ISOMETER® iso1685P...

Insulation monitoring device for unearthed AC, AC/DC and DC power supplies (IT systems) up to AC 1000 V/DC 1500 V

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Device features

- Insulation monitoring in extensive unearthed power supply systems up to AC 1000 V/DC 1500 V
- 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
- Automatic adaptation to high system leakage capacitances up to 2000 µF, selectable range
- Integrated locating current injector up to 50 mA
- Device self test with automatic fault message in the event of a fault
- Alarm relays separately adjustable for insulation fault 1, insulation fault 2 and device error
- RS-485 interface (BMS bus), e.g. to control insulation fault location
- µSD card with data logger and history memory for alarms

Certifications

C E

Product description

The iso1685P… is used for insulation monitoring of extensive IT systems up to AC 1000 V/DC 1500 V. The specially developed measurement method monitors the insulation resistance also in installations where extremely high system leakage capacitances against earth exist due to interference suppression methods. Adaptation to system-related high leakage capacitances also occurs automatically.

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.
When the insulation resistance between the IT system and earth falls below the set prewarning response value Ran1 the LED "Alarm 1" lights and the alarm relay K1 switches. When the values fall below the alarm response value R_{an2} , also LED "Alarm 2" lights and the alarm relay K2 switches.

The locating current injector integrated in the device for insulation fault location is externally activated via the BMS interface. When starting insulation fault location, the LED "PGH on" signals the locating current pulse.

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 resistances and leakage capacitances
- System voltages, partial voltages to earth, supply voltages
- Temperatures: current controller of the locating current injector, coupling L1/+, L2/–
- Insulation fault
- Connection fault
- Device error

Following each device start-up, a new file is generated. If the current file size exceeds 10 MByte during operation, a new file is generated. The file name contains the time and date of the creation time. Usually, it takes two days until the maximum file size is reached.
Hence, a µSD card with a memory space of 2 GByte can record data for approx. 400 days.

When the card has reached the maximum data volume, always the oldest file will be overwritten.

The history memory on the µSD card contains all saved alarms in csv. format.

Standards

The iso1685P was designed according to the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8
- DIN EN 61557-9 (VDE 0413-9)
- IEC 61557-9
- IEC 61326-2-4
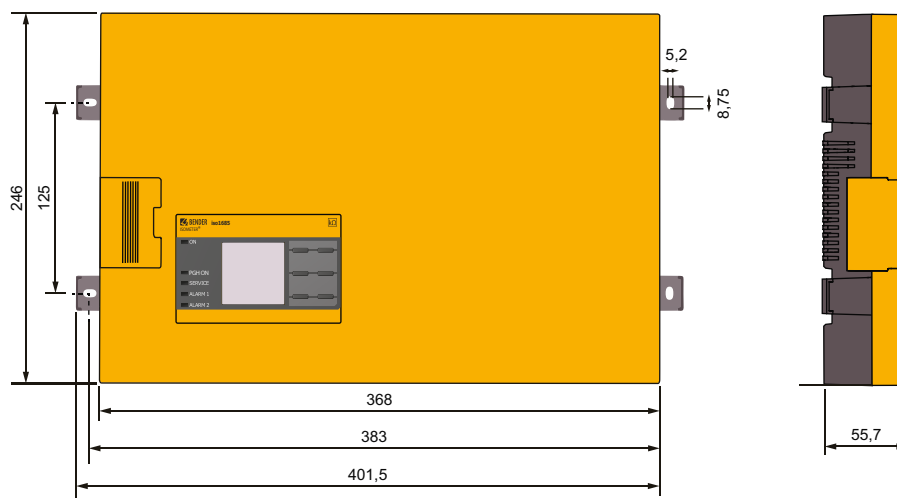- DIN EN 60664-1 (VDE 0110-1)

Ordering details

Response value range	Nominal voltage		Supply voltage [1]	Type	Art. No.
	AC	**DC**	**DC**		
200 Ω…1 MΩ	0…1000 V	0…1500 V	18…30 V	iso1685P-425	B91065801
				iso1685PW-425	B91065801W

