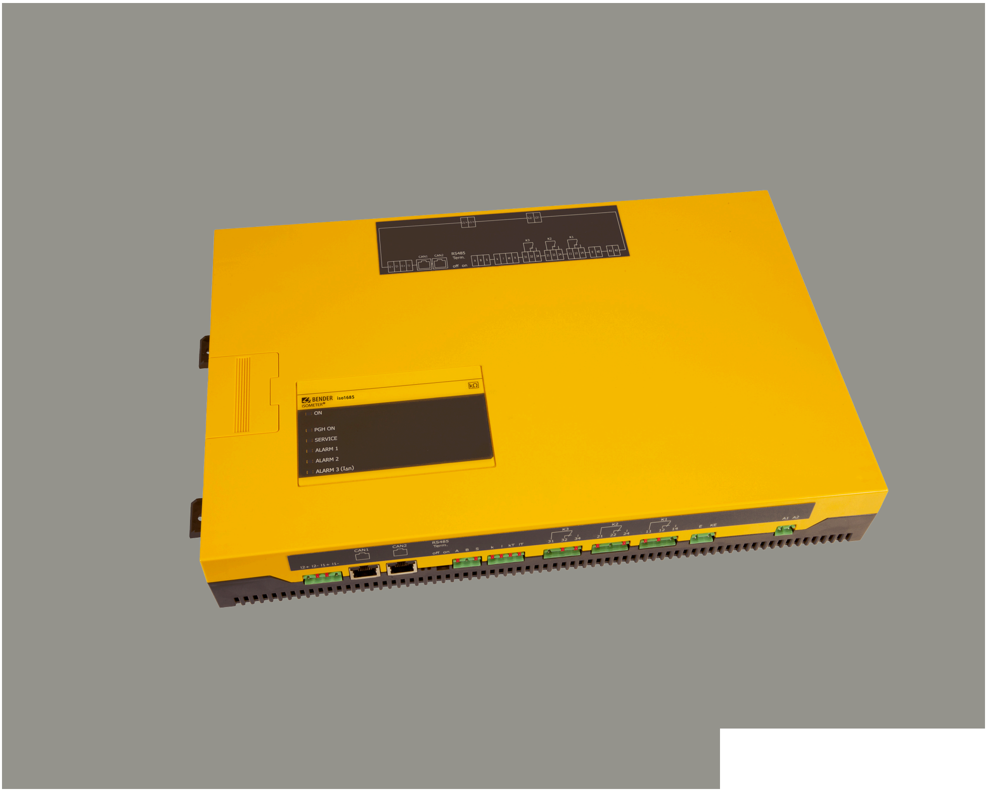
Manual EN

ISOMETER® isoHY1685-425

Insulation monitoring device for unearthed DC systems up to 1500 V
in electrolysis systems



isoHY1685_D00503_01_M_XXEN/03.2025

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1 General information

1.1 How to use the manual

ADVICE
This manual is intended for qualified personnel working in electrical engineering and electronics! Part of the device documentation in addition to this manual is the enclosed supplement 'Safety instructions for Bender products'.

ADVICE
Read the operating manual before mounting, connecting and commissioning the device. Keep the manual within easy reach for future reference.

1.2 Indication of important instructions and information

DANGER
Indicates a high risk of danger that will result in death or serious injury if not avoided.

WARNING
Indicates a medium risk of danger that can lead to death or serious injury if not avoided.

CAUTION
Indicates a low-level risk that can result in minor or moderate injury or damage to property if not avoided.

ADVICE
Indicates important facts that do not result in immediate injuries. They can lead to malfunctions if the device is handled incorrectly.

Information can help to optimise the use of the product.

1.3 Service and Support

Information and contact details about customer service, repair service or field service for Bender devices are available on the following website: Fast assistance | Bender GmbH & Co. KG.

1.4 Training courses and seminars

Regular face-to-face or online seminars for customers and other interested parties:

www.bender.de > know-how > seminars.

1.5 Delivery conditions

The conditions of sale and delivery set out by Bender GmbH & Co. KG apply. These can be obtained in printed or electronic format.

1.6 Inspection, transport and storage

Check the shipping and device packaging for transport damage and scope of delivery. In the event of complaints, the company must be notified immediately, see ‘www.bender.de > service & support.’.

When storing the devices, observe the information under Environment / EMC in the technical data.

1.7 Warranty and liability

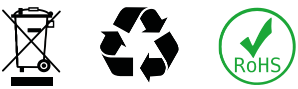
Warranty and liability claims for personal injury and property damage are excluded in the case of:

- Improper use of the device.
- Incorrect mounting, commissioning, operation and maintenance of the device.
- Failure to observe the instructions in this operating manual regarding transport, commissioning, operation and maintenance of the device.
- Unauthorised changes to the device made by parties other than the manufacturer.
- Non-observance of technical data.
- Repairs carried out incorrectly.
- The use of accessories or spare parts that are not provided, approved or recommended by the manufacturer.
- Catastrophes caused by external influences and force majeure.
- Mounting and installation with device combinations not approved or recommended by the manufacturer.

This operating manual and the enclosed safety instructions must be observed by all persons working with the device. Furthermore, the rules and regulations that apply for accident prevention at the place of use must be observed.

1.8 Disposal of Bender devices

Abide by the national regulations and laws governing the disposal of this device.



