ISOMETER® isoPV1685…

Insulation monitoring device for unearthed photovoltaic systems up to AC 1000 V and DC 1500 V

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Insulation monitoring device for unearthed photovoltaic systems up to AC 1000V* and DC 1500 V

ISOMETER® isoPV1685xxx

Device features

Only device version isoPV1685P provide a locating current injector.

- Insulation monitoring of large-scale photovoltaic systems
- Measurement of low-resistance insulation faults
- Separately adjustable response values R_{an1} (alarm 1) and R_{an2} (alarm 2) (both 200 Ω…1 MΩ) for prewarning and alarm. $R_{an1} \geq R_{an2}$ applies.
- Automatic adjustment to high system leakage capacitances up to 2000 µF, selectable range
- Connection monitoring of L+, L- for reverse polarity (DC only)
- Integrated locating current injector up to 50 mA (isoPV1685P only)
- Device self test with automatic message in the event of a fault
- Alarm relays separately adjustable for insulation fault 1, insulation fault 2
- CAN interface to output measured values, statuses and alarms
- RS-485 interface
  - isoPV1685P: BMS bus, e.g. to control the insulation fault location
  - isoPV1685RTU: BMS bus or Modbus (can be switched using the DIP switch)
- µSD card with data logger and history memory for alarms

Approvals and certifications

Only isoPV1685RTU in DC cirquits

Product description

The device is used for insulation of large photovoltaic systems up to AC 1000 V/DC 1500 V designed as IT systems. The measurement method specially developed for slow voltage fluctuations (MPP tracking) monitors the insulation resistance even in systems equipped with large solar generator panels where extremely high system leakage capacitances against earth exist due to interference suppression methods. Adaptation to system-related high leakage capacitances also occurs automatically.

Function

Insulation monitoring is carried out using an active measuring pulse which is superimposed onto the PV system to earth via the integrated coupling.

isoPV1685RTU:
If the insulation resistance between the PV system and earth falls below the preset prewarning response value R_{an1}, the "Alarm 1" LED lights and the alarm relay K1 switches. If the value also falls below response value R_{an2}, the "Alarm 2" LED also lights and the alarm relay K2 switches. The RS-485 interface can be switched between BMS bus and Modbus.

isoPV1685P:
If the insulation resistance between the PV system and earth falls below the preset prewarning response value R_{an1}, the "Alarm 1" LED lights and the alarm relay K1 switches. If the value also falls below response value R_{an2}, the "Alarm 2" LED also lights and the alarm relay K2 switches.

The locating current injector integrated in the device for insulation fault location is either activated externally via the BMS interface or via the internal backup master function if no external master has been connected. When starting the insulation fault location, the LED "PGH ON" signals the locating current pulse.

The insulation fault location can be started manually via the digital input 1, e.g. for insulation fault location with mobile insulation fault locators (e.g. EDS195).

µSD card (isoPV1685P only)
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:

- Insulation resistance and leakage capacitance
- System voltage, partial voltages to earth, supply voltages
- Temperature locating current injector (isoPV1685P only)
- Temperature coupling L+, L–
- Insulation fault
- Connection faults and device errors

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. The typical time that is needed until the maximum file size is reached is approximately 2 days. Hence, a µSD card with a memory space of 2 GBytes can record data for approx. 400 days.

When the maximum data limit of the card has been reached, the oldest file in each case will be overwritten. The history memory that 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 61557-9
- IEC 61326-2-4
- IEC 60730-1
- DIN EN 60664-1 (VDE 0110-1)
- UL508
- UL1998 (software) isoPV1685RTU in DC cirquits only