[1] Absolute values

Dimension diagram

Dimensions in mm

Operating elements

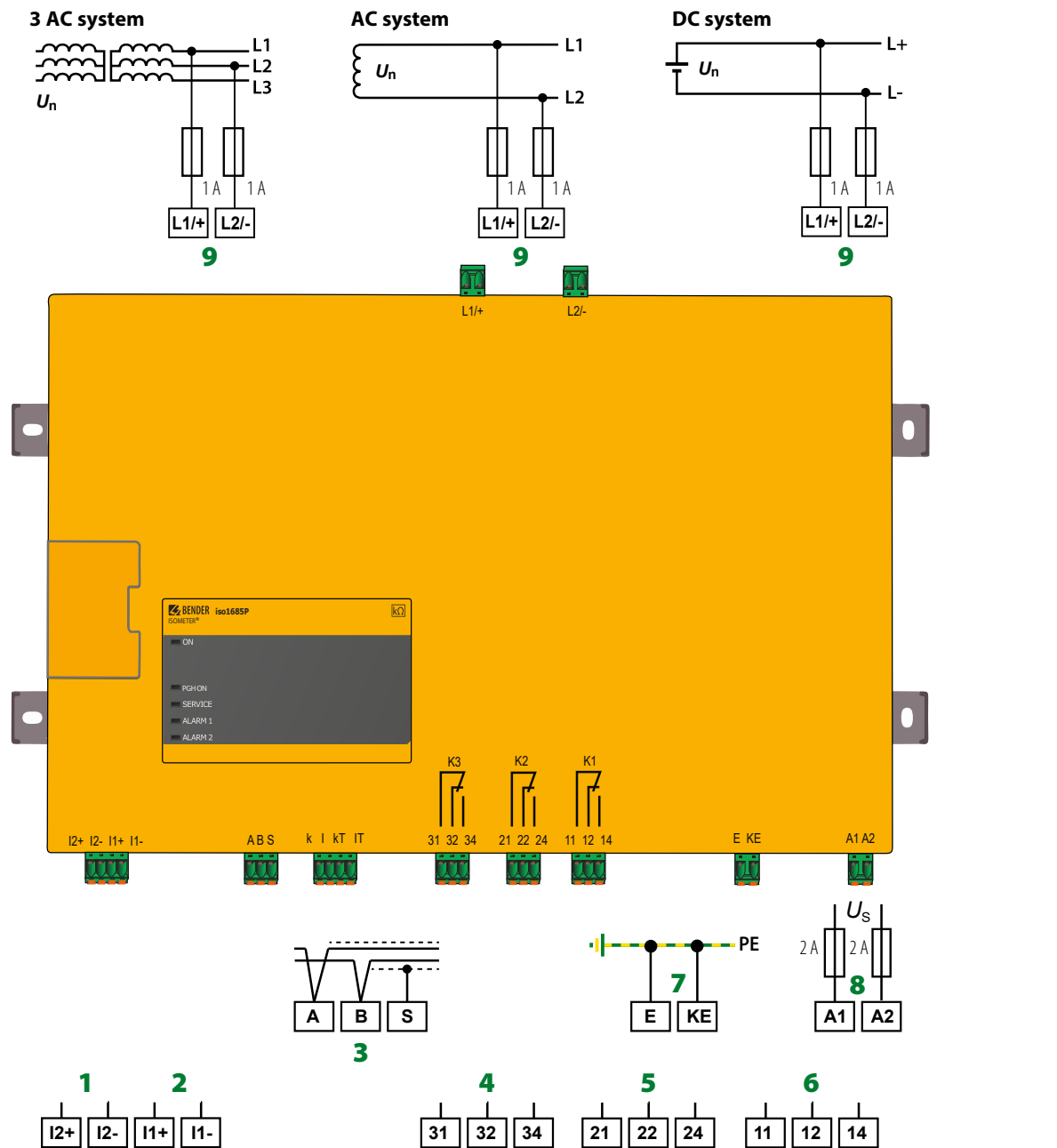