

ISOMETER®

iso1685DP-425

isoHV1685D-425

isoLR1685DP-325

Insulation monitoring device for unearthed
AC, AC/DC and DC power supplies (IT systems)



ISOMETER® iso1685DP-425/ isoHV1685D-425/isoLR1685DP-325

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ISOMETER® iso1685DP

Certifications



Device features

ISOMETER® for AC IT systems with galvanically connected rectifiers or inverters and for DC IT systems. (IT = unearthed systems)

- Automatic adjustment to high system leakage capacitances
- Combination of **AMP^{Plus}** and other profile-specific measurement method
- Separately adjustable response values R_{an1} (alarm 1) and R_{an2} (alarm 2) for prewarning and alarm
- High-resolution graphic LC display for excellent readability and recording of the device status
- Connection monitoring
- Automatic device self test with automatic alarm message in the event of a fault
- Graphical representation of the insulation resistance over time (isoGraph)
- History memory with real-time clock (buffer for 13 days) for storing 1023 alarm messages with date and time
- Freely programmable digital inputs
- Remote setting of certain parameters via the Internet (COMTRAXX® gateway)
- Remote diagnosis by the Bender service via the Internet
- RS-485 interface for data exchange with other Bender devices

iso1685DP-425

- Measurement of insulation faults 200 Ω ...1 M Ω
- Integrated locating current injector up to 50 mA for insulation fault location
- Display of insulation faults selectively located by EDS systems
- Parameter setting of EDS systems
- Customer-specific texts for each measuring channel via the menu

isoLR1685DP-425

- Measurement of low-resistance insulation faults 20 Ω ...100 k Ω
- Integrated locating current injector up to 50 mA for insulation fault location
- Display of insulation faults selectively located by EDS systems
- Parameter setting of EDS systems
- Customer-specific texts for each measuring channel via the menu

isoHV1685D-425

- Measurement of insulation faults 200 Ω ...1 M Ω in IT systems with mains voltages of AC 2000 V and DC 3000 V

Product description

ISOMETER®s of the isoxx1685Dx-x25 device family are used for insulation monitoring of IT systems with special requirements. The preferred application is in water-cooled, inductive heating systems with low insulation level or for monitoring photovoltaic systems. The following variants are available:

- **iso1685DP-425**
Induction systems with low insulation level, also in photovoltaic systems
200 Ω ...1 M Ω , AC 0...1000 V/DC 0...1500 V
- **isoHV1685D-425**
Induction systems with low insulation level,
200 Ω ...1 M Ω , AC 0...2000 V/DC 0...3000 V
- **isoLR1685DP-325**
Induction systems with low insulation level,
20 Ω ...100 k Ω , AC 0...690 V/DC 0...690 V

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

The ISOMETER®s isoxx1685DP-x25 generate locating current pulses required for insulation fault location. That allows the localisation of the insulation fault using permanently installed or mobile insulation fault locators.

Function

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 the IT system and earth falls below the set prewarning response value R_{an1} , the "ALARM 1" LED lights up and relay K1 (11/12/14) switches. If the insulation resistance falls below the alarm response value R_{an2} , alarm relay K2 (21/22/24) switches and the "ALARM 2" LED lights up.

When starting the insulation fault location, the "PGH ON" LED signals the locating current pulse.

Standards

The isoxx1685Dx devices were designed according to the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8
- IEC 61557-8 Annex C (for Fast 2000 µF profile only)
- DIN EN 61557-9 (VDE 0413-9)
- IEC 61557-9 (not for isoHV1685D)
- IEC 61326-2-4
- DIN EN 60664-1 (VDE 0110-1)