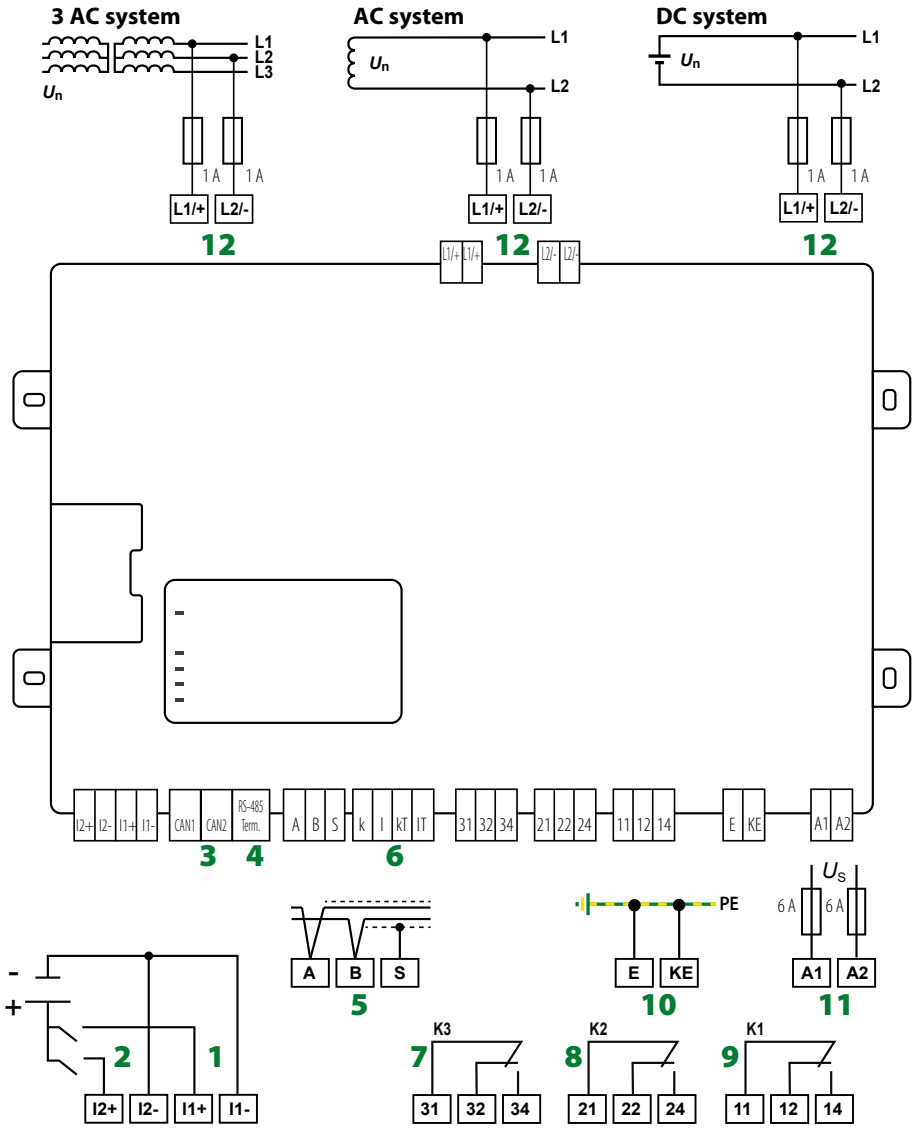
DC | AC/DC | PV

Ordering details

Response value range	Supply voltage U_s[1]	Nominal system voltage U_n		Incl. µSD card	Type	Art. No.
	DC	AC	DC			
200 Ω…1 MΩ	18…30 V	0…1000 V	0…1500 V	–	isoPV1685RTU-425	B91065603
		–	0…1500 V	■	isoPV1685P-425	B91065604

[1] Absolute values

Wiring diagram



1 - **I1+, I1–** Digital input 1:
isoPV1685RTU: Test/Standby
isoPV1685P: Starting the insulation fault location in the manual mode

2 - **I2+, I2–** Digital input 2:
isoPV1685RTU: Reset/(Memory)
isoPV1685P: No function

3 - **CAN2, CAN1** Connection to CAN bus, 2 x RJ-45, can be terminated with CAN 120-Ω termination plug.

4 - **RS-485 Term.** DIP switch for the termination of the RS-485 interface

5 - **A, B, S** Connection to Modbus or BMS bus, RS-485, S= shield (connect one end to PE), can be terminated with RS-485 Term. switch.

6 - **k, I/kT, IT** No function

7 - **31, 32, 34** Alarm relay K3 for internal device errors

8 - **21, 22, 24** Alarm relay K2 for insulation faults.