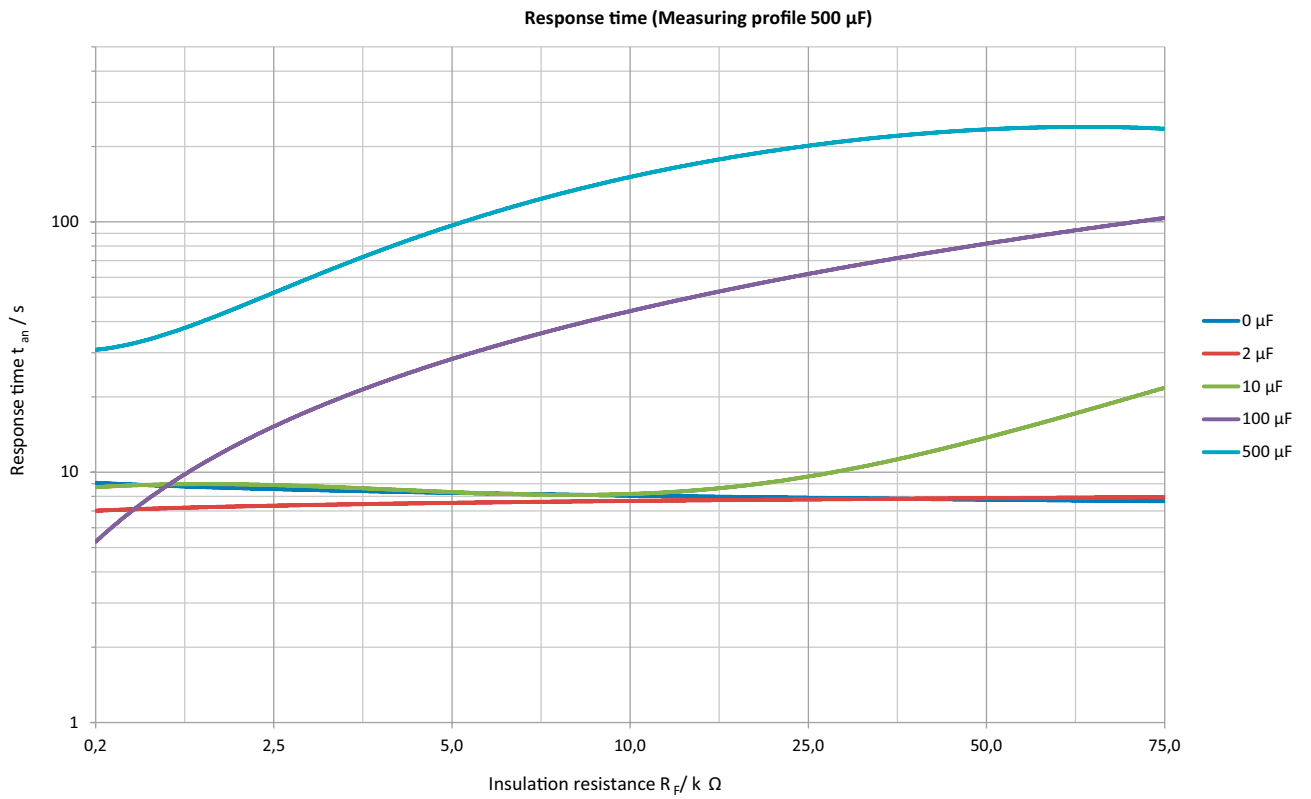**1** — ON (green) — Power On indicator: Flashes with a pulse duty factor of approx. 80 % and 1 Hz.