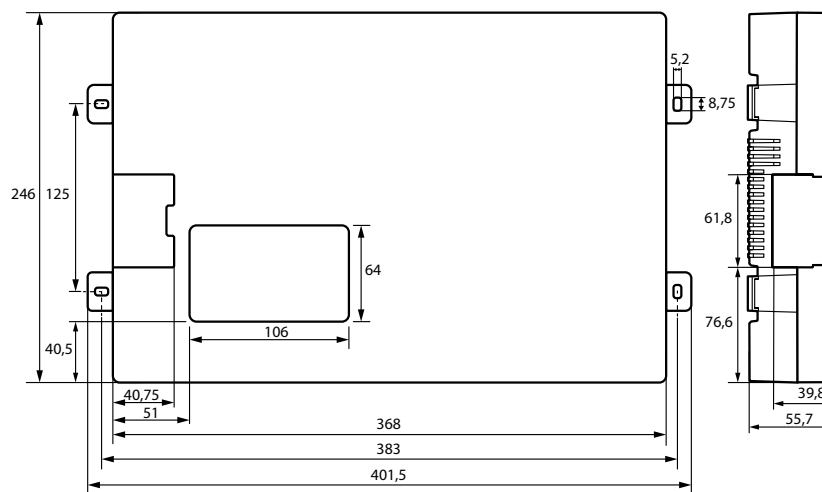
Ordering details

Supply voltage ¹⁾	Response value range	Nominal voltage		Type	Art. No.
		AC	DC		
18...30V	20 Ω...100 kΩ	0...690V	0...690V	isoLR1685DP-325	B91065803
		0...2000V	0...3000V	isoHV1685D-425	B91065805
	200 Ω...1 MΩ	0...1000V	0...1500V	iso1685DP-425	B91065802

