

ISOMETER® isoPV1685DP

Insulation monitoring device for unearthed systems
in photovoltaic systems





ISOMETER® isoPV1685DP

Device features

- Automatic adjustment to high system leakage capacitances
- Special measuring method ideal for DC systems in combination with 50/60 Hz systems
- 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
- 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
- Measurement of insulation faults 200 Ω...200 kΩ (profile-dependent)
- 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

Certifications



Product description

The device is used for monitoring the insulation resistance in large power supply systems designed as IT systems. The specific measurement method AMPPLUS monitors the insulation resistance also in installations where extremely high system leakage capacitances to earth exist due to interference suppression methods. Adaptation even to high leakage capacitances takes place automatically up to the respective limit of the profile.

The device generates 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 isoPV1685DP 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
- IEC 61326-2-4
- DIN EN 60664-1 (VDE 0110-1)

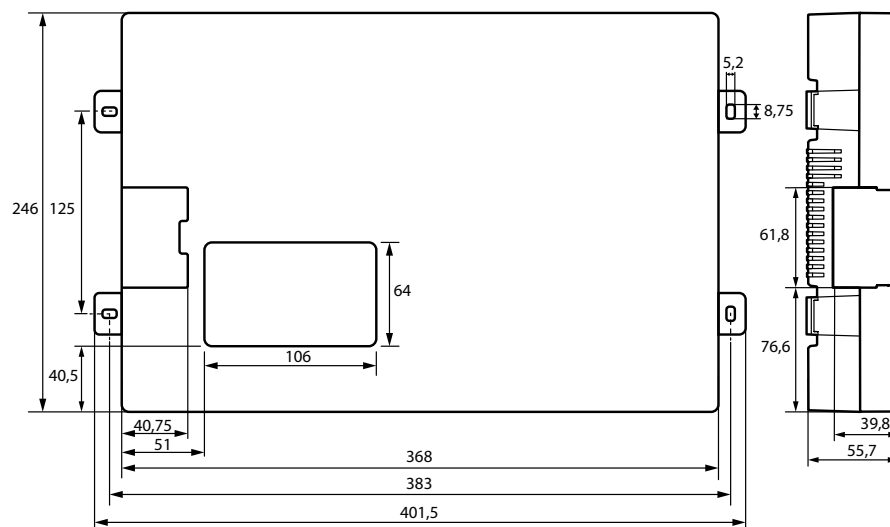
Ordering details

Response value range	Supply voltage U_s ¹⁾	Nominal voltage U_n		Type	Art. No.
	DC	AC	DC		
200 Ω...200 kΩ	18...30 V	0...1000 V	0...1500 V	isoPV1685DP-425	B91065808