Device error: Lights continuously, when the device stops functioning (device stopped).

Software update: Flashes approx. three times faster during firmware update. Update time < 4 minutes

2 — PGH ON (yellow) — The LED „PGH ON" flashes during insulation fault location. It indicates that the locating current for the insulation fault location is generated.

3 — SERVICE (yellow) — Internal device and connection error (system, earth): Lights continuously.

4 — ALARM 1 (yellow) — Insulation fault 1 (prewarning): The „ALARM 1" LED lights continuously when the insulation resistance falls below the response value 1, $R_F < R_{an1}$

Flashes: Connection fault, check earth and system (L1/+, L2/−)

5 — ALARM 2 (yellow) — Insulation fault 2 (alarm): The „ALARM 2" LED lights continuously when the insulation resistance falls below the response value 2, $R_F < R_{an2}$

Flashes: Connection fault, check earth and system (L1/+, L2/−)

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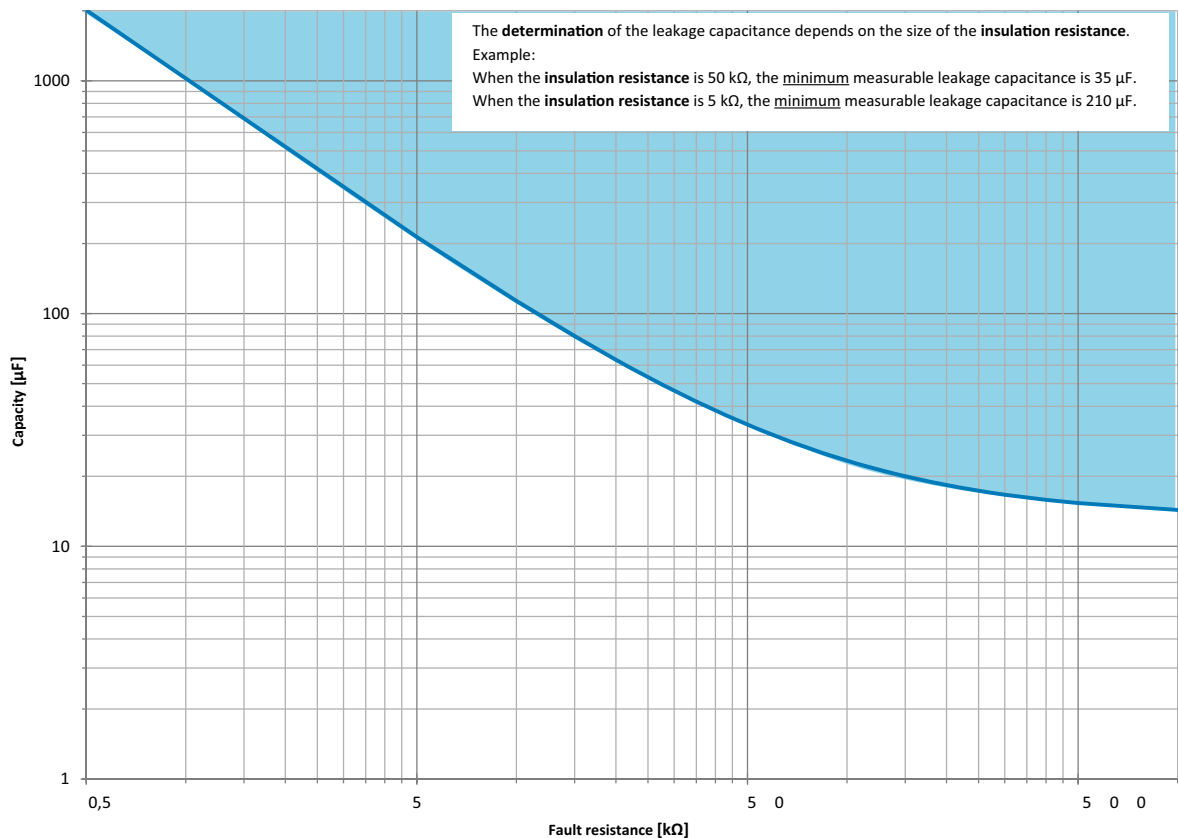## Anschlussschaltbild

3 AC system

L1
L2
L3
U_n
1 A · 1 A
L1/+ **L2/-**
9

AC system

U_n
L1
L2
1 A · 1 A
L1/+ **L2/-**
9

DC system

U_n
L+
L-
1 A · 1 A
L1/+ **L2/-**
9

L1/+ · L2/-

ON

PGH ON
SERVICE
ALARM 1
ALARM 2

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kΩ

K3 · K2 · K1

I2+ I2- I1+ I1-   A B S   k I kT IT   31 32 34   21 22 24   11 12 14   E KE   A1 A2

A · B · S
3

PE
E · KE
7

U_S
2 A · 2 A
A1 · A2
8

1 I2+ I2-   **2** I1+ I1-

4 31 32 34   **5** 21 22 24   **6** 11 12 14

1 -	**I2+, I2–**	Currently has no function, digital input	
2 -	**I1+, I1–**	Digital input	
3 -	**A, B, S**	Connection to BMS bus, RS-485, S = shield (connect one end to PE), can be terminated with S700	
4 -	**31, 32, 34**	Alarm relay K3 for internal device errors	
5 -	**21, 22, 24**	Alarm relay K2 for insulation faults alarm 2	
6 -	**11, 12, 14**	Alarm relay K1 for insulation faults alarm 1	
7 -	**E,KE**	Separate connections of E and KE to PE	
8 -	**A1, A2**	Connection to Us = DC 24 V via fuses, 2 A each	
9 -	**L1/+, L2/-**	Connection to the IT system to be monitored	