Bender GmbH & Co. KG is registered in the waste from electrical and electronic equipment (WEEE) register under the WEEE number: DE 43 124 402. For more information on the disposal of Bender devices, refer to www.bender.de > service & support.

1.9 Safety

If the device is used outside the Federal Republic of Germany, the applicable local standards and regulations must be complied with. In Europe, the European standard EN 50110 applies.

DANGER **Risk of fatal injury due to electric shock!**

Touching live parts of the system carries the risk of:

- Risk of electrocution due to electric shock
- Damage to the electrical installation
- Destruction of the device

Before installing the device and before working on its connections, make sure that the installation has been de-energised. The rules for working on electrical systems must be observed.

2 Function

2.1 Intended use

The device isoHY1685 is used for insulation monitoring of large electrolysis systems up to DC 1500 V designed as IT systems. The measuring method specially developed for electrolysis systems is relatively insensitive to faults during the start-up of the process. Due to the special physical properties of an electrolyser, short-term disturbances occur here, which the device can control. Adaptation to the system-related leakage capacitances also occurs automatically.

In order to meet the requirements of the applicable standards, customised parameter settings must be made on the equipment in order to adapt it to local equipment and operating conditions. Please heed the limits of the range of application indicated in the technical data.

Intended use also includes

- the observation of all information in the operating manual and
- compliance with test intervals.

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

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

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

2.2 Product description

The ISOMETER® isoHY1685 is an insulation monitoring device for IT systems. It has been specially developed for use in electrolysis systems. Please refer to the technical data for the exact device specification.

2.3 Device features

ISOMETER® for electrolysis systems

- Insulation monitoring of electrolysis systems
- Measurement of low-resistance insulation faults 20 Ω…100 kΩ
- Automatic adjustment to the system leakage capacitance
- Separately adjustable response values R_{an1} (Alarm 1) and R_{an2} (Alarm 2) for prewarning and alarm
- Connection monitoring of L+, L– for polarity reversal
- Device self test with automatic alarm message in the event of a fault
- Separate relays for insulation fault 1, insulation fault 2 and device error

Interfaces

- RS-485 interface for data exchange with other Bender devices
- CAN interface for the output of measured values and alarms for parameterisation

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

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

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

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

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

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

2.4 History memory

All warnings, alarms and device errors are time-stamped and stored in the device's internal history memory. The times of the start, acknowledgement and end of the event are recorded.

History data

The history data are copied from the internal EEPROM to the History.csv file on the µSD card under the following conditions:

- After device start-up
- During operation once per hour
- When a compatible µSD card has been inserted

For the evaluation of the history memory, the Excel tool “iso1685 History.xlsx” can be provided. This tool allows .csv file data to be processed and evaluated.

Example: Alarm data record in the history memory

Parameter	**Value**	**Desciption**
Index	Idx 231	Index history memory
ID	ID43	ID of the entry
Alarm	Insulation fault	Alarm type
Min	< 200	Minimum alarm value
Max	= 200	Maximum alarm value
Unit		Unit
Test	None	Alarm during test
Start Time	27.04.12 13:59	Start time of the alarm
Ack. Time		Time of acknowledgement
Stop Time	27.04.12 13:59	End time of the alarm

2.5 Self test after connection to the supply voltage

Once connected to the supply voltage, the device checks all internal measurement functions, the components of the process control such as data and parameter memory as well as the connections to earth.

Once the self test is finished, after approx. 5 seconds. The alarm relays (**K1**, **K2**) are not switched during start-up. Afterwards, the normal measuring operation starts.

If a device or connection error is detected, the corresponding alarm is output via the integrated interfaces as well as via the alarm relay **K3**. This relay operates permanently in NC operation, i.e. a device fault is signaled even in the event of a complete failure of the device.

2.5.1 Automatic self test during operation

All supply voltages are continuously monitored. The following tests are continuously carried out in the background:

- E-KE connection
- Temperature monitoring of the coupling
- Reverse polarity of mains with DC coupling
- Measuring voltage generator

A self test is automatically run at 24-hour intervals.

During the automatic self test, the alarm relays **K1** and **K2** are not switched. **K3** will *not* be switched either.

2.5.2 Manual self test during operation

The self test is started via the RS-485 or CAN interface.

The manual self-test checks:

- Internal flash
- Internal RAM
- CPU register
- Watchdogs
- Oscillator
- Function of the Iso measurement equipment
- Only when started via RS-485:
  Restart of the device including re-initialisation, recalibration and switching of all alarm relays
- Only when started via CAN:
  Switching of alarm relays K1 and K2
- Connection monitoring of the system to be monitored

ADVICE
Perform a manual self-test once a month via the interface to ensure that the device is functioning correctly.

