

## ISOMETER® iso685-...-P

Insulation monitoring device with integrated locating current injector for IT AC systems with galvanically connected rectifiers or converters and for IT DC systems



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Insulation monitoring device with integrated locating current injector  
for IT AC systems with galvanically connected rectifiers  
or converters and for IT DC systems



ISOMETER® iso685-D-P

## Application

- AC, DC or AC/DC main circuits
- AC/DC main circuits with directly connected DC components, such as rectifiers, converters, variable-speed drives
- UPS systems, battery systems
- Heaters with phase control
- Systems including switch-mode power supplies
- IT systems with high leakage capacitances
- Installations with insulation fault location

## Certifications



## Device features

### iso685-...-P

- ISOMETER® for IT AC systems with galvanically connected rectifiers or inverters and for IT DC systems (IT = unearthed systems)
- Automatic adaptation to the existing system leakage capacitance
- Combination of **AMP<sup>PLUS</sup>** and other profile-specific measurement methods
- Two separately adjustable response value ranges of 1 kΩ...10 MΩ for Alarm 1 and Alarm 2
- High-resolution graphical LC display
- Connection monitoring (monitoring of the measuring lines)
- Automatic device self test
- Graphical representation of the insulation resistance over time (isoGraph)
- History memory with real-time clock (buffer for three days) for storing 1023 alarm messages with date and time
- Current or voltage output 0(4)...20 mA, 0...400 µA, 0...10 V, 2...10 V (galvanically separated), which is analogous to the measured insulation value of the system
- Freely programmable digital inputs and outputs
- Remote setting via the Internet or Intranet (Webserver/Option: COMTRAXX® gateway)
- Worldwide remote diagnosis via the Internet (made available by Bender Service only)
- RS-485/BS (Bender sensor bus) for data exchange with other Bender devices
- ISONet: Internal separation of the ISOMETER® from the IT system to be monitored (e.g. if several IT systems are interconnected)
- BCOM, Modbus TCP/RTU and web server
- Locating current injection for selective insulation fault location
- Indication of the insulation faults selectively located by the EDS system
- Parameter setting of EDS systems
- Customer-specific texts for each measuring channel

### EDS44x

- Insulation fault location in AC, 3AC and DC IT systems
- Up to 12 measuring current transformers of the W..., WR..., WS... measuring current transformer series can be connected
- Response sensitivity insulation fault location:  
EDS440 2...10 mA  
EDS441 0.2...1 mA
- Response sensitivity residual current measurement:  
EDS440 100 mA...10 A  
EDS441 100 mA...1 A
- Communication of the components via BS bus (RS-485) or BB bus

## Product description

The ISOMETER® is an insulation monitoring device for IT systems in accordance with IEC 61557-8 and IEC 61557-9. It is universally applicable in AC, 3(N)AC, AC/DC and DC systems. AC systems may include extensive DC-supplied loads (such as rectifiers, inverters, variable-speed drives).

In combination with the insulation fault locators of the EDS44x series or the appropriate measuring current transformers, an insulation fault location system can be set up with the iso685-...-P.

### Insulation monitoring function

The insulation monitoring device continuously monitors the entire insulation resistance of an IT system during operation and triggers an alarm when the value falls below a preset response value. To obtain a measurement the device has to be connected between the IT system (unearthed system) and the protective earth conductor (PE). A measuring current in the  $\mu\text{A}$  range is superimposed onto the system which is recorded and evaluated by a microprocessor-controlled measuring circuit. The measuring time is dependent on the selected measurement profiles, the system leakage capacitance, the insulation resistance and possible system-related disturbances.

The response values and other parameters are set using a commissioning wizard as well as via different setup menus using the device buttons and a high-resolution graphical LC display. The selected settings are stored in a permanent fail-safe memory.

Different languages can be selected for the setup menus as well as the messages indicated on the display. The device utilises a clock for storing fault messages and events in a history memory with time and date stamp. The settings can be password protected to prevent unauthorised changes.

To ensure proper functioning of connection monitoring, the device requires the setting of the system type 3AC, AC or DC and the required use of the appropriate terminals L1/+, L2, L3/-.

The insulation monitoring device iso685-x-P is able to measure the insulation resistance reliably and precisely in all common IT systems (unearthed systems). Due to various applications, system types, operating conditions, application of variable-speed drives, high system leakage capacitances etc., the measurement technique must be able to meet varying requirements in order to ensure an optimised response time and relative uncertainty. Therefore different measuring profiles can be selected with which the device can optimally adjusted.

If the preset response value falls below the value of Alarm 1 and/or Alarm 2, the associated alarm relays switch, the LEDs ALARM 1 or ALARM 2 light and the measured value is shown on the LC display (in case of insulation faults in DC systems, a trend graph for the faulty conductor L+/L- is displayed). If the fault memory is activated, the fault message will be stored. Pressing the RESET button resets the insulation fault message, provided that the current insulation resistance displayed at the time of resetting is at least 25 % above the actual response value. As additional information, the quality of the measuring signal and the time required to update the measured value are shown on the display. A poor signal quality (1-2 bars) may be an indication that the wrong measurement profile has been selected.

The ISOMETER® has an internal system isolating switch, which makes it possible to operate several ISOMETER®s in coupled IT systems. For this purpose, the ISOMETER®s are connected via an Ethernet bus. The integrated ISONet function ensures that only one ISOMETER® is actively measuring at a time, while the other devices are completely isolated from the system and waiting in standby mode for measuring permission.

The ISOMETER® is able to synchronise itself with other ISOMETER®s. This makes it possible to monitor capacitive coupled IT systems without interfering with each other.