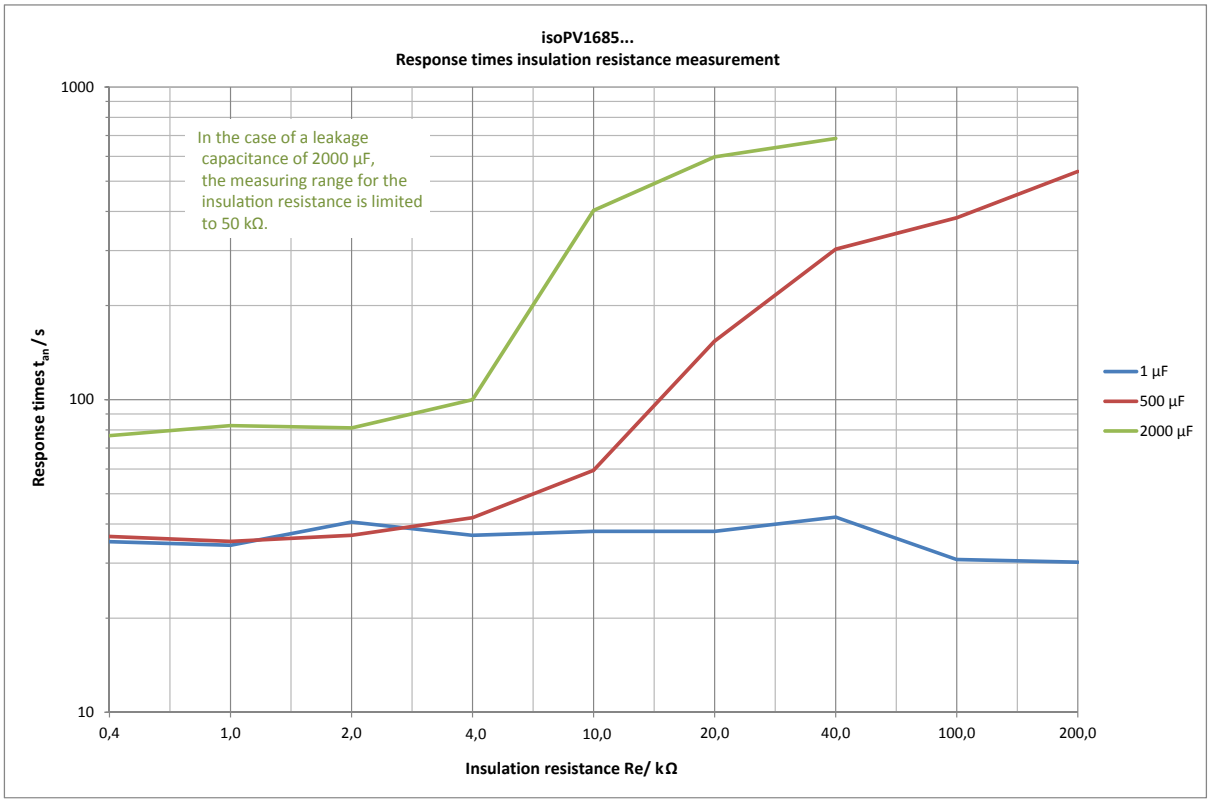
9 - **11, 12, 14** Alarm relay K1 for insulation faults.

10 - **E, KE** Separate connections for E and KE to PE.