3 Device overview

3.1 Dimensions

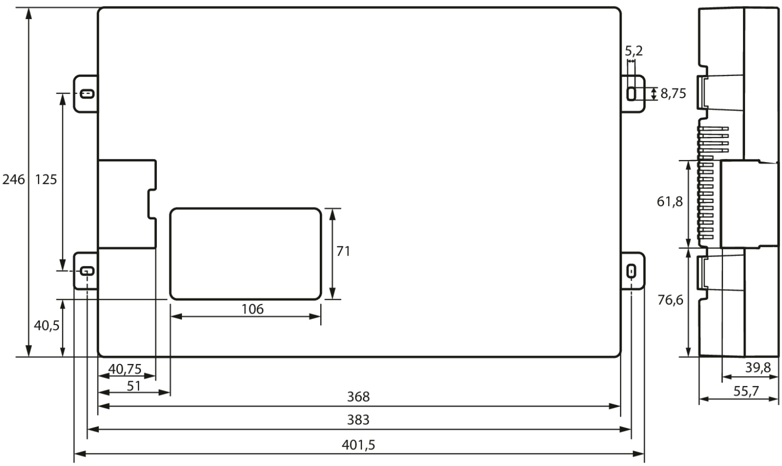


Figure: Dimensions in mm

3.2 Terminals

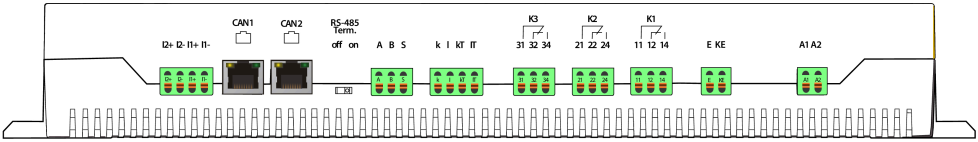


Figure 3-1: Terminals from below

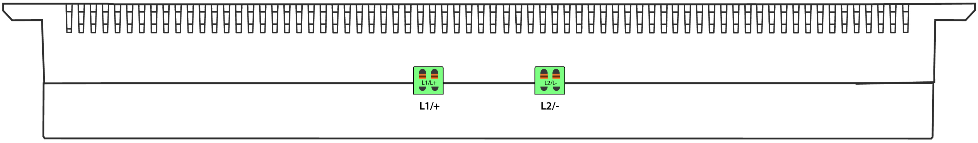


Figure 3-2: Terminals from above

	View from below
I2+, I2–	Digital input:
I1+, I1–	Digital input: starts manual self test
CAN1, CAN2	Connection CAN bus
RS485 Term. off / on	RS-485 termination
A, B, S	RS-485 bus connection (A, B) BMS protocol: PE potential, connect one end of shield (S)
k, l, kT, lT	no function
31, 32, 34	Relay output for internal device errors (LED **SERVICE**) K3 relay output
21, 22, 24	Relay output for alarm insulation faults (LED **ALARM 2**) K2 relay output
11, 12, 14	Relay output for prewarning insulation faults (LED **ALARM 1**) K1 relay output
E, KE	Separate connection of E (earth) and KE (reference) to PE.
A1, A2	Connection to supply voltage (via fuses, 2 A each)
	View from above
L1/+	Connection to L1/+ of the IT system via 1 A fuse
L2/–	Connection to L2/– of the IT system via 1 A fuse

3.3 Display and operating elements

ON (green)	Power **ON** indicator: Flashes with a pulse duty factor of approx. 80 %. Device error: Lights continuously when the device stops functioning (device stopped). Software update: Flashes approx. three times faster during the firmware update than in the standard mode, update time < 4 minutes.
PGH ON (yellow)	no function
SERVICE (yellow)	When an internal device error is detected, the LED **SERVICE** lights up. If the LED stays lit, please check the error code list.
ALARM 1 (yellow)	• lights (prewarning): insulation resistance is below the response value 1, $R_F < R_{an1}$ • flashes: connection fault, check earth and system (**L1/+**, **L2/–**)
ALARM 2 (yellow)	• lights (alarm): insulation resistance is below the response value 2, $R_F < R_{an2}$ • flashes: connection fault, check earth and system (**L1/+**, **L2/–**)
ALARM 3 (yellow)	no function

Service lid

Access to DIP switch and to the µSD card via the service lid

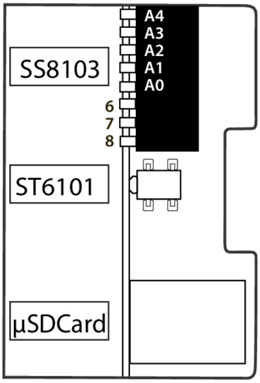
Open the service lid by pressing gently on the ribbed surface and pulling the lid from the enclosure away.

After removing the lid the following settings can be carried out:

- Changing the BMS address (SS8103)
- Changing the measurement speed (SS8103)
- Resetting alarms (ST6101)

In addition, you can access the µSD card to read out stored alarms, for example.

Operating elements in the service lid



Operating elements	Function
DIP switch (SS8103)	• BMS address setting: **A4…A0** • Measurement speed setting: **7**
Button (ST6101)	Alarm reset
Memory card slot (µSD card)	Memory for log files and history memory

4 Mounting

Mount the device using four M5 screws. Refer also to the dimension diagram where the drilling holes are illustrated. Mount the device so that the control panel can be read during operation and the mains connection is (L1/+, L2/–) positioned at the top.

