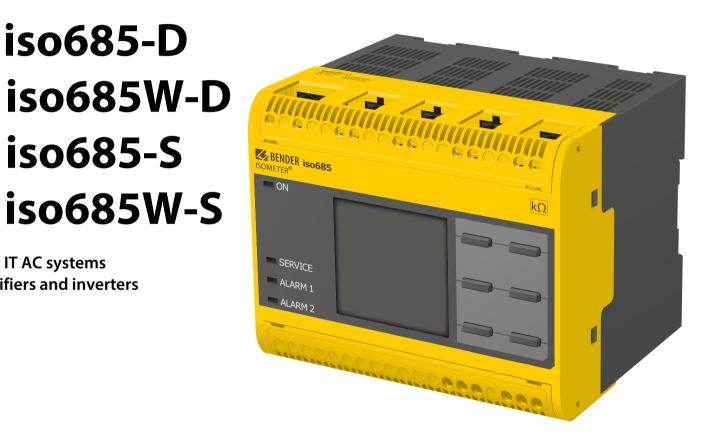




ISOMETER® iso685-D iso685W-D iso685-S

Insulation Monitoring Device for IT AC systems with galvanically connected rectifiers and inverters and for IT DC systems



PLEASE READ THIS MANUAL AND ANY ACCOMPANYING DOCUMENTS CAREFULLY AND KEEP THEM IN A SECURE PLACE FOR FUTURE REFERENCE.



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1. Safety instructions



1.1 Explanation of symbols and notes

This manual is intended for qualified personnel working in electrical engineering and electronics!

To make it easier for you to understand and revisit certain sections of text and instructions in this manual, we have used symbols to identify important instructions and information.



DANGER: This signal word indicates that there is a high risk of danger that will result in electrocution or serious injury if not avoided.



WARNING: This signal word indicates a medium risk of danger that can lead to death or serious injury if not avoided.



CAUTION: This signal word indicates a low level risk that can result in minor or moderate injury or damage to property if not avoided.



NOTE: This symbol denotes information intended to assist the user in making optimum use of the product.

1.2 Intended use

The ISOMETER® iso685-D and iso685-S monitors the insulation resistance of unearthed AC/DC main circuits (IT systems) with mains voltages of AC 0...690 V or DC 0...1000 V. The nominal voltage range U_n can be extended via coupling devices. DC components existing in AC/DC systems do not influence the operating characteristics. Due to the separate supply voltage, de-energised systems can also be monitored. The maximum permissible system leakage capacitance is 0...1000 μ F, depending on the profile.

Eine andere oder darüber hinausgehende Benutzung gilt als nicht bestimmungsgemäß. The Bender companies shall not be liable for any losses or damage resulting from improper use. Intended use implies:

The observation of all information in the operating manual. Compliance with test intervals.



When using ISOMETER®s in IT systems, make sure that only one active ISOMETER® is connected in each interconnected system. If IT systems are interconnected via coupling switches, make sure that ISOMETER®s not currently used are disconnected from the IT system and deactivated. Sind IT-Systeme über Kapazitäten oder Dioden gekoppelt, kann dies die Isolationsüberwachung beeinflussen, so dass hier eine zentrale Steuerung der verschiedenen ISOMETER® eingesetzt werden muss.

As a basic principle, our "General Conditions of Sale and Delivery" shall apply. At the latest, these shall be available to the operator when the contract is concluded.

1. Safety instructions



1.3 Warranty and liability

Warranty and liability claims in the event of injury to persons or damage to property are excluded if they can be attributed to one or more of the following causes:

- Use of the ISOMETER® other than for its intended purpose
- Incorrect assembly or installation, commissioning, operation and maintenance of the ISOMETER®
- Non-observance of instructions in this operating manual regarding transport, commissioning, operation and maintenance of the ISOMETER®
- Unauthorised changes to the ISOMETER® made by parties other than the manufacturer
- Non-observance of technical data. Repairs carried out incorrectly and the use of replacement parts or accessories not approved by the manufacturer
- Case of disasters and force majeure
- Assembly and installation with device combinations not recommended by the manufacturer

This operating manual, especially the safety instructions, must be observed above all by personnel who work on the ISOMETER®. In addition, the rules and regulations that apply for accident prevention at the place of use must be observed.

1.3.1 Personnel

Only appropriately qualified personnel may work with the ISOMETER®. Personnel who are familiar with the assembly, commissioning and operation of the product and have undergone appropriate training are considered qualified. Personnel must have read this manual and understood all instructions relating to safety.

1.3.2 About the operating manual

This manual has been compiled with great care. It may nevertheless contain errors and mistakes. Bender cannot accept any liability for injury to persons or damage to property resulting from errors or mistakes in this manual.

1.3.3 Hazards when handling the ISOMETER® iso685-D

The ISOMETER®s iso685-D/-S are built in accordance with state-of-the-art technology and accepted recognised safety regulations. However, the use of such devices may introduce risks to the life and limb of the user or third parties and/or result in damage to the ISOMETER® or other property.

Only use the ISOMETER®:

- As intended
- · In perfect working order

Immediately rectify any faults that may endanger safety. Do not make any unauthorised changes and only purchase spare parts and optional accessories recommended by the manufacturer of the devices. Failure to observe this requirement can result in fire, electric shock and injury.

Unauthorised persons must not have access to or contact with the ISOMETER®. Reference signs must always be clearly legible. Replace damaged or illegible signs immediately.

1.3.4 Inspection, transport and storage

Inspect the packaging and equipment packaging for damage, and compare the contents of the package with the delivery documents. In the event of damage in transit, please inform the Bender company immediately.

The devices must only be stored in areas where it is protected from dust, damp and spray or dripping water, and in which the specified storage temperatures can be assured.

1.3.5 Note

Make sure that the operating voltage is correct!

Prior to insulation and voltage tests, the ISOMETER® must be disconnected from the IT system for the duration of the test. In order to check the proper connection of the device, a functional test has to be carried out before starting the system. Make sure that the basic settings meet the requirements of the IT system. Children and unauthorised persons must not have access to or contact with the ISOMETER®.

2. Function



2.1 Features

- ISOMETER® for IT AC systems with galvanically connected rectifiers or inverters and for IT DC systems (IT = unearthed systems).
- The nominal voltage range U_n can be extended via coupling devices.
- · Automatic adaptation to the existing system leakage capacitance.
- Combination of **AMPPlus*** and other profile-specific measurement methods.
- Two separately adjustable response value ranges of 1 k Ω ...10 M Ω for Alarm 1 and Alarm 2.
- High-resolution graphic LC display for excellent readability and recording of the device status.
- 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 and voltage output 0(4)...20 mA, 0...400 μ A, 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 Internet.
- Modbus TCP, web server and BCOM

2.2 Product description

2.2.1 General product description

The ISOMETER®s iso685-D/-S are insulation monitoring devices for IT systems in accordance with IEC 61557-8. The devices are 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).

2.2.2 Special characteristics of ISOMETER® iso685-S with front panel The ISOMETER® iso685-D is the standard device of the iso685 device family with integrated display. This manual applies in full to the ISOMETER® iso685-D.

The ISOMETER® iso685-S is the sensor variant of the iso685 device family. The only difference between this variant and the ISOMETER® iso685-D is that it does not feature a display. The ISOMETER® iso685-S must be used in combination with a front panel because the device is operated via the front panel. The operation of the front panel is equal to the operation of the ISOMETER® iso685-D, which is described in this manual.

Hereafter, the ISOMETER® iso685-D is described, which is similar to the combination of ISOMETER® iso685-S plus front panel (e. g. FP200).

2.3 Functional description

The insulation monitoring device iso685-D 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 μA range is superimposed onto the system which is recorded and evaluated by a micro-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.

2. Function



The response values and other parameters are set using a commissioning wizard or 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 protected against unauthorised modifications by entering a password. 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/-.

To extend the nominal voltage range, different coupling devices are available as accessories which can be selected from a menu where the required adjustments can also be made. The insulation monitoring device iso685 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. Different measurement profiles which can be selected from a setup menu allow optimum adaptation of the measurement technique to the specific application.

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 resp. 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 insulation resistance is at least 25 % above the preset 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.

2.4 Interfaces

- Communication protocol Modbus/TCP
- BCOM for Bender device communication via Ethernet
- Integrated web server for reading out measured values and for parameter setting

2.5 Self test

After switching on the supply voltage, the ISOMETER, by means of the self-test functions, automatically and continuously checks all internal measuring functions, the components of the process control, such as the data and parameter memory, as well as the connections to the IT system and earth.

A manual self test can also be activated by means of the test button to check the relay function (depending on the configuration).

The progress of the manual self test is shown on the LCD by a bar graph. Depending on the conditions in the IT system being monitored, the self test is completed after 15...20 seconds. The device then returns to the standard mode (i.e. measurement mode) and the actual measured value will be displayed after the measuring time has expired.

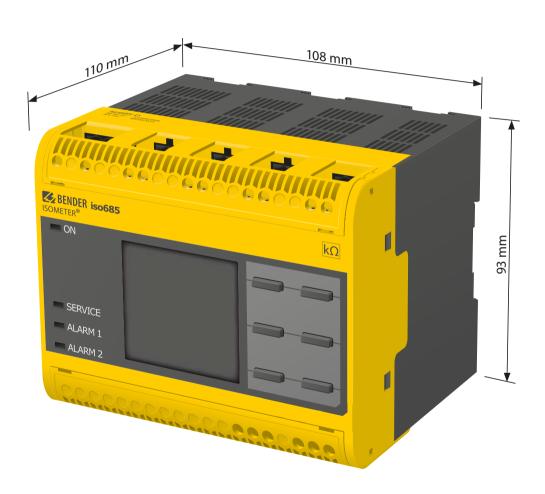
The display shows the initial measurement message until the first valid value is measured.

If an error is detected during a self-test, the corresponding device LEDs light (see "Alarm messages" on page 52). In addition, the appropriate message is displayed on the LCD and an output, if configured, provides a corresponding signal.

