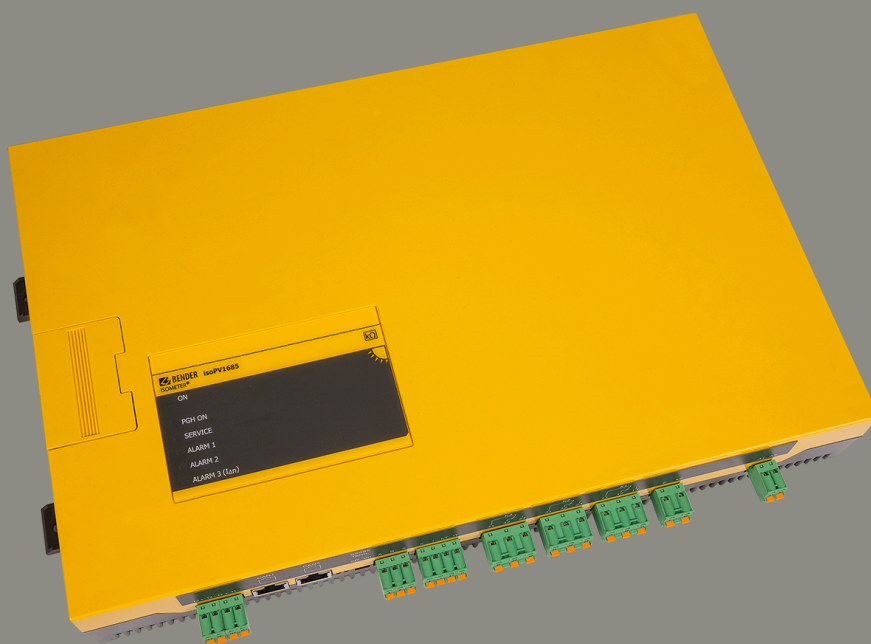


AC/DC

PV

# ISOMETER® isoPV1685RTU

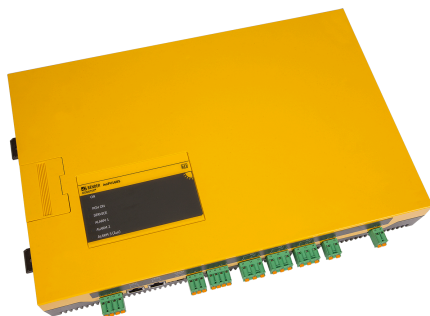
Insulation monitoring device  
for unearthed photovoltaic systems



*Image similar*

# ISOMETER® isoPV1685RTU

Insulation monitoring device  
for unearthed photovoltaic systems



## Device features

ISOMETER® for photovoltaic systems.

- Insulation monitoring of large PV systems
- Measurement of insulation faults 200 Ω...1 MΩ
- Automatic adjustment to high system leakage capacitances
- Combination of **AMP<sup>PLUS</sup>** and other profile-specific measurement methods
- Separately adjustable response values  $R_{an1}$  (Alarm 1) and  $R_{an2}$  (Alarm 2) for prewarning and alarm
- Connection monitoring
- Connection monitoring of L+, L- for polarity reversal
- Device self test with automatic alarm message in the event of a fault
- µSD card (not equipped) with data logger and history memory for alarms
- Digital inputs
- Separate relays for insulation fault 1, insulation fault 2 and device error

## Interfaces

- RS-485 interface for data exchange with other Bender devices
- BMS and Modbus RTU protocol via RS-485 interface, switchable
- Modbus RTU via RS-485 interface

## Intended use

The device isoPV1685RTU is used for insulation monitoring of large photovoltaic systems up to 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 within the selected profile.

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 the test intervals in accordance with the relevant standards and operating rules.

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.

## Functional description

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 a PV system 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.