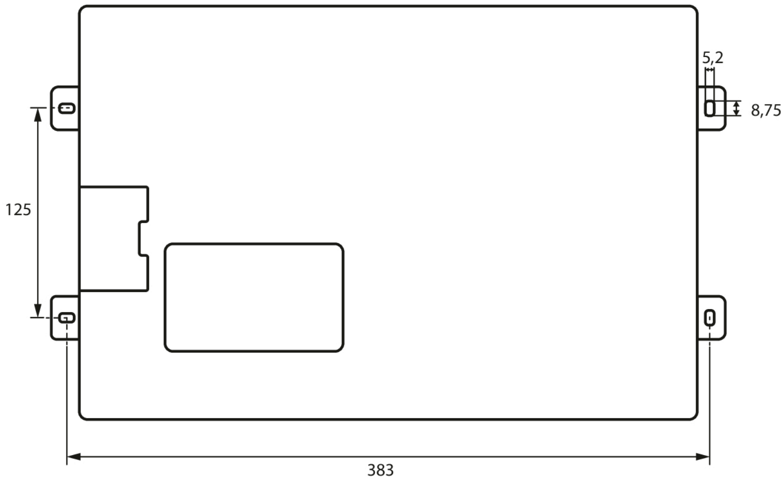


Figure 4-1: Dimensions in mm

CAUTION Damage due to unprofessional installation!
If more than one insulation monitoring device is connected to a conductively connected system, the system may be damaged. If several devices are connected, the device does not work and does not signal insulation faults.
Make sure that only one insulation monitoring device is connected.

CAUTION Heat on the enclosure surface!
The surface temperature of 60 °C can be exceeded under certain operating conditions.
Keep the cooling slots uncovered by keeping a distance of at least 15 cm above and at least 10 cm below the device to adjacent objects in order to ensure constant air circulation.

CAUTION Sharp-edged terminals!
Lacerations and injuries on hands are possible.
Touch the enclosure and the terminals with due care.

5 Connection

Connection requirements

DANGER **Risk of fatal injury due to electric shock!**

Touching live parts of the system carries the risk of:

- Risk of electrocution due to electric shock
- Damage to the electrical installation
- Destruction of the device

Before installing the device and before working on its connections, make sure that the installation has been de-energised. The rules for working on electrical systems must be observed.

Only skilled persons are permitted to carry out the work necessary to install, put into service and run a device or system.

ADVICE

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.

Pluggable push-wire terminals

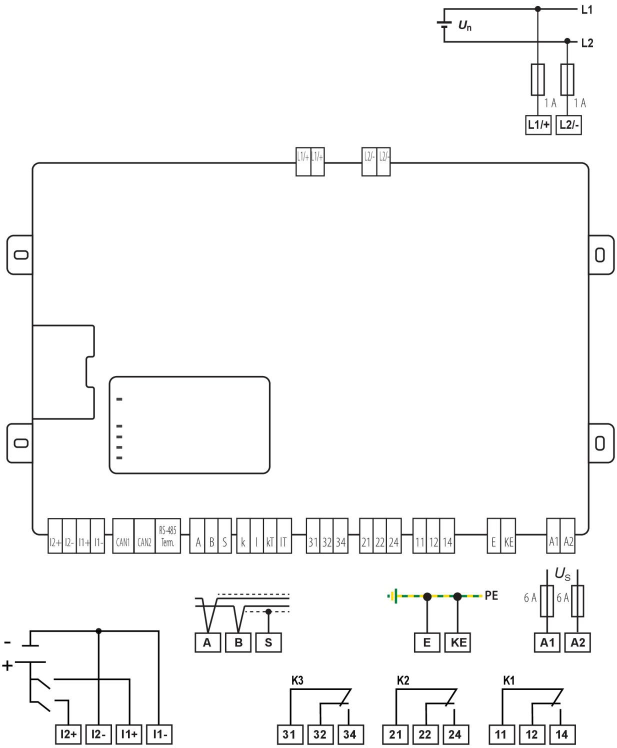
All terminals are pluggable push-wire terminals. Solid connecting wires can be directly plugged in. For connection of flexible cables, the push-wire terminals must be pushed open by pressing the corresponding orange interlocking mechanism with a flat-head screwdriver. Observe the specification in the technical data.

Check proper connection!

Prior to commissioning of the installation, check that the device has been properly connected and check that the device functions.

Perform a functional test using an earth fault via a suitable resistor.

Connection diagram



[L1/+, L2/-]: Connection to a DC system
[I1+, I1-, I2+, I2-]: Digital inputs
[A, B, S]: RS-485 interface
[E, KE]: Connection to earth and controlearth
[A1, A2]: Connection to power supply
[31, 32, 33] [21, 22, 24] [11, 12, 14]: Connection to the relays K3...K1

Step-by-step connection of the ISOMETER®

Connect the device according to the wiring diagram. Proceed as follows:

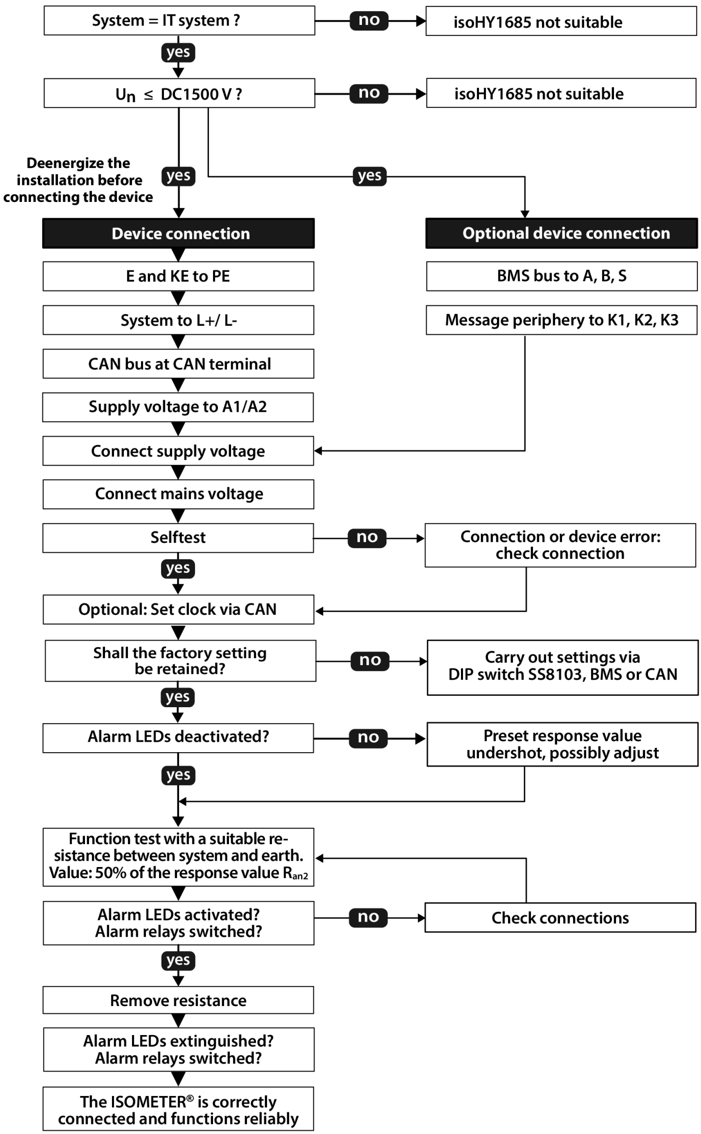
1. Connect terminals **E** and **KE** to earth (PE).
2. Connect terminals **A** and **B** to the BMS bus.
3. Connect terminal **S** to the bus conductor shield (only at one end of the conductor).
4. Connect terminals **I1+**, **I1–** and **I2+**, **I2–** with digital control switches.
5. Connect terminal **L1/+** to **L1** of the system to be monitored.
6. Connect terminal **L2/–** to **L2** of the system to be monitored.

*The coupling terminals **L1/+** and **L2/–** are locked. To unplug the terminals, the orange sliders must be slid towards the front (towards the device) to unlock the terminal. Now the terminal can be unplugged.*

7. Connect alarm outputs of the relays **K1**, **K2** und **K3**.
8. Connect terminal **A1/A2** to the supply voltage U_s.

6 Commissionig

6.1 Commissioning diagram



7 Settings

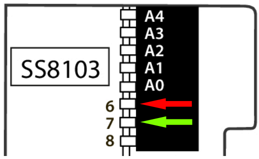
7.1 Set measuring speed

ADVICE
These settings may only be changed when the voltage is switched off.

The measurement speed can be changed using **switch 7**. The measurement speed can be set to **Slow** in case of frequently occurring fault alarms caused by transients in the system. In the mode **Slow**, the measurement time doubles.

DIP switch SS8103

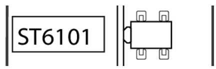
Switch 6 (red arrow):
RESERVED
Switch 7 (green arrow):
up [OFF] = Fast
down [ON] = Slow
Switch 8:
RESERVED



7.2 Resetting alarm messages

Recorded faults are provided as alarm messages on the BMS bus.

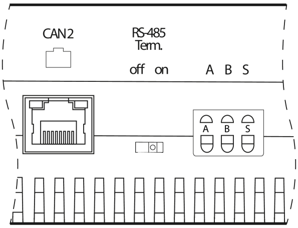
Pressing the reset button ST6101 will reset these alarm messages. If the fault persists, the message will be generated again.



8 Device communication

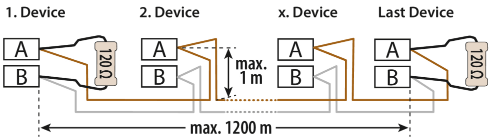
8.1 RS-485 interface

The RS-485 interface, galvanically isolated from the device electronics, serves as a physical transmission medium for the BMS protocol. When an ISOMETER® or other bus-capable devices are interconnected via the BMS bus in a network, the BMS bus must be terminated at both ends with a 120 Ω resistor. The device isoHY1685 is equipped with the terminating switch **RS-485 Term.** (on/off).



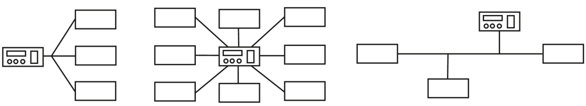
Wiring of a RS-485 network

The optimum topology for an RS-485 network is a daisy-chain connection. In this connection, device 1 is connected to device 2, device 2 to device 3, device 3 to device 4 etc. The RS-485 network represents a continuous path without branches.

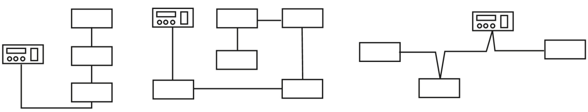


ADVICE
An RS-485 network that is not terminated is likely to become unstable and cause malfunctions. Only the first and last device in one line may be terminated. Hence, stub feeders in the network must not be terminated. The length of the stub feeders is restricted to a maximum of 1 m.