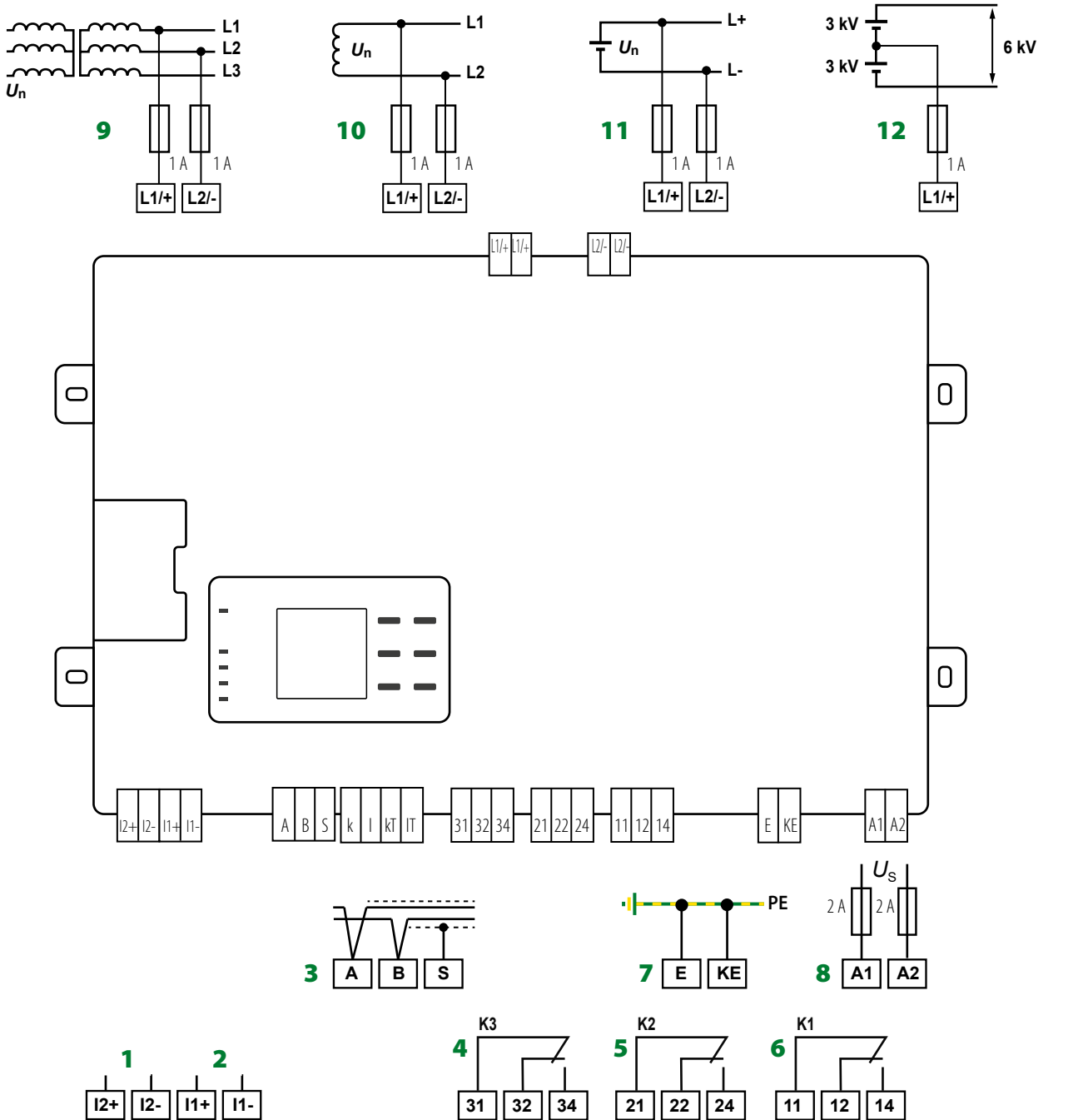
¹⁾ Absolute values

Dimension diagram

Dimensions in mm

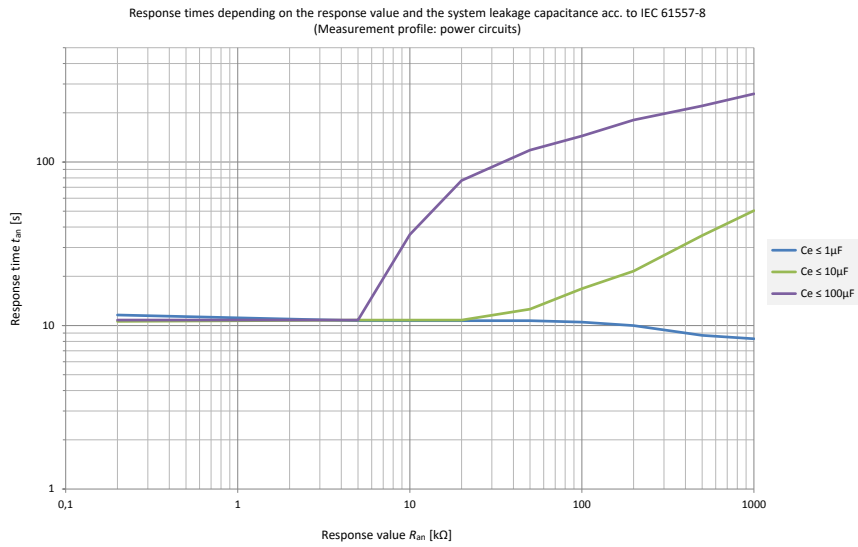


Wiring diagram

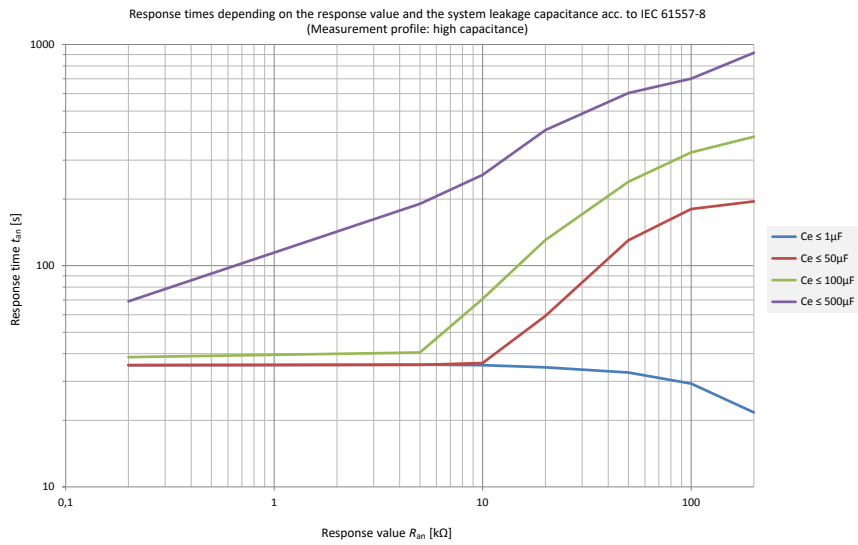


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|--|---|
| <p>1 - I2+, I2- Standby, digital input</p> <p>2 - I1+, I1- Test, digital input</p> <p>3 - A, B, S Connection to BMS bus, RS-485, S = shield (connect one end to PE), can be terminated with S700</p> <p>4 - 31, 32, 34 Alarm relay K3 for internal device errors</p> <p>5 - 21, 22, 24 Alarm relay K2 for insulation faults alarm 2</p> <p>6 - 11, 12, 14 Alarm relay K1 for insulation faults alarm 1</p> | <p>7 - E, KE Separate connections for E and KE to PE</p> <p>8 - A1, A2 Connection to $U_s = DC\ 24\ V$ via fuses, 2 A each</p> <p>9 - L1/+, L2/- Connection isoxx1685xx to 3AC</p> <p>10 - L1/+, L2/- Connection isoxx1685xx to AC</p> <p>11 - L1/+, L2/- Connection isoxx1685xx to DC</p> <p>12 - L1/+, L2/- Connection isoHV1685xx to DC with center tap</p> |
|--|---|