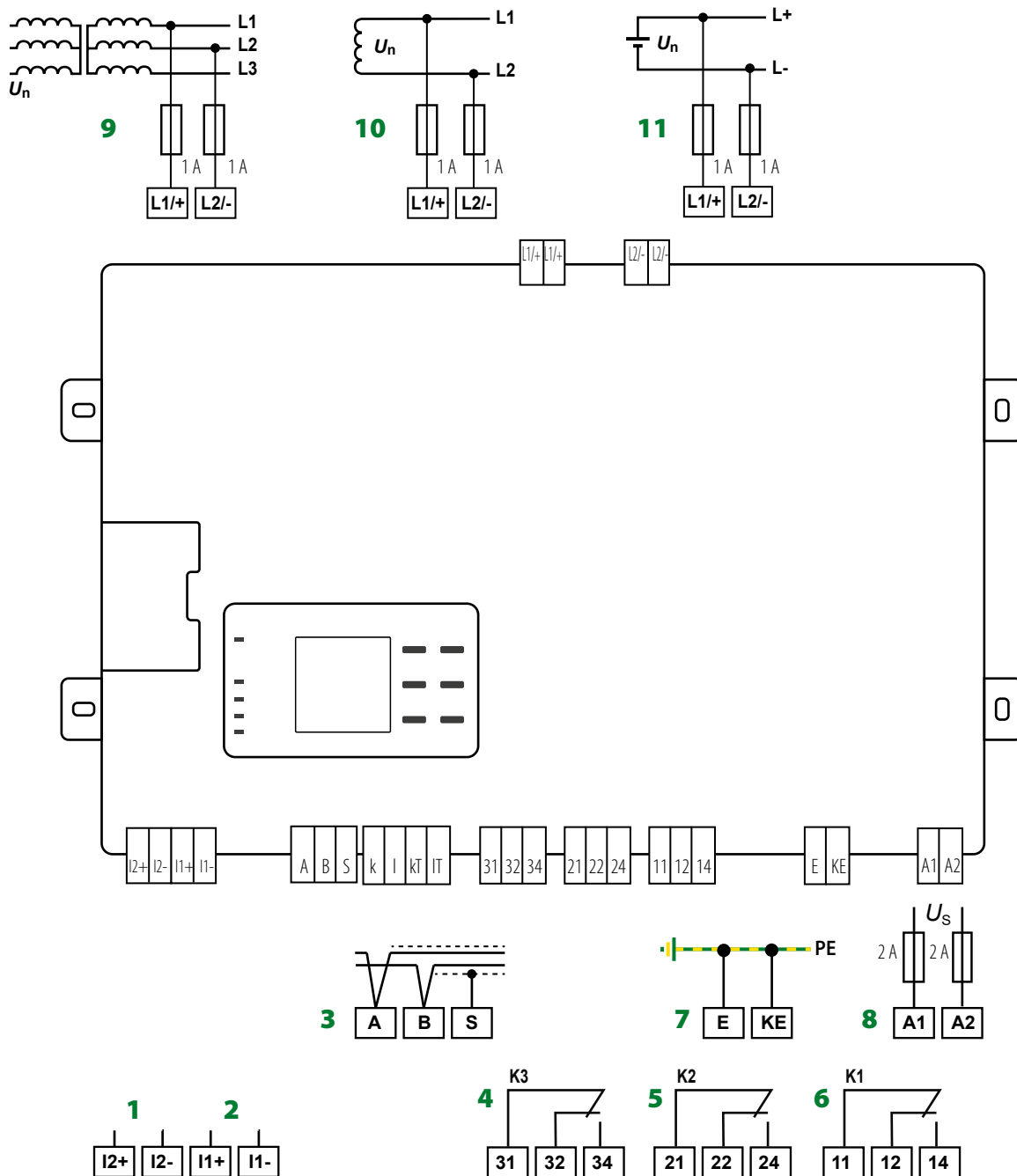
¹⁾ absolute values

Dimension diagram

Dimensions in mm



Wiring diagram

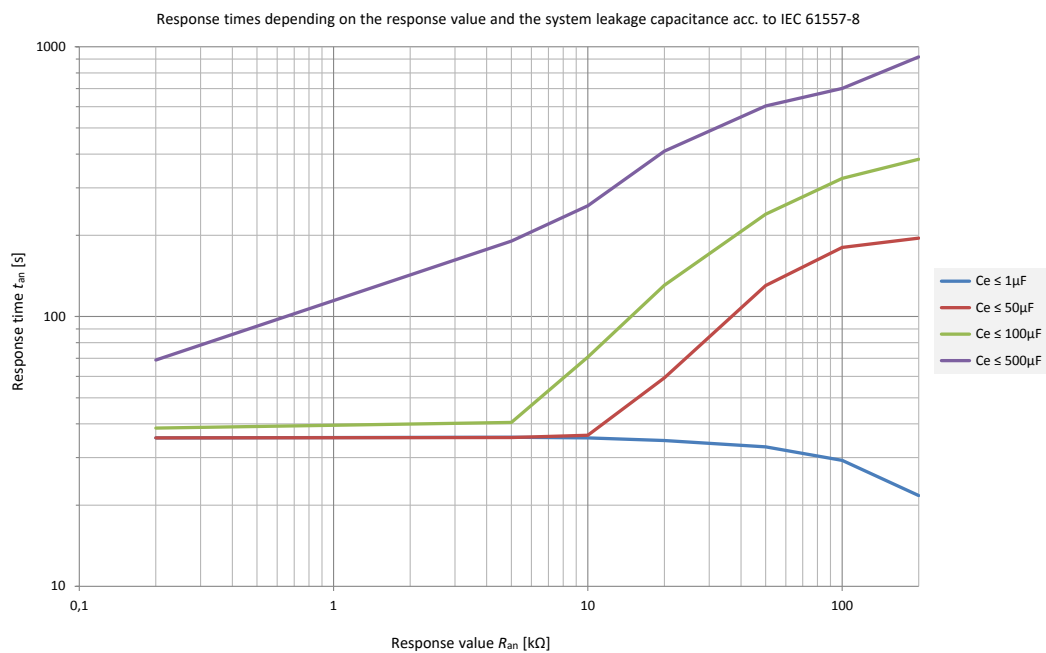


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|--|---|
| <p>1 - 12+, 12- Standby, digital input</p> <p>2 - 11+, 11- Test, digital input</p> <p>3 - A, B, S RS-485 bus connection (A,B) Protocol: BMS
S = PE potential Connect one end of shield</p> <p>4 - 31, 32, 34 Relay output for internal device errors (LED SERVICE)</p> <p>5 - 21, 22, 24 Alarm relay for insulation faults alarm 2</p> | <p>6 - 11, 12, 14 Alarm relay 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 supply voltage</p> <p>9 - L1/+, L2/- Connection to a 3AC system via 1 A fuse</p> <p>10 - L1/+, L2/- Connection to a AC system via 1 A fuse</p> <p>11 - L1/+, L2/- Connection to a DC system via 1 A fuse</p> |
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Response time profile PV up to 500 μF

Profile for PV systems with a leakage capacitance of up to 500 μF . Suitable for both central inverter and string inverter applications.

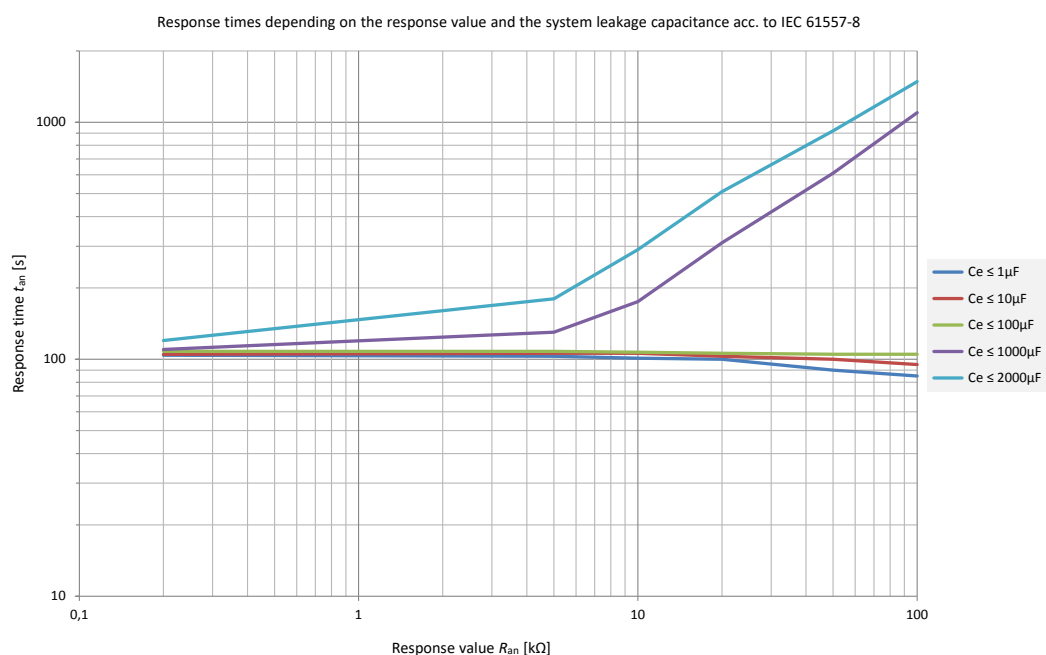
Power frequency	System leakage capacitance	Measuring voltage	Response value range
DC; 50 Hz; 60 Hz	0...500 μF	$\pm 50\text{ V}$	200 Ω ...200 k Ω



Response time profil PV up to 4000 μF

Profile for PV systems with a leakage capacitance of up to 4000 μF . Suitable for both central inverter and string inverter applications.

