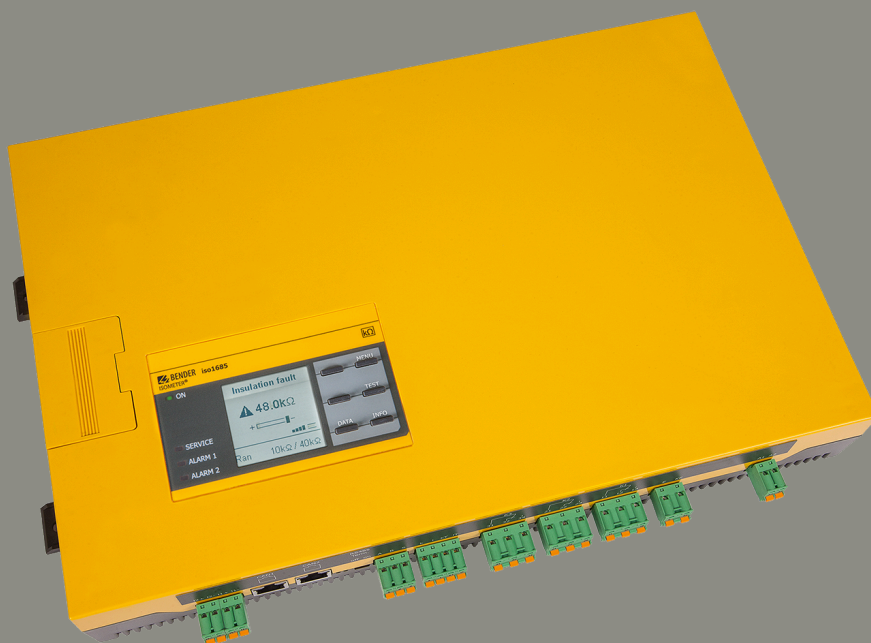


# ISOMETER® isoHR1685DW

Insulation monitoring device  
for insulated (elevating) work platforms



*Image similar*



### Intended use

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The device isoHR1685DW is used to monitor the insulation resistance of insulated elevating work platforms that allow work on live overhead lines. The device can also be used in other applications where earth clearance of working platforms must be ensured, for example in industrial hydrogen electrolyzers.

The specific measurement method **AMP<sup>PLUS</sup>** monitors the insulation resistance also in installations where extremely high system leakage capacitances to earth exist due to interference suppression methods. Adaptation event to high leakage capacitances is automatic.

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.

Intended use also includes

- the observation of all information in the operating manual and
- compliance with the test intervals in accordance with the relevant standards and operating rules.

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

Do not make any unauthorised changes to the device. Only use spare parts and optional accessories sold or recommended by the manufacturer.

Any other use than that described in this manual is regarded as improper.

### Product description

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The ISOMETER® isoHR1685DW is used for insulation monitoring of elevating work platforms and overhead catenary vehicles. Working on live overhead lines in local transport is a particularly dangerous task. To protect workers, overhead line vehicles are equipped with two insulation levels. Contamination, ageing or damage to the insulation levels can lead to currents being conducted to earth via people and cause electrical accidents.

The device is installed in the vehicle. It permanently monitors the insulation level of the work platform and informs the workers immediately if the insulation level falls below certain threshold values before and during work. In the electrochemical industry, the device monitors the ground clearance of work platforms so that personnel can work safely.

The measurement method especially developed for this purpose monitors the insulation resistance even in installations where extremely high system leakage capacitances against earth exist due to interference suppression methods. The adaptation even to system-related high leakage capacitances is automatic.

## Device features

ISOMETER® for insulated elevating work platforms and rail vehicles.

- Continuous monitoring of the insulation levels of elevating work platforms even during operation
- Measurement of high-resistance insulation faults 100 kΩ...100 MΩ
- Automatic adjustment to high system leakage capacitances
- Combination of **AMP<sup>PLUS</sup>** and other profile-specific measurement methods
- Separately adjustable response values  $R_{an1}$  (Alarm 1) and  $R_{an2}$  (Alarm 2) for prewarning and alarm
- Connection monitoring
- Device self test with automatic alarm message in the event of a fault
- History memory with real-time clock (buffer for 30 days) for storing 1023 alarm messages with date and time
- Data storage to prove the insulation condition. For the burden of proof in case of an electrical accident
- Freely programmable digital inputs/outputs
- Separate relays for insulation fault 1, insulation fault 2 and device error