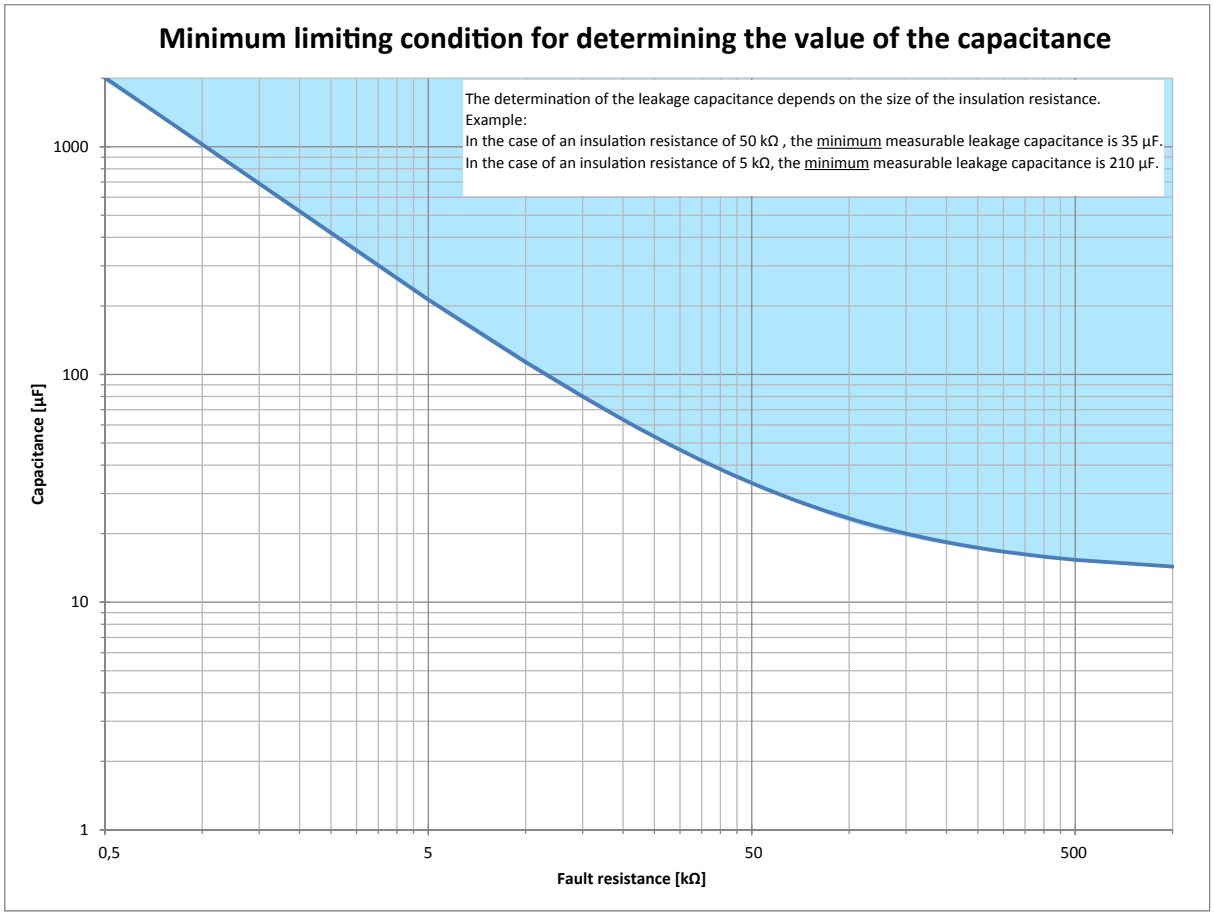
11 - **A1, A2** Connection to U_s = DC 24 V via a 6 A fuse on each line.

12 - **L1/+, L2/-** Connection to the IT system to be monitored

Response time for insulation measurement



The measurable leakage capacitance depends on the insulation resistance



Technical data

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

Insulation coordination acc. to IEC 60664-1	
Rated voltage	DC 1500 V
Rated impulse voltage/pollution degree	8 kV/2

Voltage ranges

Nominal system voltage U_n	
isoPV1685RTU	AC 0…1000 V/DC 0…1500 V
isoPV1685P	DC 0…1500 V
Nominal frequency	50/60 HZ ±1 Hz
Tolerance of U_n	AC +10%/DC +6 %
Supply voltage U_s (refer also to device name plate)	DC 18…30 V
Power consumption	≤ 7 W

Measuring circuit for insulation monitoring

Measuring voltage U_m (peak value)	±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	≤ 2000 µF (500 µF)*

Response values for insulation monitoring

Response value R_{an1} (Alarm 1)	200 Ω…1 MΩ (10 kΩ)*
Response value R_{an2} (Alarm 2)	200 Ω…1 MΩ (1 kΩ)*
Upper limit of the measuring range when set to $C_{emax} = 2000$ µF	50 kΩ
Relative uncertainty (10 kΩ…1 MΩ) (acc. to IEC 61557-8)	±15 %
Relative uncertainty (0.2 kΩ…< 10 kΩ)	±200Ω ±15 %
Response time t_{an}	see graphic in the manual
Hysteresis	25 %, +1 kΩ

isoPV1685P only: Measuring circuit for insulation fault location (EDS)