Examples for wrong arrangement



Examples for correct arrangement

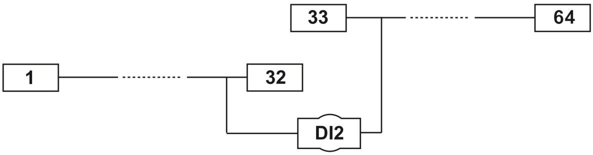


Wiring

The following cable is recommended for wiring the RS-485 network:

Shielded cable, core diameter 0.8 mm (e.g. J-Y(St)Y 2x0.8), shield connected to earth (PE) on one end.

The max number of bus nodes is restricted to 32 devices. If more devices are to be connected, Bender recommends the use of a DI1 repeater.



Commissioning of an RS-485 network

- Interconnect terminals **A** and **B** of all bus devices in one line.
- Switch the terminating resistors on at the start and the end of the RS-485 network. If a device at the end of the bus is not terminated, connect a 120 Ω resistor to terminals **A** and **B**.
- Switch the supply voltage on.
- Assign the master function and address 1 to a bus-capable device.
- Assign addresses (2, 3, 4, … 17) to all other bus devices in consecutive order.

8.2 CAN bus

Communication via the CAN interface is specified in a separate document. It can be downloaded at:

https://www.bender.de/en/service-support/download-area/

The CAN1 and CAN2 RJ45 connections are provided for connections between CAN-capable devices.

The CAN bus is terminated externally using a separate 120 Ω termination plug.

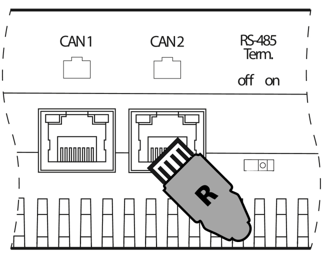


Figure 8-1: CAN bus connections and termination connector

8.3 BMS protocol

BMS protocol

This protocol is an essential part of the Bender measuring device interface (BMS bus protocol). Data transmission generally makes use of ASCII characters.

Interface data are:

- Baud rate: 9600 baud
- Transmission: 1 start bit, 7 data bits, 1 parity bit, 1 stop bit (1, 7, E, 1)
- Parity: even
- Checksum: Sum of all transmitted bytes = 0 (without CR and LF)

The BMS bus protocol works according to the master-slave principle. Only one master may exist in each network. All bus devices are identified by a unique BMS address. The master cyclically scans all other slaves on the bus, waits for their response and then carries out the corresponding commands.

A device receives the master function by assigning bus address 1 to it.

BMS master

A master can query all measured values, alarm and operating messages from a slave. If bus address 1 is assigned to a device, this device automatically operates as master, i.e. all addresses between 1 and 150 are cyclically scanned for alarm and operating messages via the BMS bus. If the master detects incorrect answers from a slave, the fault message **Fault RS-485** is output via the BMS bus.

Possible fault causes:

- Address assigned twice
- Second master on the BMS bus
- Interference signals on the bus lines
- Defective device on the bus
- Terminating resistors not activated or connected

ADVICE
The ISOMETER® isoHY1685 cannot be a master and cannot have the address 1.

However, if there is no master in the system, the ISOMETER® becomes a substitute master with a different BMS address (e.g. 2 or 3). The slaves in the system can be addressed via the substitute master.

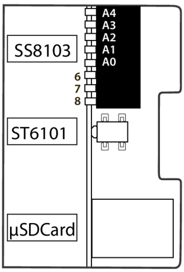
Commissioning of an RS-485 network with BMS protocol

- Interconnect terminals **A** and **B** of all bus devices in one line.
- Switch the terminating resistors on at the start and the end of the RS-485 network. If a device at the end of the bus is not terminated, connect a 120 Ω resistor to terminals **A** and **B**.
- Switch the supply voltage on.
- Assign the master function and address 1 to a bus-capable device.
- Assign addresses (2...17) to all other bus devices in consecutive order.

8.3.1 Set BMS addresses

The ISOMETER® cannot switch on a potential termination at the BMS bus. Even though this is not expected to cause communication problems, the ISOMETER® should be operated as BMS slave if possible (BMS address > 1).

The BMS address can be changed using DIP switch SS8103. Factory setting = 2

		DIP switch SS8103				
Switch position	BMS addr.	A4	A3	A2	A1	A0
Up = OFF (0) Down = ON (1)  	2	0	0	0	0	0
	3	0	0	0	0	1
	4	0	0	0	1	0
	5	0	0	0	1	1
	6	0	0	1	0	0
	7	0	0	1	0	1
	8	0	0	1	1	0
	9	0	0	1	1	1
	10	0	1	0	0	0
	...	...	...	...	...	...
	33	1	1	1	1	1

8.3.2 Messages via the BMS bus

Messages are transmitted to a maximum of 12 BMS channels. All alarm, operating and error messages are described below.