### Display

- High-resolution graphic LC display for excellent readability and recording of the device status
- Graphical representation of the insulation resistance over time (isoGraph)

### Interfaces

- RS-485 interface for data exchange with other Bender devices
- Remote setting of certain parameters via the Internet (COMTRAXX® gateway)
- Remote diagnosis by the Bender service via the Internet
- RS-485 interface with Modbus RTU for transfer of data, alarms, acknowledgement via existing communication to work platform
- Modbus RTU via RS-485 interface

## Functional description

Insulation monitoring is carried out using an active measuring pulse which is superimposed onto the IT system to earth via the integrated coupling. If the insulation resistance between an elevating work platform or a railway vehicle and earth falls below the set prewarning response value  $R_{an1}$ , the LED **ALARM 1** lights up and relay **K1** switches. If the insulation resistance falls below the alarm response value  $R_{an2}$ , the LED **ALARM 2** lights up and the alarm relay **K2** switches. The relay **K3** switches in case of device or connection failures.



### Installation inside a control cabinet

*If the ISOMETER® is installed inside a control cabinet, the insulation fault message must be audible and/or visible to attract attention.*

### IT systems with several ISOMETER®s

*Only one ISOMETER® may be connected in a galvanically connected system. In IT systems that are interconnected via tie switches, ISOMETER®s that are not required must be disconnected from the IT system or switched to inactive.*

*If IT systems are coupled via capacitors or diodes, a central control of the various ISOMETER® must be used.*

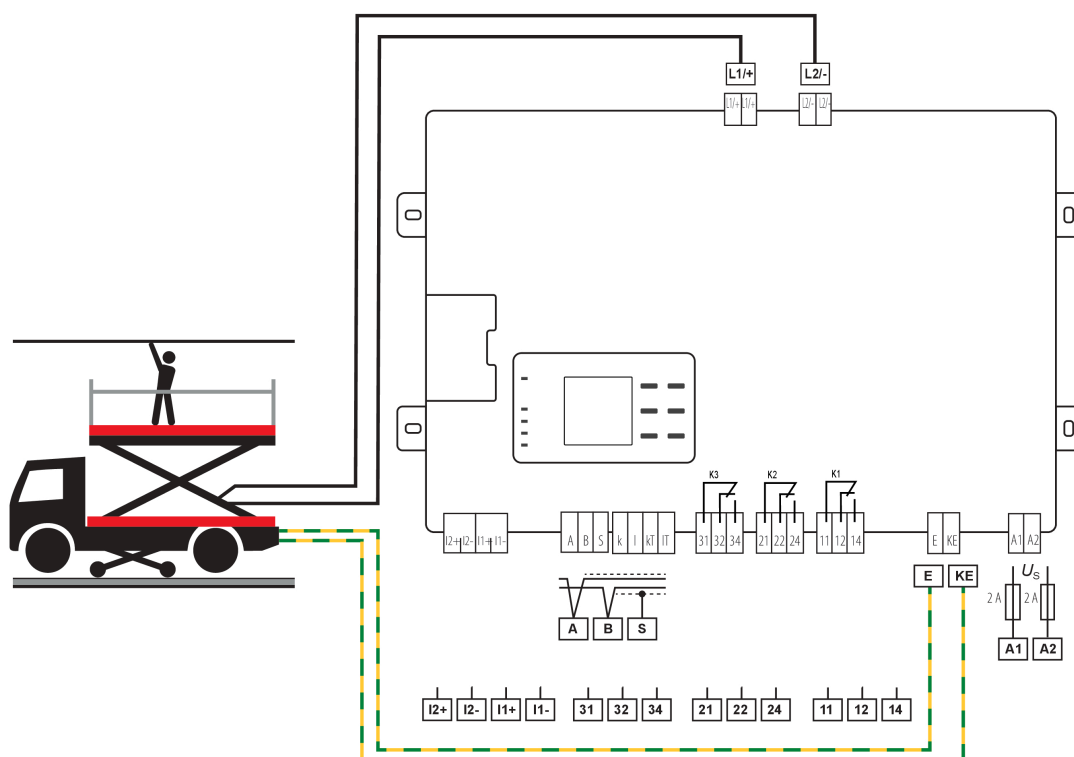
### Prevent measurement errors!