Locating current I_L DC	≤ 50 mA
Test cycle/pause	2/4 s
Number of turns of test winding	10

Displays, memory

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

Inputs

Digital inputs DigIn1/DigIn2:

High level	10…30 V
Low level	0…0.5 V

Serial interfaces

BMS/Modbus:

Interface/protocol	
isoPV1685RTU:	RS-485/BMS (Slave)/Modbus RTU (Slave); Protocol switchable
isoPV1685P:	RS-485/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 x 0.6
Terminating resistor, switchable (RS-485 Term.)	120 Ω (0.5 W)
Device address, BMS bus or Modbus adjustable (DIP switch)	isoPV1685RTU: 2…17
Device address, BMS bus adjustable (DIP switch)	isoPV1685P: 2…33 W

CAN:

Protocol	acc. to SMA/Bender specification V2.5
Frame format	CAN 2.0A 11-bit identifier
Baud rate	500 kBit/s
Connection via 2 x RJ45 acc. to CiA-303-1 connected in parallel	Pin 1: CAN-H Pin 2: CAN-L Pin 3, 7: CAN-GND
CAN identifier	permanently set acc. to the specification above
Cable length	≤ 130 m
Shielded cable	CAT 5 with RJ45 plug
Terminating resistor, can be connected (Term. CAN)	120 Ω (0.5 W)
Potential of the socket housing	functional earth potential

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 (N/C operation)*
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				

For UL application:

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 to 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
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
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

Technical data (continued)

Environment/EMC

EMC	IEC 61326-2-4 Ed. 1.0
Classification of climatic conditions acc. to IEC 60721:	
Without solar radiation, precipitation, water, icing. Condensation possible temporarily:	
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
Deviation from the classification of climatic conditions:	
Ambient temperature during operation	-40 …+70 °C
Ambient temperature for transport	-40 …+80 °C
Ambient temperature for long-term storage	-25 …+80 °C
Relative humidity	10…100 %
Atmospheric pressure	700…1060 hPa (max. height 4000 m)

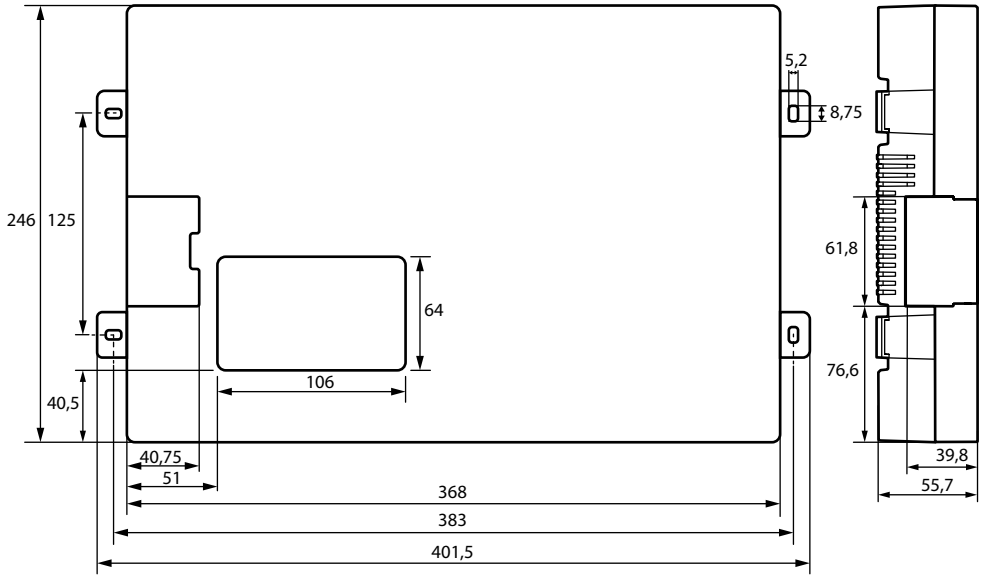
Other

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
Documentation number	D00007
Weight	≤ 1300 g

( )* = Factory settings

Dimension diagram

Dimensions in mm



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