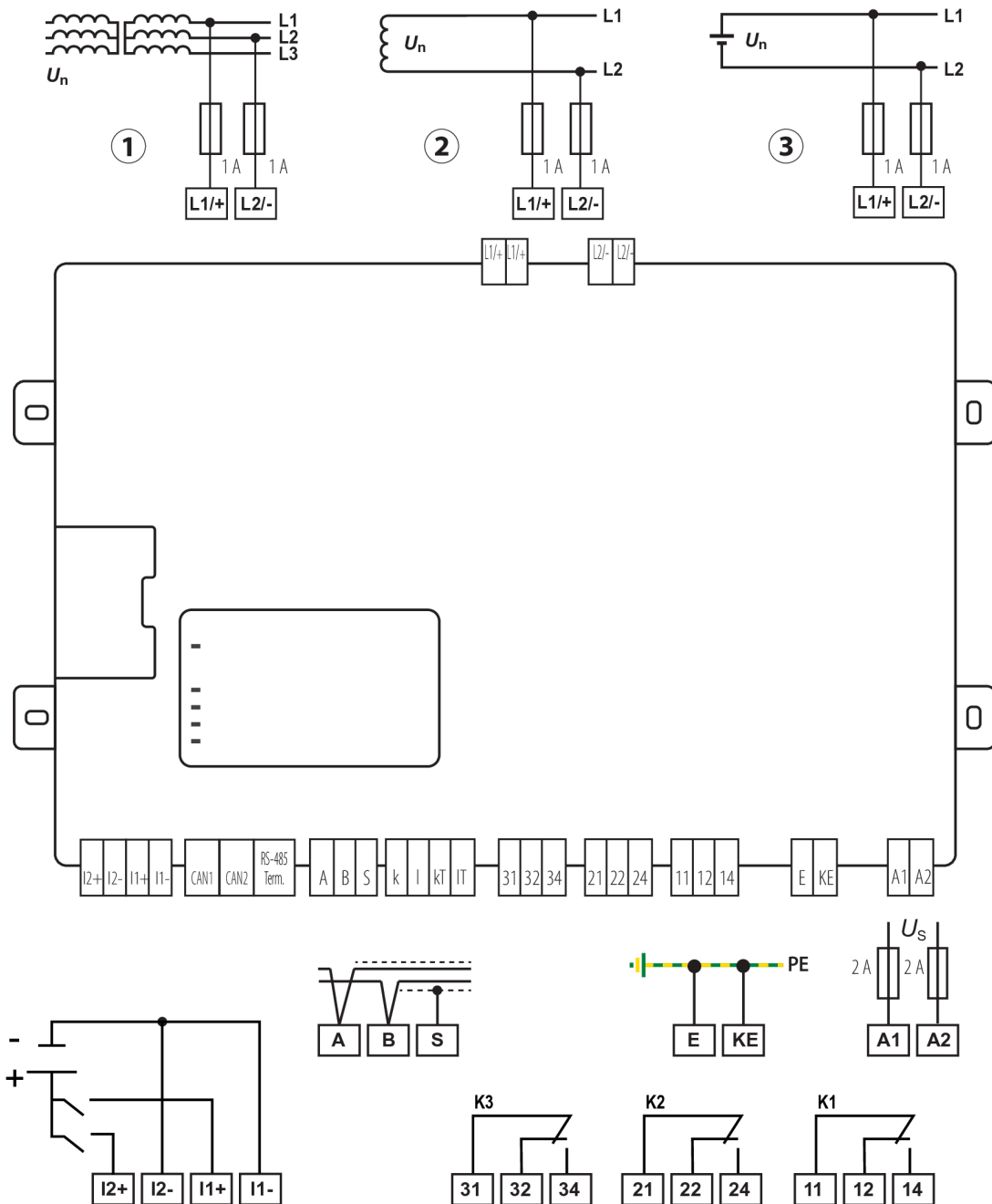
### Prevent measurement errors!

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.

## Wiring diagram



I2+, I2–	Digital input: Reset / (Memory)
I1+, I1–	Digital input: Test (Signal ≤ 1.5 s), Standby (Signal > 1.5 s)
CAN1, CAN2	No function
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, I, kT, IT	no function
31, 32, 34	Relay output for internal device errors (LED <b>SERVICE</b> )
21, 22, 24	Relay output for alarm insulation faults (LED <b>ALARM 2</b> )

11, 12, 14	Relay output for prewarning insulation faults (LED <b>ALARM 1</b> )
E, KE	Separate connection of E (earth) and KE (reference) to PE
A1, A2	Connection to supply voltage (via fuses, 2 A each)
L1/+	Connection to L1/+ of the IT system via 1 A fuse
L2/–	Connection to L2/– of the IT system via 1 A fuse