3. Device overview



3.1 Dimensions



3. Device overview



3.2 Device variants

iso685-D: Device version iso685-D features a high-resolution graphical LC display and operating controls for direct operation of the device functions.

iso685-S: Device version iso685-S neither features a display nor operating controls. It can only be used in combination with FP200 and operated via this front

panel.

Option "W": The device variants with option "W" for extreme climatic and mechanical stresses are optionally available.



ISOMETER® iso685-D



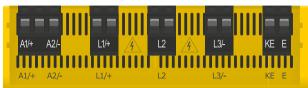
ISOMETER® iso685-S with front panel FP200 connected via an RJ45 cable

3. Device overview



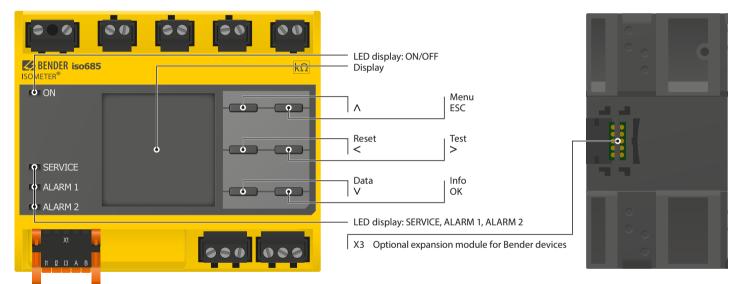
3.3 Connections and panel

Top



A1/+, A2/- Connection to the power supply voltage $U_{\rm S}$ L1/+ Connection to the IT system to be monitored L2 Connection to the IT system to be monitored Connection to the IT system to be monitored KE, E Connection to PE

Front



Bottom X1 ETH R 11 12 14 21 22 24

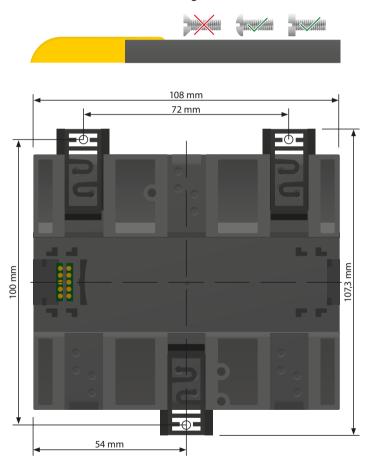
X1 Digital interface
ETH Ethernet interface
R Selectable resistance R
11 12 14 Connector for alarm relay 1
21 22 24 Connector for alarm relay 2

4. Mounting



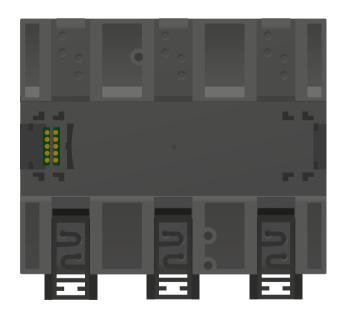
4.1 Screw mounting

- 15. Fix the three mounting clips delivered with the device (two of them packed separately) manually or using a tool, as illustrated below.
- 16. Drill the mounting holes for the M4 thread according to the dimensioned drilling template.
- 17. Fix the ISOMETER® iso685-D using three M4 screws.



4.2 DIN rail mounting

- 1. Fix the three mounting clips delivered with the device (two of them packed separately) manually or using a tool, as illustrated below.
- 2. Fix the ISOMETER® iso685-D/-S onto the DIN rail until it snaps into place.





5.1 Connection conditions

Consider the minimum distance to adjacent devices: lateral 0 mm, top 20 mm, bottom 20 mm.



Risk of electric shock!

Nominal voltages up to $1000 \, V$ may be present on the terminals L1/+ to L3/- which can be lethal. Make sure that the terminal covers are properly mounted and clicked in before you use the device.



Risk of electric shock!

High voltage is applied to the terminals which can be lethal if directly contacted. If the device is connected via the terminals L1/+, L2, L3/- to an IT system that is live,-for operational reasons, terminals KE and E must not be disconnected from th protective earth conductor (PE).



Warning of insulation monitoring devices that do not work correctly!

Connect the terminals KE and E individually to the protective earth conductor PE.



Risk of injury from sharp-edged terminals!

Risk of lacerations.

Touch the enclosure and the terminals with due care.



Ensure disconnection from the IT system!

When insulation or voltage tests are to be carried out, the device must be isolated from the system for the test period. Otherwise the device may be damaged.



Risk of property damage due to unprofessional installation!

If more than one insulation monitoring device is connected to a conductively connected system, the system can be damaged. If several devices are connected, the device does not function and does not signal insulation faults. Make sure that only one insulation monitoring device is connected in each conductively connected system.



Risk of property damage due to unprofessional installation!

The connecting lines L1/+, L2, L3/- to the system to be monitored must be carried out as spur lines. Inadmissible load current can result in damage to property and personal injury. Do not run any load current through the terminals.



Check proper connection!

Prior to commissioning of the installation, check that the device has been properly connected and check the device functions. Perform a functional test using an earth fault via a suitable resistance.



Prevent measurement errors!

When the AC system being monitored contains galvanically coupled DC circuits, take into consideration that: an insulation fault can only be detected correctly when the rectifier valves carry a minimum current of > 10 mA.



For UL applications:

Only use 60/70°C copper lines!

UL and CSA application require the supply voltage to be protected via 5-A fuses.

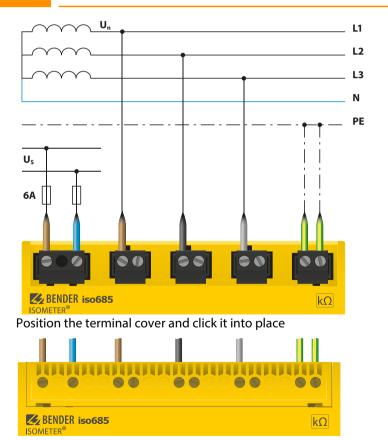


5.2 Connection to a 3(N)AC system/system type 3AC



Risk of injury, fire and damage to property due to a shortcircuit!

According to DIN VDE 0100-430, devices used to protect against a short-circuit when terminals L1/+, L2 und L3/- are coupled to the IT system to be monitored can be omitted if the wiring is carried out in such a manner as to reduce the risk of a short-circuit to a minimum. Ensure short-circuit-proof and earth-fault-proof wiring.

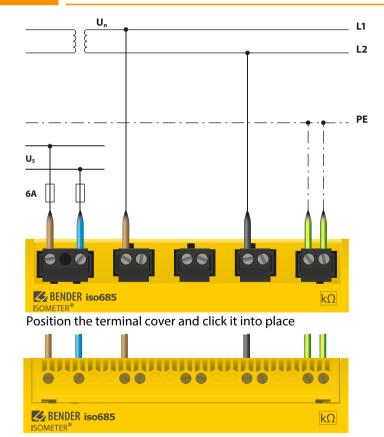


5.3 Connection to an AC system/system type AC



Risk of injury, fire and damage to property due to a short-circuit!

According to DIN VDE 0100-430, devices used to protect against a short-circuit when terminals L1/+, L2 und L3/- are coupled to the IT system to be monitored can be omitted if the wiring is carried out in such a manner as to reduce the risk of a short-circuit to a minimum. Ensure short-circuit-proof and earth-fault-proof wiring.



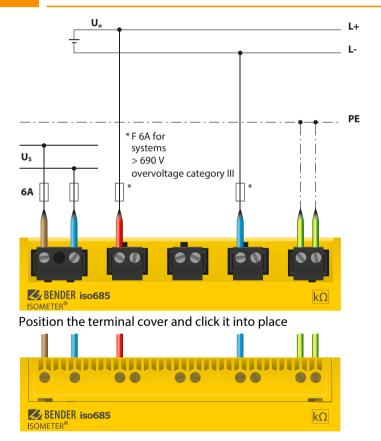


5.4 Connection to a DC system/system type DC



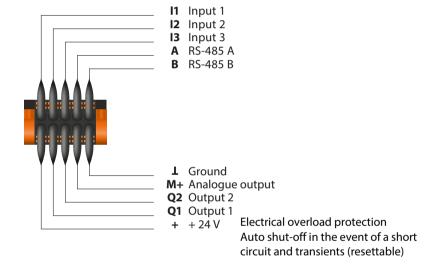
Risk of injury, fire and damage to property due to a shortcircuit!

According to DIN VDE 0100-430, devices used to protect against a short-circuit when terminals L1/+, L2 und L3/- are coupled to the IT system to be monitored can be omitted if the wiring is carried out in such a manner as to reduce the risk of a short-circuit to a minimum. Ensure short-circuit-proof and earth-fault-proof wiring.



5.5 Connection to the X1 interface





Position the terminal cover and click it into place





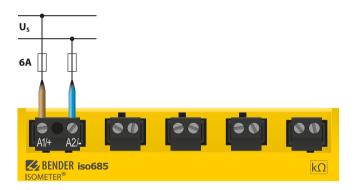
5.6 Connection to the supply voltage

5.6.1 Connection to A1/+, A2/-



Danger of damage to property due to faulty connections!

The device can be damaged if the unit is simultaneously connected to the supply voltage via the X1 interface, and A1/+, A2/- terminals. Do not connect the device simultaneously via X1, and A1/+, A2/- to different supply voltages.



5.6.2 Connection to X1



External Power supply for powering the ISOMETER® via terminal X1 must fulfil immunity and emission standards of the required application. For wiring longer than 1 m the use of a shielded cable is prescribed.



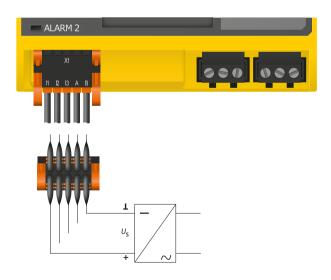
Danger of damage to property due to faulty connections!

