ISOMETER® iso1685FR/iso1685FRM

Insulation monitoring device for unearthed AC systems (IT systems) up to AC 5 kV

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ISOMETER® iso1685FR

Device features

- Insulation monitoring of AC and 3NAC systems with low leakage capacitance (< 200 nF)
- Fast tripping due to the patented SSCP (Synchron Sine Correlation Principle) measurement method: Notification of an insulation fault or shutdown within 150 ms
- Impedance measurement between the system and earth (detection of ohmic and capacitive insulation faults)
- Response value Z_{an}: 10…1000 kΩ
- Configurable interference detection for the active method (interference level, consecutive number of disrupted measurement periods) with the possibility of triggering a device error in the event of continuous interference
- Measurement of the star point shift to earth (UN-PE)
- Visual signalling of alarms, or connection or device errors via LEDs
- 2 redundant alarm relays for the notification of insulation faults
- Connection monitoring of L1/+, L2/–
- Monitoring of the earth connection E/KE
- Self test at device start with automatic notification in the event of a fault
- iso1685FR: RS-485 interface (BMS bus) to output measured values and for configuration
- iso1685FRM: RS-485 interface (BMS bus and Modbus RTU; can be switched using the DIP switch)
- The BMS bus is used to output measured values and for configuration of the device
- Modbus RTU is used to communicate with the Modbus-analogue converter M-7024. By means of the converter, the iso1685FRM provides an analogue output
- µSD card with data logger and history memory for alarms
- Protection against unauthorised or accidental parameter changes

Product description

The ISOMETER® iso1685FR… is an insulation monitoring device for IT systems in accordance with IEC 61557-8. It is applicable for use in AC systems.

Particularities of the ISOMETER® iso1685FRM

The only difference between the ISOMETER® iso1685FRM and the ISOMETER® iso1685FR is the following: By means of the Modbus-analogue converter M-7024, the ISOMETER® iso1685FRM provides an analogue output. Communication takes place via Modbus RTU. The DIP switch can be used to switch between the BMS and Modbus protocol.

Function

Insulation monitoring is carried out using an active measuring signal which is superimposed via the integrated coupling of the IT system to earth.

If the impedance value Z_e between the IT system and earth falls below the set response value Z_{an}, the alarm LEDs ALARM 1 and ALARM 2 light up, and the alarm relays K1 and K2 are switched on. In addition to the active method, an optional passive method can be activated which monitors the unbalance of the IT system by measuring the voltage between the star point and earth of the IT system. If the voltage $U_{N\text{-}PE}$ between the star point and earth exceeds the set response value U_{an}, the alarm LEDs ALARM 1 and ALARM 2 light up and the alarm relays K1 and K2 switch.

Both measuring methods (active and passive) work in parallel to the alarm relays K1 and K2. The integrated µSD card is used as data logger for storing all relevant events.

The following measured values, statuses and alarms are stored during operation:

- Impedance Z_e between the system and earth
- Insulation fault R_e between the system and earth (when the system capacity has been set)
- Voltage between the star point and earth
- System frequency
- Insulation fault
- Connection fault
- Device error

Following each device start, a new log file is generated. If the current file size exceeds 10 MByte during operation, a new file is generated. The file name contains time and date of its creation. Typically, it takes approximately 1 day until the maximum file size is reached. Hence, a µSD card with a memory space of 2 GBytes can record data for approx. 800 days. When the maximum data limit of the card has been reached, the oldest file in each case will be overwritten.

If the card cannot be written to despite an inserted µSD card, a device error occurs. This error prevents relay K3 (31, 32, 34) from being switched. If no µSD card has been inserted, a device error notification will be sent via the BMS bus. The generation of the device error notification when the µSD card has not been inserted can be activated or deactivated by means of the DIP switch 7. The history memory, which is also copied to the µSD card, contains all alarms in .csv format.