*In galvanically coupled DC circuits, an insulation fault can only be detected correctly if a minimum current of > 10 mA flows through the rectifiers.*

### Unspecified frequency range

*Depending on the application and the selected measurement profile, continuous insulation monitoring is also possible in low frequency ranges. For IT systems with frequency components above the specified frequency range, there is no influence on the insulation monitoring.*

## Connection to an elevating work platform



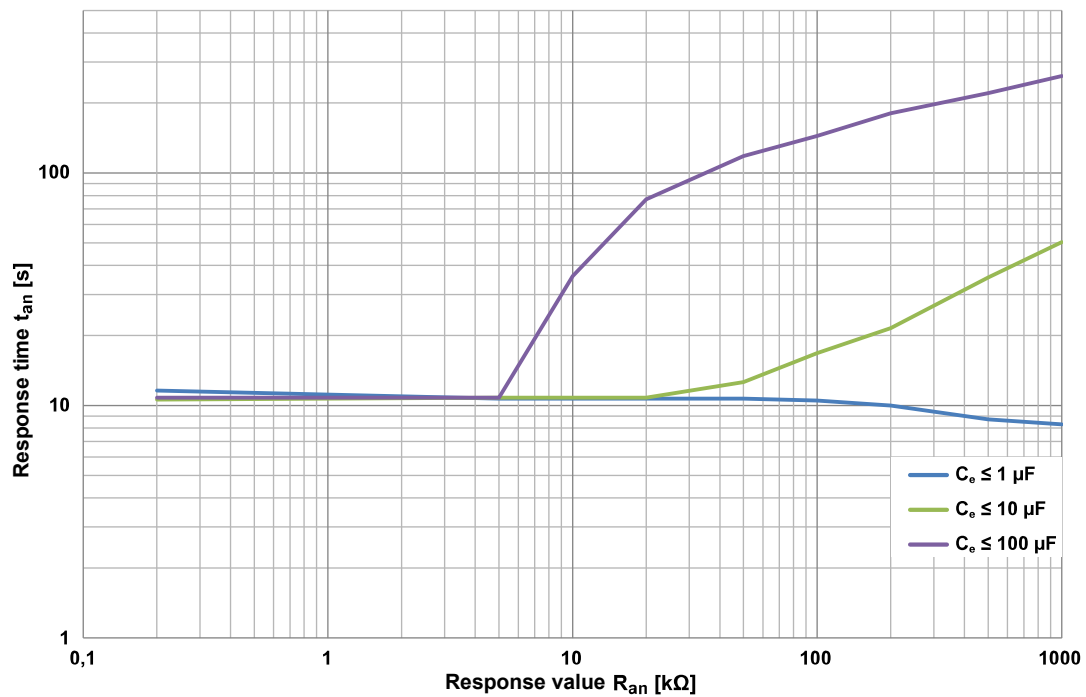
Example application

|                      |                                                                                           |
|----------------------|-------------------------------------------------------------------------------------------|
| I2+, I2–             | Digital input                                                                             |
| I1+, I1–             | Digital input                                                                             |
| CAN1, CAN2           | No function                                                                               |
| RS485 Term. off / on | RS-485 termination                                                                        |
| A, B, S              | RS-485 bus connection (A, B)<br>BMS protocol: PE potential, connect one end of shield (S) |
| k, l, kT, IT         | no function                                                                               |
| 31, 32, 34           | Relay output for internal device errors (LED <b>SERVICE</b> )                             |
| 21, 22, 24           | Relay output for alarm insulation faults (LED <b>ALARM 2</b> )                            |
| 11, 12, 14           | Relay output for prewarning insulation faults (LED <b>ALARM 1</b> )                       |
| E, KE                | Separate connection of E (earth) and KE (reference) to PE                                 |
| A1, A2               | Connection to supply voltage (via fuses, 2 A each)                                        |
| L1/+                 | Connection to L1/+ of the IT system via 1 A fuse                                          |
| L2/–                 | Connection to L2/– of the IT system via 1 A fuse                                          |