The device can be damaged if the unit is simultaneously connected to the supply voltage via the X1 interface, and A1/+, A2/- terminals.Do not connect the device simultaneously via X1, and A1/+, A2/- to different supply voltages.



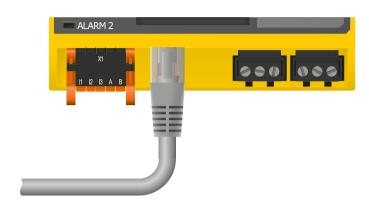
Danger of damage to property due to incorrect nominal voltage!

When the device is powered via the X1 interface, the nominal voltage must be 24 V otherwise the unit may be damaged. kann. Only connect to a nominal voltage of 24 V to the X1 interface.





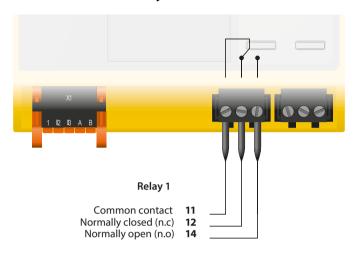
5.7 Connection to the Ethernet interface



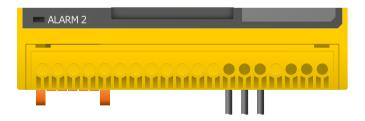
Position the terminal cover and click it into place



5.8 Connection to the relay -1 interface (11 12 14)



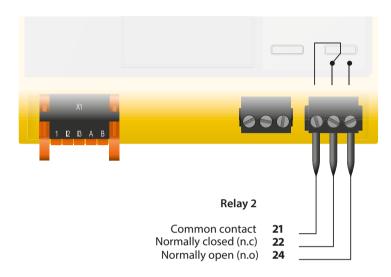
Position the terminal cover and click it into place



6. Commissioning

BENDER

5.9 Connection of the relay-2 interface (21 22 24)

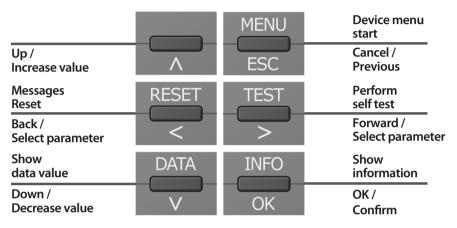


Position the terminal cover and click it into place



6.1 Device buttons

You can adjust the device settings in the respective menu using the menu buttons. Depending on the menu entry, one of the options displayed below are assigned to the buttons. The individual functions are:



6.2 General initial commissioning process

- Check that the ISOMETER® iso685-D has been properly connected to the system to be monitored.
- 2. Connect the supply voltage to the ISOMETER® iso685-D. Adjust the devicce using the commissioning wizard. The ISOMETER® then performs a 4-step self test during which the alarm relays are not checked. After completion of the test, the measured insulation resistance is shown on the display. If the value exceeds the response values indicated in the lowest line of the display, the message "OK" will additionally be displayed.
- 3. Check the ISOMETER® iso685-D in the system being monitored, e.g. using a suitable resistance to earth.



Observe the device status!

The device is in the alarm state until initial commissioning has been complete.

6. Commissioning



After setting the response value $R_{\rm an2}$ for Alarm 2, the device starts a self test, makes the first measurement and outputs the measured insulation resistance values of the IT system being monitored. After this, the commissioning of the device is complete.

6.3 Initial commissioning



Check network function!

When the device is integrated into a network, the influence on the network has to be checked with the device switched on and off.

Follow the instructions of the commissioning wizard on the display.

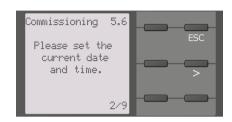
6.3.1 Set language

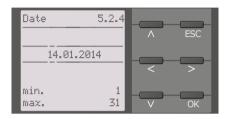
The language selected here will be used in the menu and for device messages.



6.3.2 Set time and date

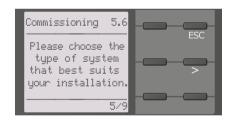
Alarm messages in the history memory and the insulation resistance value over time can only be assigned correctly to the isoGraph when the date and time are set correctly.

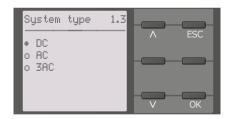




6.3.3 Set system type

By setting the system type the insulation monitoring device can be optimally adapted to the system to be monitored. The system type is essential information for the insulation monitoring device in order to determine the insulation resistance correctly.



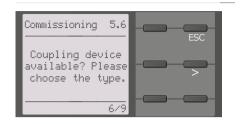


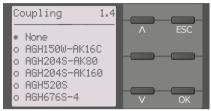
6.3.4 Select a coupling device

A coupling device connected to the insulation monitoring device (to increase the nominal system voltage) must be programmed here. The measurement of the insulation resistance takes into account the parameters of the connected coupling device. If no coupling device is available, press OK.

6. Commissioning

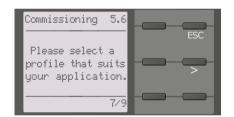


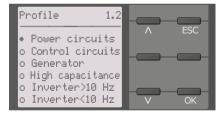




6.3.5 Set profile

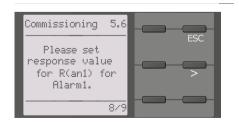
In order to adapt the insulation monitoring device optimally to the system to be monitored, select a profile here that suits your system. For an overview of the profiles refer to "Profile overview" on page 38. The profile "power circuits" is suitable for most IT systems.





6.3.6 Set response value R_{an1} for Alarm 1

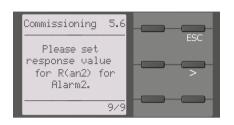
You can set the prewarning response value here. A value of 100 Ω/V is recommended for prewarning.





6.3.7 Set response value R_{an2} for Alarm 2

You can set the response value for the main alarm here. A value of $50 \Omega/V$ is recommended for the main alarm.





6.4 Recommissioning

If the device has already been put into operation before, the self test will be started shortly after the supply voltage has been connected. Start the commissioning wizard using the menu path:

Menu/Device settings/Commissioning

This menu can be used to modify settings made previously.



Observe the device status!

The device changes from the alarm state to normal state after completing initial commissioning and initial measurement by adhering to the response values set.

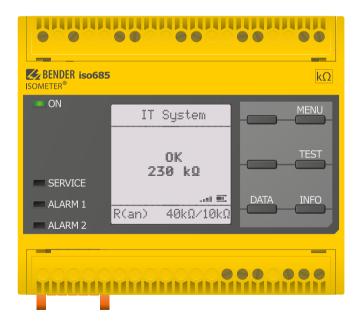


7.1 Standard display

In normal operation the ISOMETER® iso685-D displays the message **OK** and below the currently measured insulation resistance.

41	The signal quality of the measurement suits the selected profile.
. .a00	The signal quality of the measurement does not suit the selected profile. Select a suitable profile.
	Update period between the test pulses

In the bottom line of the display, the set limit values for R(an) are indicated. In the example below, the set limit values are R_{an1} =40 k Ω and R_{an2} =10 k Ω .



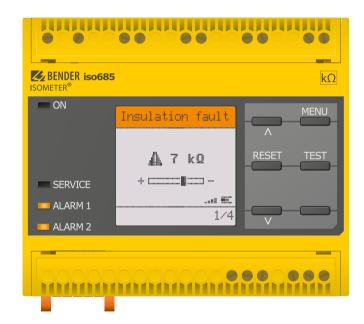
7.2 Fault display (active)

An active fault is displayed by . The upper part of the display will become orange and displays the fault message.

Depending on the type of fault, the LEDs ALARM 1, ALARM 2 or SERVICE are activated.

In the example below, the insulation resistance still is 7 k Ω . Since the values $R_{\rm an1}$ =40 k Ω and $R_{\rm an2}$ =10 k Ω both are below the set response value, ALARM 1 and ALARM 2 have been triggered.

If several fault messages occur, navigate through the faults using the $\,^{\vee}$ and $\,^{\wedge}$ button.



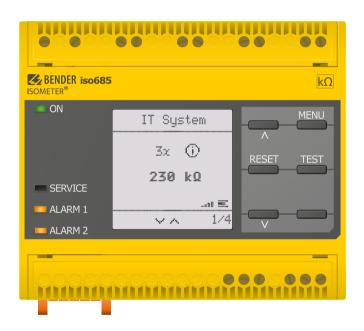
If the value falls below $R_{\rm an1}$ in a DC system or a DC shift is recognised in an AC system, additional detailed information regarding the DC shift will be displayed, as illustrated above.



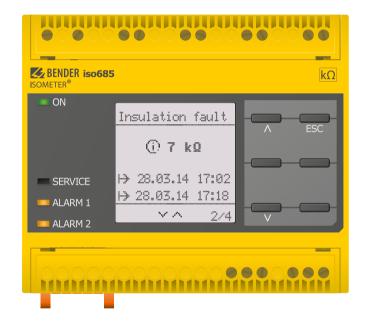
7.3 Fault display (inactive)

An inactive fault is displayed by ①. If several faults have occurred, the number of faults will also be indicated.

This message means that there has been a fault in the past but the device is no longer in fault condition.



If several fault messages occur, navigate through the faults using the $^{\vee}$ and $^{\wedge}$ button. In addition to the type of fault and the associated alarm value when the fault has occurred and how long it has been active will be shown.



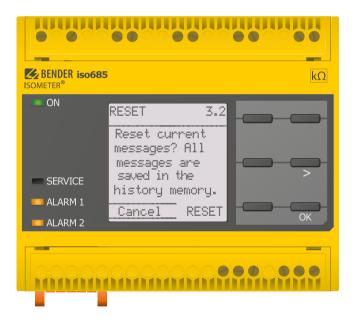


7.4 Acknowledge fault memory

In order to acknowledge the fault message and return to the iso685-D ISOMETER®'s standard display, all faults must be acknowledged by means of the reset button.

This means that fault messages can only be reset when the cause of the fault has been eliminated.