Power frequency	System leakage capacitance	Measuring voltage	Response value range
DC; 50 Hz; 60 Hz	0...4000 μF	$\pm 50\text{ V}$	200 Ω ...50 k Ω



Leakage capacitance

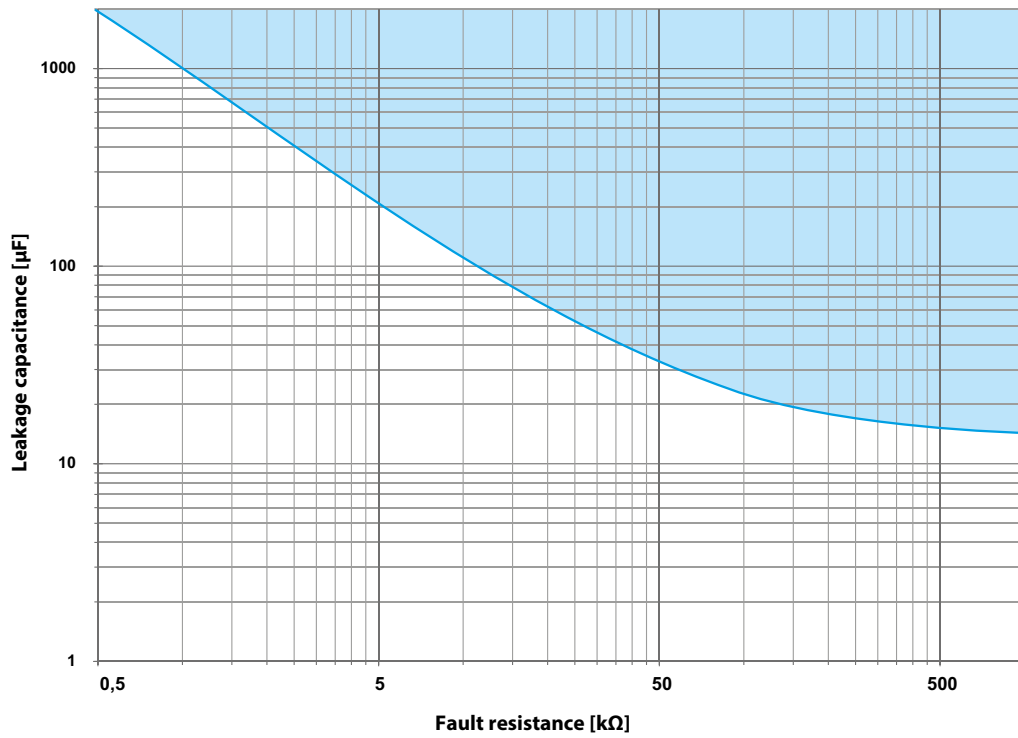
The determination of the leakage capacitance depends on the size of the insulation resistance.
The following diagrams show the relationship.

Example:

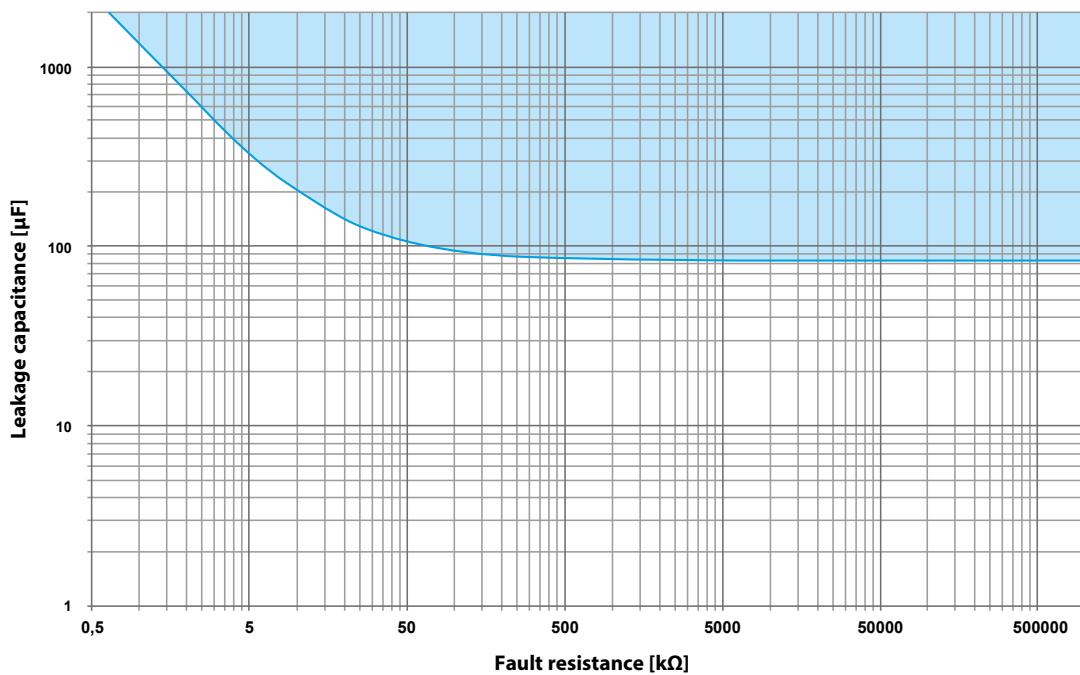
Insulation resistance 50 kOhm => min. measurable leakage capacitance 35 µF

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

Restriction for determining the leakage capacitance



Restriction for determining the leakage capacitance



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	1500 V
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Overvoltage category	III
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Rated impulse voltage:	
IC1 / (IC2-5)	8 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)	1500 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)	overvoltage category III, 1500 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	AC 0...1000 V; DC 0...1500 V
Tolerance of U_n	AC +10%/DC +5%
Frequency range of U_n	DC; 50 Hz; 60 Hz
Supply voltage U_s (see also device nameplate)	DC 18...30 V
Frequency range of U_s	DC
Power consumption	≤ 9 W

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
Internal DC resistance R_i	≥ 70 k Ω
Impedance Z_i at 50 Hz	≥ 70 k Ω
Permissible extraneous DC voltage U_{fg}	≤ DC 1600 V
Permissible system leakage capacitance C_e	profile-dependent, 0...4000 μ F

Response values for insulation monitoring

Response value R_{an1} (Alarm 1) and R_{an2} (Alarm 2)	200 Ω ...200 k Ω (profile-dependent)
Condition response value	$R_{an1} \geq R_{an2}$
Upper limit of the measuring range for setting for measurement profile	
„PV up to 500 μ F“ $C_{emax} = 500 \mu$ F	200 k Ω
Upper limit of the measuring range for setting for measurement profile	
„PV up to 4000 μ F“ $C_{emax} = 4000 \mu$ F	50 k Ω
Relative uncertainty	
10 k Ω ...1 M Ω (acc. to IEC 61557-8)	±15 %
0.2 k Ω ...< 10 k Ω	±200 Ω ±15 %
Hysteresis	25 %

Time response

Response time t_{an} at $R_f = 0.5 \times R_{an}$ ($R_{an} = 10 \text{ k}\Omega$) 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)

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 ...200 k Ω

LEDs

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

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
flexible with ferrule, without/with plastic sleeve	0.25...2.5 mm ²
Conductor sizes (AWG)	24...12

Technical data (continuation)
Mains connection

Connection type	pluggable push-wire terminals
Connection	
rigid/flexible	0.2...10 mm ² /0.2...6 mm ²
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 / 24 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	-40...+70 °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
Documentation number	D00479
Weight	≤ 1600 g



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