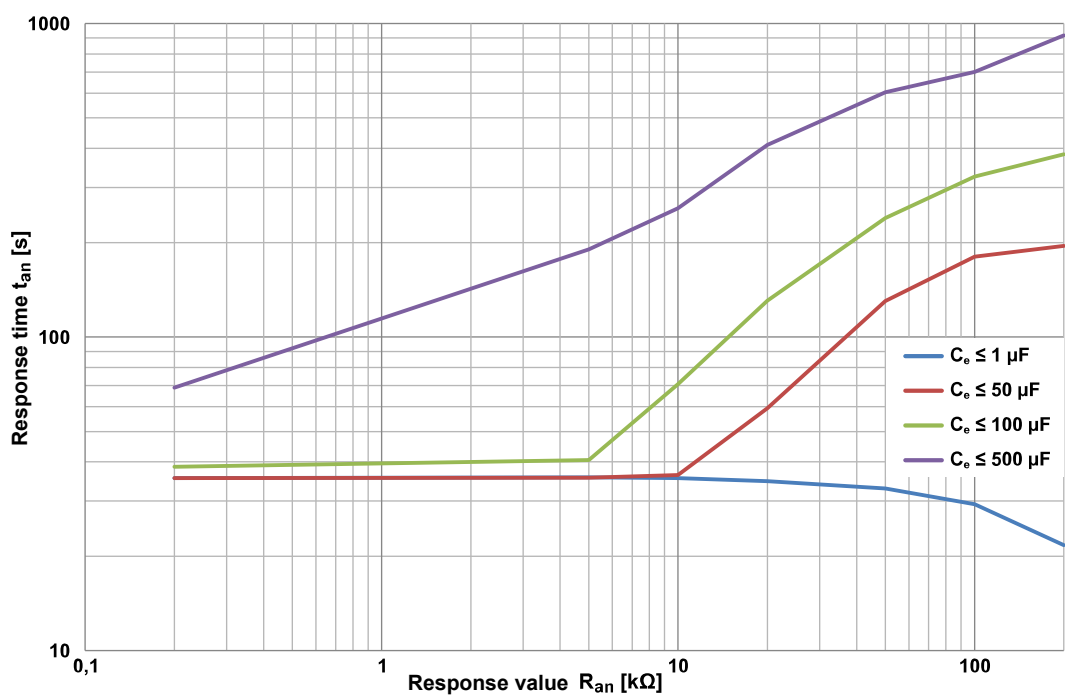
## Device profiles

The adaptation to different applications is achieved by selecting a device profile. The following device profiles are available.