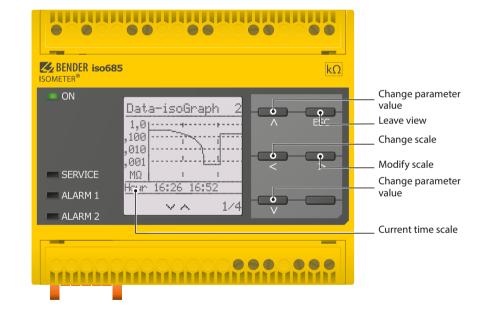
Press the reset button, then \geq and OK to clear the fault memory. The ISOMETER® iso685-D then returns to the standard display.



7.5 Data-isoGraph

The isoGraph represents the chronological sequence of the insulation resistance over time. This graphical representation can be displayed over the following time periods: hour, day, week, month and year.

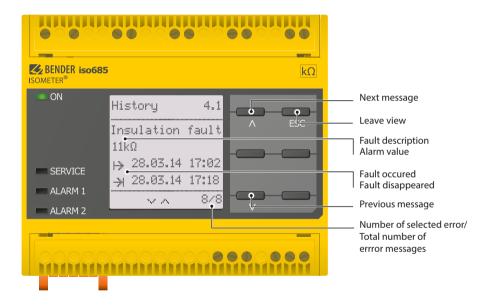
The measured values for individual representations are stored in a separate memory. Up to 100 measured values are available to represent each graph and the resolution of each graph is determined by these values.



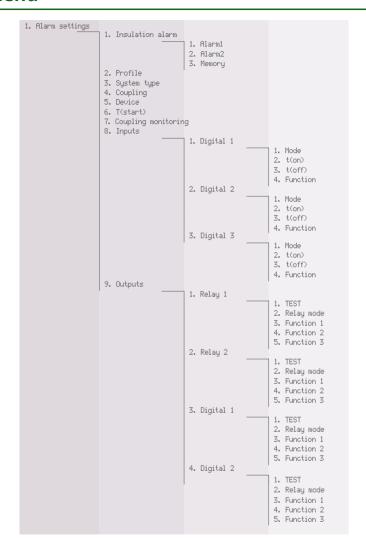


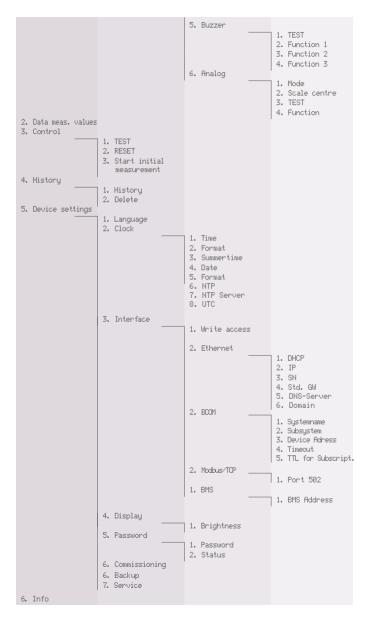
7.6 History memory

Up to 1023 alarm messages and device errors are stored in the history memory with date and time stamp. When the history memory is deleted, the minimum insulation resistance R_{\min} will then be reset (refer to "Data measured values" on page 22).











1.0 Alarm settings

The limit values for the insulation resistances of Alarm 1 and Alarm 2 can be specified in the alarm settings menu and can be adapted to the iso685-D ISOMETER® user profile. A device password is required for entering the settings. You can adjust the following functions:

1.1 Insulation alarm

In the "Insulation alarm" menu you can set the iso685-D ISOMETER® limit values for ALARM 1 and ALARM 2:

1.1.1 Alarm 1

For ALARM 1 an insulation resistance of 1 k Ω ...10 M Ω can be set irrespective of ALARM 2.

1.1.2 Alarm 2

For ALARM 2 an insulation resistance of 1 k Ω ...10 M Ω can be set irrespective of ALARM 1.

1.1.3 Fault memory

Automatic reset of inactive faults at the outputs of relay 1, relay 2, digital output 1, digital output 2:

•on	If a fault becomes inactive, the programmed outputs remain
TUI!	if a fault becomes mactive, the programmed outputs remain

in fault condition until they are reset manually.

○ f f If a fault becomes inactive, the programmed outputs auto-

matically change the state.

1.2 Profile

Adapt the applicabilty of the ISOMETER® iso685-D to your system profile. For a description of the profiles refer to "Profile overview" on page 38. You may select:

*Power circuits Suitable for most IT systems.

*Control circuits Not recommended for voltages > 230 V.

•Generator

•High capacitance

•Inverter > 10 Hz

•Inverter <10 Hz

1.3 System type

Adapt the ISOMETER® iso685-D to the IT system to be monitored. You may select:

*DC

•AC

*****3AC

1.4 Coupling

Adapt the ISOMETER® iso685-D to the requirements of Bender coupling devices. For a description about the connection of coupling devices refer to "Coupling devices" on page 43. You may select:

None

•AGH150W-AK160

•AGH204S-AK80

◆AGH204S-AK160

•AGH520S

•AGH676S-4



1.5 Device

Set the iso685-D ISOMETER®'s insulation resistance measurement function to avtive or inactive:

*Active The device is active.

 \bullet In active The device DOES NOT measure the insulation resistance, the

message Device inactive appears on the display. The

IT system is NOT being monitored!

1.6 T(Start)

The ISOMETER® iso685-D can be operated with a startup delay of 0...120 seconds. The startup is delayed until the first measurement takes place.

1.7 Coupling monitoring

The ISOMETER® iso685-D continuously monitors the coupling of energised systems. The coupling of deenergised systems is monitored at 8 hour intervals. This monitoring function can be activated or deactivated.

coupling monitoring is activated.coffCoupling monitoring is deactivated.

1.8 Inputs

The ISOMETER® iso685-D provides a total of three inputs.

1.8.1 Digital 1

The following parameters can be set for the digital input:

1.8.1.1 Mode

The operating mode for the digital input can be set to the following values. For a description of the operating modes refer to "Digital input mode" on page 39. You may select:

•active high

•active low

1.8.1.2 t(on)

The response time t(on) after a switch-off signal can be set between 100 and 300 milliseconds. For a description of the operating modes refer to "Digital input mode" on page 39.

1.8.1.3 t(off)

The response time t(off) after a switch-off signal can be set between 100 milliseconds and 300 seconds. You will find a description of the operating modes under "Digital input mode" on page 39.

1.8.1.4 Function

The parameters for the digital input functions of the ISOMETER® iso685-D can be set differently:

*off Digital input without function

◆TEST Device self test

■RESET Reset of fault and alarm messages

*Deactivate device The device DOES NOT measure the insulation

resistance, the message Device inactive

appears on the display.

The IT system is NOT being monitored!

•Start initial measure-

ment

All recorded measurements are discarded and a

new measurement will be started

1.8.2 Digital 2

See Digital 1 under 1.8.1

1.8.3 Digital 3

See Digital 1 under 1.8.1



1.9 Outputs

The ISOMETER® iso685-D provides a total of six outputs: The following parameters can be set for the outputs:

1.9.1 Relay 1

The following parameters can be set for each relay:

1.9.1.1 TEST

The functional test of the relay can be activated or deactivated. This only applies to the manual test and not to the cyclic device self test:

•on	The manual test checks the relay's switching function
•off	The manual test does not check the relay's switching func-
	tion

1.9.1.2 Relay mode

•N/C

The relay mode can be adapted to the application:

	24 (The alarm relay is energised in normal operation).
•N/0	Normally open - N/O operation contacts 11-12-14 / 21-22-24
	(The alarm relay is de-energised in normal operation).

Normally closed- N/C operation contacts11-12-14 / 21-22-

1.9.1.3 Function 1

Select the appropriate setting for function 1. The following parameters can be set. For a detailed functional description refer to "Description of the output functions" on page 40:

- *off
- •Iso. Alarm 1
- •Iso. Alarm 2
- *Connection fault
- •DC- Alarm
- •DC+ Alarm
- •Symmetrical alarm
- •Device error
- *Common alarm
- •Measurement ended
- *Device inactive

1.9.1.4 Function 2

See function 1 under 1.9.1.3

1.9.1.5 Function 3

See function 1 under 1.9.1.3

1.9.2 Relay 2

See relay 1 under 1.9.1



1.9.3 Digital 1

The following parameters can be set for each of the digital outputs:

1.9.3.1 TEST

The functional test of the digital output can be activated or deactivated. This only applies to the manual test and not to the cyclic device self test:

◆on The manual test changes the status of the dig-

ital output.

***** □ f f The manual test does not change the status of

the digital output.

1.9.3.2 Mode

The operating mode for the digital output can be set to the following values. For a detailed functional description refer to "Digital output modes" on page 40:

•Active

*Passive

1.9.3.3 Function 1

See function 1 under 1.9.1.3

1.9.3.4 Function 2

See function 1 under 1.9.1.3

1.9.4 Digital 2

See Digital 1 under 1.9.3

1.9.5 Buzzer

The following parameters can be set for the buzzer:

1.9.5.1 TEST

The functional test of the buzzer can be activated or deactivated. This only applies to the manual test and not to the cyclic device self test:

• on The manual test activates the buzzer sound.

of f The manual test does not activate the buzzer

sound.

1.9.5.2 Function 1

See function 1 under 1.9.1.3

1.9.5.3 Function 2

See function 1 under 1.9.1.3

1.9.5.4 Function 3

See function 1 under 1.9.1.3

1.9.6 Analog

The following parameters can be set for the analogue output:

1.9.6.1 Mode

The operating mode for the analogue output can be set to the values listed below. For a detailed functional description refer to "Description of the analogue output" on page 41:

•0-20 mA

•4-20 mA

•0-400 μA

•0-10 U

•2-10 V



1.9.6.2 Midscale

Select the appropriate midscale. The following parameters can be set. For a detailed description refer to "Description of the analogue output" on page 41.