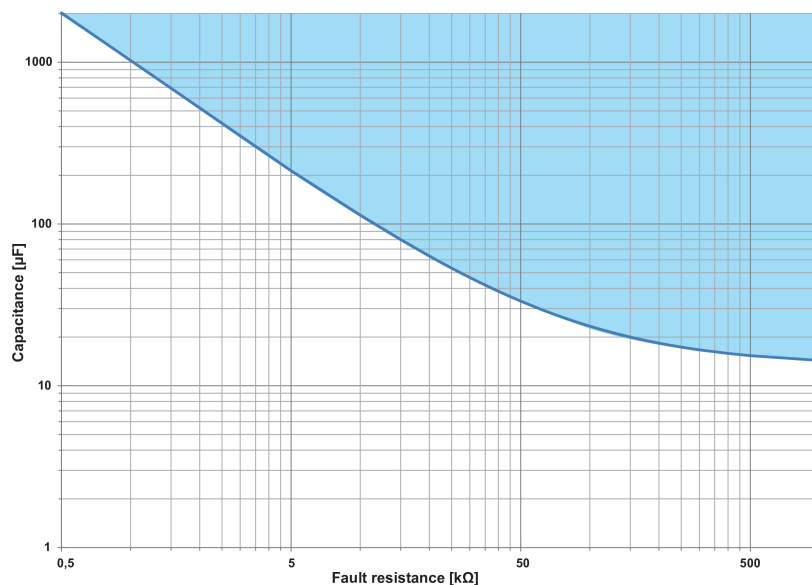
## Diagrams

### System leakage capacitance

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

Examples

- minimum measurable leakage capacitance at  $R_F = 50 \text{ k}\Omega$ : **35  $\mu\text{F}$**
- minimum measurable leakage capacitance at  $R_F = 5 \text{ k}\Omega$ : **210  $\mu\text{F}$**

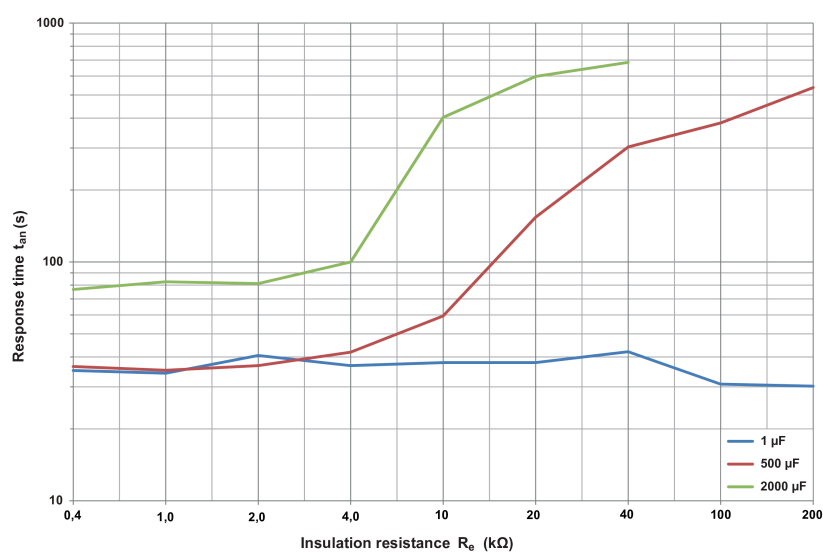


### Response time



#### ADVICE

*In the case of a leakage capacitance of 2000  $\mu\text{F}$ , the measuring range for the insulation resistance is limited to 50  $\text{k}\Omega$ .*



## Technical data

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

Rated voltage	DC 1500 V
Rated impulse voltage	10 kV
Pollution degree	2

### Voltage range

Nominal system voltage range $U_n$	AC 0...1000 V, DC 0...1500 V
Nominal frequency range	50/60 Hz $\pm$ 1 Hz
Tolerance of $U_n$	AC +10 %, DC + 6 %
Supply voltage $U_s$	DC 18...30 V
Power consumption	$\leq$ 7 W

### Measuring circuit for insulation monitoring

Measuring voltage $U_m$ (peak)	$\pm$ 50 V
Measuring current $I_m$ (at $R_F = 0 \Omega$ )	$\leq$ 1.5 mA
Internal DC resistance $R_i$	$\geq$ 70 k $\Omega$
Impedance $Z_i$ at 50 Hz	$\geq$ 70 k $\Omega$
Permissible extraneous DC voltage $U_{ig}$	$\leq$ DC 1500 V
Permissible system leakage capacitance $C_e$	$\leq$ 2000 $\mu$ F