### Insulation fault location

An additional function of the ISOMETER® in combination with the EDS is the selective insulation fault location. Therefore, the ISOMETER® generates a periodic locating current after the values has fallen below the set response value  $R_{an2}$  (LED ALARM 2). Thereby, the system conductors are alternately connected to earth via a defined resistance. The resulting locating current depends on the size of the existing insulation fault and the system voltage. It is limited by the ISOMETER® depending on the settings. The insulation fault is selectively located by means of the EDS and the measuring current transformer connected to it. The locating current flows from the locating current injector via the live lines to the insulation fault position taking the shortest way. From there, it flows through the insulation fault and the conductor PE back to the ISOMETER®. This locating current pulse is detected by the measuring current transformer on the insulation fault path and signalled by the connected EDS.

For the duration of the insulation fault location, the function of the insulation monitoring device is deactivated. If during the insulation fault location the locating current falls below the value measurable by the EDS, the insulation fault location is ended by the ISOMETER®.

### Interfaces

- Communication protocol Modbus TCP
- Communication protocol Modbus RTU
- BCOM for Bender device communication via Ethernet
- BS bus for communication of Bender devices (RS-485)
- BB bus for communication of Bender devices (Bender-internal device bus)
- Integrated web server for reading out measured values and for parameter setting

### Device variants

#### iso685-D-P

The device variant ISOMETER® iso685-D-P features a high-resolution graphic LC display and operating controls for direct operation of the device functions. It **cannot** be combined with an FP200.

#### iso685-S-P

The device variant ISOMETER® iso685-S-P features **neither a display nor operating controls**. It can only be used in combination with the FP200 and it is operated via this front panel.

#### Option "W"

The ISOMETER®s with and without integrated display are available with option "W" for extreme climatic and mechanical conditions (ISOMETER® iso685W-D-P and iso685W-S-P).

### System setup

In general, an EDS system is constituted by an iso685-...-P as well as one or more EDS44x insulation fault locators with the appropriate measuring current transformers. The information is exchanged between the EDS44x and the iso685-...-P via a backbone bus or a 2-wire sensor bus in order to save time and costs.

The insulation monitoring device iso685-...-P and the insulation fault locators EDS44x constitute a complete IT system monitoring unit. In a system like this, up to 600 channels can be monitored.

The insulation monitoring devices can be connected to various gateways via an Ethernet interface, whereby an almost infinite amount of channels distributed in different IT systems can be monitored.

## ISOloop

Ring systems are a special type of coupled systems in which all systems can be coupled to form a ring interconnection. The ISOloop function ensures that, in a system with several insulation monitoring devices, one device is always actively measuring. The devices that work in an ISOloop configuration are combined into a group. Within the group, digital inputs are used to control which devices are currently working together in a team. Within the team, the device with the lowest BCOM address takes over the measuring task.

The basis of the ISOloop function is the combination of several ISOMETER®s to form an interconnection. The grouping of up to 10 ISOMETER®s is carried out with a separate software, the BCOM Group Manager. The program can be downloaded from the Bender website at [www.bender.de/service-support/downloads](http://www.bender.de/service-support/downloads) or via the web server ("Menu" > "Settings" > "File" \wwwroot\group-cfg.zip). The tested setup file can be executed on any Windows PC in the network.

## EDSsync

The "EDSsync" function ensures that in an installation with several iso685-x-P insulation monitoring devices, all connected EDS participate in the insulation fault location. The devices that work in an EDSsync configuration are combined into a group.

The "EDSsync" function can be combined with the "System isolation via digital input", "System isolation via ISONet" and "ISOloop" functions.

## Measurement method

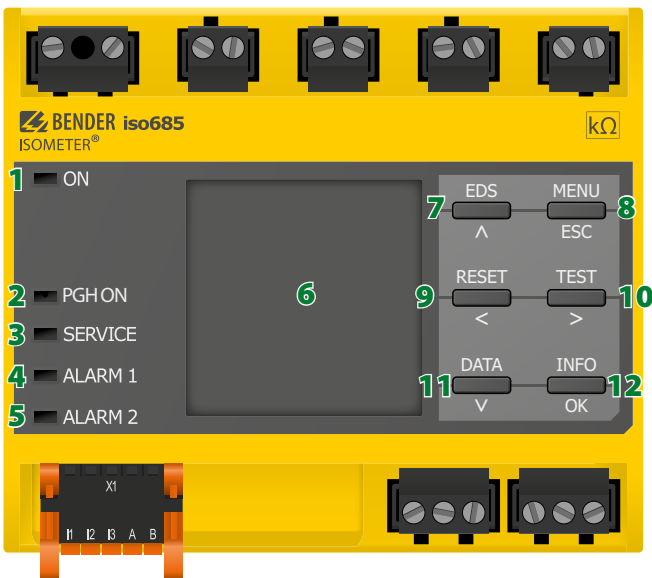
**AMPPlus** The iso685-...-P series uses the patented **AMPPlus** measurement method. This measurement method allows concise monitoring of modern power supply systems, also in case of extensive, directly connected DC components and high system leakage capacitances.

## Standards

The ISOMETER® has been developed in compliance with the following standards:

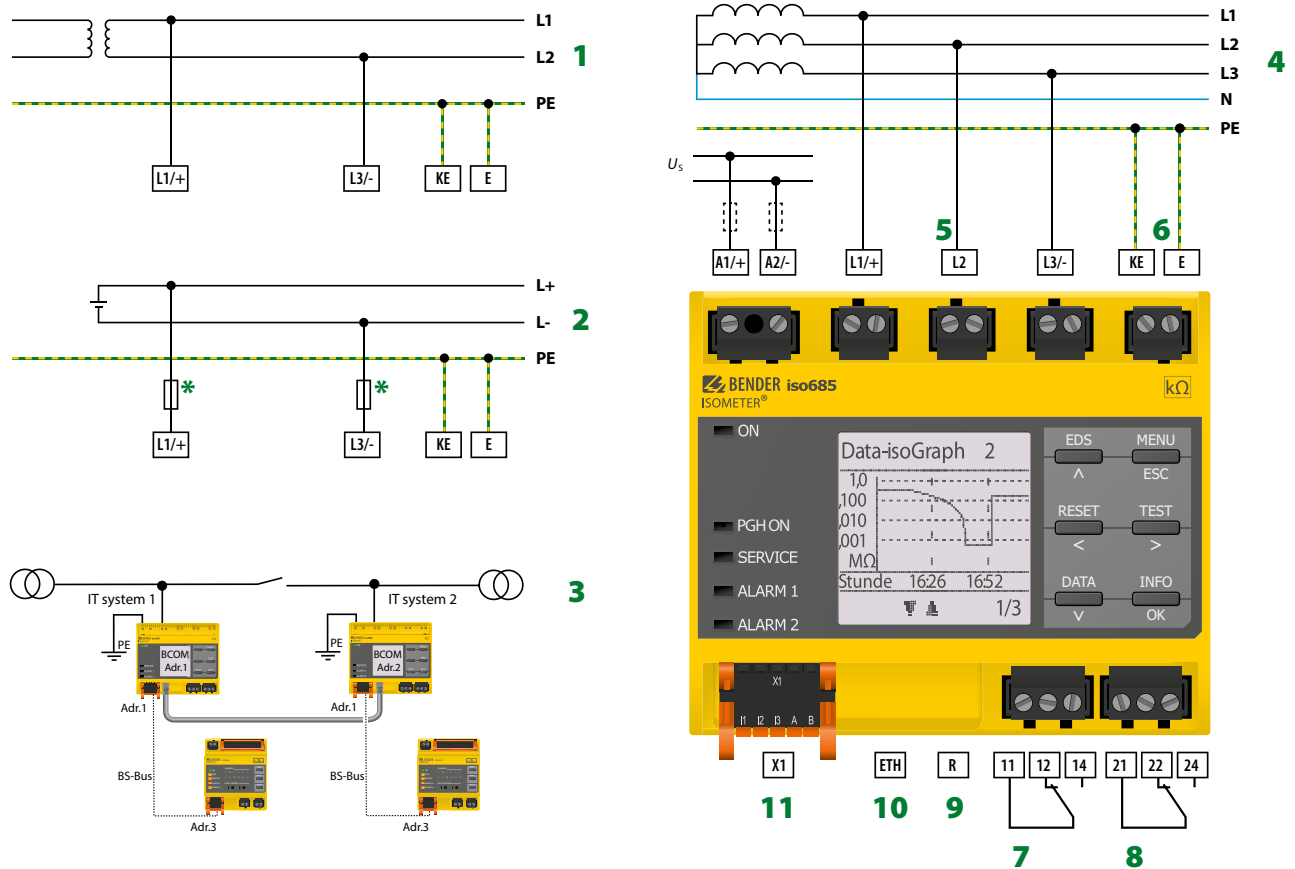
- DIN EN 61557-8 (VDE 0413-8):2015-12
- IEC 61557-8:2014-12
- IEC 61557-8:2014/COR1:2016
- DIN EN 61557-8 Ber 1 (VDE 0413-8 Ber 1):2016-12

## Operating elements



- |  |  |
|--|--|
| <p>1 - ON</p> <p>2 - PGH ON</p> <p>3 - SERVICE</p> <p>4 - ALARM 1</p> <p>5 - ALARM 2</p> <p>6 - Display</p> <p>7 - EDS</p> <p>8 - MENU</p> <p>9 - RESET</p> <p>10 - TEST</p> <p>11 - DATA</p> <p>12 - INFO</p> | <p>The LED "ON" lights when the device is turned on.</p> <p>The LED „PGH ON“ flashes during insulation fault location. It indicates that the locating current for the insulation fault location is generated.</p> <p>The LED "SERVICE" lights when there is either a device fault or a connection fault, or when the device is in maintenance mode.</p> <p>The LED "ALARM 1" lights when the insulation resistance of the IT system falls below the set response value <math>R_{an1}</math>.</p> <p>The LED "ALARM 2" lights when the insulation resistance of the IT system falls below the set response value <math>R_{an2}</math>.</p> <p>The device display shows information regarding the device and the measurements.</p> <p>Manually starts the insulation fault location, which runs continuously. Stops the insulation fault location immediately when it is pressed again.</p> <p>^ Navigates up in a list or increases a value.</p> <p>Opens the device menu</p> <p>Cancels the current process or navigates one step back in the device menu.</p> <p>Resets alarms.</p> <p>&lt; Navigates backwards (e.g. to the previous setting step) or selects a parameter.</p> <p>Starts the device self test.</p> <p>&gt; Navigates forwards (e.g. to the next setting step) or selects a parameter.</p> <p>Indicates data and values.</p> <p>v Navigates down in a list or reduces a value.</p> <p>Shows information.</p> <p>OK Confirms an action or a selection.</p> |
|--|--|

## Wiring diagram



- 1 - Connection to an AC system  $U_n$
- 2 - Connection to a DC system  $U_n$
- 3 - Linked with two IT systems which can be interconnected via a coupling switch. Information regarding the state of the coupling switch is not necessary.
- 4 - Connection to a 3(N)AC system
- 5 - Connection to the IT system to be monitored (L1/+, L2, L3/-)
- 6 - Separate connection of KE, E to PE
- 7 - (K1) Alarm relay 1, available changeover contacts

- 8 - (K2) Alarm relay 2, available changeover contacts
- 9 - Switchable resistor R for RS-485 bus termination
- 10 - Ethernet interface
- 11 - Digital interface

\* - For systems > 690 V and with overvoltage category III a fuse for the connection to the system to be monitored must be provided.

Recommendation: 2A screw-in fuses.

**Provide line protection!**

According to DIN VDE 0100-430, a line protection shall be provided for the supply voltage.

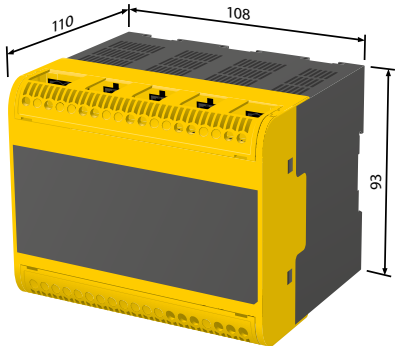
**Note**

According to DIN VDE 0100-430, devices for protection against a short circuit can be omitted for the coupling of terminals L1/+, L2 and L3/- to the IT system  $\leq 690$  V to be monitored if the wiring is carried out in such a manner as to reduce the risk of a short-circuit to a minimum. (A short-circuit-proof and earth-fault-proof wiring is recommended).

