (except condensation and formation of ice)
- Long-term storage (IEC 60721-3-1): K15 (except condensation and formation of ice)

Classification of mechanical conditions acc. to IEC 60721:
- Stationary use (IEC 60721-3-3): M3
- Transport (IEC 60721-3-2): M2
- Long-term storage (IEC 60721-3-1): M1

Other
- Operating mode: Continuous operation
- Mounting: cooling slots must be ventilated vertically
- Distance to adjacent devices from U > 800 V: ≥ 30 mm
- 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
- Weight: ≤ 150 g

Connection
- Connection type screw-type terminal or push-wire terminal
- Screw-type 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 plastic sleeve: 0.25…2.5 mm²
  - Multi-conductor flexible with 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 plastic sleeve: 0.25…2.5 mm²
  - Multi-conductor flexible with ferrules with plastic sleeve: 0.25…1.5 mm²

Single cables for terminals Up, AK1, GND, AK2:
- Cable lengths: ≤ 0.5 m
- Connection properties: ≥ 0.75 mm²

Other
- Operating mode: Continuous operation
- Mounting: cooling slots must be ventilated vertically
- Distance to adjacent devices from U > 800 V: ≥ 30 mm
- 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
- Weight: ≤ 150 g

( )* = factory setting
Example of application

**TN-C-S system**

<table>
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<tr>
<th>Source</th>
<th>Distribution</th>
<th>Installation</th>
<th>Feeder</th>
<th>Input</th>
<th>DC charger</th>
<th>Cable assembly</th>
<th>Vehicle connector</th>
<th>Vehicle inlet</th>
<th>Electric vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

**Mode 4 IT system**

- **Load Switch**
- **F**
- **F**

**Vehicle inlet**

**Cable assembly**

**DC**

**DC+**

**DC−**

**CP**

**PE**

**Example of application**

**Ordering information**

<table>
<thead>
<tr>
<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></td>
<td>AC</td>
<td>DC</td>
<td>Screw-type terminal</td>
</tr>
<tr>
<td>100…240 V, 47…63 Hz</td>
<td>≤ 5 μF</td>
<td>isoeV425-4-4 with AGH420</td>
<td>B91036401</td>
</tr>
<tr>
<td></td>
<td>≤ 20 μF</td>
<td>isoeV425HC-4-4 with AGH420</td>
<td>B71036401</td>
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</table>

**Accessories**

<table>
<thead>
<tr>
<th>Description</th>
<th>Art. no.</th>
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<tr>
<td>Mounting clip for screw mounting (1 piece per device)</td>
<td>B98060008</td>
</tr>
</tbody>
</table>

**Dimension diagram XM420**

- Dimensions in mm
- Open the front plate cover in direction of arrow!

**Screw mounting**

Note: The above mounting clip is an accessory and must be ordered separately (see accessories).

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