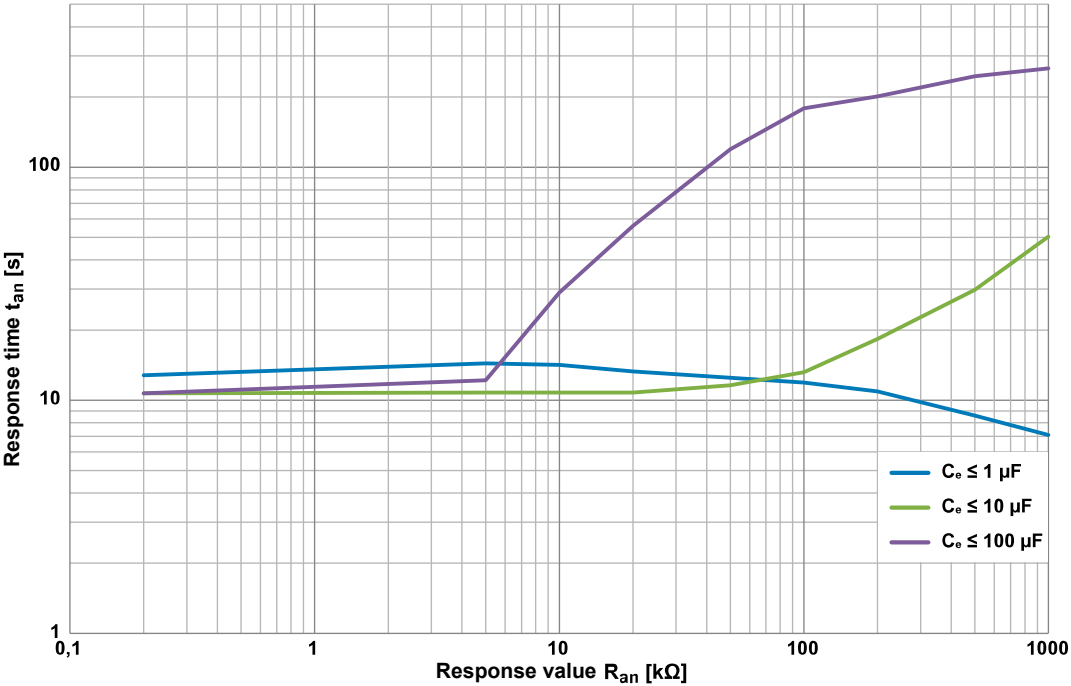
### Power circuits



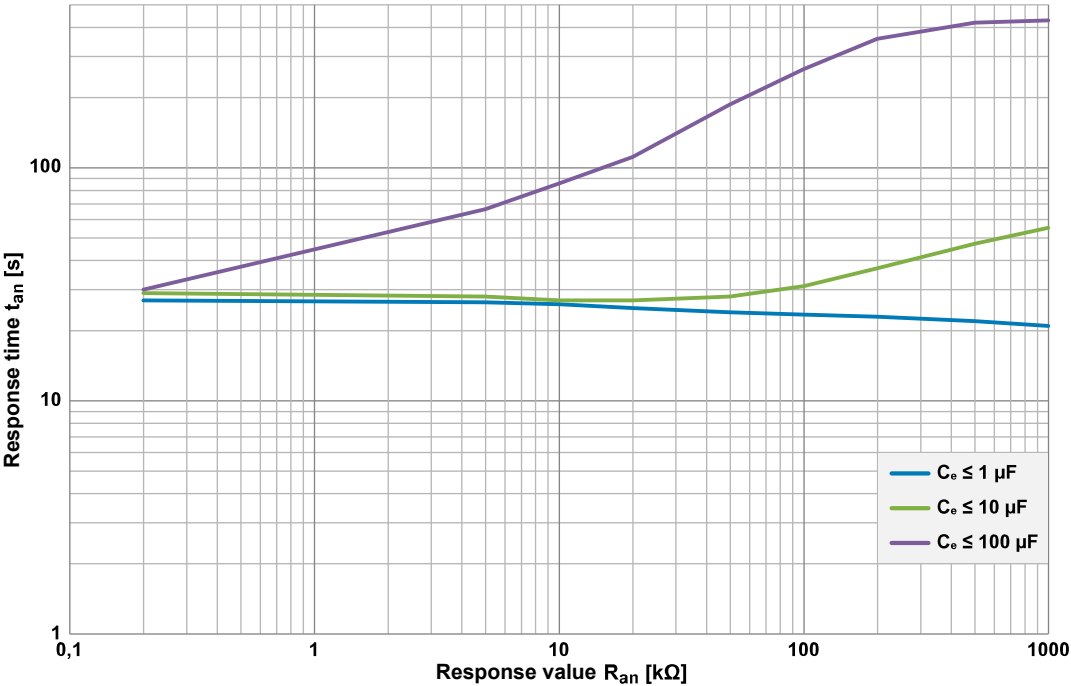
### High capacitance



Inverter > 10 Hz



Inverter < 10 Hz



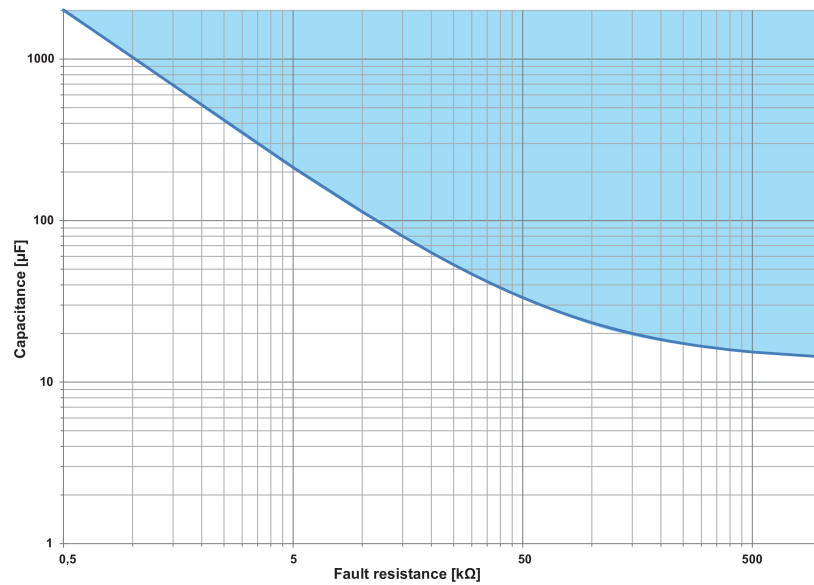
**Leakage capacitance diagram**

The determination of the leakage capacitance depends on the size of the insulation resistance. The following diagrams show the relationship