The connecting lines L1/+, L2, L3/- to the system to be monitored must be carried out as spur lines. No load current may be conducted through the terminals.

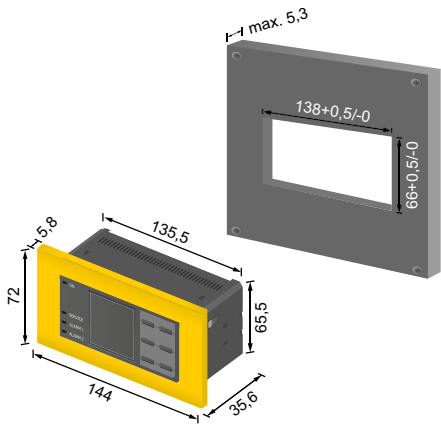
Dimension diagram iso685-...-P

Dimensions in mm

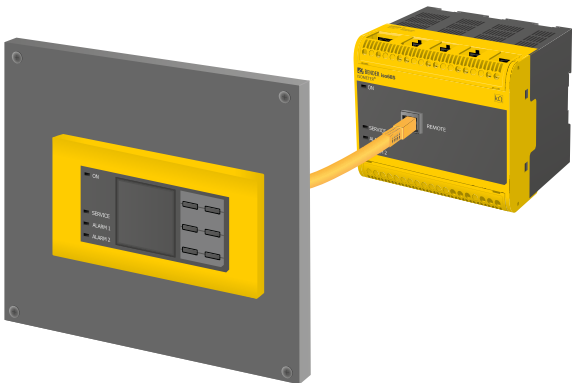


Dimension diagram Panel cut-out FP200

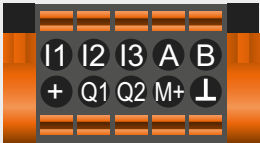
Dimensions in mm

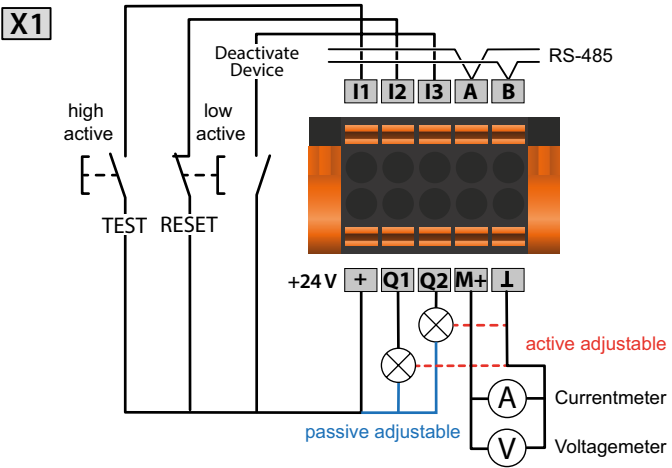


Connection to FP200

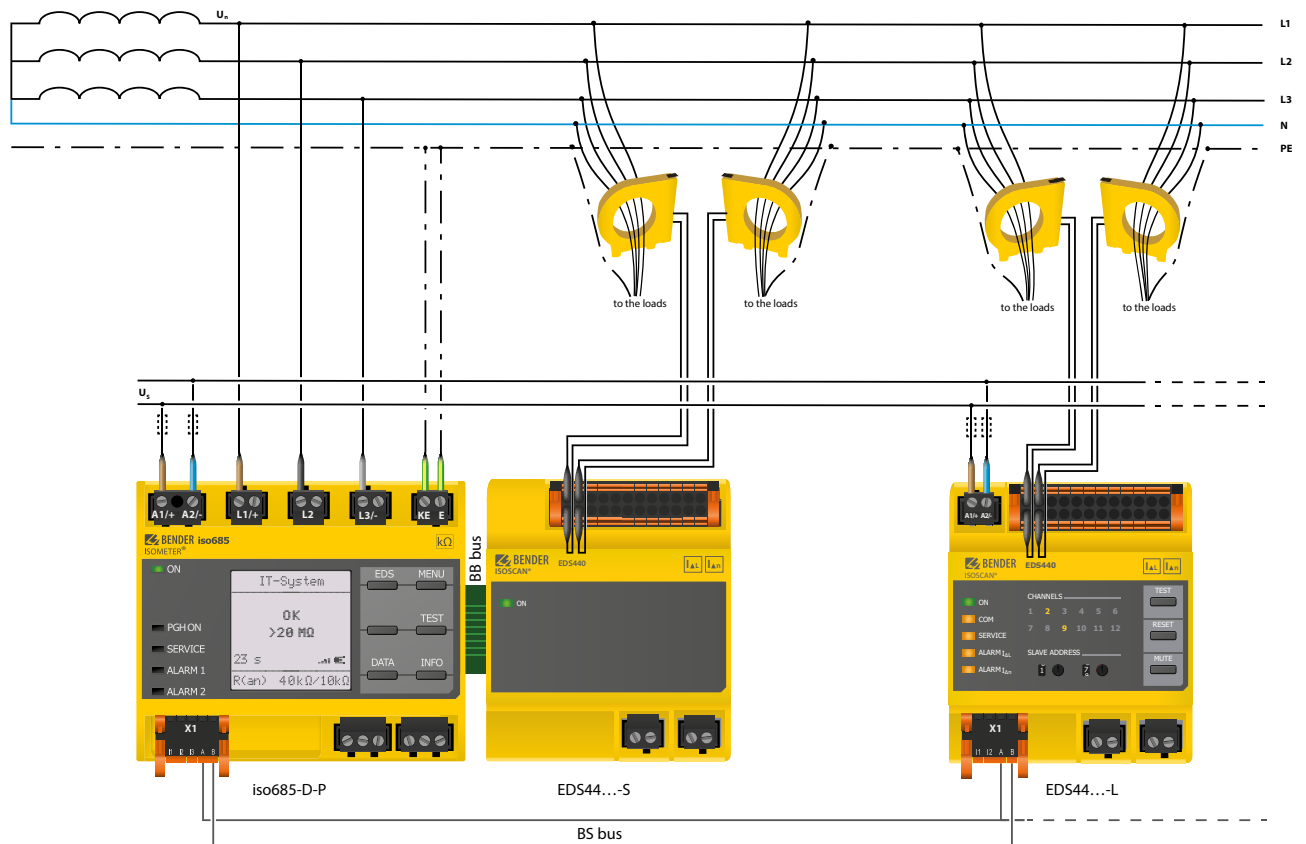


Digital interface X1

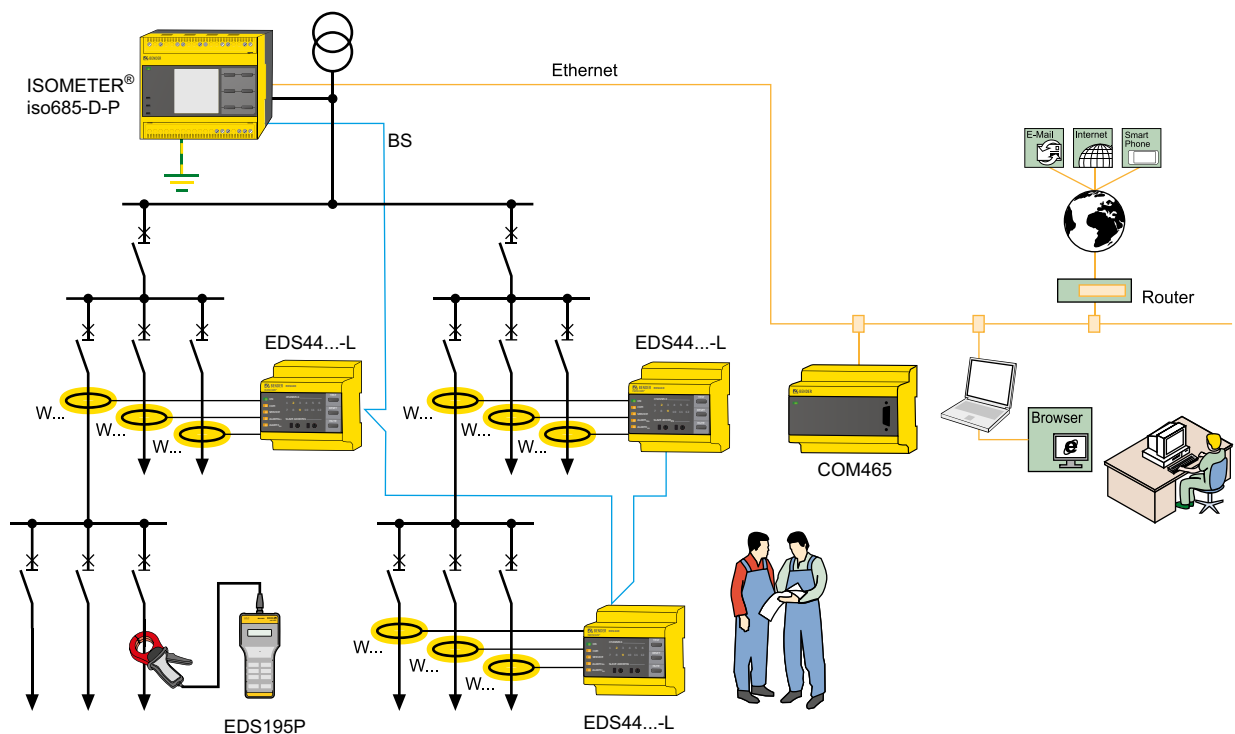
| Digital interface   | Terminal | Colour          |
|---|----------|-----------------|
|  | I1       | Input 1         |
|   | I2       | Input 2         |
|   | I3       | Input 3         |
|   | A        | RS-485 A        |
|   | B        | RS-485 B        |
|   | +        | +24 V           |
|   | Q1       | Output 1        |
|   | Q2       | Output 2        |
|   | M+       | Analogue output |
|   | ⏏        | Ground          |



### Connection example ISOMETER® with insulation fault locators



### System setup



## Technical data

### Insulation coordination according to IEC 60664-1/IEC 60664-3

|  |                                  |
|--|----------------------------------|
| Definitions:   |                                  |
| Measuring circuit (IC1)  | (L1/+, L2, L3/-)                 |
| Supply circuit (IC2)   | A1, A2                           |
| Output circuit 1 (IC3)   | 11, 12, 14                       |
| Output circuit 2 (IC4)   | 21, 22, 24                       |