Alarm messages

Alarm	Channel	Meaning
Alarm 1 (insulation fault)	1	Insulation resistance Prewarning (Value < response value 1, $R_F < R_{an1}$)
Alarm 2 (insulation fault)	2	Insulation resistance Alarm (Value < response value 2, $R_F < R_{an2}$)
Connection system	4	Connection fault system
Connection PE	5	Connection fault earth
Device error	7	Internal device error
Overtemperature coupling	10	Overtemperature coupling **L1/+**
Overtemperature coupling	11	Overtemperature coupling **L2/–**

Operating messages

Alarm	Channel	Meaning
Insulation resistance	1	Current insulation resistance R_F (if $R_F > (R_{an1}$ + Hysteresis))
Insulation resistance	2	Current insulation resistance R_F (if $R_F > (R_{an2}$ + Hysteresis))

Alarm	Channel	Meaning
Leakage capacitance	4	Leakage capacitance C_e in nF, µF
Mains voltage	5	Current system voltage U_N
Partial voltage U+/PE	6	Current partial voltage terminal **L1/+** to earth
Partial voltage U–/PE	7	Current partial voltage terminal **L2/–** to earth
Temperature coupling	10	Current temperature of the coupling **L1/+**
Temperature coupling	11	Current temperature of the coupling **L2/–**

Error codes

Error code		Component	Error	Action
BMS	CAN			
0.10	0x2040	Connection	CT connection	Check connection
0.30	0x2008	Connection	Connection earth (**E**/**KE**)	Check connection
0.40		Connection	Connection system (**L1/+**, **L2/–**)	Check connection
4.05		Parameter	Incorrect measurement method selected	Change measurement method
7.63		System	Timeout system management	Restart the device
8.11	0x8003	Hardware	Self test insulation measurement	Contact service
8.12	0x8007	Hardware	Hardware measuring voltage source	Replace the device
8.41	0x8005	Connection	Mains voltage polarity incorrect (**L+**, **L–**)	Check connection
8.42	0x8007	Hardware	Supply voltage ADC	Replace the device
8.43	0x8007	Hardware	Supply voltage +12 V	Replace the device
8.44	0x8007	Hardware	Supply voltage –12 V	Replace the device
8.45	0x8007	Hardware	Supply voltage +5 V	Replace the device
8.46	0x8007	Hardware	Supply voltage +3.3 V	Replace the device
9.61	0x8006	Parameter	Insulation measurement	Load factory settings and parameterise again
9.62	0x8006	Parameter	Residual current measurement	Load factory settings and parameterise again
9.64	0x8008	Parameter	Voltage measurement	Contact service
9.70		System	General software error	Restart the device
9.71	0x80FF	System	Control flow	Restart the device
9.72		System	Programme sequence insulation measurement	Restart the device
9.74	0x80FF	System	Programme sequence voltage measurement	Restart the device
9.75	0x80FF	System	Programme sequence temperature measurement	Restart the device

Error code		Component	Error	Action
BMS	CAN			
9.76	0x80FF	System	Programme sequence history memory	Restart the device
9.77	0x80FF	System	Programme sequence console	Restart the device
9.78	0x80FF	System	Programme sequence self test	Restart the device
9.79	0x80FF	System	Stack error	Restart the device
9.80		System	Stack error	Restart the device
9.81		System	Internal programme sequence	Restart the device
9.82		System	Internal programme sequence	Restart the device

Resetting error messages

Recorded errors are presented as alarm messages on the BMS bus.

The fault messages are reset via the device menu. If the fault continues to exist, the message will be generated again. The error can also be reset by means of the acknowledgement command via the BMS bus.

Firmware update via BMS bus

The firmware is updated via the BMS bus with the 'BMS Update Manager', which is available from Bender.

9 Technical data

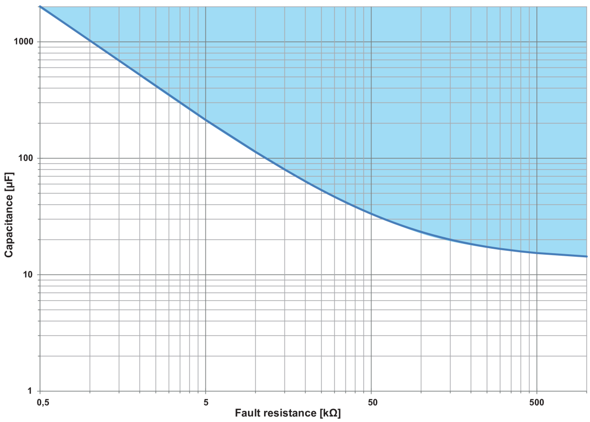
9.1 Diagrams

System leakage capacitance

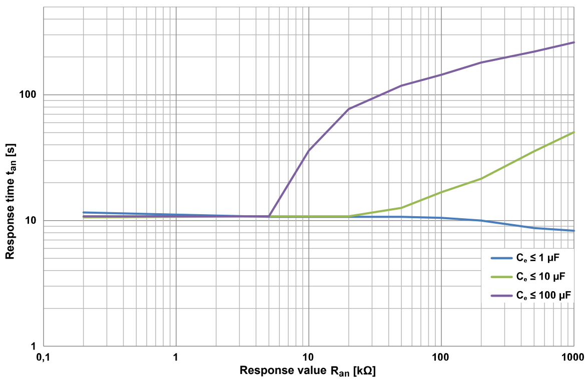
The determination of the leakage capacitance depends on the size of the insulation resistance.