•Linear

•28 kΩ

•120 kΩ

1.9.6.3 TEST

The functional test of the analogue output can be activated or deactivated. In this way, the analogue output is adjusted once for the entire range. This only applies to the manual test and not to the cyclic device self test:

● on The manual test checks the analogue output

function.

#off The manual test does not check the analogue

output function.

1.9.6.4 Function

Select the appropriate setting for function 3. The following parameters can be set. For a detailed description refer to "Function" on page 42.

•Insulation value

•DC shift

2.0 Data measured values

The ISOMETER® iso685-D stores certain measured values for a specific period of time. You can view these data in the "Data meas. value" menu. Navigate through the different views using the \land and \lor buttons:

⊕Data – isoGraph	Displays the insulation resistance and chronological sequence. See "Device communication" on page 36.
⊕Data - Insulation	Displays the actual insulation resistance, the minimum insulation resistance measured and the system leakage capacitance.
•Data – IT system	Displays the system phase-to-phase voltages

*Data - IT system Displays the system phase-to-earth voltages.

and the system frequency.

3.0 Control

In the control menu you can start a manual test reset, reset alarm messages and start an initial measurement:

•TEST	Manual device test.
*RESET	Reset of fault and alarm messages
•Start initial measure- ment	All recorded measurements are discarded and a new measurement will be started

4.0 History

In the history menu, the faults detected by the ISOMETER® iso685-D are displayed. For a detailed functional description refer to "History memory" on page 26:

*History	Overview of faults that have occurred.
*Delete	Reset the history memory.



5.0 Device settings

The device settings menu allows you to configure the basic settings for the ISOMETER® iso685-D:

5.1 Language

Choose the language to be displayed by the ISOMETER® iso685-D. For example, you can set the languages:

- •Deutsch
- *English
- **.**..

5.2 Clock

In the clock menu you can set the display format of time and date for the ISOMETER® -D:

5.2.1 Time

Based on the selected time format you can set the current time to display 24-hour or 12-hour notation (am/pm).

5.2.2 Format (time)

Select the appropriate time format to be displayed:

- ₱ 12 h

 12-hour notation am/pm.
- 24 h 24-hour notation

5.2.3 Summertime

Summer time can be considered in the following settings:

*****off No automatic change between summertime and standard time.

***** □ST Daylight Saving Time

Automatic change between summer and standard time according to North American regulation.

North American summer time begins on each second Sunday in March at 02:00 local time by setting the clock forward by one hour from 2:00 to 03:00 local time. Summertime always ends the first Sunday in October at 03:00 local time by setting the clock back 1 hour from 3:00 to 2:00.

***** CEST Central European Summer Time

Automatic change between summertime and standard time according to Central European regulation.

Central European summer time begins on each last Sunday in March at 02:00 Uhr CEST by setting the clock forward by one hour from 2:00 to 03:00. Central European summer time always ends on the last Sunday in October at 03:00 CEST by setting the clock back 1 hour from 3:00 to 2:00.

5.2.4 Date

Based on the selected date format you can set the current date.

5.2.5 Format (date)

Select the appropriate date format you want to be displayed:

#dd:mm:yy day, month, year

★mm-dd-yy month, day, year

5.2.6 NTP

Choose whether you want to synchronise the current time via NTP:

•on

*off

5.2.7 NTP server

Set the NTP server.



5.2.8 UTC

Set the time according to UTC (coordinated world time). For Germany, set +1 for wintertime (MEZ) and +2 for summertime (MESZ).

5.3 Interface

Set the parameters for the connection of other device to the ISOMETER® in the interface menu:

5.3.1 Write access

Set whether the device can be parameterised externally via Modbus or web server. Displaying and reading out data via Modbus and web server will always work, regardless of this setting.

*Allow	Allow external parameter setting
•Denu	Deny external parameter setting

5.3.2 Ethernet

Set the parameters for communication with other devices via the Ethernet interface.

5.3.2.1 DHCP

Decide whether you want to use the DHC protocol:

•on •off

5.3.2.2 IP

Set the appropriate IP address.

5.3.2.3 SN

Set the appropriate subnet mask.

5.3.2.4 Std. GW

If you use a standard gateway, enter the IP address here.

5.3.2.5 DNS server

If you use a DNS server, enter the server's IP address.

5.3.2.6 Domain

Enter the domain.

5.3.3 BCOM

Set the parameters for communication with other devices via BCOM.

5.3.3.1 System name

Set the system name of the network in which the devices are located. In order to guarantee that all devices are able to communicate via BCOM, all devices must have the same system name.

5.3.3.2 Subsystem

Set the subsystem name of the network in which the devices are located. The devices can communicate with subsystems of the same or different subsystem address.

5.3.3.3 Device address

Assign a device address. Each device must have a different address to distinguish one device from another in the system and ensure correct communication.

5.3.3.4 Timeout

Set the timeout for messages between 100 ms...10 s.

This time specification defines the maximum permissible time for a device to respond.

5.3.3.5 TTL for subscription

Set a time between 1 s...1092 min.

This time defines the intervals at which the ISOMETER® sends messages to e.g. a gateway. Essential messages (e.g. insulation alarm or substantial value changes) are always sent immediately.



5.3.4 Modbus/TCP

Set the parameters for communication with other devices via Modbus/TCP.

5.3.4.1 Port 502

Decide whether you want to use Modbus/TCP:

•on

#off

5.3.5 BMS

For Retrofit only. For further information please contact the Bender-Service.

5.4 Display

Adjust the brightness for the iso685-D ISOMETER®'s display here.

5.4.1 Brightness

Adjust the brightness for the display between 0 and 100 %.

5.5 Password

Use the password function to protect the device parameters against unauthorised adjustment. The default password is 0000.

5.5.1 Password

Enter an individual four-digit password.

5.5.2 Status

Decide whether you want to use the password query:

on Password query activeof f Password query inactive

5.6 Commissioning

Open the iso685-D ISOMETER®'s commissioning wizard again in the commissioning menu.

5.7 Backup

In the data backup menu device settings can be saved or device settings you have already saved can be restored.

•Save

•Restore

5.8 Service

The service menu can only be accessed by Bender Service staff.

6.0 Info

You can view the iso685-D ISOMETER®'s current settings in the Info menu. Navigate through the different views using the $^{\Lambda}$ and $^{\vee}$ buttons:

*Info - Device Device name, serial number, article number

*Info - Version Software version measurement technique, software version HMI

*Info - Measurement technique Selected profile, selected system type

*Info - Clock Time, date, summer time

◆Info - Ethernet IP address, DHCP status, MAC address

9. Device communication



9.1 Ethernet interface

The Ethernet interface can be used for communication with Modbus, web server and BCOM.

9.2 BCOM

BCOM is intended for communication of Bender devices via Ethernet

All devices that communicate over BCOM must have the same system name. Devices can be organised in subsystems. Each device requires an individual device address.

For more information regarding BCOM, refer to the BCOM manual (D00256) on http://www.bender.de/manuals.



When address 0 has been set for the communication via BCOM the device can be accessed via the network (e. g. for parameter setting, etc.) but it cannot communicate with other devices.

9.3 Modbus/TCP

Modbus is an international widely spread protocol for data transfer.

All measured values, messages and parameters are stored in virtual register addresses. Data can be read out with a read command on a register address. With a write command, data can be written into a register address.

The register addresses of the individual measured values und parameters can be found in the annex "Modbus configuration" of the ISOMETER® iso685 (D00022) on http://www.bender.de/manuals.



A maximum of 5 TCP/IP connections can be used simultaneously.



In order to be able to parameterise the device externally via Modbus, the menu item "Allow" must have been set in the "Write access" menu (see "Write access" on page 34).

9. Device communication



9.4 Web server

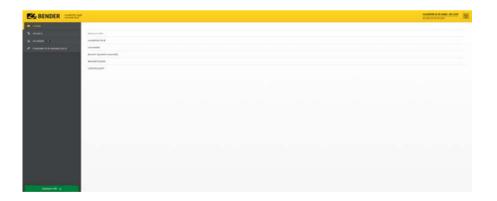
The web server of the device ISOMETER® iso685 represents the device functions graphically. The web server can be used to read out measured values and also for parameter setting.



A maximum of 5 TCP/IP connections can be used simultaneously.



Only one device may access the web server at the same time. If several devices try to access the web server it may result in timeouts.





10.1 Profile overview

	Nominal system voltage	Power frequency	System leakage capacitance	Measuring voltage	Description
Power circuits	AC 0690 V/ DC 01000 V	15460 Hz	0150 μF	± 50 V	Main circuits without dynamic frequency changes. The universal profile is suitable for all systems primarily with constant system frequencies and extraneous DC voltages. When using inverters and dynamic frequency control, select inverters > 10 Hz or inverters < 10 Hz.
Control circuits	AC 0230 V/ DC 0230 V	15460 Hz	0150 μF	± 10 V	This profile is used to reduce the measurement voltage to \pm 10 V in control systems with lower nominal voltages in order to reduce the impact on sensitive switching elements.
Generator	AC 0690 V	5060 Hz	05 μF	± 50 V	This profile allows the realisation of a very fast measuring time, e.g. as required for generator monitoring. Furthermore, this profile can be used to support fast fault localisation in an IT system. The generator profile is suitable for AC systems containing DC components.
High capacitance	AC 0690 V/	15460 Hz	01000 μF	± 50 V	For systems with high leakage capacitances, e.g. ship applications, the impact of leakage capacitances on the measuring result can be significantly reduced by selecting this profile.
Inverter > 10 Hz	AC 0690 V/ DC 01000 V	10460 Hz	020 μF	± 50 V	This profile is used for systems with dynamic frequency control by inverters in the range 10 to 460 Hz in order to optimise the measurement with respect to the measuring time and quality.
Inverter <10 Hz	AC 0690 V/ DC 01000 V	1460 Hz	020 μF	± 50 V	For systems involving extremely low frequency control in the range of up to 1460 Hz and very low and continuously changing extraneous DC voltages due to dynamic load conditions in an IT system, continuous insulation monitoring can be optimised using this profile.

response times see "Diagrams" on page 48.