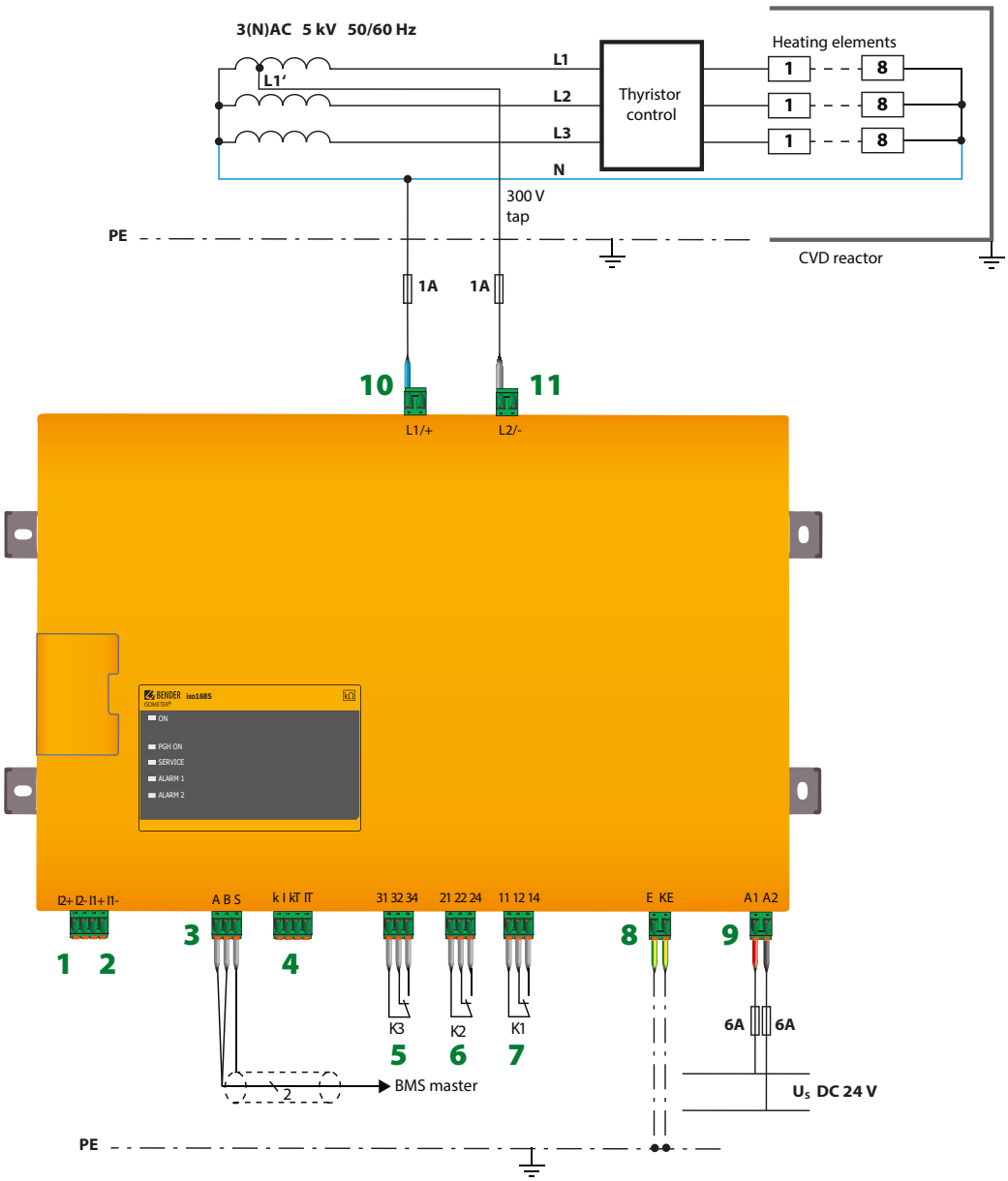
Standards

The ISOMETER® has been developed in compliance with the following standards:
DIN EN 61557-8 (VDE 0413-8), IEC 61557-8, IEC 61326-2-4, DIN EN 60664-1 (VDE 0110-1), EN 50178:1998-04.

Ordering information

Response value range	Nominal voltage	Supply voltage	Communication	Type	Art. No.
	AC	DC			
10…1000 kΩ	0…5 kV	18…30 V	BMS	iso1685FR-525	B 9106 5800
			BMS/Modbus RTU	iso1685FRM-525	B 9106 5804

Wiring diagram



1 - **I2+, I2–** Digital input, currently has no function

2 - **I1+, I1–** Digital input, currently has no function

3 - **A, B, S** – Connection to BMS bus, RS-485, S= shielded (internally connected to PE), terminating switch "RS-485 Term."
– Connection Modbus RTU (iso1685FRM only)

4 - **k, l / kT, lT** No function

5 - **31, 32, 34** Alarm relay K3 for internal device errors and connection faults