| Control circuit (IC5)  | (E, KE), (X1, ETH, X3, X4)       |
| Rated voltage  | 1000 V                           |
| Overvoltage category   | III                              |
| Rated impulse voltage:   |                                  |
| IC1/(IC2-5)  | 8 kV                             |
| IC2/(IC3-5)  | 4 kV                             |
| IC3/(IC4-5)  | 4 kV                             |
| IC4/IC5  | 4 kV                             |
| Rated insulation voltage:  |                                  |
| IC1/(IC2-5)  | 1000 V                           |
| IC2/(IC3-5)  | 250 V                            |
| IC3/(IC4-5)  | 250 V                            |
| IC4/IC5  | 250 V                            |
| Pollution degree for accessible parts on the outside of the device housing ( $U_n < 690$ V)        | 3                                |
| Pollution degree for accessible parts on the outside of the device housing ( $U_n > 690 < 1000$ V) | 2                                |
| Protective separation (reinforced insulation) between:   |                                  |
| IC1/(IC2-5)  | Overvoltage category III, 1000 V |
| IC2/(IC3-5)  | Overvoltage category III, 300 V  |
| IC3/(IC4-5)  | Overvoltage category III, 300 V  |
| IC4/IC5  | Overvoltage category III, 300 V  |
| Voltage test (routine test) according to IEC 61010-1:  |                                  |
| IC2/(IC3-5)  | AC 2,2 kV                        |
| IC3/(IC4-5)  | AC 2,2 kV                        |
| IC4/IC5  | AC 2,2 kV                        |