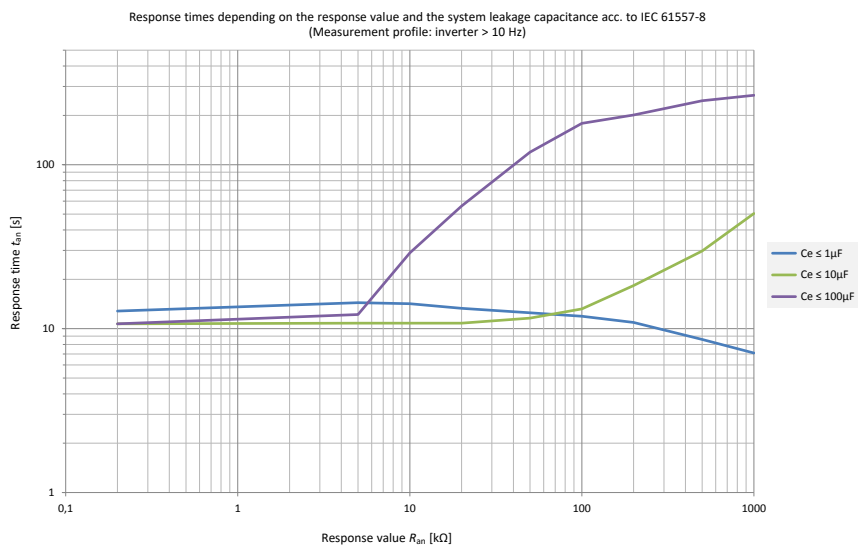
Response time Power circuits profile



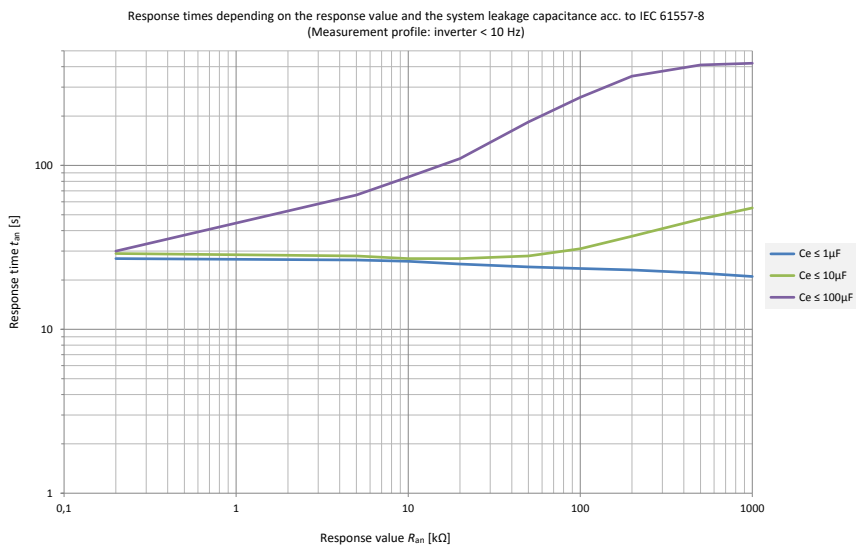
Response time High capacitance profile



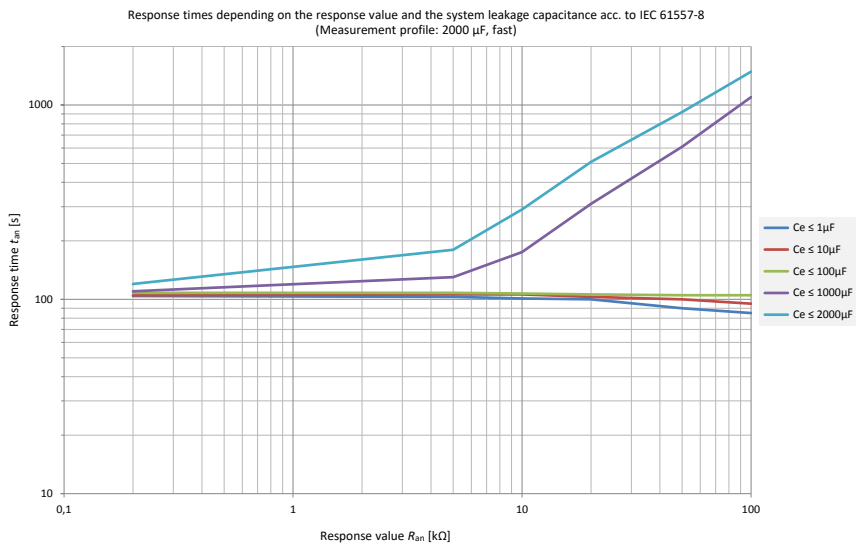
Response time Inverter > 10 Hz profile



Response time Inverter < 10 Hz profile



Response time Fast 2000 μF profile



Leakage capacitance

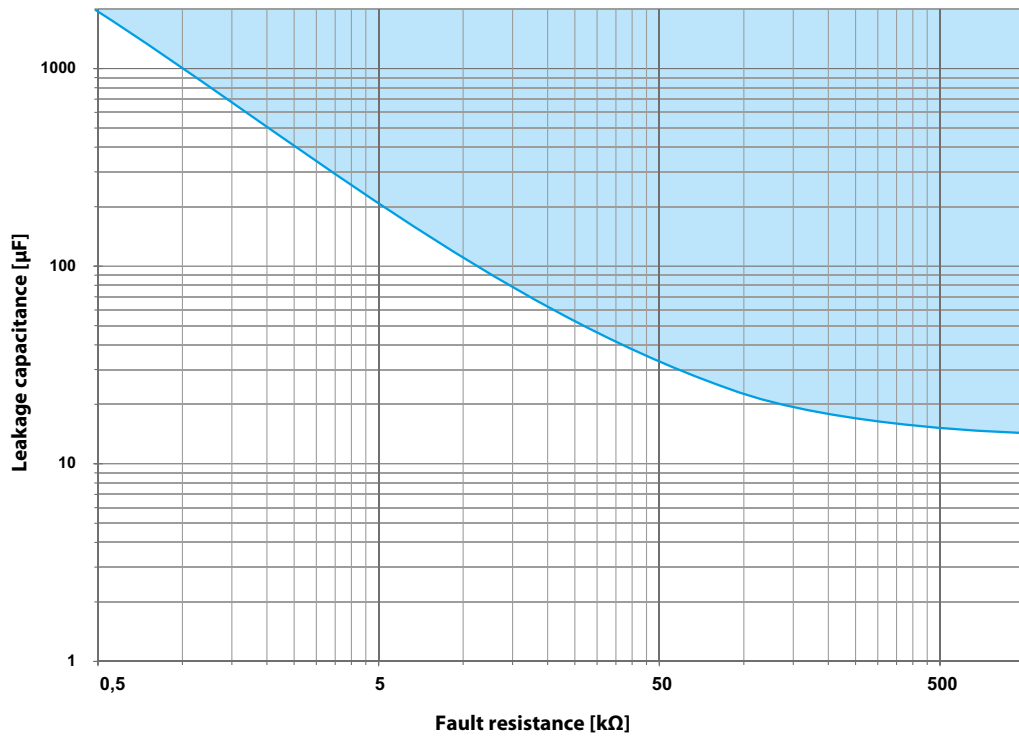
The determination of the leakage capacitance depends on the size of the insulation resistance.
The following diagrams show the relationship.

Example:

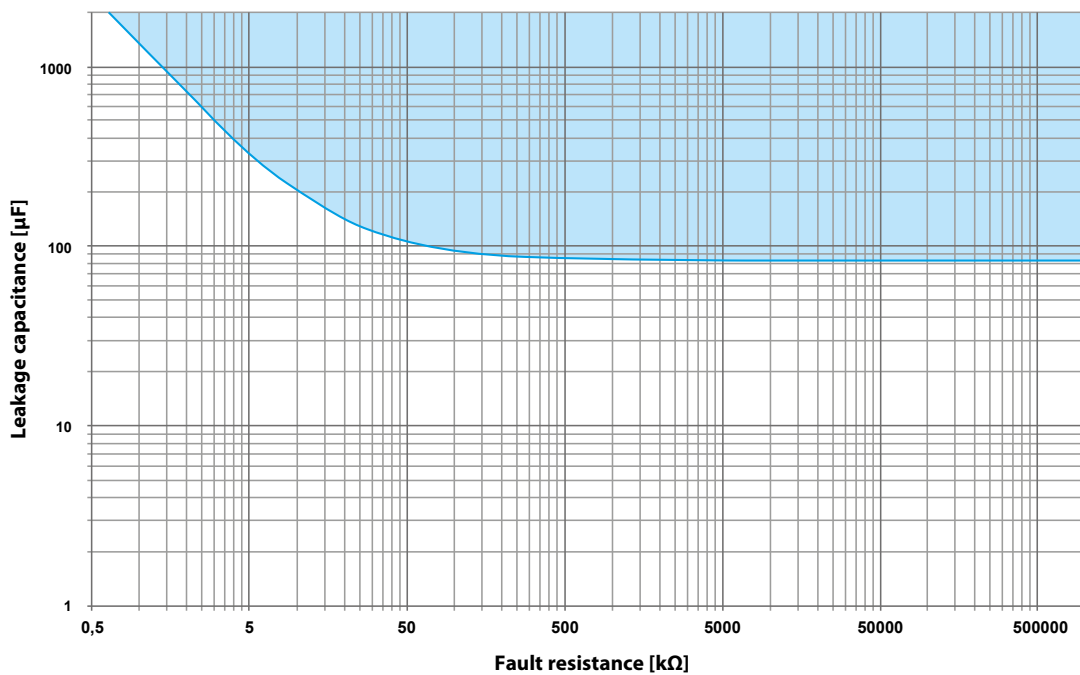
Insulation resistance 50 kOhm => min. measurable leakage capacitance 35 µF

Insulation resistance 5 kOhm => min. measurable leakage capacitance 210 µF

Restriction for determining the leakage capacitance (iso1685DP; isoHV1685D)



Restriction for determining the leakage capacitance (isoLR1685DP)



Technical data

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

Definitions:	
Measuring circuit (IC1)	(L1/+, L2/-), (E, KE)
Supply circuit (IC2)	A1, A2
Output circuit 1 (IC3)	11, 12, 14
Output circuit 2 (IC4)	21, 22, 24
Output circuit 3 (IC4)	31, 32, 34
Control circuit (IC6)	(A, B), (I1+, I1-, I2+, I2-)

Rated voltage [for isoHV1685D]	1500 V [3000 V]
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Overvoltage category	III
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Rated impulse voltage:	
IC1 / (IC2-5) [for isoHV1685D]	8 kV [16.670 kV]
IC2 / (IC3-5)	4 kV
IC2 / IC1+IC6	800 V
IC3 / (IC4-6)	4 kV
IC4 / (IC5-6)	4 kV
IC5 / IC6	4 kV

Rated insulation voltage:	
IC1 / (IC2-6) [for isoHV1685D]	1500 V [3000 V]
IC2 / (IC3-5)	250 V
IC2 / IC6	50 V
IC3 / (IC4-6)	250 V
IC4 / (IC5-6)	250 V
IC5 / IC6	250 V

Pollution degree	3
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Safe isolation (reinforced insulation) between:	
IC1 / (IC2-5) [for isoHV1685D]	overvoltage category III, 1500 V [3000 V]
IC2 / (IC3-5)	Overvoltage category III, 300 V
IC2 / IC6	Overvoltage category III, 50 V
IC3 / (IC4-6)	Overvoltage category III, 300 V
IC4 / (IC5-6)	Overvoltage category III, 300 V
IC5 / IC6	Overvoltage category III, 300 V

Voltage test (routine test) acc. to IEC 61010-1:	
IC2 / (IC3-5)	AC 2.2 kV
IC2 / IC6	DC ±0.50 kV
IC3 / (IC4-6)	AC 2.2 kV
IC4 / (IC5-6)	AC 2.2 kV
IC5 / IC6	AC 2.2 kV

Voltage ranges

Nominal system voltage range U_n	
iso1685DP	AC 0...1000 V; DC 0...1500 V
isoHV1685D	AC 0...2000 V; DC 0...3000 V
isoLR1685DP	AC 0...690 V; DC 0...690 V

Tolerance of U_n	AC +10 %/DC +5%
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Frequency range of U_n	DC 0.1...460 Hz
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Supply voltage U_s (see also device nameplate)	DC 18...30 V
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Frequency range of U_s	DC
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Power consumption	≤ 9 W
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Measuring circuit for insulation monitoring