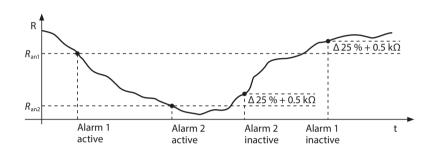


10.2 Settings Insulation Alarm

Activation or deactivation of the two alarm levels R_{an1} (Alarm 1) and R_{an2} (Alarm

2) are illustrated in the following graphic:

An alarm will become inactive as soon as +25 % +0.5 $k\Omega$ of the set operating value is exceeded.



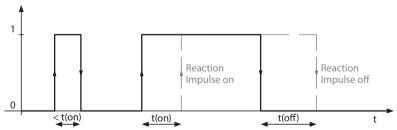
10.3 Digital input mode

The operating mode for the digital input can be set to the following values:

•high active

Response time t(on) / t(off) after a switch-on signal.

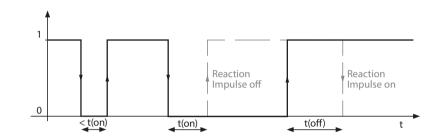






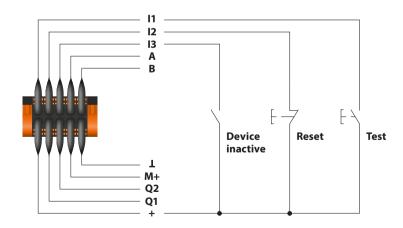
Response time t(on) / t(off) after a switch-off signal.





10.4 Typical digital input circuits

The digital inputs can be wired as follows:





10.5 Digital output modes

The following settings can be used to set the operating mode for the digital output:

◆Active
In the active mode + 24 V will be applied across the output.

*Passive In the passive mode the output of the applied

potential switches to ground.





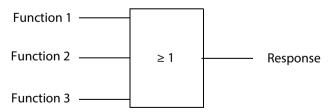
Observe the maximum output current!

Maximum output current in case of internal voltage supply via A1/+ and A2/-: 200 mA in total to X1.

Maximum output current in case of external voltage supply via X1+: 1 A per output.

10.6 Description of the output functions

Three functions can be assigned to one output. The functions are linked to an OR operator:



The following output functions are possible:

#off The function is not used.

*Iso. Alarm 1 The status of the output changes when the value falls below the set response value Ran1

*Iso. Alarm 2 The status of the output changes when the value falls

below the set response value Ran2_.

*Connection fault The status of the output changes when one of the following connection fault occurs:

No low-resistance connection between the line conductors.

 No low-resistance connection between the terminals E and KE to earth (PE).

 The connected load resistor for the voltage output is too low.

• The load connected to the current output is too high.

 The sum of the external loads to X1 is too high, resp. operation is outside the temperature limit 0...+55 °C.

*****DC− Alarm The status of the output changes in case of an earth fault

in the direction of DC- when 75% of the value are exceeded. This does not concern symmetrical faults. This function will only be carried out when the value falls below the response value $R_{\rm an1}$ and when the nominal sys-

tem voltage is $U_n \ge 50 \text{ V}$.

*DC+ Alarm The status of the output changes in case of an earth fault

in the direction of DC+ when 25% of the value are exceeded. This does not concern symmetrical faults. This function will only be carried out when the value falls below the response value $R_{\rm an1}$ and when the nominal sys-

tem voltage is $U_n \ge 50 \text{ V}$.

*Symmetrical alarm The status of the output changes in the event of a resist-

ance ratio between DC+ and DC- of 25 % to 75 %.



DC+ Alarm	l I	Symmetrical alarm	 	DC- Alarm
0 %	25 %	50 %	75 %	100 %
•Device error		The status of the output on all device error.	changes in t	he event of an inter-
◆Common alarm		The status of the output changes on the occurrence of any alarm and fault messages (Iso. Alarm 1 & 2, DC- / DC+ Alarm, symmetrical alarm, connection and device faults).		
•Measurement ended		The status of the output changes at the end of the initial measurement.		
•Device inactive		The status of the output of	_	

10.7 Description of the analogue output

10.7.1 Mode

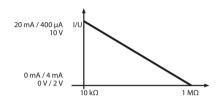
The following values can be set for the operating mode of the analogue output.

Current output	X1 X1
•0-20 mA	Permissible load \leq 600 Ω
•4-20 mA	Permissible load \leq 600 Ω
•0-400 μA	Permissible load $\leq 4 \text{ k}\Omega$
Voltage output	X1 X1 <u>M.</u> <u>U</u>
•0-10 V	Permissible load $\geq 1 \text{ k}\Omega$
•2-10 V	Permissible load $\geq 1 \text{ k}\Omega$

10.7.2 Midscale

Select the appropriate midscale. The following parameters can be set:

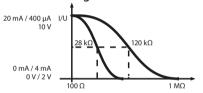
*Linear The switching signal is linear to the insulation resistance in the indicated measuring range.



- •28 kΩ
- •120 kΩ

The switching signal is analogue to the mid scale of $28 \text{ k}\Omega$ or $120 \text{ k}\Omega$ on a measuring instrument.





Calculation of the insulation resistance using the analogue output:

$$R_F = \frac{(A_2 - A_1) * R_{SKM}}{A_3 - A_1} - R_{SKM}$$

$$\begin{split} R_{SKM} &= 28 \text{ k}\Omega \text{ or } 120 \text{ k}\Omega/\text{midscale} \\ A_3 &= \text{Measured analogue output} \\ R_F &= \text{Insulation in k}\Omega \end{split}$$

Upper value	
put	
•	



10.7.3 Function

Select the appropriate setting for function. The following parameters can be set:

*Insulation value Depending on the measured insulation value, an analogue current or voltage signal is provided at the output.

*DC shift Depending on the measured DC shift, an analogue current or voltage signal is provided at the output. This setting can only be used when Linear is selected in the menu "Mid-

scale"..

DC+ Alarm	1 	Symmetrical alarm	! !	DC- Alarm
0 %	25 %	50 %	75 %	100 %
0 V/2 V				10 V
0 mA/4 mA				20 mA
0 μΑ				400 μΑ



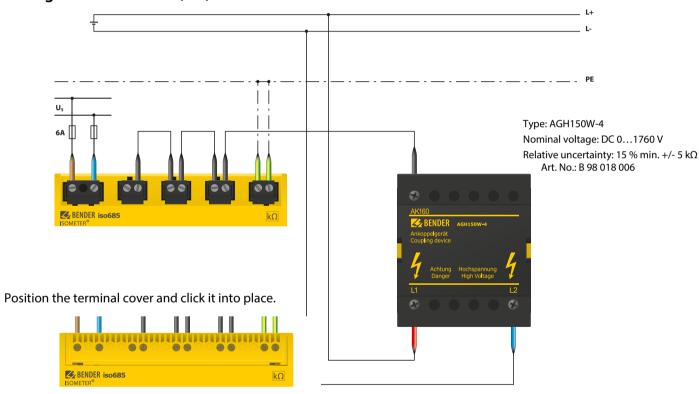


If a coupling device is selected during the commissioning or in the device menu, the ISOMETER® automatically sets the system type to 3AC. This setting must not be changed.



If the ISOMETER® is operated with a coupling device, this device must be specified in the commissioning assistant during commissioning or in the device menu later on.

11.1 Connection using the AGH150W-4(DC)



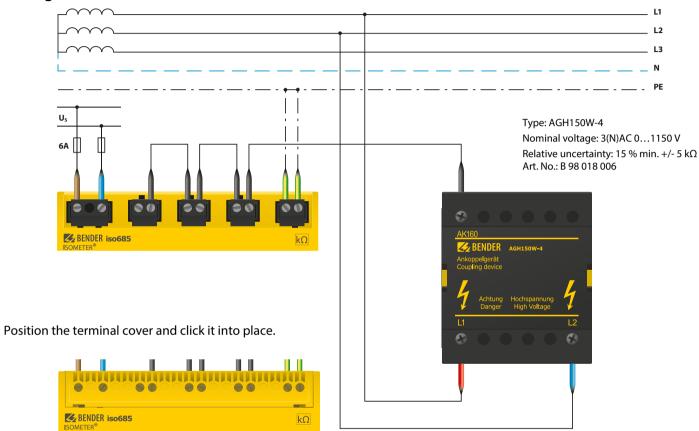


Risk of electric shock!

The coupling device is operated with high voltage, which can be life-threatening in case of direct contact. Make sure that only electrically skilled persons work on or with the device. Read the operating manual of the coupling device carefully.



11.2 Connection using the AGH150W-4 (3(N)AC)



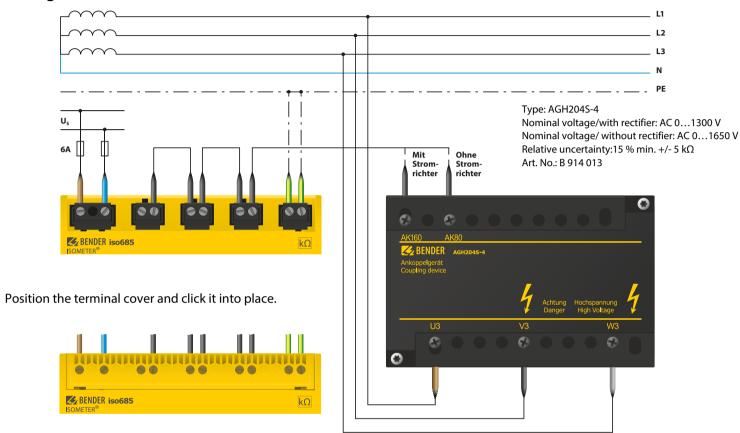


Risk of electric shock!

The coupling device is operated with high voltage, which can be life-threatening in case of direct contact. Make sure that only electrically skilled persons work on or with the device. Read the operating manual of the coupling device carefully.