### Supply voltage

#### Supply via A1/+, A2/-:

|  |                               |
|--|-------------------------------|
| Supply voltage range $U_s$                 | AC/DC 24...240 V              |
| Tolerance of $U_s$                         | -30...+15%                    |
| Maximum permissible input current of $U_s$ | 650 mA                        |
| Frequency range of $U_s$                   | DC, 50...400 Hz <sup>1)</sup> |
| Tolerance of the frequency range of $U_s$  | -5...+15 %                    |
| Power consumption, typically DC            | ≤ 12 W                        |
| Power consumption, typically 50/60 Hz      | ≤ 12 W/21 VA                  |
| Power consumption, typically 400 Hz        | ≤ 12 W/45 VA                  |

#### Supply via X1:

|                      |                |
|----------------------|----------------|
| Supply voltage $U_s$ | DC 24 V        |
| Tolerance of $U_s$   | DC -20...+25 % |

### IT system being monitored

|   |  |
|---|--|
| Nominal system voltage range $U_n$                                | AC 0...690 V                                 |
|   | DC 0...1000 V                                |
|   | AC/DC 0...600 V (for UL applications)        |
| Tolerance of $U_n$  | AC/DC +15 %                                  |
| Frequency range of $U_n$  | DC 0.1...460 Hz                              |
| Max. AC voltage $U_{-}$ in the frequency range $f_n = 0.1...4$ Hz | $U_{-max} = 50 \text{ V/Hz}^2 * (1 + f_n^2)$ |

### Response values

|  |   |
|--|---|
| Response value $R_{an1}$ (alarm 1)         | 1 kΩ...10 MΩ                                    |
| Response value $R_{an2}$ (alarm 2)         | 1 kΩ...10 MΩ                                    |
| Relative uncertainty (acc. to IEC 61557-8) | dependent on the profile, ±15 %, at least ±1 kΩ |
| Hysteresis                                 | 25 %, at least 1 kΩ                             |

### Time response

|  |  |
|--|--|
| Response time $t_{an}$ at $R_f = 0.5 \times R_{an}$ ( $R_{an} = 10 \text{ kΩ}$ ) and $C_e = 1 \text{ μF}$ according to IEC 61557-8 | profile dependent, typ. 4 s (see diagrams in manual) |
| Response time DC alarm at $C_e = 1 \text{ μF}$   | profile dependent, typ. 2 s (see diagram in manual)  |
| Start-up delay $T_{start-up}$  | 0...120 s  |

### Measuring circuit

|   |  |
|---|--|
| Measuring voltage $U_m$   | profile dependent, ±10 V, ±50 V (see profile overview) |
| Measuring current $I_m$   | ≤ 403 μA   |
| Internal resistance $R_i, Z_i$  | ≥ 124 kΩ   |
| Internal resistance on decoupled systems (inactive by I/O, inactive by ISOnet or cut-off) | typ. 50 MΩ   |
| Permissible extraneous DC voltage $U_{iq}$  | ≤ 1200 V   |
| Permissible system leakage capacitance $C_e$  | profile dependent, 0...1000 μF                         |

### Measuring ranges

|   |  |
|---|--|
| Measuring range $f_n$                           | 0.1...460 Hz   |
| Tolerance measurement of $f_n$                  | ±1 % ±0.1 Hz   |
| Voltage range measurement of $f_n$              | AC 25...690 V  |
| Measuring range $U_n$                           | AC 25...690 V  |
|   | DC 0...1000 V  |
| Voltage range measurement of $U_n$              | AC/DC > 10 V   |
| Tolerance measurement of $U_n$                  | ±5 % ±5 V  |
| Measuring range $C_e$                           | 0...1000 μF  |
| Tolerance measurement of $C_e$                  | ±10 % ±10 μF   |
| Frequency range measurement of $C_e$            | DC, 30...460 Hz  |
| Min. insulation resistance measurement of $C_e$ | depending on the profile and coupling mode, typ. > 10 kΩ |

### Display

|  |  |
|--|--|
| Indication                                       | graphic display 127 x 127 pixels, 40 x 40 mm <sup>2)</sup> |
| Display range measured value                     | 0.1 kΩ...20 MΩ   |
| Operating uncertainty (according to IEC 61557-8) | ±15 %, at least ±1 kΩ                                      |

### LEDs

|                    |        |
|--------------------|--------|
| ON (operation LED) | green  |
| PGH ON             | yellow |
| SERVICE            | yellow |
| ALARM 1            | yellow |
| ALARM 2            | yellow |

### In-/Outputs (X1-Interface)

|   |   |
|---|---|
| Cable length X1 (unshielded cable)  | ≤ 10 m  |
| Cable length X1 (shielded cable, shield connected to earth (PE) on one end, recommended:    |   |
| J-Y(St)Y min. 2x0,8)  | ≤ 100 m   |
| Total max. supply output current for each output (device supplied by X1-/X1.GND)            | max. 1 A  |
| Total max. supply output current on X1 (device supplied by A1+/A2-)                         | max. 200 mA   |
| Total max. supply output current on X1 (device supplied by A1+/A2- between 16,8 V and 40 V) | $I_{LmaxX1} = 10 \text{ mA} + 7 \text{ mA/V} * U_s$ <sup>3)</sup> |
| (negative values are not allowed for $I_{LmaxX1}$ )   |   |

### Digital Inputs (I1, I2, I3)

|                            |   |
|----------------------------|---|
| Number                     | 3   |
| Operating mode, adjustable | active high, active low   |
| Functions                  | off, test, reset, deactivate device, start initial measurement, insulation fault location |
| Voltage                    | Low DC -3...5 V, High DC 11...32 V  |
| Tolerance Voltage          | ±10 %   |