Measuring voltage U_m (peak value)	±50 V
Measuring current I_m (at $R_f = 0 \Omega$)	≤ 0.7 mA
Measuring current I_m isoLR1685DP (at $R_f = 0 \Omega$)	≤ 3.5 mA
Internal DC resistance R_i	
iso1685DP	≥ 70 k Ω
isoHV1685D (two-pole coupling)	≥ 210 k Ω
isoHV1685D (single-pole coupling)	≥ 420 k Ω
isoLR1685DP	≥ 15 k Ω ¹⁾

Impedance Z_i at 50 Hz	
iso1685DP	≥ 70 k Ω
isoHV1685D (two-pole coupling)	≥ 210 k Ω
isoHV1685D (single-pole coupling)	≥ 420 k Ω
isoLR1685DP	≥ 15 k Ω ¹⁾

Permissible extraneous DC voltage U_{fg}	
iso1685DP	≤ DC 1600 V
isoHV1685D	≤ DC 3150 V
isoLR1685DP	≤ DC 720 V

Permissible system leakage capacitance C_e	profile-dependent, 0...2000 μ F
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¹⁾ for $U_n > 500$ V no longer acc. to IEC61557-8

Response values for insulation monitoring

Response value R_{an1} (Alarm 1) and R_{an2} (Alarm 2)	200 Ω ...1 M Ω
Response value R_{an1} (Alarm 1) and R_{an2} (Alarm 2) isoLR1685DP	20 Ω ...100 k Ω
Condition response value	$R_{an1} \geq R_{an2}$

Upper limit of the measuring range for setting for measurement profile "Fast"	
$C_{max} = 2000 \mu$ F (isox1685DP only)	50 k Ω

Upper limit of the measuring range for setting for measurement profile "High capacity"	
$C_{max} = 500 \mu$ F	200 k Ω

Relative uncertainty iso1685DP	
(10 k Ω ...1 M Ω) (acc. to IEC 61557-8)	±15 %
(0.2 k Ω ... < 10 k Ω)	±200 Ω ±15 %

Relative uncertainty isoHV1685D	
(10 k Ω ...1 M Ω) (acc. to IEC 61557-8)	±15 %
(0.2 k Ω ... < 10 k Ω)	±1 k Ω ±15 %

Relative uncertainty isoLR1685DP	
(1 k Ω ...100 k Ω) (acc. to IEC 61557-8)	±15 %
(20 Ω ... < 1 k Ω)	±20 Ω ±15 %

Hysteresis	25 %
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Time response

Response time t_{an} at $R_f = 0.5 \times R_{an}$ ($R_{an} = 10$ k Ω) and $C_e = 1 \mu$ F acc. to IEC 61557-8	profile-dependent, typ. 10 s
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Measuring circuit for insulation fault location (EDS) (isox1685DP)

Locating current I_L DC	≤ 50 mA (1/2,5/5/10/25/50 mA)
Test cycle/pause	2 s/4 s

Display

Display	Graphic display 127 x 127 pixel, 40 x 40 mm
Display range measured value	200 Ω ...50 M Ω
Display range measured value isoLR1685DP	20 Ω ...1 M Ω

LEDs

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

Technical data (continuation)
Digital inputs

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

Serial interface

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

Connection (except mains connection)

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

Mains connection

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

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 or N/O operation
Operating principle K3	N/C operation, cannot be changed
Electrical endurance under rated operating conditions, number of cycles	100,000

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

Utilisation category	AC 13 / AC 14 / DC-12 / DC-12 / DC-12
Rated operational voltage	230 V / 230 V / 4 V / 10 V / 20 V
Rated operational current	5 A / 3 A / 1 A / 0.2 A / 0.1 A
Rated insulation voltage	250 V
Minimum contact rating	1 mA at AC/DC ≥ 10 V

Environment/EMC

EMC	IEC 61326-2-4
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Classification of climatic conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3K22
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

Deviation from the classification of climatic conditions:

Ambient temperature during operation iso1685DP, isoLR1685DP	-40...+70 °C
Ambient temperature during operation isoHV1685D	-40...+55 °C
Ambient temperature transport	-40...+80 °C
Ambient temperature long-term storage	-25...+80 °C
Area of application	≤ 3000 m AMSL

Other

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



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