11.3 Connection using the AGH 204S-4



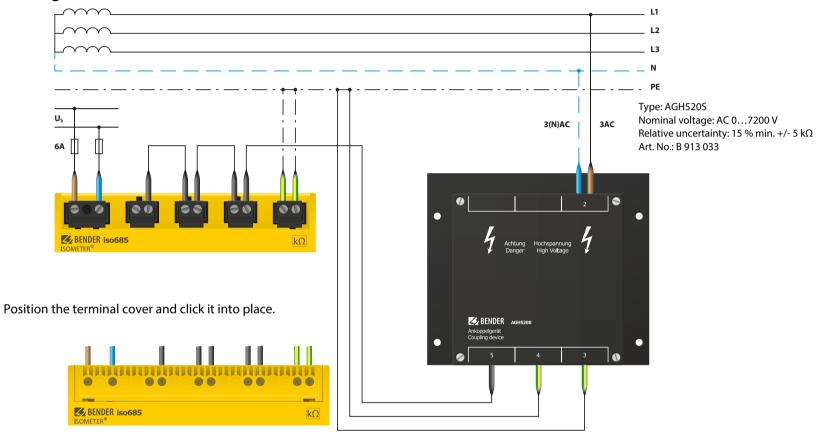


Risk of electric shock!

The coupling device is operated with high voltage, which can be life-threatening in case of direct contact. Make sure that only electrically skilled persons work on or with the device. Read the operating manual of the coupling device carefully.



11.4 Connection using the AGH520S



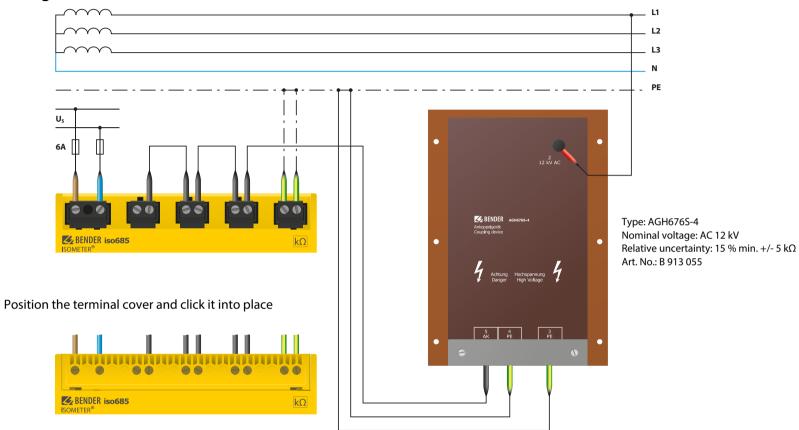


Risk of electric shock!

The coupling device is operated with high voltage, which can be life-threatening in case of direct contact. Make sure that only electrically skilled persons work on or with the device. Read the operating manual of the coupling device carefully.



11.5 Connection using the AGH676S-4





Risk of electric shock!

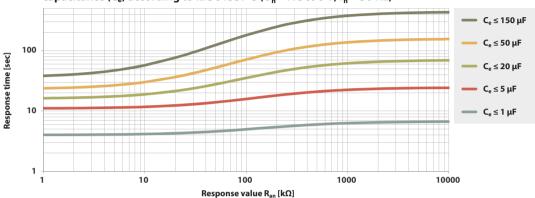
The coupling device is operated with high voltage, which can be life-threatening in case of direct contact. Make sure that only electrically skilled persons work on or with the device. Read the operating manual of the coupling device carefully.

12. Diagrams



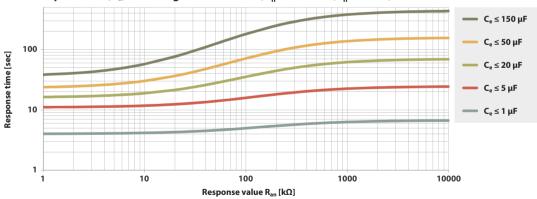
12.1 Response time profile power circuits

Response time as a function of the response value (R_{an}) and system leakage capacitance (C_e) according to IEC 61557-8 ($U_p = AC 690 \text{ V}$, $f_p = 50 \text{ Hz}$)



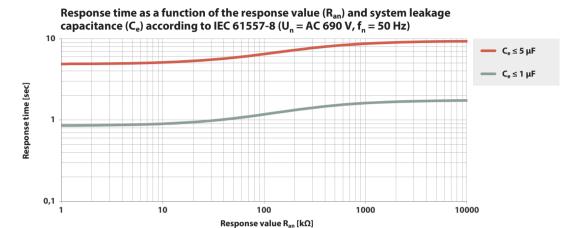
12.2 Response time profile control circuits

Response time as a function of the response value (R_{an}) and system leakage capacitance (C_e) according to IEC 61557-8 ($U_p = AC 690 \text{ V}$, $f_n = 50 \text{ Hz}$)



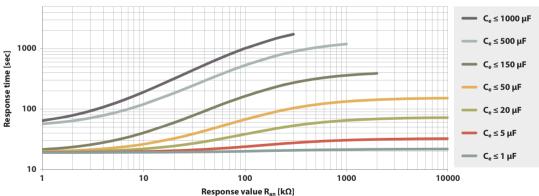


12.3 Response time profile generator



12.4 Response time profile high capacitance

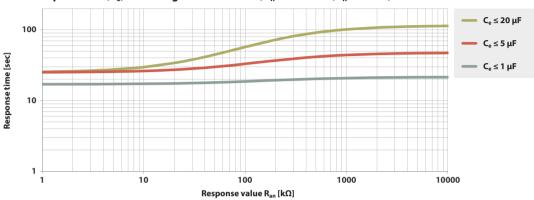






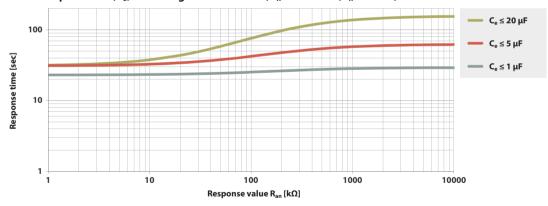
12.5 Response time profile inverter > 10 Hz

Response time as a function of the response value (R_{an}) and system leakage capacitance (C_e) according to IEC 61557-8 (U_n = AC 690 V, f_n = 50 Hz)



12.6 Response time profile inverter < 10 Hz

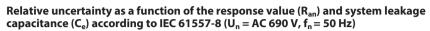
Response time as a function of the response value (R_{an}) and system leakage capacitance (C_e) according to IEC 61557-8 (U_n = AC 690 V, f_n = 50 Hz)

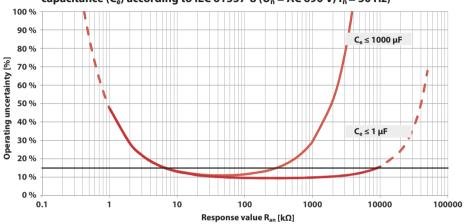


12. Diagrams



12.7 Relative uncertainty





13. Alarm messages



Description	Actions	Reference	LED indicators
No low-resistance connection between the line conductors	 Check the wiring of the terminals L1/+, L2 and L3/- to the IT system Press the test button Check mains voltage Check the fuses 	Chapter 5	ALARM 1 + ALARM 2 flash alternately
No low-resistance connection between the terminals E and KE to earth (PE)	 Check the wiring of the terminals E and KE to earth (PE) Press the test button 	Chapter 5	ALARM 1 + ALARM 2 flash in common mode
The device is in maintenance condition	Contact Bender Service		SERVICE lights up
Wrong profile selected for this application	 Check measured system capacitance resp. system frequency in the Info menu Select another profile taking the characteristics into consideration 	Chapter 10.1/ menu 1.2	
Connection problem at the Ethernet interface	 Check cable connection at the Ethernet interface. Check the DHCP server's availability. Check the DHCP's interface configuration in the device/see menu 5.3.2.1 		
Time and date have not yet been set.	Set local time and date (in case of voltage failure a buffer for three days)	Chapter 8/menu 5.2	-
The sum of the external loads to X1 is too high, or operation is outside the temperature limit 0+55 °C	 Check load at X1.+, X1.Q1 and X1.Q2 Check ambient temperature 	Chapter 10.5	
Internal device error	Press the test buttonSwitch the supply voltage on and offContact Bender Service		SERVICE lights up
	No low-resistance connection between the line conductors No low-resistance connection between the terminals E and KE to earth (PE) The device is in maintenance condition Wrong profile selected for this application Connection problem at the Ethernet interface Time and date have not yet been set. The sum of the external loads to X1 is too high, or operation is outside the temperature limit 0+55 °C	Check the wiring of the terminals L1/+, L2 and L3/- to the IT system Press the test button Check mains voltage Check the fuses Check the wiring of the terminals E and KE to earth (PE) Check the wiring of the terminals E and KE to earth (PE) Press the test button Check the wiring of the terminals E and KE to earth (PE) Press the test button Check the wiring of the terminals E and KE to earth (PE) Press the test button Contact Bender Service Check measured system capacitance resp. system frequency in the Info menu Select another profile taking the characteristics into consideration Connection problem at the Ethernet interface Connection problem at the Ethernet interface Check cable connection at the Ethernet interface. Check the DHCP's interface configuration in the device/see menu 5.3.2.1 Time and date have not yet been set. Set local time and date (in case of voltage failure a buffer for three days) Check load at X1.+, X1.Q1 and X1.Q2 Check ambient temperature Press the test button Switch the supply voltage on and off	No low-resistance connection between the line conductors No low-resistance connection between the line conductors No low-resistance connection between the terminals E and KE to earth (PE) No low-resistance connection between the terminals E and KE to earth (PE) The device is in maintenance condition Wrong profile selected for this application Connection problem at the Ethernet interface Connection problem at the Ethernet interface - Check the DHCP's interface configuration in the device/see menu 5.3.2.1 Time and date have not yet been set. The sum of the external loads to X1 is to high, or operation is outside the temperature limit 0+55 °C - Check load at X1.+, X1.Q1 and X1.Q2 - Check ambient temperature - Check meins voltage - Check the wiring of the terminals L1/+, L2 and L3/- to the IT system - Press the test button - Check the wiring of the terminals L1/+, L2 and L3/- to the IT system - Check the wiring of the terminals L1/+, L2 and L3/- to the IT system - Check the wiring of the terminals L1/+, L2 and L3/- to the IT system - Check the wiring of the terminals L1/+, L2 and L3/- to the IT system - Check the wiring of the terminals L1/+, L2 and L3/- to the IT system - Check the wiring of the terminals L1/+, L2 and KE to earth (PE) - Check the System capacitance resp. system frequency in the length of the Info menu - Check measured system capacitance resp. system frequency in the Info menu - Check measured system capacitance resp. system frequency in the Info menu - Check measured system capacitance resp. system frequency in the Info menu - Check measured system capacitance resp. system frequency in the Info menu - Check measured system capacitance resp. system frequency in the Info menu - Check measured system capacitance resp. system frequency in the Info menu - Check the DHCP system capacitance resp. system frequency in the Info menu - Check the DHCP system capacitance resp. system frequency in the Info menu - Check the DHCP system capacitance resp. system frequency in the Info menu - Check t