Example:

Insulation resistance 50 k $\Omega$  => min. measurable leakage capacitance 35  $\mu$ F

Insulation resistance 5 k $\Omega$  => min. measurable leakage capacitance 210  $\mu$ F



## Technical data

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

#### Definitions

|                            |                              |
|----------------------------|------------------------------|
| Measuring circuit (IC1)    | (L1/+, L2/-), (E, KE)        |
| Supply circuit (IC2)       | A1, A2                       |
| Output circuit 1 (IC3)     | 11, 12, 14                   |
| Output circuit 2 (IC4)     | 21, 22, 24                   |
| Output circuit 3 (IC5)     | 31, 32, 34                   |
| Control circuit (IC6)      | (A, B), (I1+, I1-, I2+, I2-) |
| Rated voltage              | DC 1500 V                    |
| Overvoltage category (OVC) | III                          |

#### Rated impulse voltage

|               |        |
|---------------|--------|
| IC1 / (IC2-5) | 8 kV   |
| IC2 / (IC3-5) | 4 kV   |
| IC2 / IC1+IC6 | 0.8 kV |
| IC3 / (IC4-6) | 4 kV   |
| IC4 / (IC5-6) | 4 kV   |
| IC5 / IC6     | 4 kV   |

#### Rated insulation voltage

|                  |        |
|------------------|--------|
| IC1 / (IC2-5)    | 1500 V |
| IC2 / (IC3-5)    | 250 V  |
| IC2 / IC1+IC6    | 50 V   |
| IC3 / (IC4-6)    | 250 V  |
| IC4 / (IC5-6)    | 250 V  |
| IC5 / IC6        | 250 V  |
| Pollution degree | 3      |

#### Safe isolation (reinforced insulation) between

|               |                 |
|---------------|-----------------|
| IC1 / (IC2-5) | OVC III, 1500 V |
| IC2 / (IC3-5) | OVC III, 300 V  |
| IC2 / IC1+IC6 | OVC III, 50 V   |
| IC3 / (IC4-6) | OVC III, 300 V  |
| IC4 / (IC5-6) | OVC III, 300 V  |
| IC5 / IC6     | OVC III, 300 V  |

#### Voltage test (routine test) acc. to IEC61010-1

|               |            |
|---------------|------------|
| IC1 / (IC2-5) | AC 2.2 kV  |
| IC2 / IC6     | DC ±0.5 kV |
| IC3 / (IC4-6) | AC 2.2 kV  |
| IC4 / (IC5-6) | AC 2.2 kV  |
| IC5 / IC6     | AC 2.2 kV  |

#### Supply voltage

|                      |              |
|----------------------|--------------|
| Supply voltage $U_s$ | DC 18...30 V |
| Power consumption    | ≤ 9 W        |

#### Voltage range of the system to be monitored

|                                    |                              |
|------------------------------------|------------------------------|
| Nominal system voltage range $U_n$ | AC 0...1000 V; DC 0...1500 V |
| Frequency range $f_n$              | DC 0.1...460 Hz              |
| Tolerance of $U_n$                 | AC +10 %; DC +5 %            |

### Measuring circuit for insulation monitoring

|                                                                  |                 |
|------------------------------------------------------------------|-----------------|
| Measuring voltage $U_m$ (peak)                                   | ± 50 V          |
| Measuring current $I_m$ (at $R_F = 0 \Omega$ )                   | ≤ 1 $\mu$ A     |
| Internal DC resistance $R_i$                                     | ≥ 50 M $\Omega$ |
| Impedance $Z_i$ at 50 Hz                                         | ≥ 50 M $\Omega$ |
| Permissible extraneous DC voltage $U_{ig}$                       | ≤ 1600 V        |
| Permissible system leakage capacitance $C_e$ (profile-dependent) | 0...1 $\mu$ F   |