### Digital Outputs (Q1, Q2)

|                            |  |
|----------------------------|--|
| Number                     | 2  |
| Operating mode, adjustable | active, passive  |
| Functions                  | off, Ins. alarm 1, Ins. alarm 2, connection fault, DC- alarm <sup>4)</sup> , DC+ alarm <sup>4)</sup> , symmetrical alarm, device fault, common alarm, measurement complete, device inactive, DC offset alarm, common alarm EDS |
| Voltage                    | passive DC 0...32 V, active DC 0/19.2...32 V   |

### Analogue Output (M+)

|  |   |
|--|---|
| Number   | 1   |
| Operating mode                                       | linear, midscale point 28 kΩ/120 kΩ                           |
| Functions  | insulation value, DC offset                                   |
| Current  | 0...20 mA (< 600 Ω), 4...20 mA (< 600 Ω), 0...400 μA (< 4 kΩ) |
| Voltage  | 0...10 V (> 1 kΩ), 2...10 V (> 1 kΩ)                          |
| Tolerance related to the current/voltage final value | ±20 %   |

**Interfaces****Field bus:**

|                             |                            |
|-----------------------------|----------------------------|
| Interface/protocol          | web server/Modbus TCP/BCOM |
| Data rate                   | 10/100 Mbit/s, autodetect  |
| Max. amount Modbus requests | < 100/s                    |
| Cable length                | ≤ 100 m                    |
| Connection                  | RJ45                       |
| IP address                  | DHCP/manual* 192.168.0.5*  |
| Network mask                | 255.255.255.0*             |
| BCOM address                | system-1-0                 |
| Function                    | communication interface    |

**ISOnet:**

|  |                    |
|--|--------------------|
| Number ISOnet devices                    | 0...20 devices     |
| Max. nominal system voltage range ISOnet | AC 690 V/DC 1000 V |

**EDSsync:**

|                        |                |
|------------------------|----------------|
| Number EDSsync devices | 2...10 devices |
|------------------------|----------------|

**ISOloop**

|                        |                |
|------------------------|----------------|
| Number ISOloop devices | 2...10 devices |
|------------------------|----------------|

**Sensor bus:**

|  |                                    |
|--|------------------------------------|
| Interface/protocol                                     | RS-485/BB-Bus/Modbus RTU           |
| Data rate  | 9.6 kBaud/s                        |
| Cable length   | ≤ 1200 m                           |
| Cable: twisted pair, one end of shield connected to PE | recommended: J-Y(St)Y min. 2x0.8   |
| Connection   | terminals X1.A, X1.B               |
| Terminating resistor                                   | 120 Ω, can be connected internally |
| Device address   | 1...90                             |

**Switching elements**

|   |  |
|---|--|
| Number of switching elements  | 2 changeover contacts  |
| Operating mode  | N/C operation/N/O operation  |
| Contact 11-12-14  | off, Ins. alarm 1, Ins. alarm 2, connection fault, DC- alarm <sup>4)</sup> ,<br>DC+ alarm <sup>4)</sup> , symmetrical alarm, device fault, common alarm,<br>measurement complete, device inactive, DC offset alarm, common alarm EDS |
| Contact 21-22-24  | off, Ins. alarm 1, Ins. alarm 2, connection fault, DC- alarm <sup>4)</sup> ,<br>DC+ alarm <sup>4)</sup> , symmetrical alarm, device fault, common alarm,<br>measurement complete, device inactive, DC offset alarm, common alarm EDS |
| Electrical endurance under rated operating conditions, number of cycles | 10.000   |

**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                |
| Rated insulation voltage ≤ 2000 m NN |       |       |       |       | 250 V                |
| Rated insulation voltage ≤ 3000 m NN |       |       |       |       | 160 V                |
| Minimum contact rating               |       |       |       |       | 1 mA at AC/DC ≥ 10 V |

**Environment/EMC**

|     |                             |
|-----|-----------------------------|
| EMC | IEC 61326-2-4 <sup>5)</sup> |
|-----|-----------------------------|

**Ambient temperatures:**

|                       |              |
|-----------------------|--------------|
| Operating temperature | -25...+55 °C |
| Transport             | -40...+85 °C |
| Long-term storage     | -40...+70 °C |

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

|                                   |  |
|-----------------------------------|--|
| Stationary use (IEC 60721-3-3)    | 3K5 (except condensation and formation of ice) |
| 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)    | 3M4         |
| Transport (IEC 60721-3-2)         | 2M4         |
| Long-term storage (IEC 60721-3-1) | 1M12        |
| Area of application               | ≤ 3000 m NN |

**Connection**

|                 |   |
|-----------------|---|
| Connection type | pluggable screw-type terminal or push-wire terminal |
|-----------------|---|

**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   | 7 mm                       |
| rigid/flexible   | 0.2...2.5 mm <sup>2</sup>  |
| flexible with ferrules, with/without plastic sleeve                | 0.25...2.5 mm <sup>2</sup> |
| Multiple conductor, rigid  | 0.2...1 mm <sup>2</sup>    |
| Multiple conductor, flexible                                       | 0.2...1.5 mm <sup>2</sup>  |
| Multiple conductor, flexible with ferrule without plastic sleeve   | 0.25...1 mm <sup>2</sup>   |
| Multiple conductor, flexible with TWIN ferrule with plastic sleeve | 0.5...1.5 mm <sup>2</sup>  |

**Push-wire terminals:**

|  |                            |
|--|----------------------------|
| Nominal current  | ≤ 10 A                     |
| Conductor sizes  | AWG 24-12                  |
| Stripping length   | 10 mm                      |
| rigid/flexible   | 0.2...2.5 mm <sup>2</sup>  |
| flexible with ferrules, with/without plastic sleeve                | 0.25...2.5 mm <sup>2</sup> |
| Multiple conductor, flexible with TWIN ferrule with plastic sleeve | 0.5...1.5 mm <sup>2</sup>  |