Example

– minimum measurable leakage capacitance at R_F = 50 kΩ: **35 µF**



Response time



9.2 Factory settings

Parameter	Value	Setting via		
		SS8193	BMS	CAN
Response value R_{an1} (ALARM 1)	20 kΩ		×	×
Response value R_{an2} (ALARM 2)	10 kΩ		×	×
Fault memory	off		×	×
Relay K1	N/C operation		×	×
Relay K2	N/C operation		×	×
Relay K3	N/C operation		×	×
Reset to factoty settings	---		×	×
BMS address	2	×		
BMS termination	ON	×		
Measurement speed	Fast	×		
Time	not defined		×	×

9.3 Tabular data isoHY1685

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

Rated voltage	DC 1500 V
Rated impulse voltage	8 kV
Pollution degree	2

Voltage range

Nominal system voltage range U_n	DC 0…1500 V
Tolerance of U_n	DC + 6 %
Supply voltage U_s	DC 18…30 V
Power consumption	≤ 7 W

Measuring circuit for insulation monitoring

Measuring voltage U_m (peak)	± 50 V
Measuring current I_m (at $R_F = 0\ \Omega$)	≤ 1.5 mA
Internal DC resistance R_i	≥ 70 kΩ
Impedance Z_i at 50 Hz	≥ 70 kΩ
Permissible extraneous DC voltage U_{fg}	≤ DC 1500 V
Permissible system leakage capacitance C_e	≤ 150 µF

Response values for insulation monitoring

Response value R_{an1} (Alarm 1)	200 Ω … 1 MΩ
Response value R_{an2} (Alarm 2)	200 Ω … 1 MΩ
Relative uncertainty (10 kΩ … 1 MΩ) (nach IEC 61557-8)	± 15 %
Relative uncertainty (0.2 kΩ … < 10 kΩ)	± 200 Ω ± 15 %
Response time t_{an}	“Response time”, page 27
Hysteresis	25 %, +1 kΩ

Display, storage

LEDs for alarms and operating states	2x green, 4 x yellow
µSD card (Spec. 2.0) for history memory and log files	≤ 32 GB

Inputs

Digital inputs DigIn1 / DigIn2:	
High level	10…30 V
Low level	0…0.5 V

Serial interface

Interface	RS485; CAN
Protocol	BMS (Slave)
Connection	Terminals A/B Shield: Terminal S
Cable length	≤ 1200 m
Shielded cable (shield to functional earth on one end)	2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2×0.6
Terminating resistor, can be connected (RS-485 Term.)	120 Ω (0.5 W)
Device address, BMS bus adjustable	2…33

Switching elements

Switching elements	3 changeover contacts
K1	Insulation fault alarm 1
K2	Insulation fault alarm 2
K3	Device error
Operating principle K1, K2	N/C operation, N/O operation
Operating principle K3	N/C operation, cannot be changed
Contact data acc. to IEC 60947-5-1:	
Utilisation category	AC 13 | AC 14 | DC-12 | DC-12 | DC-12
Rated operational voltage	230 V | 230 V | 24 V | 110 V | 220 V
Rated operational current	5 A | 3 A | 1 A | 0.2 A | 0.1 A
Minimum contact rating	1 mA bei AC/DC ≥ 10 V
For UL applications: Utilisation category for AC control circuits with 50/60 Hz (Pilot duty)	B300
AC load of the alarm relay outputs	AC 240 V, 1.5 A in case of a power factor of 0.35
AC load of the alarm relay outputs	AC 120 V, 3 A in case of a power factor of 0.35
AC load of the alarm relay outputs	AC 250 V, 8 A in case of a power factor of 0.75...0.80
DC load of the alarm relay outputs	DC 30 V, 8 A in case of ohmic load

Connection (except system coupling)

Connection type	pluggable push-wire terminals
Connection, rigid/flexible	0.2…2.5 mm² / 0.2…2.5 mm²
Connection, flexible with ferrule, without/with plastic sleeve	0.25…2.5 mm²
Conductor sizes (AWG)	24…12

Connection of the system coupling

Connection type	pluggable push-wire terminals
Connection, rigid/flexible	0.2…10 mm² / 0.2…6 mm²
Connection, flexible with ferrule, without/with plastic sleeve	0.25…6 mm² / 0.25…4 mm²
Conductor sizes (AWG)	24…8
Stripping length	15 mm
Opening force	90…120 N

Environment/EMC

EMC	IEC 61326-2-4
Ambient temperature during operation	−40…+70 °C
Ambient temperature transport	−40…+80 °C
Ambient temperature long-term storage	−25…+80 °C
Relative humidity	10…100 %

Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K23
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22

Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Atmospheric pressure	700…1060 hPa (max. height 4000 m)

Other

Operating mode	continuous operation
Position of normal use	vertical, system coupling on top
PCB fixation	lens head screw DIN7985TX
Tightening torque	4.5 Nm
Degree of protection, internal components	IP30
Degree of protection, terminals	IP30
Weight	≤1300 g

9.4 Standards and approvals

The ISOMETER® isoHY1685 was developed in compliance with the following standards:

- DIN EN 60664-1 (VDE 0110-1)
- DIN EN 61557-8 (VDE 0413-8)
- IEC 60730-1
- IEC 61326-2-4
- IEC 61557-8
- UL 1998 (Software)
- UL 508

9.5 Ordering details

Model	Response value	Nom. system voltage	Supply voltage	Art. No.
isoHY1685-425	200 Ω…1 MΩ	DC 0…1500 V	DC 24 V ±25%	B91065605

Change log manual isoHY1685

Date	Document version	Software version	Changes
02/2025	00	D0817 V1.00x	First issue
03/2025	01	D0817 V1.00x	UL certification, isoHY1685-425 added to title and order data

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