\* for  $U_n > 500$  V no longer in accordance with IEC61557-8

### Response values for insulation monitoring

|                                                                                                                            |                                   |
|----------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Response values $R_{an}$ (profile-dependent)                                                                               | 100 k $\Omega$ ... 100 M $\Omega$ |
| Condition for response values $R_{an1}$ and $R_{an2}$                                                                      | $R_{an1} \geq R_{an2}$            |
| Upper limit of the measuring range for setting $C_{emax} = 1 \mu$ F                                                        | 24 M $\Omega$                     |
| Relative uncertainty (acc. to IEC 61557-8)                                                                                 | ±15 %                             |
| 100 k $\Omega$ ...10 M $\Omega$                                                                                            | ±200 $\Omega$ ±15 %               |
| Response time $t_{an}$ at $R_F = 0.5 \times R_{an}$ ( $R_{an} = 10$ k $\Omega$ ) and $C_e = 1 \mu$ F (acc. to IEC 61557-8) | profile-dependent, typ. 10 s      |
| Hysteresis                                                                                                                 | 25 %, +1 k $\Omega$               |

### Display

|                                                  |                                            |
|--------------------------------------------------|--------------------------------------------|
| Indicator LEDs for alarms and operating states   | 1 × green, 4 × yellow                      |
| Display                                          | Grafic display 127 × 127 pixel, 40 × 40 mm |
| Display range measured value (profile-dependent) | 100 k $\Omega$ ... 10 G $\Omega$           |

### Inputs

|                |                                                                |
|----------------|----------------------------------------------------------------|
| Operating mode | active high, active low                                        |
| Functions      | off, test, reset, deactivate device, insulation fault location |
| High level     | 10...30 V                                                      |
| Low level      | 0...0.5 V                                                      |



**Serial interface**

|                                                           |                                                      |
|-----------------------------------------------------------|------------------------------------------------------|
| Interface                                                 | RS-485                                               |
| Protocols                                                 | BMS; Modbus RTU                                      |
| Connection                                                | Terminals A/B<br>Shield: terminal S                  |
| Cable length                                              | ≤ 1200 m                                             |
| Shielded cable<br>(shield to functional earth on one end) | 2-core, ≥ 0.6 mm <sup>2</sup> , z. B. J-Y(St)Y 2x0.6 |
| Terminating resistor, can be connected (Term. RS-485)     | 120 Ω (0.5 W)                                        |
| Device address, BMS bus                                   | 2...90                                               |
| Device address, Modbus RTU                                | 1...247                                              |
| Baud rate                                                 | 9.6 / 19.2 / 38.4 / 57.6 / 115 kB                    |
| Parity                                                    | even / odd                                           |
| Stop bits                                                 | 1 / 2 / auto                                         |

**Switching elements**

|                                                       |                              |
|-------------------------------------------------------|------------------------------|
| Switching elements                                    | 3 changeover contacts:       |
| K1                                                    | Insulation fault alarm 1     |
| K2                                                    | Insulation fault alarm 2     |
| K3                                                    | Device error                 |
| Operating principle K1, K2                            | n/c operation; n/o operation |
| Operating principle K3                                | n/c operation                |
| Electrical endurance under rated operating conditions | 100,000 cycles               |

**Contact data acc. to IEC 60947-5-1:**

|                           |                                       |
|---------------------------|---------------------------------------|
| Utilisation category      | AC-13 / 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 / 3 A / 1 A / 0.2 A / 0.1 A       |
| Minimum contact rating    | 1 mA bei AC/DC ≥ 10 V                 |

**Connection (except mains connection)**

|                                                                |                                                       |
|----------------------------------------------------------------|-------------------------------------------------------|
| Connection type                                                | pluggable push-wire terminals                         |
| Connection, rigid/flexible                                     | 0.2...2.5 mm <sup>2</sup> / 0.2...2.5 mm <sup>2</sup> |
| Connection, flexible with ferrule, without/with plastic sleeve | 0.25...2.5 mm <sup>2</sup>                            |
| Conductor sizes (AWG)                                          | 24...12                                               |

**Mains connection**

|                                                                |                                                     |
|----------------------------------------------------------------|-----------------------------------------------------|
| Connection type                                                | pluggable push-wire terminals                       |
| Connection, rigid/flexible                                     | 0.2...10 mm <sup>2</sup> / 0.2...6 mm <sup>2</sup>  |
| Connection, flexible with ferrule, without/with plastic sleeve | 0.25...6 mm <sup>2</sup> / 0.25...4 mm <sup>2</sup> |
| Conductor sizes (AWG)                                          | 24...8                                              |
| Stripping length                                               | 15 mm                                               |
| Opening force                                                  | 90...120 N                                          |