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Response time for insulation measurement

Response time (Measuring profile 500 µF)

Legend:
- 0 µF
- 2 µF
- 10 µF
- 100 µF
- 500 µF

Y-axis: Response time t_{an} / s
X-axis: Insulation resistance R_F / k Ω

The measurable leakage capacitance depends on the insulation resistance

Minimum limiting condition for determining the value of the capacitance

The **determination** of the leakage capacitance depends on the size of the **insulation resistance**.
Example:
When the **insulation resistance** is 50 kΩ, the minimum measurable leakage capacitance is 35 µF.
When the **insulation resistance** is 5 kΩ, the minimum measurable leakage capacitance is 210 µF.

Y-axis: Capacity [µF]
X-axis: Fault resistance [kΩ]

Technical data

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

Insulation coordination according to IEC 60664-1

Rated voltage	DC 1500 V
Overvoltage category (OVC)	III
Rated impulse withstand voltage	8 kV
Rated insulation voltage	1500 V
Pollution degree exterior	3
Voltage test, routine test (IEC 61010-1)	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 +6 %
Frequency range of U_n	DC, 1…460 Hz
Supply voltage U_S (see also device nameplate)	DC 18…30 V
Frequency range of U_S	DC
Power consumption	≤ 7 W

Measuring circuit for insulation monitoring

Measuring voltage U_m (peak value)	±50 V
Measuring current I_m (at $R_F = 0$ Ω)	≤ 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	≤ 500 µF (150 µF)*
Measuring range leakage capacitance	20…500 µF
Tolerance measurement of C_e	±10 % ±10 µF
Frequency range measurement of C_e	DC, 30…460 Hz

Response values for insulation monitoring

Response value R_{an1} (alarm 1)	200 Ω…1 MΩ (40 kΩ)*
Response value R_{an2} (alarm 2)	200 Ω…1 MΩ (10 kΩ)*
Condition response value	$R_{an1} ≥ R_{an2}$
Upper limit of the measuring range when set to $C_{emax} = 500$ µF	200 kΩ
Relative uncertainty (10 kΩ…1 MΩ) (acc. to IEC 61557-8)	±15 %
Relative uncertainty (0.2 kΩ…< 10 kΩ)	±200 Ω ±15 %
Hysteresis	25%

Time response

Response time t_{an} at $R_F = 0.5$ x R_{an} ($R_{an} = 10$ kΩ) and $C_e = 1$ µF acc. to IEC 61557-8	profile dependent, typ. 10 s

Measuring circuit for insulation fault location (EDS)

Locating current I_L DC	≤ 50 mA
Test cycle/pause	2 s/4 s
Nominal system voltage range U_n:	
AC ≥ 25 Hz, DC	AC 0…1000 V/DC 0…1500 V
AC < 25 Hz	AC 0…690 V

Memory

µSD card for history memory and log files	≤ 32 GB

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	
digital input 1	test (< 1 s)/standby (> 2 s)
digital input 2	reset
High level	10…30 V
Low level	0…0.5 V

Serial interface

Interface/protocol	RS-485/BMS
Connection	terminals A/B
Cable length	≤ 1200 m
Shielded cable (shield to functional earth on one end)	2-core, ≥ 0.6 mm², 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	2…33 (2)*

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, cannot be changed
Electrical endurance under rated operating conditions, number of cycles	100.000

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

Utilisation category	AC13	AC14	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
Rated insulation voltage					250 V
Minimum contact rating					1 mA at AC/DC ≥ 10 V

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 mm²0.25…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

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)	
iso1685P	3M4
iso1685PW	3M7
Transport (IEC 60721-3-2)	2M2
Long-term storage (IEC 60721-3-1)	1M3

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
Area of application	≤ 3000 m AMSL

Other

Operating mode	continuous operation
Position of normal use	vertical, system coupling on top
PCB fixation	lens head screw DIN7985TX
Tightening torque of the screws 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

( )* = Factory setting

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The Power in Electrical Safety©

Bender GmbH & Co. KG

P.O. Box 1161 • 35301 Grünberg • Germany
Londorfer Straße 65 • 35305 Grünberg • Germany
Tel.: +49 6401 807-0 • Fax: +49 6401 807-259
E-mail: info@bender.de • www.bender.de

BENDER Group