6 - **21, 22, 24** Alarm relay K2 for insulation faults

7 - **11, 12, 14** Alarm relay K1 for insulation faults

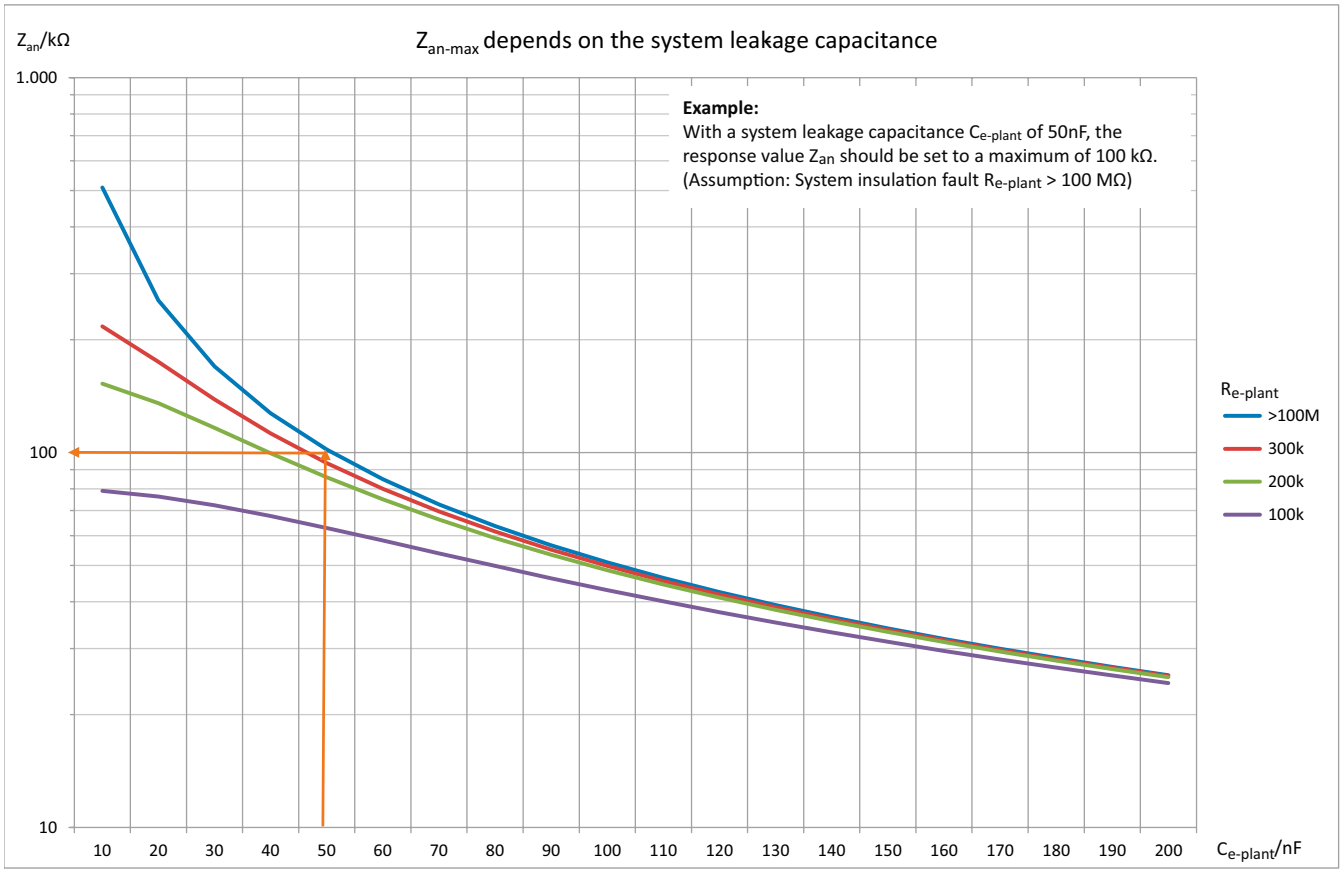
8 - **E,KE** Separate connections for E and KE to PE

9 - **A1, A2** Connection to *Us* = DC 24 V via a 6 A fuse on each line

10 - **L1/+** Connection to N line

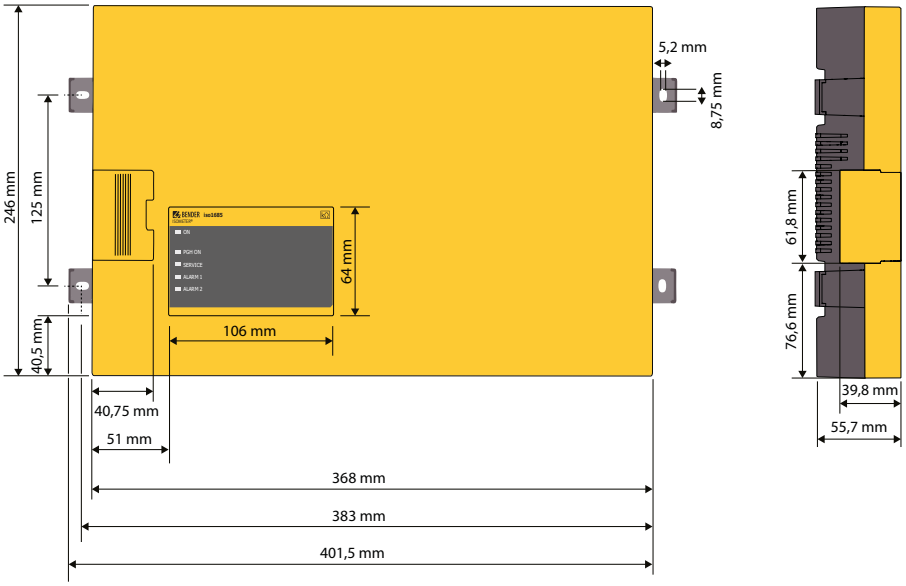
11 - **L2/–** Connection to L1' (300 V tap)