**Environment / EMC**

|                     |               |
|---------------------|---------------|
| EMC                 | IEC 61326-2-4 |
| Rel. humidity       | 10...100 %    |
| Area of application | ≤ 3000 m NN   |

**Ambient temperature**

|                   |              |
|-------------------|--------------|
| Stationary use    | -40...+70 °C |
| Transport         | -40...+80 °C |
| Long-term storage | -25...+80 °C |

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

|                                   |      |
|-----------------------------------|------|
| Stationary use (IEC 60721-3-3)    | 3K23 |
| Transport (IEC 60721-3-2)         | 2K11 |
| Long-term storage (IEC 60721-3-1) | 1K22 |

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

|                                   |      |
|-----------------------------------|------|
| Stationary use (IEC 60721-3-3)    | 3M11 |
| Transport (IEC 60721-3-2)         | 2M4  |
| Long-term storage (IEC 60721-3-1) | 1M12 |

**Other**

|                                                  |                                   |
|--------------------------------------------------|-----------------------------------|
| Operating mode                                   | continuous operation              |
| Position of normal use                           | vertical, mains connection on top |
| Tightening torque for enclosure mounting (4x M5) | 1.0...1.5 Nm                      |
| Degree of protection, internal components        | IP30                              |
| Degree of protection, terminals                  | IP30                              |
| Enclosure material                               | polycarbonate                     |
| Flammability class                               | V-0                               |
| Software version                                 | D0601   D0602                     |
| Weight                                           | ≤ 1600 g                          |

**Standards and approvals**

The ISOMETER® isoHR1685DW was developed in compliance with the following standards:

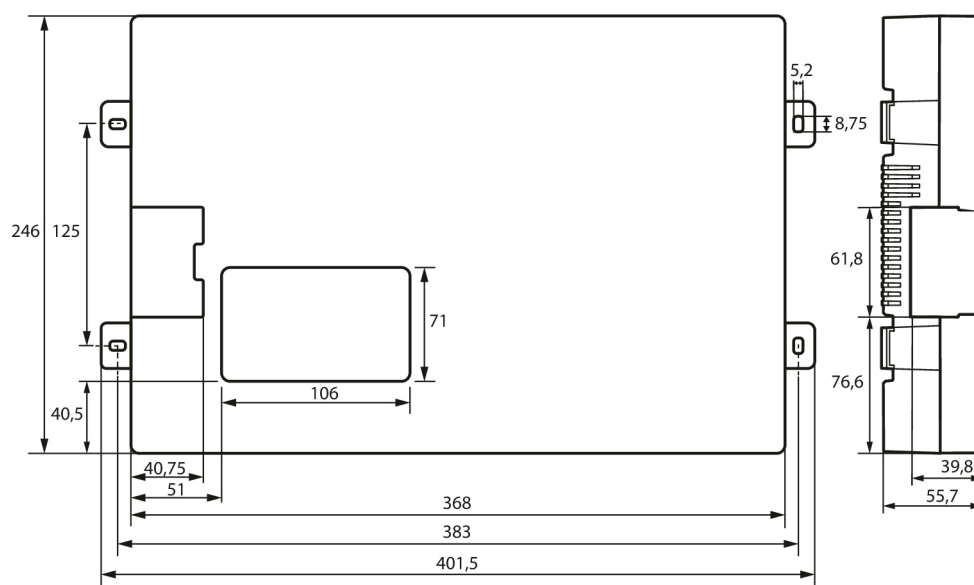
- IEC 61557-8
- IEC 61557-8 Appendix C (for profile **Fast 2000 µF** only)



## Ordering details

| Model          | Response value                   | Nom. system voltage            | Supply voltage    | Art. No.   |
|----------------|----------------------------------|--------------------------------|-------------------|------------|
| isoHR1685DW-92 | 100 k $\Omega$ ...100 M $\Omega$ | AC 0...1000 V<br>DC 0...1500 V | DC 24 V $\pm$ 25% | B91065806W |

## Dimensions



Dimensions in mm



**Bender GmbH & Co. KG**

Londorfer Straße 65  
35305 Grünberg  
Germany

Tel.: +49 6401 807-0  
info@bender.de  
www.bender.de



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Subject to change!

The specified standards take into account the  
edition valid until unless otherwise indicated.