14.1 Data in tabular form

()* = Factory setting

Insulation coordination	
3	1000 V
, , , , ,	8 kV
÷ ::	3
	/A1 A2\ /11 12 14\ /21 22 24\ [/[1]/. [2] [2]/\
	(A1, A2) - (11, 12, 14) - (21, 22, 24) - [(L1/+, L2, L3/-),
	(E, KE), (X1, ETH)] 4.3 kV
Supply voltage	
Supply via A1/+, A2/-:	
* * *	AC/DC 100 240 V
, 3 3 3	AC -15 +10 %
5	DC -15+15 %
	DC, 47 460 Hz
Power consumption typically 50 Hz (460 Hz)	5.7 W/20 VA (7.9 W/45.5 VA)
Supply via X1:	
Supply voltage U _s	DC 24 V
Tolerance of <i>U_s</i>	DC -20+25 %
IT system being monitored	
, , , , , , , , , , , , , , , , , , , ,	AC 0 690 V
	DC 0 1000 V
	AC/DC +15 %
Frequency range of <i>U</i> _n	DC, 1460 Hz
Response values	
	1 kΩ10 MΩ (40 kΩ)*
. unz	1 kΩ10 MΩ (10 kΩ)*
Relative uncertainty (acc. to IEC 61557-8) dependent on t	he profile, \pm 15 %, at least \pm 1 k Ω

	profile dependent, typ. 4 s (see diagrams)
Startup delay T _{startup}	0120 s (0 s)*
Measuring circuit	
	profile dependent, $\pm 10 \text{ V}$, $\pm 50 \text{ V}$ (see profile overview)
	≤ 403 μA
Internal resistance R_i , Z_i	≥ 124 kΩ
Permissible extraneous DC voltage U_{fg}	≤ 1200 V
Permissible system leakage capacitance $C_{\rm e}$	profile dependent, 0 1000 μF
Measuring ranges	
Measuring range f_n	10 460 Hz
Tolerance measurement of f_n	±1 % ±0.1 Hz
	AC 25 690 V
Measuring range U_n (without external coupling device)	AC 25 690 V
	DC 25 1000 V
	AC/DC > 10 V
	±5 % ±5 V
	01000 μF
	±10 % ±10 μF
	DC, 30 460 Hz
Min. insulation resistance measurement of $C_{\rm e}$. depending on the profile and coupling mode, typ. $>$ 10 k Ω
Display	
Graphic display 127 x 127 pixel, 40 x 40 mm	
Display range measured value	
LEDs	
ON (operation LED)	green
SERVICE	yellow
ALARM 1	yellow
ALARM 2	yellow



Digital inputs	
	3
1 3 , ,	active high, active low
	none, test, reset, start measurement, deactivate device
Voltage	Low DC -35 V, High DC 1132 V
Digital outputs	
	2
Operating mode, adjustable active, passive	
	m DC+, Alarm DC-, symmetrical insulation fault, device error,
	DC 0 32 V, active DC 0/19.2 32 V
3 1	max. 200 mA
	max. 1 A
'	
Analogue output	
	1
1 3	linear, midscale point 28 kΩ/120 kΩ
	insulation value, DC shift
	0 Ω), 0400 μA (< 4 kΩ), 010 V (>1 kΩ), 210 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. number of 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
Sensor bus:	
	RS-485/BMS
	9.6 kBaud/s
casici cinistea pany one ena or sinera connectea to i E	3 1 (3t) 1 Hills 2/0.0

Connection terminals	X1.A, X1.I
Terminating resistor	120 Ω, can be connected internall
Device address, BMS bus	190 (3)
Switching elements	
_	2 changeover contact
Operating mode	N/C operation*/N/O operation
Contact 11-12-14None	e, Alarm 1, Alarm 2, connection fault, Alarm DC-, Alarm DC+
symmetrical insulation fault, device e	rror, common alarm, measurement complete, device inactiv
Contact 21–22–24None	e, Alarm 1, Alarm 2, connection fault, Alarm DC-, Alarm DC+
symmetrical insulation fault, device e	rror, common alarm, measurement complete, device inactiv
Electrical endurance under rated operating conditions, nu	ımber of cycles 10.000
Contact data acc. to IEC 60947-5-1:	
Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-1:
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
Rated insulation voltage ≤ 2000 m NN	250 \
Rated insulation voltage ≤ 3000 m NN	160 \
Minimum contact rating	1 mA at AC/DC \geq 10 V
Environment/EMC	
EMC	IEC 61326-2-4 ⁽
Ambient temperatures:	
Operating temperature	25+55°
Transport	40+85°
Long-term storage	25+70°
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)	2K
Long-time storage (IEC 60721-3-1)	1K4
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M ₁
Transport (IEC 60721-3-2)	2M
Long-term storage (IEC 60721-3-1)	1M3
Area of application	<3000 m NN



Connection	
Connection type	pluggable screw terminal or push-wire terminal
Screw-type terminal:	
Nominal current	≤10 A
Tightening torque	
Conductor sizes	AWG 24-12
Stripping length	7 mm
rigid/flexible	
flexible with ferrules, with/without plastic collar	0.25 2.5 mm²
Multiple conductor, rigid	0.2 1 mm²
Multiple conductor, flexible	0.20.5 mm²
Multiple conductor, flexible with ferrule without plastic sleeve	0.25 1 mm²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	
Push-wire terminal:	
Nominal current	≤10 A
Conductor sizes	AWG 24-12
Stripping length	10 mm
rigid/flexible	
flexible with ferrules, with/without plastic collar	0.25 2.5 mm²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	
Push-wire terminals X1:	
Nominal current	≤8 A
Conductor sizes	AWG 24-16
Stripping length	10 mm
rigid/flexible	
flexible with ferrule without plastic sleeve	0.25 1.5 mm²
flexible with TWIN ferrule with plastic sleeve	0.25 0.75 mm ²
Other	
Operating mode	continuous operation
Mounting display oriented, cooling slots must be ventilated vertically	
Degree of protection internal components	IP40
Degree of protection terminals	IP20
DIN rail mounting acc. to	
Screw fixing	
Enclosure material	. ,
Flammability class	
Dimensions (W x H x D)	108 x 93 x 110 mm

Weight	< 390 g
Option "W" data different from the stand	dard version
Classification of climatic conditions acc. to IEC 60721:	
Operating temperature	40+70°C
Staionary use (IEC 60721-3-3)	
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M7

¹⁾ This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

14.2 Option "W"

Devices with the suffix "W" feature increased shock and vibration resistance. The electronics is covered with a special varnish to provide increased protection against mechanical stress and moisture.



Combination sensor variant iso685 with FP200:

The requirements of Option "W" will only be fulfilled when the sensor variant iso685 is mounted on DIN rail and connected to the FP200 via the patch cable.

Also refer to Quickstart FP200.

14.3 Standards and certifications

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

• DIN EN 61557-8 (VDE 0413-8)







only for iso685-D B 91067010



14.4 Ordering details

Туре	Supply voltage U _S	Art. No.
iso685-D	AC 100240 V; 47460 Hz DC 24 V, 100240 V	B 91067010
iso685W-D*	AC 100240 V; 47460 Hz DC 24 V, 100240 V	B 91067010W
Combination iso685-S + FP200	AC 100240 V; 47460 Hz DC 24 V, 100240 V	B 91067210
Combination iso685W-S + FP200W*	AC 100240 V; 47460 Hz DC 24 V, 100240 V	B 91067210W

^{*} Option "W": Increased shock and vibration resistance 3K5, 3M7; -40...+70 °C

Accessories

Description	Art. No.
iso685 Mechanical accessories comprising: Terminal cover and 2 mounting clips*	B 91067903
iso685 Plug kit, screw terminals*	B 91067901
iso685 plug kit, with push-wire terminals	B 91067902
IP65 cover forf FP200	B 98060005
BB bus 6TE	B 98110001
* included in the scope of delivery	

Suitable system components

Description	Туре	Art. No.
Suitable measuring instruments	7204-1421	B 986 763
SKMP**: 28 kΩ,120 kΩ Current values: 0400 μA, 020 mA (additonal information here)	9604-1421	B 986 764
	9620-1421	B 986 841
Display for front plate mounting	FP200	B 9106 7904
Display for front plate mounting	FP200W	B 9106 7904W
iso685-S (only in combination with FP200)	Supply voltage: AC 100240 V; 47460 Hz DC 24 V, 100240 V	B 91067110
iso685W-S* (only in combination with FP200)	Supply voltage: AC 100240 V; 47460 Hz DC 24 V, 100240 V	B 91067110W

^{*}Option "W": Increased shock and vibration resistance 3K5, 3M7; -40...+70 °C

^{**} SKMP = midscale point

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