Insulation measurement response value



Dimension diagram

Dimensions in mm



Technical data

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

Insulation coordination acc. to IEC 60664-1	
Rated insulation voltage (terminals L1/L2 to E/KE)	5 kV
Overvoltage category	II
Pollution degree	2

Voltage ranges

Nominal voltage U_n L1+/L2-	AC 0…400 V**
Line-to-line voltage	AC 0…5 kV
Voltage component L1/+ to PE ($U_{N\text{-}PE}$)	AC 0…3 kV***
Voltage component L2/- to PE ($U_{L1'\text{-}PE}$)	AC 0…3 kV***
Supply voltage U_s (refer also to device name plate)	DC 18…30 V
Power consumption	≤ 7 W
Power consumption	≤ 7 VA

Measuring circuit for insulation monitoring

Measuring voltage U_m (r.m.s. value)	34 V
Measuring current I_m (at $R_e = 0\ \Omega$)	≤ 150 µA
Internal DC resistance R_i	≥ 260 kΩ
Impedance Z_i at 50 Hz	≥ 260 kΩ
Permissible extraneous DC voltage U_{fg}	0 V
Permissible system leakage capacitance C_e	≤ 200 nF

Response values for insulation monitoring (active method)

Response value Z_{an} (alarm)	10…1000 kΩ (25 kΩ)*
Relative uncertainty (100 kΩ…1 MΩ) (acc. to IEC 61557-8:2007-01)	±15 %
Relative uncertainty (10…100 kΩ)	±5 kΩ ±15 %
Response time t_{an} (for measurement buffer size MPT = 3)	≤ 150 ms
Hysteresis	25 %

Response values for insulation monitoring (passive method)

Response value U_{an} (alarm)	0…3000 V (125 V)*
Relative uncertainty (100…3000 V)	±5 %
Relative uncertainty (1…100 V)	±5 V ±5 %
Response time t_{an} (for measurement buffer size MPT = 3)	≤ 150 ms
Hysteresis	25 %

Displays, memory

LEDs for alarms and operating states	1 x green, 3 x yellow
µSD card for history memory and log files	≤ 32 GB

Digital inputs

I1+, I1- (active high)	no function
I2+, I2-	no function

Analogue output (via ICP M-7024 Modbus-analogue converter)

Number	1
Operating principle	linear, 0…200 kΩ (refer to diagram)
Function	insulation value Z_e
Current	4…20 mA (< 600 Ω)
Tolerance	±10 %

Serial interfaces

Interface/protocol	
iso1685FR	RS-485/BMS (Slave)
iso1685FRM	RS-485/BMS (Slave), Modbus RTU (switchable)
Connection	Bus: Terminals A/B Shielded: Terminal S
Cable length	≤ 1200 m
Shielded cable (shield to PE on one side)	2-core, Ø 0.6 mm², e.g. J-Y(St)Y 2 x 0.6
Terminating resistor, switchable (RS-485 Term. switch)	120 Ω (0.5 W)
Device address, BMS bus, adjustable (DIP switch)	
iso1685FR	2…33 (2)*
iso1685FRM	2…17 (2)*

Switching elements

Switching elements	3 changeover contacts: K1 (insulation fault), K2 (redundant insulation fault), K3 (device error)
Operating principle K1, K2	N/C operation, not changeable
Operating principle K3	N/C operation, not changeable

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 at AC/DC ≥ 10 V				

Connection via terminals (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
Connection AWG/kcmil	min 24
Conductor cross section AWG/kcmil	max 8

Environment

EMC	EN 61326-2-4
EMC exception, IEC 61000-4-3 (radiated immunity 80 MHz – 1 GHz):	8 V/m
Ambient temperatures:	
Operating temperature	-25…+70 °C
Transport	-25…+80 °C
Long-term storage	-25…+80 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3
Long-term storage (IEC 60721-3-1)	1K4
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-term storage (IEC 60721-3-1)	1M3

Other

Operating mode	continuous operation
Position of normal use	vertical, system coupling on top
Degree of protection, internal components	IP30
Degree of protection, terminals	IP30
Weight	650 g

( )* = Factory settings

** = The specification refers only to the residual voltage between the coupling terminals, not to earth. Higher voltages lead to a device error notification (ADC overload), but not to a defect in the device. Maximum permissible voltage between terminals L1 and L2 = 3.0 kV

*** = Corresponds to a maximum phase voltage of the system to be monitored of 5 kV.

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The Power in Electrical Safety©

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