**Push-wire terminals X1:**

|  |                             |
|--|-----------------------------|
| Nominal current                                | ≤ 8 A                       |
| Conductor sizes                                | AWG 24-16                   |
| Stripping length                               | 10 mm                       |
| rigid/flexible                                 | 0.2...1.5 mm <sup>2</sup>   |
| flexible with ferrule without plastic sleeve   | 0.25...1.5 mm <sup>2</sup>  |
| flexible with TWIN ferrule with plastic sleeve | 0.25...0.75 mm <sup>2</sup> |

**Other**

|  |   |
|--|---|
| Operating mode                           | continuous operation  |
| Mounting (0°)                            | display oriented, cooling slots must be ventilated vertically <sup>6)</sup> |
| Degree of protection internal components | IP40  |
| Degree of protection terminals           | IP20  |
| DIN rail mounting acc. to                | IEC 60715   |
| Screw fixing                             | 3 x M4 with mounting clip   |
| Enclosure material                       | polycarbonate   |
| Flammability class                       | V-0   |
| ANSI code                                | 64  |
| Dimensions (W x H x D)                   | 108 x 93 x 110 mm   |
| Weight                                   | < 510 g   |

**Option "W" data different from the standard version**

|   |                                |
|---|--------------------------------|
| Rated operational current of switching elements | max. 3 A (for UL applications) |
|---|--------------------------------|

**Ambient temperatures:**

|                       |                                    |
|-----------------------|------------------------------------|
| Operating temperature | -40...+70 °C                       |
|                       | -40...+65 °C (for UL applications) |
| Transport             | -40...+85 °C                       |
| Long-term storage     | -40...+70 °C                       |

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

|                                |  |
|--------------------------------|--|
| Stationary use (IEC 60721-3-3) | 3K5 (condensation and formation of ice possible) |
|--------------------------------|--|

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

|                                |     |
|--------------------------------|-----|
| Stationary use (IEC 60721-3-3) | 3M7 |
|--------------------------------|-----|

<sup>1)</sup> At a frequency > 200 Hz, the connection of X1 and Remote must be insulated. Only permanently installed devices which at least have overvoltage category CAT2 (300V) may be connected.

<sup>2)</sup> Indication limited outside the temperature range -25...+55 °C.

<sup>3)</sup>  $U_s$  [Volt] = ISOMETER® supply voltage

<sup>4)</sup> For  $U_n \geq 50$  V only.

<sup>5)</sup> This is a class A product. This product may cause radio interference in residential areas. In this case, the user may be required to take corrective actions.

<sup>6)</sup> Recommendation: Devices mounted at 0° (display oriented, cooling slots must be ventilated vertically) For devices mounted at an angle of 45°, the max. working temperature is reduced by 10 °C. For devices mounted at an angle of 90°, the max. working temperature is reduced by 20 °C.

## Ordering information

| Nominal system voltage range $U_n$ |            | Supply voltage $U_s$       |            | Display    | Option "W"                | Type                 | Art. No.   |
|------------------------------------|------------|----------------------------|------------|------------|---------------------------|----------------------|------------|
| AC                                 | DC         | AC                         | DC         |            |                           |                      |            |
| 0...690 V;<br>0.1...460 Hz         | 0...1000 V | 24...240 V;<br>50...400 Hz | 24...240 V | integrated | –                         | iso685-D-P           | B91067030  |
|                                    |            |                            |            |            | -40...+70 °C,<br>3K5, 3M7 | iso685W-D-P          | B91067030W |
|                                    |            |                            |            | detached   | –                         | iso685-S-P + FP200   | B91067230  |
|                                    |            |                            |            |            | -40...+70 °C,<br>3K5, 3M7 | iso685W-S-P + FP200W | B91067230W |

## Insulation fault locators

| Description               | Supply voltage $U_s$ | Response value | Type          | Art. No.   |
|---------------------------|----------------------|----------------|---------------|------------|
|                           | AC/DC                |                |               |            |
| Insulation fault locators | 24...240V            | 2...10mA       | EDS440-S-1    | B91080201  |
|                           |                      |                | EDS440W-S-1   | B91080201W |
|                           |                      |                | EDS440-L-4    | B91080202  |
|                           |                      |                | EDS440W-L-4   | B91080202W |
|                           |                      | 0.2...1mA      | EDS441-S-1    | B91080204  |
|                           |                      |                | EDS441W-S-1   | B91080204W |
|                           |                      |                | EDS441-L-4    | B91080205  |
|                           |                      |                | EDS441W-L-4   | B91080205W |
|                           |                      |                | EDS441-LAB-4  | B91080207  |
|                           |                      |                | EDS441W-LAB-4 | B91080207W |

<sup>1)</sup> Absolute values

## Accessories

| Description  | Art. No.  |
|--|-----------|
| A set of screw-type terminals <sup>1)</sup>                            | B91067901 |
| A set of push-wire terminals   | B91067902 |
| Enclosure accessories (terminal cover, 2 mounting clips) <sup>1)</sup> | B91067903 |
| Transparent cover 144x72 (IP65) for FP200 <sup>2)</sup>                | B98060005 |
| BB bus 6TE connector <sup>3)</sup>                                     | B98110001 |

<sup>1)</sup> included in the scope of delivery

<sup>2)</sup> If the "transparent front cover 144x72 (IP65)" is used, the cutout in the control cabinet must be increased in height from 66 mm to 68 mm (+ 0.7/-0 mm).

<sup>3)</sup> Necessary for the connection of the ISOMETER®s with an EDS44...-S

## Suitable system components

| Description                      | Type        | Art. no.   |
|----------------------------------|-------------|------------|
| Device version without display   | iso685-S-P  | B91067130  |
|                                  | iso685W-S-P | B91067130W |
| Display for front panel mounting | FP200       | B91067904  |
|                                  | FP200W      | B91067904W |

Suitable measuring instruments on request!



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