### Response values for insulation monitoring

Response value $R_{an1}$ (Alarm 1)	200 $\Omega$ ... 1 M $\Omega$
Response value $R_{an2}$ (Alarm 2)	200 $\Omega$ ... 1 M $\Omega$
Upper limit of the measuring range when set to $C_{e\max} = 2000 \mu$ F	50 k $\Omega$
Relative uncertainty (10 k $\Omega$ ... 1 M $\Omega$ ) (nach IEC 61557-8)	$\pm$ 15 %
Relative uncertainty (0.2 k $\Omega$ ... < 10 k $\Omega$ )	$\pm$ 200 $\Omega$ $\pm$ 15 %
Response time $t_{an}$	see Response time
Hysteresis	25 %, +1 k $\Omega$

### Display, storage

LEDs for alarms and operating states	2x green, 4 x yellow
$\mu$ SD card (Spec. 2.0) for history memory and log files	$\leq$ 32 GB

### Inputs

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

### Serial interface

Interface	RS485
Protocol	BMS (Slave)
	Modbus RTU (Slave); switchable
Connection	Terminals A/B Shield: Terminal S
Cable length	$\leq$ 1200 m
Shielded cable	2-core, $\geq$ 0.6 mm <sup>2</sup> , e.g. J-Y(St)Y 2x0.6 (shield to functional earth on one end)
Terminating resistor, can be connected (RS-485 Term.)	120 $\Omega$ (0.5 W)
Device address, BMS bus or Modbus adjustable	2...17

### 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 $\geq$ 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 mm <sup>2</sup> / 0.2...2.5 mm <sup>2</sup>
Connection, flexible with ferrule, without/with plastic sleeve	0.25...2.5 mm <sup>2</sup>
Conductor sizes (AWG)	24...12

### Connection of the system coupling

Connection type	pluggable push-wire terminals
Connection, rigid/flexible	0.2...10 mm <sup>2</sup> / 0.2...6 mm <sup>2</sup>
Connection, flexible with ferrule, without/with plastic sleeve	0.25...6 mm <sup>2</sup> / 0.25...4 mm <sup>2</sup>
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

## Standards and approvals

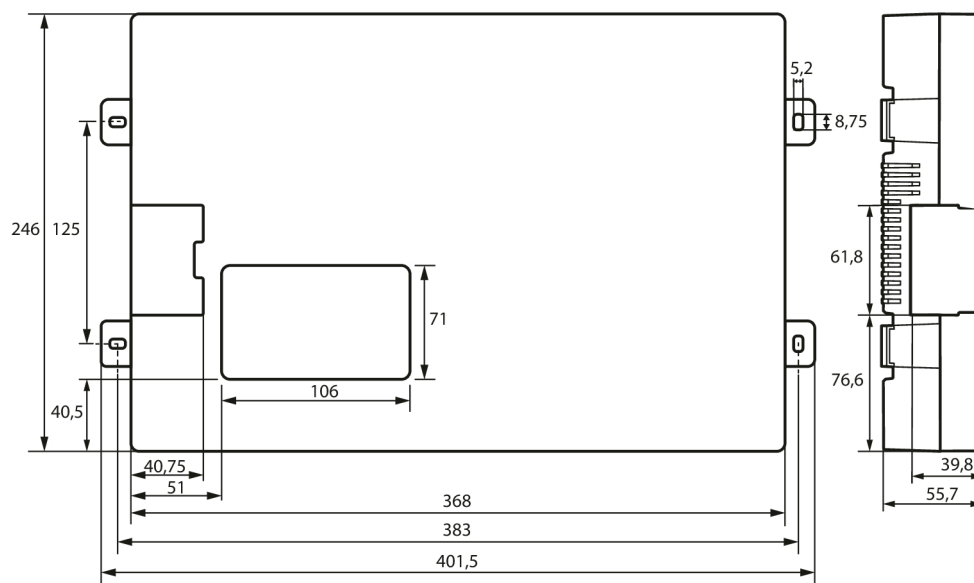
The ISOMETER® isoPV1685RTU was developed in compliance with the following standards:

- 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



**Ordering details**

Model	Response value	Nom. system voltage	Supply voltage	Art. No.
isoPV1685RTU-425	200 $\Omega$ ...1 M $\Omega$	AC 0...1000 V DC 0...1500 V	DC 24 V $\pm$ 25%	B91065603

**Dimensions**

Dimensions in mm



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Subject to change!

The specified standards take into account the  
edition valid until unless otherwise indicated.